

FAQ Number: 09-0056

FAQ Revision: 0

FAQ Title: Radioactive Release Transition

Plant: N/A

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Submitter Contact: NRC (Harold Barrett)

Phone: 301-415-1402

Email: Harold.Barrett@nrc.gov

Purpose of FAQ:

A sufficient level of information is required to demonstrate compliance with NFPA 805 Radioactive Release Criteria.

Interpretation of guidance? Yes / No

Proposed new guidance not in NEI 04-02? Yes / No

Details:

NEI 04-02 guidance needing interpretation (include section, paragraph, and line numbers as applicable):

NEI 04-02, Section 4.3.4 and Appendix G

Evaluation of the potential for radiological release due to fire fighting activities includes the following:

- **Review pre-fire plans.** Ensure for locations that have the potential for contamination that specific steps are included for containment and monitoring of potentially contaminated fire suppression water. Update pre-fire plans as necessary.
- **Review fire brigade training materials.** Ensure that training materials deal specifically with the containment and monitoring of potentially contaminated fire suppression water. Update training materials as necessary.
- **Document results in Transition Table G-1.**

Table G-1		
NFPA 805 – Radioactive Release Transition Review Guidance		
NFPA 805 Requirements	Implementing Guidance	Results
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 <i>CFR</i> , Part 20, Limits.	Review pre-fire plans. Ensure for locations that have the potential for contamination that specific steps are included for containment and monitoring of potentially contaminated fire suppression water. Update pre-fire plans as necessary.	Describe how the pre-fire plans do (or will) provide guidelines for the containment and monitoring for potentially contaminated fire suppression water.
	Review fire brigade training materials. Ensure that training materials deal specifically with the containment and monitoring of potentially contaminated fire suppression water. Update training materials as necessary.	Describe how the fire brigade training materials do (or will) provide instruction for the containment and monitoring for potentially contaminated fire suppression water.

Circumstances requiring guidance interpretation or new guidance:

The subject of radioactive release transition review is discussed in NEI 04-02 Section 4.3.4 and Appendix G. However, it is unclear how following the stated guidance will show that the plant's fire protection program (FPP) meets the NFPA 805 radioactive release performance criteria. Clarification is requested regarding the information that must be provided in the transition report to demonstrate compliance with the NFPA 805 criteria.

Detail contentious points if licensee and NRC have not reached consensus on the facts and circumstances:

N/A

Potentially relevant existing FAQ numbers:

None

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.”

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.”

Information presented in pilot LARs

The information provided in the pilot LARs describes review of the fire pre-plans and fire brigade training to address potential effluent (water run-off and smoke) release during a fire per the NEI 04-02 guidance. However, neither LAR specifically addressed the NFPA 805 radioactive release performance criteria, nor did they provide an assessment of whether and how the FPP will meet the criteria.

Response Section:

Proposed resolution of FAQ and the basis for the proposal:

Revise NEI 04-02 Section 4.3.4 and Appendix G to clearly identify the information needed to demonstrate compliance with the radioactive release performance criteria, including:

- the methodology used to identify which systems / components / flow paths are used to meet the release criteria (similar to safe shutdown analysis)
- identification of FPP elements, measures / systems / procedural control actions / flow paths, credited to meet the criteria
- description of plant programs, such as fire brigade training and equipment maintenance, that are relied upon to sustain equipment reliability and fire brigade performance
- a bounding analysis, qualitative risk analysis, or detailed risk analysis that demonstrates the release criteria are met either by crediting the identified FPP elements or by showing the available source term as “too low to challenge” the criteria

Furthermore, methods for achieving radioactive release performance criteria must be addressed on a fire area-by-fire area basis (NFPA 805 Section 2.2.3), during low/non-power operations, and consider/address the potential for cross-contamination (water run-off and smoke from a contaminated area being directed through an uncontaminated area).

If appropriate, provide proposed rewording of guidance for inclusion in the next Revision:

NEI 04-02 Section 4.3.4, Radioactive Release Transition Review

Independent of whether the deterministic (NFPA 805 Section 4.3.1) or performance-based (NFPA 805 Section 4.3.2) approach is chosen, a licensee must also show that the radioactive release goals, objectives and criteria are met. Therefore, licensees must now evaluate fire risks and fire protection for various scenarios (not involving fuel damage) that could lead to radioactive release to an unrestricted area.

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. When the deterministic approach is selected (Section 4.3.1), 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. When the risk evaluation option of the performance-based approach is selected (Section 4.3.2), the risk analysis must address both core damage frequency (CDF) and Large Early Release Frequency (LERF). The evaluation of LERF includes consideration of source term and containment integrity.

Fire Fighting Activities

The potential for radiological release due to fire fighting activities must also be addressed using either the deterministic (Section 4.3.1) or performance-based (Section 4.3.2) approaches. The objective is to address the potential for the loss of boundary control and/or source strength control for contaminated spaces.

To demonstrate compliance with the radioactive release performance criteria, the following strategy is recommended:

- Review fire pre-plans and fire brigade training materials to identify FPP elements (e.g., systems / components / procedural control actions / flow paths, etc.) that are being credited to meet the release criteria during both power and low/non-power operations (similar to safe shutdown analysis).
- For those portions of the radioactive release analysis performed using the deterministic approach, review the equipment inspection and testing procedures for equipment being relied upon to meet the criteria.
- Identify areas where there is a potential for cross-contamination (i.e., water run-off and smoke from a contaminated area is directed through an uncontaminated area).

- Provide a bounding analysis, qualitative risk analysis, or detailed risk analysis on a fire area-by-fire area basis that demonstrates the release criteria are met either by crediting the identified FPP elements or by showing the available source term as “too low to challenge” the criteria.
- Establish a monitoring program to address those portions of the radioactive release analysis performed using a risk-informed, performance-based approach. Establish values of availability, reliability and performance methods as needed to demonstrate that the equipment relied upon to meet the radioactive release performance criteria will continue to operate within analysis assumptions.
- Identify plant/procedure changes to reduce the risk of not meeting the radioactive release performance criteria.

Refer to Appendix G for examples of this process and the documentation requirements anticipated.

G. Considerations for Radioactive Release

To demonstrate compliance with the radioactive release performance criteria, the following tasks should be performed:

- **Review pre-fire plans.** Identify FPP elements (e.g., systems / components / procedural control actions / flow paths, etc.) that are being credited to meet the release criteria during both power and low/non-power operations (similar to safe shutdown analysis). Ensure for locations that have the potential for contamination that specific steps are included for containment and monitoring of potentially contaminated smoke and fire suppression water. Update pre-fire plans as necessary. Provide the details of any changes to pre-fire plans made to address radioactive release goals, objectives and performance criteria.
- **Review fire brigade training materials.** Ensure that training materials deal specifically with the containment and monitoring of potentially contaminated smoke and fire suppression water. Update training materials as necessary. Provide the details of any changes to training materials made to address radioactive release goals, objectives and performance criteria.
- Review the equipment inspection and testing for equipment being relied upon to meet the criteria.
- Identify areas where there is a potential for cross-contamination (i.e., water run-off and smoke from a contaminated area is directed through an uncontaminated area).
- Provide a bounding analysis, qualitative risk analysis, or detailed risk analysis on a fire area-by-fire area basis that demonstrates the release criteria are met either by crediting the identified FPP elements or by showing the available source term as “too low to challenge” the criteria.

- Establish a monitoring program to address those portions of the radioactive release analysis performed using a risk-informed, performance-based approach. Establish values of availability, reliability and performance methods as needed to demonstrate that the equipment relied upon to meet the radioactive release performance criteria will continue to operate within analysis assumptions.
- Identify and provide a detailed description of plant/procedure changes to reduce the risk of not meeting the radioactive release performance criteria.
- Document results in Transition Table G-1.

Table G-1 Radioactive Release Transition Report

Unit	Fire Area Name	Description
Unit 1	RB1	Unit 1 Reactor Building

Fire Zone(s)	Description	Contaminated
122	Unit 1 Reactor Building	Yes

Regulatory Basis	Phase
APCSB 9.5-1 Section IV A2; B1i	Pre-Transition
NFPA 805 Section 4.3	Post-Transition

Time Constrained Visibility: Yes / No [MOA or other plant operation required in smoke filled area]

Smoke Equipment Used: normal purge / exhaust fans / portable smoke fans [Controls local / remote, staging equipment required, qualified for heat and smoke]

Filter Required: Yes / No [Filter smoke loading consideration]

Method of Accomplishment of Radioactive Release Criteria	Comments
<p>During Power Operations</p> <p>Floor drains are routed to contaminated hold-up tanks, then processed prior to release.</p> <p>Smoke management is addressed in the "Ventilation Equipment" section of the pre fire plan. This section discusses / informs the fire brigade leader and or control room of existing or possible supply air pathways as well as exhaust air pathways and ventilation pathways via HVAC units as well as fire dampers. These units can be shut down for smoke management during a contaminated fire event. Also identified are ingress and egress points for smoke mitigation. General building ventilation is monitored by radiation instruments and/or alarms.</p> <p>Training on radiological release potential is provided in one lesson plan. The Hazardous materials lesson plan discusses radioactive materials and need for containment of run off and use of ALARA principles. Other topical lesson plans do not address radiological release boundary control or monitoring. Creation of SOG-16 for fires within a RCA/RCZ requires inclusion into this training.</p> <p>During NPO</p> <p>Normal recirculation ventilation may be either operating or secured. Upon notification of fire, HVAC is secured. Inside the Reactor Building (RB) after the brigade has entered and extinguished the fire, portable smoke fans are installed in doorways and at open equipment hatch(s) that can be used to evacuate the spaces. Smoke yield for transient fire or cable fire in this area is not expected to be extensive because of low combustible loading and large RB volume dilution.</p> <p>Floor drains may or may not be operational. If they are operational, water run-off is collected in monitored drain tanks. If floor drains are inoperable, water can be left staged until sampled and removed by portable sump pump, or returning floor drains to service.</p>	<p>No uncontrolled flow path for effluents out of reactor building during operations.....</p> <p>[Discuss open hatch] Containment open hatch has provisions for emergency closure in the event of an accident during outage. The hatch closure, during a fire will act to contain smoke and water run-off, until such time as it can be sampled and dispositioned appropriately.</p> <p>There is no time constraint on smoke or water</p>

<p>Training on radiological release potential is provided in one lesson plan. Containment confinement during outages is coordinated in training response for both Outage Management and Brigade Response. The Hazardous materials lesson plan discusses radioactive materials and need for containment of run off and use of ALARA principles. Other topical lesson plans do not address radiological release boundary control or monitoring. Creation of SOG-16 for fires within a RCA/RCZ requires inclusion into this training.</p>	<p>removal.</p>
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Reference Document

Zone 45 Pre-fire Plan

Fire Brigade Standard Operating Guideline 16, "Fires within a RCA/RCZ"

Document Detail

Engineering Evaluation ID	Summary	Evaluation
None		

Licensing Action	Basis	Date
Approval of liquid effluent release limits	NRC approval previously given for the concentration of radioactive material in releases of liquid effluents at anytime from the site boundary to unrestricted areas [denoted in Figure 2.1-4(a) of the UFSAR] that shall be limited to 10 times the effluent concentrations specified in 10 CFR20.	

Open Item ID	Open Item	Disposition	Open/Closed	Date Entered
	<p>Creation of SOG-16 for fires within a RCA/RCZ requires inclusion into the fire brigade training.</p> <p>Write New Fire Pre-plan(s) for outlying areas that contain radioactive storage. The include Waste Storage Facility, Dry Cask Support Building, Contaminated Waste Oil Storage Buildings.</p>			

Corrective Action Reference

Include in LAR/TR

Change Eval / Mod Reference

Unit	Fire Area Name	Description
Unit 1	RAB 5	Unit 1 Reactor Aux Building Switchgear Room

Fire Zone(s)	Description	Contaminated
133	Train 'A' Switchgear Room	No

Regulatory Basis	Phase
APCSB 9.5-1 Section IV A2; B1i	Pre-Transition
NFPA 805 Section 4.3	Post-Transition

Time Constrained Visibility: Yes / No [MOA or other plant operation required in smoke filled area]

Smoke Equipment Used: normal exhaust fans / purge exhaust fans / portable smoke fans [Controls local/remote, staging equipment required, qualified for heat and smoke]

Filter Required: Yes / No [Filter smoke loading consideration]

Performance Goal	Method of Accomplishment	Comments
Radiation Release	<p>During Power Operations</p> <p>Floor Drains This switchgear room is not in the Radiation Controlled Area. Risk Assessment Calculation #### indicates very low expectation of radiation release for either smoke or runoff.</p> <p>Floor drains are not present in the switchgear rooms. Water runoff is controlled by minimizing the amount of water used in the switchgear room fire, routing water through the doors to adjacent HVAC Equipment Rooms, into the contaminated floor drains, and then processed prior to release.</p> <p>Smoke management is addressed in the "Ventilation Equipment section of the pre fire plan. This section discusses / informs the fire brigade leader and or control room of existing or possible supply air pathways as well as exhaust air pathways and ventilation pathways via HVAC units as well as fire dampers. These units can be shut down for smoke management during a fire event. Also identified are ingress and egress points for smoke mitigation.</p> <p>Training on smoke removal is provided in one lesson plan.</p> <p>During NPO</p> <p>Normal ventilation may be either operating or secured. Upon notification of fire, HVAC is secured and fire dampers are expected to shut. After the brigade has extinguished the fire, portable smoke fans are installed in doorways (E-12 and W-6) or Fire Dampers are re-opened and normal ventilation can be used to evacuate the spaces. Smoke yield for transient fire or cable fire in this area is not expected to be greater than the capacity of the HEPA filter. Because of little or no contamination, HEPA filters can be bypassed without any impact to unrestricted release of smoke.</p> <p>Floor drains in the fire area are not available. Once water is routed to adjacent rooms, water</p>	<p>Water is routed to contaminated floor drain system and held up, monitored, and appropriately release in accordance with approved, controlled environmental procedures.</p> <p>Flow path for effluents out of reactor auxiliary building switchgear rooms during operations will be done after appropriate Radiation Protection sampling done on smoke.</p>

	<p>run-off is collected in monitored drain tanks. If floor drains are inoperable, water can be left staged until sampled and removed by portable sump pump, or returning floor drain tanks to service.</p> <p>There is no time constraint on smoke or water removal to conduct MOAs.</p> <p>Training on smoke removal is provided in one lesson plan. Accommodations for heat and smoke are made in determining operability for removal capability.</p>	
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Reference Document

Document Detail

Engineering Evaluation ID	Summary	Evaluation
None		

Licensing Action	Basis	Date
None		

Open Item ID	Open Item	Disposition	Open/Closed	Date Entered
None				

Corrective Action Reference

Include in LAR/TR

Change Eval / Mod Reference