



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

July 29, 1997

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The Honorable Joseph R. Biden, Jr.
United States Senate
Washington, D.C. 20510-0802

Dear Senator Biden:

I am responding to your letter of July 11, 1997, in which you requested information about fire barrier penetration seals at the Salem Nuclear Generating Station, Units 1 and 2. On the basis of its reviews, evaluations, and inspections, the NRC staff has concluded that properly designed and installed silicone foam penetration seals will provide an adequate level of fire resistance and will perform their intended fire protection function by confining a fire to the area of origin.

Regarding Salem Unit 2, an NRC fire protection inspection was conducted in April 1997. The inspection identified two violations of NRC requirements related to the adequacy of the licensee's alternative shutdown system and electrical raceway fire barriers. The licensee took corrective actions which the staff found acceptable. On July 8, 1997, the staff conducted a predecisional enforcement conference with Salem Unit 2 management. The licensee presented its position regarding these violations. The staff is following Agency procedures regarding enforcement associated with these violations.

The inspection also included an audit of fire barrier penetration seals. The inspection in this area did not identify any violations of NRC requirements. Also, in a letter dated July 22, 1997, the licensee presented an overview of their fire barrier penetration seal program that provides the basis for their belief that there is reasonable assurance that the fire barrier penetration seals are installed, maintained and subject to periodic surveillance in a manner which supports operability. Based on the results of the above NRC inspection and the licensee's implementation of its fire barrier penetration seal program, the staff is confident that the fire barrier penetration seals are capable of performing their intended safety function. The enclosure to this letter provides responses to your specific questions regarding fire barrier penetration seals.

Following the extended shutdown of Salem Unit 2, the licensee is in the process of undertaking final activities to support return to power operation. The Commission was briefed on June 25, 1997, by the licensee, the State of New Jersey and the NRC staff regarding the restart readiness and status of Salem Unit 2.

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The staff continues to monitor the licensee's activities, and has plans in place to closely monitor the licensee's progress as the plant approaches return to power operation. The licensee is projecting return to service in August.

I trust this letter is responsive to your concerns.

Sincerely,

A handwritten signature in cursive script that reads "Shirley Ann Jackson".

Shirley Ann Jackson

Enclosure: Response to Questions Regarding
Fire Penetration Seals

The Honorable Joseph R. Biden, Jr. - 2 -

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I trust this letter is responsive to your concerns.

Sincerely,

/S/

Shirley Ann Jackson

Enclosure: Response to Questions Regarding
Fire Penetration Seals

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Letter to The Honorable Joseph R. Biden, Jr., from Chairman Shirley Ann Jackson, dated July 29, 1997

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RESPONSE TO QUESTIONS REGARDING FIRE BARRIER PENETRATION SEALS AT SALEM NUCLEAR GENERATING STATION, UNITS 1 AND 2

Background:

Nuclear power plants are divided into separate areas by such structural fire barriers as concrete floors, walls, and ceilings. The fire protection function of these barriers is to prevent a fire that starts in one plant area from spreading to another area. A barrier's fire resistance rating, which is a measure of the extent to which the barrier resists the effects of fire, is determined by exposing a mockup of the barrier to an intense test fire for a required period. Most of the nuclear power plant fire barriers of interest have a fire resistance rating of 3 hours. Openings are needed in structural fire barriers to allow such items as cable trays, conduits, pipes, and ventilation ducts to pass from one plant area to another. To maintain the fire protection function of the structural fire barriers, the openings or "penetrations" are sealed with materials that offer the same fire resistance as that of the barrier in which they are installed.

RTV silicone foam is commonly used as a component of fire barrier penetration seals installed in nuclear power plants and is technically classified as "combustible" when it is tested in accordance with an American Society for Testing and Materials test method for combustibility. This characteristic is acknowledged in NRC NUREG-1552, "Fire Barrier Penetration Seals in Nuclear Power Plants," which provides the staff's evaluation of potential fire hazards. However, this report concludes that the qualified silicone-based fire barrier penetration seals can accomplish their intended design function and are not credible fire hazards. It is important to note that RTV silicone foam has different properties from the polyurethane foam used in the seal that was involved in the Browns Ferry fire of 1975. Independent organizations, such as Underwriters Laboratories, Incorporated, have performed numerous fire resistance tests on full-scale mockups of RTV silicone foam penetration seals, using nationally recognized fire test standards. The NRC staff has observed such tests first hand, and has witnessed that RTV silicone foam penetration seals can provide the same level of fire resistance as the structural fire barriers in which they are installed. That is, the fire resistance of an RTV silicone foam penetration seal is equivalent to the fire resistance of the structural barrier. On the basis of such tests, reviews, evaluations, and inspections, the NRC staff has concluded that properly designed and installed RTV silicone foam seal designs can perform their intended fire protection function and thereby provide reasonable assurance that a fire will not spread from one side of the fire barrier to the other.

In addition, the multiple layers of fire protection provided at each reactor (for example, control of combustibles, fire barriers, fire detection and suppression systems, and fire brigades) offer reasonable assurance that penetration seal deficiencies, if any, will not result in actual safety consequences (for example, loss of safety systems, radiation overexposure, or offsite releases). For all these reasons, the use of RTV silicone foam penetration seals poses no undue risk to public health and safety.

It is important to note that the NRC staff plans to propose a rule change that would eliminate the Appendix R requirement that penetration seal materials be noncombustible

since there is no technical basis for it. Further, this requirement is not applicable to most of the nation's operating plants.

The responses to Senator Biden's specific questions follow.

1. **"Section III.M of Appendix R to Part 50 of Title 10 in the Code of Federal Regulations explicitly requires that fire barrier cable penetration seals use only noncombustible materials. I understand that RTV silicon foam, such as that being used at Salem Units 1 and 2, is combustible. Is Salem Unit 2 required to comply with 10 CFR Part 50, Appendix R, Section III.M?"**

No. By its own terms and by the terms of 10 CFR 50.48, Appendix R to 10 CFR Part 50 is only applicable to nuclear power facilities that were licensed to operate prior to January 1, 1979. The Salem Unit 2 operating license was issued on May 20, 1981. Therefore, Section III.M of Appendix R does not apply to Salem Unit 2.

2. **"If Appendix R, Section III.M, is applicable for Salem Unit 2:**
 - a) **Has the NRC issued an exemption from this regulation to permit PSE&G [Public Service Electric and Gas Company] to restart the plant with its combustible fire barriers?**
 - b) **If no such exemption has been granted, under what authority could Salem Unit 2 be permitted to start?**

As explained in the response to Question 1, Section III.M does not apply to Salem Unit 2.

3. **"If Appendix R, Section III.M, is not applicable for Salem Unit 2:**
 - a) **What regulation applies to the fire penetration seals for Salem Unit 2?**

The basic fire protection regulation for commercial nuclear power plants is 10 CFR 50.48, "Fire protection." It is the regulation that applies to Salem Unit 2.

Penetration seals are not explicitly addressed in 10 CFR 50.48. Rather, Section 50.48 requires that each operating nuclear power plant have a fire protection plan and refers to NRC guidance documents for the criteria for developing and implementing an acceptable fire protection plan. The fire protection plan for Salem Unit 2, is based, in part, on NRC Branch Technical Position (BTP) Auxiliary Power Conversion Systems Branch (APCSB) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants." Fire barrier penetration seals are one element of the fire protection plan. Appendix A to BTP APCS 9.5-1, specifies that penetrations in fire barriers enclosing separate fire areas be sealed or closed to provide a fire-resistance rating at least equal to that of the fire barrier itself. The BTP does not specify that penetration seal materials be noncombustible and, for the reasons summarized in the Background section, the NRC staff has approved the use of RTV silicone foam as a component of fire barrier seal assemblies.

On the basis of its evaluation of the licensee's fire protection plan for Salem Unit 2, including the fire barrier penetration seals, the NRC staff approved the plan. The staff's approval of the plan is documented in a number of safety evaluation reports and is reflected in the fire protection license condition for Salem Unit 2. On the basis of the NRC-approved fire protection plan, Salem Unit 2, meets the regulatory requirements of 10 CFR 50.48.

3. **"If Appendix R, Section III.M, is not applicable for Salem Unit 2:**
b) **Why does NRC refer only to Appendix R requirements, and not the regulation cited in the response to Question 3.a above, when the staff audits Salem Unit 2 for compliance with the fire protection regulations?"**

The fire protection plan for Salem Unit 2, is based on BTP APCS 9.5-1 and the licensee's commitment to meet Section III.G, "Fire protection of safe shutdown capability," Section III.J, "Emergency lighting," and Section III.O, "Oil collection system for reactor coolant pump," of Appendix R to 10 CFR Part 50. The focus of the staff's April 1997, inspection of Salem was directed toward the licensee's activities to satisfy Section III.G of Appendix R.

4. **"What inspection report or other document has been issued by your staff that determines that PSE&G is in compliance with the applicable fire penetration seal regulation for Salem Unit 2?"**

The staff conducted a fire protection inspection at the Salem Unit 2 in April 1997, which included an audit of fire barrier penetration seals, and is documented in Inspection Report 50-272, 50-311/97-09, dated June 3, 1997. The inspection did not identify any deficiencies or violations of NRC regulatory requirements regarding penetration seals.

The inspectors visually inspected a sample of installed fire barrier penetration seals and compared them to the fire test configurations and design drawings. On the basis of this inspection, the inspectors concluded that the installed penetration seals were bounded by the licensee's qualification fire tests which conservatively bound the typical fire hazards present at Salem.

While positive conclusions were drawn regarding fire barrier penetration seals, the staff identified steps that could be taken by the licensee to provide added assurance that installed fire barrier penetration seals have adequate margins of safety. The inspection report identifies this as a future inspection followup item.

5. **"Does the Salem Generating Station's Updated Final Safety Analysis Report Section 9.5.1.2.2, "Penetration Seals," clearly specify the applicable licensing bases for Salem Units 1 and 2? If not, under what authority could Salem 2 be permitted to restart?"**

Section 9.5.1.1 of the UFSAR states that the Salem Fire Protection Program is described in several documents and lists the five documents. The applicable licensing bases, and the information related to fire barrier penetration seals, contained in these documents, are summarized in subsection 9.5.1.2.2, "Penetration Seals." License Condition 2.C.(10) of the Salem Unit 2 license states that PSE&G shall implement and maintain in effect all provisions of the approved fire protection program as described in the UFSAR and as approved in the staff's safety evaluation of November 20, 1979, and its supplements. This license condition, along with 10 CFR 50.48, specifies the fire protection regulatory requirements for Salem Unit 2. The staff has concluded that the requirements have been satisfied for Salem Unit 2.

6. **"Assuming that Appendix R, Section III.M, is applicable for Salem Unit 1 since this plant was licensed prior to January 1, 1979, how have PSE&G and the NRC ensured that penetrations through areas common to both units, such as the main control room, comply with the appropriate regulation?"**

Salem Unit 1, was licensed to operate on December 1, 1976. Therefore, Appendix R, which applies to nuclear power plants licensed to operate prior to January 1, 1979, applies to Salem Unit 1. The extent to which the specific requirements of Appendix R are applicable to Salem Unit 1, is specified in 10 CFR 50.48(b). Section III of Appendix R contains 15 subsections, lettered A through O, which specify requirements for nuclear power plant fire protection features. These requirements are divided into two categories. The first consists of those requirements that were backfitted to all plants operating prior to January 1, 1979, regardless of whether or not the staff had previously approved alternatives to the requirements of those sections. These requirements are set forth in Section III.G, "Fire protection of safe shutdown capability," Section III.J, "Emergency lighting," and Section III.O, "Oil collection system for reactor coolant pump." The second category consists of requirements that were backfitted on a plant-specific basis and only to the extent needed to resolve the "open" items of previous NRC staff fire protection reviews. An open item was defined as a fire protection feature that had not been previously approved by the NRC staff as satisfying the guidelines of Appendix A to BTP APCSB 9.5-1, as documented in a staff safety evaluation. Section III.M, "Fire barrier cable penetration seal qualification," of Appendix R was one such provision. On the effective date of Appendix R, fire barrier penetration seals were not an open item at Salem Unit 1. Therefore, Section III.M of Appendix R does not apply to the fire barrier penetration seals installed at Salem, Unit 1.

In summary, as with Unit 2, Unit 1 provided penetration seals in accordance with the guidance of BTP APCSB 9.5-1, which does not specify that penetration seal materials be noncombustible. For the reasons summarized in the Background section, the NRC staff has approved the use of RTV silicone foam as a component of fire barrier seal assemblies in spite of the fact that in accordance with an American Society for Testing Materials test method it is classified as a combustible material.