



[7590-01-P]

**NUCLEAR REGULATORY COMMISSION**

**10 CFR Part 50**

**[Docket No. PRM-50-113; NRC-2015-0230]**

**Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools**

**AGENCY:** Nuclear Regulatory Commission.

**ACTION:** Petition for rulemaking; denial.

**SUMMARY:** The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), dated September 10, 2015, submitted by Dr. Alexander DeVolpi (the petitioner). The petition was docketed by the NRC on September 21, 2015, and was assigned Docket No. PRM-50-113. The petitioner requested that the NRC amend its regulations to require “installation of ex-vessel instrumentation for uninterrupted monitoring of coolant and fuel in reactors and spent-fuel pools.” The NRC is denying the petition because the Commission finds that the issues raised by the petitioner have been addressed by actions taken by the NRC in response to the Fukushima Dai-ichi nuclear accident.

**DATES:** The docket for the petition for rulemaking, PRM-50-113, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

**ADDRESSES:** Please refer to Docket ID NRC-2015-0230, when contacting the NRC about the availability of information regarding this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2015-0230. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: [Carol.Gallagher@nrc.gov](mailto:Carol.Gallagher@nrc.gov). For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly-available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "ADAMS Public Documents" and then select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to [pdr.resource@nrc.gov](mailto:pdr.resource@nrc.gov). For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

**FOR FURTHER INFORMATION CONTACT:** Jennifer C. Tobin, Office of Nuclear Reactor Regulation, telephone: 301-415-2328; e-mail: [Jennifer.Tobin@nrc.gov](mailto:Jennifer.Tobin@nrc.gov); U.S. Nuclear Regulatory Commission, Washington DC 20555-0001.

**SUPPLEMENTARY INFORMATION:**

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### **I. The Petition**

Section 2.802 of title 10 of the *Code of Federal Regulations* (10 CFR), “Petition for rulemaking,” provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition dated September 10, 2015, from Dr. Alexander DeVolpi and assigned it Docket No. PRM-50-113. The NRC published a notice of docketing in the *Federal Register* (FR) on December 1, 2015 (80 FR 75009). The NRC did not request public comment on PRM-50-113 because it had sufficient information to review the issues raised by the petitioner.

The petitioner requested that the NRC amend 10 CFR part 50, “Domestic licensing of production and utilization facilities,” to require “installation of ex-vessel instrumentation for uninterruptible monitoring of coolant and fuel in reactors and spent-fuel pools.”

### **II. Reasons for Denial**

The NRC is denying the petition because the issues raised by the petitioner have been addressed through actions taken in response to the Fukushima Dai-ichi nuclear accident. The NRC determined that there is no sufficient technical or regulatory basis to amend the NRC’s regulations as requested by the petitioner.

The petitioner proposed that Recommendation 5.1A in the 2014 National Academy of Sciences (NAS) report entitled “Lessons Learned from the Fukushima Nuclear Accident for Improving Safety of U.S. Nuclear Plants” should be mandated (as an NRC regulation) to require installation of ex-vessel instrumentation for uninterrupted monitoring of coolant and fuel in reactors and spent fuel pools. The petitioner stated that NAS gave a high priority to this recommendation and the petitioner indicated that he has developed instrumentation that is capable of uninterrupted monitoring of critical thermodynamic parameters. The petitioner included diagrams and explanations of his patented instrumentation and supportive technical papers and requested that the NRC require use of such instrumentation to prevent or mitigate accidents. In particular, the petitioner contends that the accident at Three Mile Island, Unit 2 might have been prevented if real-time uninterrupted ex-vessel reactor water-level monitoring had been in place. Further, the petitioner states that one or two of the Fukushima Dai-ichi meltdowns might have been delayed or averted if uninterrupted ex-vessel real-time reactor water-level monitoring had been in place and operating on self-contained low-current battery supplies.

The NRC staff responded to the NAS report and its recommendations in SECY-15-0059, “Seventh 6-Month Status Update on Response to Lessons Learned from Japan’s March 11, 2011, Great Tōhoku Earthquake and Subsequent Tsunami,” dated April 9, 2015. The NRC staff’s discussion of Recommendation 5.1A in enclosure 6 of SECY-15-0059 addresses the installation of ex-vessel instrumentation for uninterrupted monitoring of coolant and fuel in reactors and spent fuel pools. The NRC staff found that this recommendation was addressed by existing requirements and other ongoing activities. The issues that the petitioner’s proposal would address are being or have already been addressed by NRC actions taken in response to the Fukushima Dai-ichi nuclear accident, as summarized in this document.

Instrumentation used to support strategies in the mitigation of beyond-design-basis events is addressed in Order EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." This Order ensures that plant operators have the information concerning key parameters needed to support implementation of mitigation strategies to maintain or restore core cooling, spent fuel pool cooling, and containment prior to the onset of core or spent fuel damage. Either installed instrumentation remains powered during an extended loss of alternating current power via safety-related batteries and other power supplies that provide coping capabilities for an indefinite period of time, or portable instruments are used that are independent from installed plant power systems. If mitigation strategies are not successful and severe accident conditions develop, the enhancements made in response to Order EA-12-049 will provide for monitoring of key parameters on the condition of the reactor, containment, and spent fuel pool throughout the accident's progression until instrumentation becomes unavailable or unreliable. These enhancements should also enable licensees to more easily transition to the use of computational aids when direct diagnosis of key plant conditions cannot be determined reliably from instrumentation. Further, spent fuel pool instrumentation is also required by Order EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," to remotely report three distinct water levels: normal level; low level but still enough to shield workers above the pools from radiation; and a level near the top of the spent fuel rods, at which more water should be added without delay.

Following the issuance of the Orders, the NRC staff presented its evaluation of enhanced instrumentation for beyond-design-basis conditions in enclosure 5 to SECY-15-0137, "Proposed Plans for Resolving Open Fukushima Tier 2 and 3 Recommendations." The staff recommended that that the Commission not pursue additional regulatory requirements for

enhanced reactor and containment instrumentation. The NRC staff concluded that additional studies are unlikely to support additional regulatory requirements related to enhanced reactor and containment instrumentation for beyond-design-basis conditions, when evaluated against the criteria for operating reactors in § 50.109, "Backfitting," or the issue finality provisions of 10 CFR part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

In the staff requirements memorandum associated with SECY-15-0137, the Commission directed the NRC staff to provide the final results of its evaluation following interactions with external stakeholders and the Advisory Committee on Reactor Safeguards (ACRS). Accordingly, the NRC staff provided updated information regarding enhanced reactor and containment instrumentation for beyond-design-basis conditions in enclosure 2 to SECY-16-0041, "Closure of Fukushima Tier 3 Recommendations Related to Containment Vents, Hydrogen Control, and Instrumentation." The updated information addressed the observations provided by the ACRS in letters dated November 16, 2015, and March 15, 2016, and insights provided by external stakeholders. For example, information was added to the final assessment that describes the technical support guidance (TSG) for the severe accident management guidelines (SAMGs) and related assessments of plant parameters as well as the status of safety functions that would be performed by plant personnel during a severe accident. The SAMGs are entered when plant conditions indicate that cooling of the spent fuel pool or core cannot be maintained and the fuel in the spent fuel pool or reactor is on a trajectory towards damage. The SAMGs then invoke the TSGs that are based on an engineering evaluation of the scenario. This would include an assessment of the available parameter indications, their functional consistency, and their trends as the plant transitions to severe accident conditions, which may be more severe than the conditions assumed in instrument design and environmental qualifications. The severe accident response strategies are then

based on fundamental principles that do not rely on precise indications of parameter values, but rather on an integrated technical assessment of the evolving event scenario and the conditions that preceded the onset of fuel damage in the spent fuel pool or core.

The additional NRC staff evaluations further support the conclusion that regulatory actions to require enhancements to reactor and containment instrumentation to support the response to severe accidents would not provide a substantial safety enhancement, and therefore, additional regulatory actions would not be warranted when evaluated against the § 50.109 criteria. The ACRS agreed in its March 15, 2016, letter that no further regulatory action is warranted in support of the closure of the recommendation on enhanced instrumentation.

In addition to the discussions in SECY-15-0137 and SECY-16-0041, the NRC staff notes that, depending on an accident's progression, licensees will use available indicators and technical assessments of the evolving scenario to implement adequate measures to protect public health and safety in accordance with the NRC's emergency preparedness requirements. If an accident progresses to fuel damage, specific additional actions may be required, including initiating predetermined protective actions for the public.

Moreover, the NRC is proposing to amend its regulations to establish regulatory requirements for nuclear power reactor applicants and licensees to mitigate beyond-design-basis events to reflect requirements imposed on current licensees by Order and the lessons learned from the Fukushima Dai-ichi accident. This proposed rule, "Mitigation of Beyond-Design-Basis Events," which was published in the *Federal Register* on November 13, 2015 (80 FR 70610; corrected November 30, 2015 at 80 FR 74717), would, among other things, add a new regulation (proposed 10 CFR 50.155) to make Orders EA-12-049 and EA-12-051 generically applicable, establish regulatory requirements for an integrated response capability,

and include requirements for enhanced onsite emergency response capabilities.

Therefore, in accordance with the NRC staff's evaluation in SECY-15-0137, the Commission's direction on SECY-15-0137, updated information provided in SECY-16-0041, and existing emergency preparedness requirements, and the proposed Mitigation of Beyond-Design-Basis Events rulemaking, the NRC has determined that additional instrumentation requirements to address severe accident conditions proposed in PRM-50-113 are not necessary.

### III. Conclusion

For the reasons cited in Section II of this document, the NRC has concluded that the issues raised by the petitioner have been addressed by NRC actions taken in response to the Fukushima Dai-ichi nuclear accident and there is no sufficient technical or regulatory basis to amend the NRC's regulations as requested by the petitioner. Therefore, the NRC is denying PRM-50-113.

### IV. Availability of Documents

The documents identified in the following table are available to interested persons through one or more of the methods listed in the ADDRESSES section of this document.

<b>DOCUMENT</b>	<b>ADAMS ACCESSION NO. / WEB LINK / FEDERAL REGISTER CITATION</b>
ACRS Letter, "Plans for Resolving the NRC Near-Term Task Force Open Fukushima Tier 2 and 3 Recommendations," November 16,	ML15320A074

2015.	
ACRS Letter, "Closure of Fukushima Tier 3 Recommendations Related to Vents, Hydrogen Control, and Enhanced Instrumentation," March 15, 2016.	ML16075A330
<i>Federal Register</i> notice, "Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools," December 1, 2015.	80 FR 75009
<i>Federal Register</i> notice, "Mitigation of Beyond-Design-Basis Events," November 13, 2015.	80 FR 70610 (corrected by 80 FR 74717; November 30, 2015)
Letter from Nuclear Energy Institute to NRC, "Submittal of Industry Initiative to Maintain Severe Accident Management Guidelines," October 26, 2015.	ML15335A442
National Academy of Sciences, "Lessons Learned from the Fukushima Nuclear Accident for Improving Safety of U.S. Nuclear Plants," 2014.	<a href="http://www.nap.edu/read/18294/chapter/1">http://www.nap.edu/read/18294/chapter/1</a>
NRC Generic Letter 1982-033, "Supplement 1 to NUREG-0737 – Requirements for Emergency Response Capability," December 17, 1982.	ML031080548
NUREG-0933, "Resolution of Generic Safety Issues," December 2011.	<a href="http://nureg.nrc.gov/sr0933">http://nureg.nrc.gov/sr0933</a>
Order EA-12-049, "Issuance of Order to Modify Licenses With Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," March 12, 2012.	ML12054A735
Order EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," March 12, 2012.	ML12056A044
PRM-50-113, "Uninterruptible Monitoring of Critical Thermodynamic Parameters (Coolant and Fuel in Reactors and Spent-Fuel Pools)," September 10, 2015.	ML15264A857
SECY-15-0059, "Seventh 6-Month Status Update on Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Subsequent Tsunami," April 9, 2015.	ML15069A444 ML15069A568 (enc. 3) ML15069A600 (enc. 6)
SECY-15-0065, "Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)," April 30, 2015.	ML15049A201
SECY-15-0137, "Proposed Plans for Resolving Open Fukushima Tier 2 and 3 Recommendations," October 29, 2015.	ML15254A006 ML15254A034 (enc. 5)
SECY-16-0041, "Closure of Fukushima Tier 3 Recommendations Related to Containment Vents, Hydrogen Control, and Enhanced Instrumentation," March 31, 2016.	ML16049A079
SRM-SECY-15-0065, "Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)," August 27, 2015.	ML15239A767

SRM-SECY-15-0137, "Proposed Plans for Resolving Open Fukushima Tier 2 and 3 Recommendations," February 8, 2016.
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ML16039A175
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Dated at Rockville, Maryland, this 14th day of February, 2017.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,  
Secretary of the Commission.

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