May 11, 2009

The Honorable Byron Dorgan
Chairman, Subcommittee on Energy
and Water Development
Committee on Appropriations
United States Senate
Washington, D. C. 20510

Dear Mr. Chairman:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am providing the enclosed report on the status of the NRC's fire safety requirements for nuclear power reactors. This report is in response to Congressional direction contained in the Explanatory Statement that accompanied the Omnibus Appropriations Act of 2009.

The report provides background information on this issue and describes how NRC licensees are required to comply with either deterministic or performance-based fire protection requirements, the application of standards developed by independent entities, the status of the fire safety pilot project, and the transparency and public access to NRC activities.

The NRC takes the issue of fire protection very seriously. The Commission will continue to monitor this important issue until the fire protection regulatory infrastructure has been sufficiently stabilized. Please contact me with any other questions you may have on this issue.

Sincerely,

/RA/

Dale E. Klein

Enclosure:
Report on Status of the Fire Safety
Requirements for Nuclear Power Reactors

cc: Senator Robert F. Bennett

Identical letter sent to:

The Honorable Byron Dorgan
Chairman, Subcommittee on Energy
and Water Development
Committee on Appropriations
United States Senate
Washington, D. C. 20510
cc: Senator Robert F. Bennett

The Honorable Peter J. Visclosky
Chairman, Subcommittee on Energy
and Water Development
Committee on Appropriations
United States House of Representatives
Washington, D.C. 20515
cc: Representative Rodney Frelinghuysen

REPORT ON STATUS OF THE FIRE SAFETY REQUIREMENTS FOR NUCLEAR POWER REACTORS

May 2009

Enclosure

I. Overview

All operating nuclear power reactors comply with the U.S. Nuclear Regulatory Commission's (NRC's) fire safety requirements or have compensatory measures in place that assure adequate protection of the public. However, ultimately it is the NRC's goal to have licensees in compliance with the regulations without the reliance on compensatory measures.

The NRC's fire protection regulation in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.48, "Fire Protection," provides the agency's regulatory requirements for nuclear power plant fire protection activities. It includes two regulatory frameworks that licensees may use to establish fire safety programs for nuclear power facilities:

- the prescriptive deterministic fire protection rule included in 10 CFR 50.48(b) and Appendix R, and

- the risk-informed, performance-based fire protection rule included in 10 CFR 50.48(c) and National Fire Protection Association (NFPA) Standard 805.

Appendix R was published in 1981 and uses prescriptive requirements. The performance-based fire protection rule published in 2004 incorporates, by reference, the 2001 revision of NFPA 805. This rule uses advances in computerized fire modeling and fire risk analyses that have been developed since the NRC issued the deterministic fire protection rule in 1981. The risk-informed, performance-based rule focuses attention on issues that have a higher impact on plant safety, while reducing regulatory requirements that have a low impact on plant safety.

Both of these frameworks provide requirements that ensure adequate public safety through multiple levels of protection using the concept of "defense-in-depth." The "defense-in-depth" concept includes facility design, procedures, and practices that prevent fires from occurring; engineered systems and personnel capability to rapidly detect and extinguish fires that do occur; and nuclear safety system designs, which provide assurance that fires that do occur cannot impact the successful performance of essential safety functions.

II. Application of the Deterministic Fire Protection Rules 10 CFR 50.48(b) and Appendix R

The deterministic fire protection rules contain prescriptive requirements such as specific ratings for fire barriers (e.g., ability to withstand a fire for 3 hours), specific requirements for the installation of fire protection systems, and specifications for separation distances between redundant safe-shutdown equipment (e.g., 20 feet of separation without intervening combustibles).

The "one size fits all" nature of the prescriptive requirements creates significant safety margins in certain areas while assuring adequate safety margins in others. Licensees were challenged to meet these prescriptive requirements, since the requirements were imposed in 1981 after the majority of the currently operating plants were designed or built. Where meeting the requirements created undue hardship without safety benefit, licensees requested and were granted appropriate exemptions to the specific requirements.

Since promulgation of the deterministic fire protection regulations in 1981, a number of implementation details required clarification to assure consistent, predictable, and efficient implementation of the rules. In addition, a number of fire safety generic issues have been identified and all but one has been resolved. For example, the staff has worked with industry to address certain fire barrier systems issues based on the information received from licensees' response to a generic letter and the results of related inspections. The NRC staff determined that plants that have not committed to adopt 10 CFR 50.48(c) (NFPA 805) have resolved the fire barrier systems issues through approvals for exemptions or by completion of plant modifications to achieve compliance (plants that are transitioning to the new risk-informed, performance-based fire protection requirements are being handled differently as discussed in Section III, below). The one remaining generic issue with regard to the deterministic fire protection regulations concerns an unlikely, but possible, scenario during which the equipment necessary to assure the safety of the plant improperly operates or fails to operate due to fire damage, causing multiple simultaneously occurring circuit faults in separate wires. The NRC anticipates finalizing a resolution for this final issue during 2009.

Licensees who comply with the prescriptive deterministic fire protection requirements in 10 CFR 50.48(b) and Appendix R are providing adequate protection of the public health and safety.

III. Application of the Risk-Informed, Performance-Based Fire Protection Requirements 10 CFR 50.48(c) and NFPA 805

In June 2004, the NRC promulgated 10 CFR 50.48(c) endorsing NFPA 805, a performance-based fire protection rule. Licensees may choose to voluntarily adopt the new risk-informed, performance-based fire protection requirements in 10 CFR 50.48(c) and NFPA 805 in place of the prescriptive requirements of 10 CFR 50.48(b) and 10 CFR Part 50, Appendix R. The performance-based fire protection rule combines prescriptive, performance-based, and risk-informed methods to provide adequate protection and meet nuclear safety criteria in the event of a fire.

Fire models simulate fire behavior using sophisticated calculations. Advances in computer technology have allowed these models to more accurately and precisely simulate fire behavior and fire conditions in nuclear power plant environments. The NRC has verified and validated the applicability of several fire models for use in nuclear power plant applications. Fire probabilistic risk assessment (PRA) is a tool that quantitatively evaluates the frequency of fires, the effectiveness of fire detection and suppression capabilities, and the impact of fires on nuclear safety.

Nuclear facilities that comply with 10 CFR 50.48(c) and NFPA 805 will have fire PRAs and fire models that comport with NRC guidance and will have the flexibility to change their fire protection programs within the limits specified in 10 CFR 50.48(c), NFPA 805, and the conditions in their plant-specific license without prior NRC staff approval. The limits placed upon self approval of changes include consideration of fire risk, defense-in-depth, and safety margins. This flexibility will improve efficiency and effectiveness by focusing NRC resources on issues that have a greater impact on safety. The NRC will review a sample of these changes as part of its routine reactor oversight inspection program.

As allowed by the NRC approved fire protection programs, plants that are transitioning to 10 CFR 50.48(c) are maintaining safety using compensatory measures while resolving their fire protection issues as part of their transition to NFPA 805. Additionally, the Commission expects

that licensees will identify new fire protection-related issues as a result of information learned during their transition to NFPA 805. The Commission has issued an enforcement discretion policy which allows licensees limited enforcement discretion from the date that the licensee commits to adopting NFPA 805. This policy was established by the Commission to allow licensees to inform their decisions with the results and lessons learned from the pilot plant studies discussed in section V, below, and to avoid making decisions before they complete a full analysis if the issues.

IV. Application of Independent Consensus Standards

10 CFR 50.48(c) endorses NFPA 805, a national consensus standard developed by the National Fire Protection Association. The NRC's reliance upon NFPA 805 comports with the National Technology Transfer and Advancement Act of 1995 (Pub. L. 104-113), which requires that Federal agencies use technical standards that are developed or adopted by voluntary consensus standards bodies unless inconsistent with applicable law or otherwise impractical. The American National Standards Institute approved NFPA 805 as an American National Standard in 2001. The NRC participated in the development of NFPA 805, and continues to maintain membership on the technical committee responsible for NFPA 805.

The development of 10 CFR 50.48(c) is also consistent with the 1995 NRC policy on enhancing the use of PRA in nuclear regulation. The rulemaking process is an open public process in accordance with the Administrative Procedure Act. Extensive public participation and comment opportunities were provided during development of the rule.

The NRC also relies on risk analysis standards developed by the American Nuclear Society and the American Society of Mechanical Engineers to implement the risk attributes of the regulation. The NRC has participated, and continues to participate with these organizations' efforts to develop PRA quality standards that are applied, as appropriate, to all risk-informed agency activities, including fire protection.

V. Status of the NFPA 805 Fire Safety Pilot Projects and Transparency of Implementation

To support the implementation of 10 CFR 50.48(c) and NFPA 805, two U.S. nuclear facilities volunteered to be pilot plants to test the implementation process for the rule. These pilot plants are the Oconee Nuclear Power Plant in South Carolina and the Shearon Harris Nuclear Power Plant in North Carolina. The pilot plants began their transition to the performance-based fire protection rule in mid-2005. The activities that these licensees have completed to date include development of fire models and fire PRAs, and evaluation of the facility using advanced analytical tools. In mid-2008, after completing a large number of transition activities, both plants submitted requests to amend their licenses as required by 10 CFR 50.48(c). If the NRC approves the license amendments the two pilot plants will complete additional plant modifications, finalize the development of procedures, and finish their transition to NFPA 805.

As part of the pilot process, the NRC staff has conducted frequent public meetings with the pilot plant licensees, both at the local sites as well as at NRC headquarters, to discuss the progress in implementing the requirements. These meetings occurred both before and after the formal submittal of the license amendment applications. The agency has also developed a public process to resolve implementation issues identified during the transition process. This process is documented in Regulatory Issue Summary 2007-019, "Process for Communicating Clarifications of Staff Positions Provided in Regulatory Guide 1.205 Concerning Issues Identified

during the Pilot Application of National Fire Protection Association Standard 805," dated August 20, 2007. A copy of this Regulatory Issue Summary is attached. As with any "first of a kind" technical analysis evaluation, implementation challenges are expected. Public meetings to discuss these challenges are conducted monthly. Occasionally, information that is business proprietary or otherwise sensitive will be discussed in closed meetings with the licensees. The non-proprietary and non-sensitive information submitted by the licensee as part of the license amendment process is available to the public.

The NRC is scheduled to complete the review of the pilot plant applications in late 2009 and early 2010 for Shearon Harris and Oconee respectively. NRC also plans to use lessons learned from those pilot plants to complete the development or update of regulatory guidance documents.

Based on the analyses that the licensees have completed as part of the transition to the performance-based fire protection rule, licensees have identified plant and program changes that are needed to meet the requirements of 10 CFR 50.48(c). The NRC may revise the licenses for these plants, as necessary, to document those changes. To date, 51 of the 104 operating nuclear power reactors have provided letters of intent stating they intend to transition to NFPA 805. The NRC expects to receive additional licensee 10 CFR 50.48(c)-related submittals in 2010 after completion of the review of the pilot plant applications.

Finally, the NRC staff performs quarterly, annual, and triennial fire safety inspections of every operating nuclear power reactor. Specialized procedures are being implemented for those units transitioning to the new fire protection requirements. The scope and results of those inspections are documented in publicly available reports and discussed annually in public meetings held near each site.

VI. Conclusion

All operating power reactors have fire protection programs in place that protect the public health and safety. Power reactor licensees have two regulatory frameworks within which to achieve adequate protection in the area of fire safety.

In 2004, the NRC established an alternative risk-informed, performance-based fire protection regulation. This regulation is based on guidelines developed by independent consensus engineering and scientific societies and uses advances in fire PRA and fire modeling technology to increase NRC's and licensees' focus on issues important to safety. Two pilot plants are currently testing the implementation of this rule.

NRC fire protection regulation and guidance development, licensing activities, and inspections are conducted in a transparent manner open to the public.

Attachment:
Regulatory Issue Summary 2007-019,
dated August 20, 2007