January 14, 2011

MEMORANDUM TO: AFPB Files

FROM: Alexander R. Klein, Branch Chief ***/RA/***
Fire Protection Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

SUBJECT: CLOSE-OUT OF NATIONAL FIRE PROTECTION ASSOCIATION 805 FREQUENTLY ASKED QUESTION 09-0056 ON RADIOACTIVE RELEASE TRANSITION

Frequently Asked Question (FAQ) 09-0056 was proposed by the U. S. Nuclear Regulatory Commission (NRC) through the Nuclear Energy Institute (NEI) National Fire Protection Association (NFPA) 805 Task Force, to clarify the guidance for radioactive release transition in NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program under Title 10 of the *Code of Federal Regulations* (10 CFR) 50.48(c)."

Background

NFPA 805 Section 1.3.2, Radioactive Release Goal, states:

> *The radioactive release goal is to provide reasonable assurance that a fire will not result in a radiological release that adversely affects the public, plant personnel, or the environment.*

NFPA 805 Section 1.4.2, Radioactive Release Objective, states:

> *Either of the following objectives shall be met during all operational modes and plant configurations.*
> *(1) Containment integrity is capable of being maintained.*
> *(2) The source term is capable of being limited.*

NFPA 805 Section 1.5.2, Radioactive Release Performance Criteria, states:

> *Radiation release to any unrestricted area due to the direct effects of fire suppression activities (but not involving fuel damage) shall be as low as reasonably achievable and shall not exceed applicable 10 CFR, Part 20, Limits.*

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While not specifically endorsed by 10 CFR 50.48(c), NFPA Section A.4.3, Radiation Release, states:

> *Radioactive releases can take the form of solids, liquids, or gases generated from the combustion of radioactive material, the fire-related rupture of holding vessels, or fire suppression activities." The model used for determining the plant risk can be a bounding risk analysis, a qualitative risk analysis, or a detailed risk analysis such as a Level III PRA. Effects from radioactive releases can be estimated from comparison of source terms and do not necessarily require detailed determination of health effects.*
>
> *Release of radioactivity is defined to include releases from all sources such as primary containment buildings, radioactive waste processing, and so forth.*

Summary of NRC Staff Proposal

A licensee must show that the radioactive release goals, objectives, and performance criteria are met. Therefore, licensees must evaluate fire risks and fire protection for various scenarios (most likely not involving fuel damage (see below)) that could lead to radioactive release to an unrestricted area.

Furthermore, methods for achieving radioactive release performance criteria must be addressed on a fire area-by-fire area basis (NFPA 805 Section 2.2.4). However, with proper justification, this criterion may be met on a finer or coarser level, such as fire zone or grouping fire areas together if the same measures, systems, and procedural controls apply. Additionally, the review for radioactive release must cover all plant operational modes, including full power and non-power modes.

The treatment of radiological release to any unrestricted area due to fire is focused on potential radioactive release due to potential fuel damage and fire fighting activities.

Fuel Damage

- The Nuclear Safety Performance Criteria (NSPC) already requires the prevention of fuel cladding damage. As such, radiological release due to fuel damage should not require a separate examination since no such damage is assumed to occur without violating the basic requirements of NFPA 805. This effectively limits the source of radiation (release source term). Containment integrity should not require specific examination. This means the scope of the fire protection analyses need not be expanded to include all containment isolation valves.

- The use of NFPA 805 Section 4.2.3 explicitly meets the radioactive release objective by limiting the source term (no fuel damage). The use of NFPA 805 Section 4.2.4 and Section 4.2.4.1 also explicitly meets the radioactive release objective by limiting the source term (no fuel damage and success path free of fire damage with margin between the Maximum Expected Fire Scenario and Limiting Fire Scenario). The use of NFPA 805 Section 4.2.4 and Section 4.2.4.2 meets the radioactive release goal by providing "reasonable assurance that a fire will not result in a radiological release that adversely affects the public, plant personnel, or the environment" via a measure of CDF and LERF along with defense in depth and safety margin considerations.

Fire Fighting Activities

- The Radioactive Release Performance Criteria (NFPA 805 Section 1.5.2) requires that radiation release to unrestricted areas due to direct affects of fire suppression activities shall be low as reasonably achievable and shall not exceed the limits designated in the plant's Technical Specifications.

The combination of the above limits the radioactive release review to fire fighting activities and the control of combustion products (smoke and particulates) and the control of fire fighting agents (primarily water).

- The potential for radiological release due to fire fighting activities should be addressed via fire pre-plans, fire brigade training, and engineering controls. The objective is to address the potential for the loss of boundary control for contaminated spaces.

Compliance with the radioactive release goals, objectives, and performance criteria, can be demonstrated as follows:

- Review fire pre-plans and fire brigade training materials to identify Fire Protection Program elements (for example systems / components / procedural control actions / flow paths, etc.) that are being credited to meet the radioactive release goals, objectives, and performance criteria during all plant operating modes, including full power and non-power conditions.

- Review engineering controls to ensure containment of gaseous and liquid effluents (for example smoke and fire fighting agents). This review shall cover all plant operating modes (including full power and non-power conditions). Otherwise, provide a bounding analysis, quantitative analysis, or other analysis that demonstrates that the limitations for instantaneous release of radioactive effluents specified in the unit's Technical Specifications are met. Examples of these limitations are sections 5.5.4.g (gaseous effluents) and 5.4.4.b (liquid effluents) of the Standard Technical Specifications.

Since the limitations for instantaneous release of radioactive effluents in a licensee's Technical Specifications are structured to provide reasonable assurance that the 10 CFR Part 20 limits are maintained, it is the NRC staff position that these limitations are appropriate to meet the NFPA 805 Radioactive Release Performance Criteria (NFPA 805 Section 1.5.2).

<u>Summary of Information Expected to be Submitted by a Licensee</u>

- Justification of the radioactive release review compartmentation, if performed on other than a fire area basis.
- Results of the review of pre-fire plans.
- Results of the review of fire brigade training materials.
- Results of the review of engineering controls for gaseous effluents.
- Results of the review of engineering controls for liquid effluents.

Conclusion

Technical exchange between the NRC staff and the NEI Task Force has led to the clarification documented in Revision 2 to this FAQ. The NRC staff finds that nothing in this FAQ would prevent continued endorsement of NEI 04-02. In accordance with RIS 2007-19, "Process for Communicating Clarifications of Staff Positions Provided in Regulatory Guide 1.205 Concerning Issues Identified during the Pilot Application of NFPA Standard 805," the guidance in this FAQ is acceptable for use by licensees in transition. The final endorsement of this FAQ will be addressed by a revision to Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants."

References:

For details regarding this FAQ, please see the following:

- FAQ 09-0056, Revision 0 (Agency-wide Documents Access and Management System (ADAMS) accession number ML090490170)
- Industry Response to FAQ 09-0056, Revision 0 (ADAMS accession number ML100060137)
- FAQ 09-0056, Revision 1 (ADAMS accession number ML102040149)
- FAQ 09-0056, Revision 2 (ADAMS accession number ML102810600)
- NEI 04-02, Revision 2 (ADAMS accession number ML081130188)
- NFPA 805, 2001 Edition (available through the Public Document Room or NFPA)
- Regulatory Guide 1.205, Revision 1 (ADAMS accession number ML092730314)
- NFPA 805 FAQ Process Document, Revision 1 (ADAMS accession number ML061660105)
- RIS 2007-19 (ADAMS accession number ML071590227)

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