



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

June 23, 2021

Dr. Gregory Piefer, Chief Executive Officer  
SHINE Medical Technologies, LLC  
101 East Milwaukee Street, Suite 600  
Janesville, WI 53545

SUBJECT: SHINE MEDICAL TECHNOLOGIES, LLC – REQUEST FOR ADDITIONAL  
INFORMATION RELATED TO FIRE PROTECTION (EPID NO. L-2019-NEW-  
0004)

Dear Dr. Piefer:

By letter dated July 17, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19211C044), as supplemented by letters dated November 14, 2019 (ADAMS Accession No. ML19337A275), March 27, 2020 (ADAMS Accession No. ML20105A295), August 28, 2020 (ADAMS Accession No. ML20255A027), November 13, 2020 (ADAMS Accession No. ML20325A026), December 10, 2020 (ADAMS Accession No. ML20357A084), December 15, 2020 (ADAMS Accession No. ML21011A264), and March 23, 2021 (ADAMS Accession No. ML21095A235), SHINE Medical Technologies, LLC (SHINE) submitted to the U.S. Nuclear Regulatory Commission (NRC) an operating license application for its proposed SHINE Medical Isotope Production Facility in accordance with the requirements contained in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities."

During the NRC staff's review of SHINE's operating license application, questions have arisen for which additional information is needed. The enclosed request for additional information (RAI) identifies information needed for the NRC staff to continue its review of the SHINE final safety analysis report, submitted in connection with the operating license application, and prepare a safety evaluation report. The specific chapter of the SHINE operating license application covered by this RAI includes Chapter 9, "Auxiliary Systems."

It is requested that SHINE provide responses to the enclosed RAI within 60 days from the date of this letter. In accordance with 10 CFR 50.30(b), "Oath or affirmation," SHINE must execute its response in a signed original document under oath or affirmation. The response must be submitted in accordance with 10 CFR 50.4, "Written communications." Information included in the response that is considered sensitive or proprietary, that SHINE seeks to have withheld from the public, must be marked in accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding." Any information related to safeguards should be submitted in accordance with 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements." Following receipt of the additional information, the NRC staff will continue its evaluation of the subject chapters and technical areas of the SHINE operating license application.

As the NRC staff continues its review of SHINE's operating license application, additional RAIs for other chapters and technical areas may be developed. The NRC staff will transmit any further questions to SHINE under separate correspondence.

If SHINE has any questions, or needs additional time to respond to this request, please contact me at 301-415-1524, or by electronic mail at [Steven.Lynch@nrc.gov](mailto:Steven.Lynch@nrc.gov).

Sincerely,



Signed by Lynch, Steven  
on 06/23/21

Steven T. Lynch, Senior Project Manager  
Non-Power Production and Utilization Facility  
Licensing Branch  
Division of Advanced Reactors and Non-Power  
Production and Utilization Facilities  
Office of Nuclear Reactor Regulation

Docket No. 50-608  
Construction Permit No. CPMIF-001

Enclosure:  
As stated

cc: See next page

SHINE Medical Technologies, LLC

Docket No. 50-608

cc:

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SUBJECT: SHINE MEDICAL TECHNOLOGIES, LLC – REQUEST FOR ADDITIONAL  
INFORMATION RELATED TO FIRE PROTECTION (EPID NO. L-2019-NEW-  
0004) DATED: JUNE 23, 2021

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**ADAMS Accession No.: ML21162A318****NRR-088**

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OFFICE OF NUCLEAR REACTOR REGULATION  
REQUEST FOR ADDITIONAL INFORMATION  
REGARDING OPERATING LICENSE APPLICATION FOR  
SHINE MEDICAL TECHNOLOGIES, LLC  
CONSTRUCTION PERMIT NO. CPMIF-001  
SHINE MEDICAL ISOTOPE PRODUCTION FACILITY  
DOCKET NO. 50-608

By letter dated July 17, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19211C044), as supplemented by letters dated November 14, 2019 (ADAMS Accession No. ML19337A275), March 27, 2020 (ADAMS Accession No. ML20105A295), August 28, 2020 (ADAMS Accession No. ML20255A027), November 13, 2020 (ADAMS Accession No. ML20325A026), December 10, 2020 (ADAMS Accession No. ML20357A084), December 15, 2020 (ADAMS Accession No. ML21011A264), and March 23, 2021 (ADAMS Accession No. ML21095A235), SHINE Medical Technologies, LLC (SHINE) submitted to the U.S. Nuclear Regulatory Commission (NRC) an operating license application for its proposed SHINE Medical Isotope Production Facility in accordance with the requirements contained in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities."

During the NRC staff's review of SHINE's operating license application, questions have arisen for which additional information is needed. The enclosed request for additional information (RAI) identifies information needed for the NRC staff to continue its review of the SHINE final safety analysis report (FSAR), submitted in connection with the operating license application, and prepare a safety evaluation report. The specific chapter of the SHINE operating license application covered by this RAI includes Chapter 9, "Auxiliary Systems."

Applicable Regulatory Requirements and Guidance Documents

The NRC staff is reviewing the SHINE operating license application, which describes the SHINE irradiation facility, including the irradiation units, and radioisotope production facility, using the applicable regulations, as well as the guidance contained in NUREG-1537, Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors, Format and Content," issued February 1996 (ADAMS Accession No. ML042430055), and NUREG-1537, Part 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors, Standard Review Plan and Acceptance Criteria," issued February 1996 (ADAMS Accession No. ML042430048). The NRC staff is also using the "Final Interim Staff Guidance [ISG] Augmenting NUREG-1537, Part 1, 'Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Format and Content,' for Licensing Radioisotope Production Facilities and Aqueous Homogeneous Reactors," dated October 17, 2012 (ADAMS Accession No. ML12156A069), and "Final Interim Staff Guidance Augmenting NUREG-1537, Part 2, 'Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Standard Review Plan and Acceptance Criteria,' for Licensing Radioisotope Production Facilities and Aqueous Homogeneous Reactors," dated October 17, 2012 (ADAMS

Enclosure

Accession No. ML12156A075). As applicable, additional guidance cited in SHINE's FSAR or referenced in NUREG-1537, Parts 1 and 2, or the ISG Augmenting NUREG-1537, Parts 1 and 2, has been utilized in the review of the SHINE operating license application.

For the purposes of this review, the term "reactor," as it appears in NUREG-1537, the ISG Augmenting NUREG-1537, and other relevant guidance can be interpreted to refer to SHINE's "irradiation unit," "irradiation facility," or "radioisotope production facility," as appropriate within the context of the application and corresponding with the technology described by SHINE in its application. Similarly, for the purposes of this review, the term "reactor fuel," as it appears in the relevant guidance listed above, may be interpreted to refer to SHINE's "target solution."

## Chapter 9 – Auxiliary Systems

The following regulatory requirements and guidance are applicable to RAIs 9-3 through 9-10:

Paragraph (b) of 10 CFR 50.34, “Contents of applications; technical information,” states, in part, that “[t]he final safety analysis report shall include information that describes the facility, presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems and components and of the facility as a whole....”

Furthermore, 10 CFR 50.34(b)(2) states, in part, that FSAR shall include “[a] description and analysis of the structures, systems and components of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which such requirements have been established, and the evaluations required to show that safety functions will be accomplished. The description shall be sufficient to permit understanding of the system designs and their relationship to safety evaluations.”

Paragraph (a)(1) of 10 CFR 20.1301, “Dose limits for individual members of the public,” states, in part, that “[e]ach licensee shall conduct operations so that [t]he total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year....”

Paragraph (a) of 10 CFR 50.48, “Fire protection,” based on SHINE’s commitment to implementing the elements of a fire protection plan described in this paragraph. Specifically, paragraph (a)(1) requires, in part, that the fire protection plan must include the following:

- Describe the overall fire protection program for the facility;
- Identify the various positions within the licensee’s organization that are responsible for the program;
- State the authorities that are delegated to each of these positions to implement those responsibilities; and
- Outline the plans for fire protection, fire detection and suppression capability, and limitation of fire damage.

Paragraph (a)(2) further requires that the fire protection plan must also “describe specific features necessary to implement the program,” including the following:

- Administrative controls and personnel requirements for fire prevention and manual fire suppression activities;
- Automatic and manually operated fire detection and suppression systems; and
- The means to limit fire damage to structures, systems, or components important to safety so that the capability to shut down the plant safely is ensured.

SHINE has also developed the following principal design criterion in Chapter 3, "Design of Structures, Systems, and Components," of its FSAR relevant to implementing its fire protection program:

Criterion 3 – Fire protection

Safety-related SSCs [structures, systems, and components] are designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions.

Noncombustible and heat resistant materials are used wherever practical throughout the facility, particularly in locations such as confinement boundaries and the control room.

Fire detection and suppression systems of appropriate capacity and capability are provided and designed to minimize the adverse effects of fires on safety-related SSCs. Firefighting systems are designed to ensure that their rupture or inadvertent operation does not significantly impair the safety capability of these SSCs.

The RAIs that follow are intended to ensure that SHINE has provided and developed sufficient analyses applicable to and commensurate with the risks of releases of radioactive material associated with fire hazards in the unrestricted environment at the site, and any doses received by members of the public are within the regulatory limits of 10 CFR Part 20, "Standards for Protection against Radiation." Additionally, the RAIs seek to confirm that SHINE's fire protection plan includes the applicable elements of 10 CFR 50.48, satisfies the SHINE principle design criteria, and supports the evaluation findings described in Section 9.3, "Fire Protection Systems and Programs," of NUREG-1537, Part 2.

**RAI 9-3** Appendix A.2, "Regulatory Commitments Identified in Response to Requests for Additional Information," of NUREG-2189, "Safety Evaluation Report Related to SHINE Medical Technologies, Inc., Construction Permit Application for a Medical Radioisotope Production Facility" (ADAMS Accession No. ML16229A140), includes regulatory commitments that "are the responsibility of the applicant" and were not fulfilled at the time of issuance of the construction permit (CP). As stated in Appendix A.2 of NUREG-2189, "...the applicant should ensure that these items are fully addressed in the FSAR supporting the issuance of an operating license. The staff is tracking these items as regulatory commitments and will verify their implementation during the review of a SHINE operating license application."

The NRC staff identified the following fire-protection-related regulatory commitments in NUREG-2189 for which it was unable to determine how they are fully addressed in the FSAR and consequently, verify their implementation:

- a. Firefighting procedures for use in a moderation-controlled area evaluate the use of moderator material (from CP RAI 6b.3-28)
- b. Specific guidance in Rock County 911 Communications Center's SHINE-specific response information binder on the use of firefighting foam at the SHINE facility (from CP RAI 9a2.3-7)



Provide a discussion of how each of the above-mentioned fire protection regulatory commitments in NUREG-2189 are fully addressed in the FSAR supporting SHINE's operating license application.

This information is necessary for the NRC staff to ensure that SHINE is satisfying the elements of 10 CFR 50.48(a) to which it has committed and to make the necessary evaluation findings described in NUREG-1537, Part 2, Section 9.3. Specifically, the requested information will support the NRC staff in concluding that the plans for preventing fires ensure that the facility meets local and national fire and building codes.

**RAI 9-4**

Section 9.3 of NUREG-1537, Part 2, identifies areas of NRC staff review for fire protection systems and programs to include the following:

- A discussion of fire protection plans and protective equipment used to limit the consequence of a fire;
- A list of the objectives of the fire protection program, as well as a discussion of the organizations, methods, and equipment for attaining the objectives;
- The source of facility fire protection brigades and their training and the summary of the more detailed discussions of these personnel and offsite fire protection forces in the facility emergency plan.

SHINE FSAR Section 9a2.3.1, "Fire Protection Plan and Program," identified elements of the SHINE's fire protection program, including references to lower tier documents maintained as part of the overall SHINE fire protection program. However, SHINE does not provide adequate discussions of how these lower tier documents are used to adequately protect the facility's safety-related SSCs against fires. Therefore, additional information is needed to give the NRC staff a clear understanding of how SHINE is implementing the programmatic elements of its fire protection program, consistent with the guidelines in NUREG-1537. Provide additional discussion of SHINE's fire protection program implementing procedures that ensure protection of safety-related SSCs and safe facility shutdown in the event of a fire. Examples of elements and of implementing fire protection procedures to include in this discussion, as applicable to the SHINE design and facility, are as follows:

- a. Fire protection organization, its staffing, and their responsibilities
- b. Fire protection engineering design bases
- c. Description of electrical cable construction
- d. Fire brigade and fire brigade training program
- e. General employee fire protection training program
- f. Pre-fire planning and emergency planning considerations
- g. Manual firefighting capability
- h. Lighting and communications for operator actions
- i. Applicability of corrective action program and compensatory measures
- j. Fire testing, qualification reports, and data for fire rated systems, barriers, and assemblies
- k. Fire protection features of the facility's emergency diesel generator room and battery room

- I. Confirm that SHINE will follow 10 CFR 50.59 as the change control process for making changes to its fire protection features and program

This information is necessary for the NRC staff to ensure that SHINE is satisfying the elements of 10 CFR 50.48(a) to which it has committed and to make the necessary evaluation findings described in NUREG-1537, Part 2, Section 9.3. Specifically, the requested information will support the NRC staff in concluding the following:

- The plans for preventing fires ensure that the facility meets local and national fire and building codes;
- The systems designed to detect and combat fires at the facility can function as described and limit damage and consequences at any time;
- The potential for radiological consequences of a fire will not prevent safe shutdown, and any fire-related release of radioactive material from the facility to the unrestricted environment has been adequately addressed in the appropriate sections of the facility emergency plan; and
- Any release of radioactive material as a result of fire would not cause radiation exposures that exceeded the requirements of 10 CFR Part 20.

**RAI 9-5**

NUREG-1537, Part 1, Section 9.3, "Fire Protection Systems and Programs," states, in part, that "[t]he applicant should discuss passive design features required by the [facility] design characteristics. In addition, the objectives of the fire protection program should limit fire consequences and provide that the facility is designed, and protective systems exist to prevent the uncontrolled release of radioactive material should a fire occur. The acceptance criteria in NUREG-1537, Part 2, Section 9.3, state, in part, that the information on the fire protection systems and programs should include descriptions of the "[m]ethods to detect, control, and extinguish fires...."

SHINE FSAR Section 9a2.3.3, "Fire Hazards Analysis," does not adequately describe passive design features intended to limit fire consequences, fire protection systems, active and passive fire suppression systems, and fire detection and alarm systems. Therefore, additional information is needed for the NRC staff to confirm that SHINE has adequately addressed these elements of fire protection in the design of its facility and implementing procedures. Provide descriptions of the following, including key objectives and elements of design and implementation for the fire protection program:

- a. Facility construction elements related to the fire protection program. Examples of elements include building codes (including any deviations); facility fire barriers, including fire barrier penetrations, intended to limit fire consequences, including features of the facility that could affect safe shutdown or release radioactive material in the event of a continuing fire
- b. Facility life safety features related to the fire protection program. Examples of features include egress from the building in the event of fire and compliance

with codes, such as National Fire Protection Association (NFPA)-101, "Life Safety Code"

- c. Fire protection water supply systems
- d. Active and passive fire suppression systems
- e. Fire detection and alarm/signaling systems
- f. The code of record (e.g., NFPA-780) for the facility lightning protection system, including justification for the choice of code and any deviations.

This information is necessary for the NRC staff to ensure that SHINE is satisfying the elements of 10 CFR 50.48(a) to which it has committed and to make the necessary evaluation findings described in NUREG-1537, Part 2, Section 9.3. Specifically, the requested information will support the NRC staff in concluding the following:

- The plans for preventing fires ensure that the facility meets local and national fire and building codes;
- The systems designed to detect and combat fires at the facility can function as described and limit damage and consequences at any time;
- The potential for radiological consequences of a fire will not prevent safe shutdown, and any fire-related release of radioactive material from the facility to the unrestricted environment has been adequately addressed in the appropriate sections of the facility emergency plan; and
- Any release of radioactive material as a result of fire would not cause radiation exposures that exceeded the requirements of 10 CFR Part 20.

**RAI 9-6**

Section 9.3 of NUREG-1537, Part 1, states that discussions of the fire protection systems and program should include descriptions of "any possible effects of a fire on the safe shutdown of the [facility]." As part of its review, as described in Section 9.3 of NUREG-1537, Part 2, the NRC staff is to evaluate the "designs of [facility] systems that can ensure safe [facility] shutdown in the event of fire."

While the SHINE FSAR Section 9a2.3.4, "Safe Shutdown Analysis," states that a safe shutdown analysis is to be performed as part of the SHINE fire protection program and included in implementing procedures and reports, insufficient detail is included for the NRC staff to ensure that the design of systems and implementation of such procedures is sufficient to provide for the safe shutdown of the SHINE facility in the event of fire. Therefore, additional information is needed for the NRC staff to confirm that SHINE has adequately performed a safe shutdown analysis, such that the design of its facility and implementing procedures can ensure safe facility shutdown in the event of fire. Provide descriptions of the following, as applicable, including key objectives and elements of design and implementation for the fire protection program related to the SHINE safe shutdown analysis:

- a. Summarize the safe shutdown performance goals and the safe shutdown analysis methodology.
- b. Identify the functions required for safe shutdown. Such functions may include inventory control, process monitoring, and reactivity control. Include any auxiliary equipment or cables required to support a safe shutdown function (e.g., room cooling).
- c. Identify any required safe shutdown function that has only a single train and justify how such a configuration can ensure safe shutdown in the event of a fire.
- d. Describe the separation criteria for redundant trains of a safe shutdown function located in the same fire area.
- e. Describe and justify any deviations from the separation criteria described in item (d).
- f. Identify the fire area(s) that contain equipment or cables from all trains of a required safe shutdown function. If such area(s) exist, describe how safe shutdown is ensured for a fire occurring in that fire area(s).
- g. Identify any fire areas where fire damage could prevent safe shutdown. If such areas exist, justify how safe shutdown is ensured for a fire occurring in those fire areas.
- h. Identify the entry conditions for the facility fire safe shutdown procedure.
- i. Identify the guidance used to perform any safe shutdown-related circuit analysis.

This information is necessary for the NRC staff to ensure that SHINE is satisfying the elements of 10 CFR 50.48(a) to which it has committed and to make the necessary evaluation findings described in NUREG-1537, Part 2, Section 9.3. Specifically, the requested information will support the NRC staff in concluding the following:

- The plans for preventing fires ensure that the facility meets local and national fire and building codes;
- The systems designed to detect and combat fires at the facility can function as described and limit damage and consequences at any time;
- The potential for radiological consequences of a fire will not prevent safe shutdown, and any fire-related release of radioactive material from the facility to the unrestricted environment has been adequately addressed in the appropriate sections of the facility emergency plan; and
- Any release of radioactive material as a result of fire would not cause radiation exposures that exceeded the requirements of 10 CFR Part 20.

**RAI 9-7**

NUREG-1537, Part 2, Section 9.3, states, in part, that “[t]he fire protection plan should discuss the prevention of fires, including limiting the types and quantities of combustible materials.” Additionally, Section 9.3 of NUREG-1537, Part 2, states, in part, that the application should describe the “methods to detect, control, and extinguish fires....” SHINE FSAR Section 9a2.3.5, “Administrative Control,” does not provide adequate information on SHINE’s fire protection-related administrative controls intended to prevent and mitigate fires. Therefore, additional information is needed for the NRC staff to confirm that SHINE has adequately developed administrative controls for fire protection. Provide descriptions of the following administrative and design controls, as applicable, included as part of the SHINE fire protection program and implementing procedures to prevent and mitigate fires, including controls to limit the types and quantities of combustible materials:

- a. Fire protection systems design criteria (e.g., sprinkler system design densities, fire pump capacities, etc.).
- b. Ignition sources.
- c. Fire prevention methods intended to control handling, use, and disposal of combustibles materials.
- d. Fire protection procedures, instructions, and design drawings.
- e. Manual fire suppression actions.

This information is necessary for the NRC staff to ensure that SHINE is satisfying the elements of 10 CFR 50.48(a) to which it has committed and to make the necessary evaluation findings described in NUREG-1537, Part 2, Section 9.3. Specifically, the requested information will support the NRC staff in concluding the following:

- The plans for preventing fires ensure that the facility meets local and national fire and building codes;
- The systems designed to detect and combat fires at the facility can function as described and limit damage and consequences at any time;
- The potential for radiological consequences of a fire will not prevent safe shutdown, and any fire-related release of radioactive material from the facility to the unrestricted environment has been adequately addressed in the appropriate sections of the facility emergency plan;
- Any release of radioactive material as a result of fire would not cause radiation exposures that exceeded the requirements of 10 CFR Part 20; and
- Acceptable TSs related to fire protection have been proposed and justified.

**RAI 9-8**

FSAR Section 9a2.3.6, “Regulatory and Code Requirements,” states, in part, that “[t]he design, installation, testing, and surveillance of the facility fire protection features, and systems are based on applicable guidance from nationally

recognized codes and standards. The codes and standards used, and the code-of-record is as defined in the FPP [fire protection program] and applicable design documentation.” Consistent with the guidance in Section 9.3 of NUREG-1537, Parts 1 and 2, for the design of fire protection systems and features, the applicant should use local building fire codes, as applicable, to help ensure that fire damage to structures, systems and components at the facility would not cause or allow an uncontrolled release of radioactive material.

SHINE FSAR Section 9a2.3.6, does not identify the codes and standards used in the development of SHINE’s fire protection program or any deviations from such codes and standards. Therefore, additional information is needed for the NRC staff to confirm that SHINE has adequately implemented appropriate codes and standards in the design of its fire protection systems and development of its fire protection program. Provide the following:

- a. A list of the building and fire codes and standards that SHINE considered in the design of the facility as related to the development of the fire protection program and implementing procedures, including identification of the edition (year). For codes and standards where more than one edition is used, identify which edition pertains to which areas of the facility.
- b. Identify and justify any deviations from the codes and standards for the design and installation of fire protection systems identified in item (a), above.

This information is necessary for the NRC staff to ensure that SHINE is satisfying the elements of 10 CFR 50.48(a) to which it has committed and to make the necessary evaluation findings described in NUREG-1537, Part 2, Section 9.3. Specifically, the requested information will support the NRC staff in concluding the following:

- The plans for preventing fires ensure that the facility meets local and national fire and building codes;
- The systems designed to detect and combat fires at the facility can function as described and limit damage and consequences at any time;
- The potential for radiological consequences of a fire will not prevent safe shutdown, and any fire-related release of radioactive material from the facility to the unrestricted environment has been adequately addressed in the appropriate sections of the facility emergency plan; and
- Any release of radioactive material as a result of fire would not cause radiation exposures that exceeded the requirements of 10 CFR Part 20.

**RAI 9-9**

NUREG-1537, Part 1, Section 9.3, states, in part, that “[t]he applicant should discuss passive design features required by the [facility] design characteristics.” In addition, the objectives of the fire protection program should limit fire consequences and provide that the facility is designed, and protective systems exist to prevent the uncontrolled release of radioactive material should a fire occur. Additionally, NUREG-1537, Part 2, Section 9.3, states, in part, that “[t]he

fire protection plan should discuss the prevention of fires, including limiting the types and quantities of combustible materials.”

SHINE FSAR Section 9a2.3.7, “Facility Fire Protection System Description,” does not provide sufficient detail of the use of SHINE’s fire hazards analysis and the results. Therefore, additional information is needed to ensure that the passive design features, including fire barriers and facility fire areas and zones, are adequate to limit fire consequences to prevent the uncontrolled release of radioactive material should a fire occur.

- a. Discuss means of egress for fire areas and zones and means of egress protection.
- b. Describe the types of combustibles found in each fire area.
- c. Describe combustible loading in fire areas and zones.
- d. Discuss fire hazards and ignition sources that were considered for facility fire areas.
- e. Describe the types of fire-resistant coatings and electric raceway fire barriers systems used for the protection of electrical cables and structural steel.
- f. Identify the fire modeling tools or methods used in the development of the fire hazard analysis including how these tools or methods were applied. Describe the process to validate and verify the fire models, including any calculational and numerical methods used, used in support of fire hazard analysis. Discuss how the fire modeling uncertainties were accounted in the fire modeling calculations.
- g. Describe how the installed cabling in the fire areas was characterized. Specifically, describe the critical damage threshold temperatures and heat fluxes for thermoset and thermoplastic cables consistent with the use of these cables in the facility. Include an explanation of how exposed temperature-sensitive equipment was treated in the fire modeling and justify the damage criteria that was used for such equipment. Alternatively, justify why this information is not necessary.

This information is necessary for the NRC staff to ensure that SHINE is satisfying the elements of 10 CFR 50.48(a) to which it has committed and to make the necessary evaluation findings described in NUREG-1537, Part 2, Section 9.3. Specifically, the requested information will support the NRC staff in concluding the following:

- The plans for preventing fires ensure that the facility meets local and national fire and building codes;
- The systems designed to detect and combat fires at the facility can function as described and limit damage and consequences at any time;

- The potential for radiological consequences of a fire will not prevent safe shutdown, and any fire-related release of radioactive material from the facility to the unrestricted environment has been adequately addressed in the appropriate sections of the facility emergency plan; and
- Any release of radioactive material as a result of fire would not cause radiation exposures that exceeded the requirements of 10 CFR Part 20.

This information is also requested to ensure that SHINE is satisfying its Design Criterion 3, which provides that “noncombustible and heat resistant materials are used whenever practicable....”

**RAI 9-10**

Paragraph (a)(1) of 10 CFR 20.1301 states, in part, that “[e]ach licensee shall conduct operations so that [t]he total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year....”

SHINE FSAR Section 9a2.3.8 “Radiological Fire Hazards,” does not describe how SHINE will meet 10 CFR Part 20 exposure limits from fire-fighting effluents.

Describe how it is assured that the release of radioactive material as a result of fire-fighting activities would not cause radiation exposures that exceed the requirements of 10 CFR Part 20 and/or bounded by the accident analysis provided in SHINE FSAR Chapter 13, as applicable. Include in the response a description of fire protection program elements, programs and design elements (e.g., fire brigade training and physical barriers), and engineering controls, that result in reasonable assurance of containment of gaseous and liquid fire-fighting related effluents within facility boundaries or an analysis that demonstrates that the 10 CFR Part 20 limits are met. In this context, “gaseous and liquid fire-fighting related effluents” means smoke and fire fighting agent (generally water). This evaluation may be done on a fire area basis.

This information is necessary for the NRC staff to ensure that SHINE is satisfying the elements of 10 CFR 50.48(a) to which it has committed and to make the necessary evaluation findings described in NUREG-1537, Part 2, Section 9.3. Specifically, the requested information will support the NRC staff in concluding the following:

- The plans for preventing fires ensure that the facility meets local and national fire and building codes;
- The systems designed to detect and combat fires at the facility can function as described and limit damage and consequences at any time;
- The potential for radiological consequences of a fire will not prevent safe shutdown, and any fire-related release of radioactive material from the facility to the unrestricted environment has been adequately addressed in the appropriate sections of the facility emergency plan; and



- Any release of radioactive material as a result of fire would not cause radiation exposures that exceeded the requirements of 10 CFR Part 20.