UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 6, 2016

Ms. Victoria K. Anderson, Senior Project Manager
Nuclear Energy Institute
1201 F. Street, NW, Suite 1100
Washington DC 20004

SUBJECT: RESPONSE TO LETTER REGARDING INDUSTRY TABLETOP PILOT EXERCISE OF DRAFT NUREG-2180, "DETERMINING THE EFFECTIVENESS, LIMITATIONS, AND OPERATOR RESPONSE FOR VERY EARLY WARNING FIRE DETECTION SYSTEMS IN NUCLEAR FACILITIES"

Dear Ms. Anderson:

Thank you for providing the results from a tabletop pilot exercise using the information contained in a pre-publication version of NUREG-2180, "Determining the Effectiveness, Limitations, and Operator Response for Very Early Warning Fire Detection Systems in Nuclear Facilities." We appreciate the time and effort it took you and those supporting the tabletop pilot to complete this initiative.

NUREG-2180 documents a confirmatory research project requested by the Office of Nuclear Reactor Regulation (NRR) following the issuance of an interim staff position documented in Frequently Asked Question (FAQ) 08-0046, "Incipient Detection." The basis for the interim staff position was the staff's understanding of very early warning fire detection (VEWFD) systems and failure modes of electrical and electronic equipment in nuclear power plants. NUREG-2180 provides the most comprehensive and complete evaluation to date on the performance of VEWFD systems, human response, and operating experience related to detecting fires during the incipient stage in nuclear power plant installations. This report has significantly advanced the state of knowledge and approaches for evaluating smoke detection performance during the incipient stage. This information was not available when the interim staff position was developed to support closure of FAQ 08-0046, "Incipient Detection." All objectives as identified in Section 1.4 of the report are complete as documented in the report.

In your letter dated July 28, 2016, concerns are raised with several aspects outside of the scope of NUREG-2180. One of the concerns raised is related to fire modeling assumptions and approaches, specifically fire growth timing, which model the fire development subsequent to the incipient stage. The NRC recognizes this is an area where operational experience may be pertinent to methodology advancements and is currently working with the Electrical Power Research Institute (EPRI) under a Memorandum of Understanding to investigate potential advancements in fire growth behavior. NUREG-2180 supports using fire modeling approaches acceptable to the NRC to estimate the *time to damage*, which is an input to the NUREG-2180 approach. The most advanced methods that support fire modeling of electrical enclosure hazards are described in NUREG/CR-2178, "Refining and Characterizing Heat Release." Thus, NUREG-2180 does address fire growth modeling and does not predict the time when fire-induced damage occurs.

Based on discussions with NRC staff, the information contained in your letter dated July 28, 2016, provides additional details not presented at the July 21 meeting conducted between NRC-RES, NRC-NRR and the Electric Power Research Institute (EPRI) under the NRC-RES/EPRI Memorandum of Understanding. The July 21, 2016 meeting included NEI presentations of the results and preliminary recommendations by NEI on a path forward. Our response to the individual points made in your July 28, 2016 letter, were provided during a September 20, 2016 public meeting and additionally formal responses to these concerns are enclosed.

Presentations and a meeting summary from the September 20, 2016 meeting can be found in ADAMS under Accession No. ML16270A594. Based on feedback from industry representatives at this meeting, additional clarifications regarding incorporation of the de-energization strategy have been added to the NUREG. A de-energization approach would necessitate performing a detailed human reliability analysis based on plant specific information to quantify human error probabilities (HEPs) and risk reduction.

In NUREG-2180, the duration of the incipient stage is used to support estimation of HEPs via a human reliability analysis. At the September 20, 2016 meeting, NEI recommended an expert elicitation process be conducted to better understand the duration of the incipient stage. Although NUREG-2180 has identified such an effort as an 'alternative approach' to the one taken in the report, the approach presented in NUREG-2180 is substantiated by a rigorous search, review, evaluation and incorporation of operating experience into the NUREG. In probabilistic risk assessment, use of data is preferable over judgment. The sensitivity study included in NUREG-2180, along with the NEI tabletop analysis, demonstrates that the HEPs, which use timing information developed from operating experience, have minimal impact on the overall quantification results. Therefore, current operating practices as modeled in NUREG-2180 indicate that changes to the incipient stage duration estimate (if any) will have little effect on the end result. As such, the NRC does not plan to perform an expert elicitation exercise.

If NEI chooses to perform an expert elicitation, we suggest following the guidance contained in ASME/ANS RA-Sa-2009, "Addenda to ASME/ANS RA-S-2008 Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications" as endorsed by Revision 2 of Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities." Section 1-4.3, "Use of Expert Judgment," of the ASME/ANS standard identifies guidance documents for performing expert elicitation efforts, along with insights into both the strength and potential pitfalls of using experts. If NEI or industry conducts an expert elicitation, representatives from NRR and RES would be interested in observing. In addition, NUREG-2180 provides a framework, developed in cooperation with EPRI for the collection of future operational experience in Appendix G "VEWFD Systems Data Collection." As future operational experience with VEWFD systems becomes available updates to the methodology could be made as appropriate.

We appreciate the time and effort NEI and licensees have made in commenting on NUREG-2180 as well as providing operating experience and observations and discussions of installed VEWFD systems at various facilities. Based on our interactions and feedback on this report, no new information has been provided that changes the results of this report. As such, the NRC will issue NUREG-2180 as a final report.

Please contact Gabriel Taylor at (301) 415-0781 or via e-mail at gabriel.taylor@nrc.gov, if you require any additional information.

Sincerely,

/RA/

Mark Thaggard, Acting Director
Division of Risk Analysis
Office of Nuclear Regulatory Research

Enclosure:
As stated

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As stated

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