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

May 19, 1999

MEMORANDUM TO: William D. Travers
Executive Director for Operations

FROM: Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

SUBJECT: DIRECTOR'S REVIEW OF MAINE YANKEE ATOMIC POWER COMPANY'S BACKFIT CLAIM REGARDING BEYOND-DESIGN-BASIS SPENT FUEL POOL ACCIDENTS AND NRR STAFF RESPONSE TO BACKFIT REVIEW PANEL FINDINGS

Background

By letter dated February 17, 1998, Maine Yankee Atomic Power Company (MYAPCo) claimed that the criteria being used by the U.S. Nuclear Regulatory Commission (NRC) staff to evaluate a Maine Yankee exemption request constituted a backfit as described in 10 CFR 50.109. On April 21, 1998, Mr. Jack Roe, Acting Director, Division of Reactor Program Management, responded to the backfit claim by stating that the NRC staff had determined that its decision to require a spent fuel pool heatup analysis before approving MYAPCo's request for exemption from offsite emergency preparedness requirements did not constitute a backfit. On May 6, 1998, MYAPCo appealed the NRC backfit determination. In response to the appeal, the Deputy Director of the Office of Nuclear Reactor Regulation (NRR) appointed a backfit review panel to evaluate the appeal. On October 28, 1998, the backfit review panel made its recommendations to me (Attachment 1). The panel determined that the staff did not impose a backfit while reviewing MYAPCo's exemption request. However, the panel also made a number of observations and conclusions regarding the process used by the staff in reviewing MYAPCo's emergency preparedness exemption request.

Evaluation

On February 10, 1999, at my request, the NRR staff responded to the backfit review panel's report by providing me with the staff's views on the findings of the panel (Attachment 2). The staff commented on the backfit review panel's findings in four areas: (1) the panel's concurrence with MYAPCo's claim that the application of the backfit rule does not depend on whether a change comes from an NRC initiative or a licensee application, (2) the level of detail of the review conducted by the staff, (3) the timeliness of the review, and (4) the applicability of certain technical conclusions relied upon by the panel. My conclusions in each of these areas are given below.

1. MYAPCO's assertion that the application of the backfit rule does not depend on whether a change comes from an NRC initiative or a licensee application

In recent discussions with staff from the Office of the General Counsel, the agency's position on this issue has been clarified. The backfit rule was intended to ensure that once the NRC issues a license, the terms and conditions for operating under the license and regulations are

not arbitrarily changed after the fact by the Commission. The backfit rule precludes the staff from imposing new or different requirements or interpretations without meeting the specific criteria established by 10 CFR 50.109.

An exemption request made by a licensee is a request to do what is not currently permitted under its license and applicable regulations and represents a proposed deviation from how the facility is licensed. When considering exemptions, the staff has an obligation to satisfy additional considerations about why it is acceptable to allow a licensee to operate outside of existing regulations. Requests for additional information (RAIs) or the imposition of special conditions associated with approving exemption requests are outside the realm of the backfit rule and do not constitute an imposition of new requirements by the staff. In these situations, licensees are not protected by the backfit rule; instead, 10 CFR 50.54(f) applies and requires the staff to provide a reasonable basis to justify the need for the additional information. If the staff's request is not related to the issues associated with the exemption, a licensee could challenge it as arbitrary and capricious under 10 CFR 50.54(f). Application of the backfit rule in a manner similar to its application to exemptions also holds for staff RAIs associated with review of licensee-requested license amendments and proposed changes to technical specifications. In these examples management must exercise appropriate oversight and ensure agency expectations are met. Management will become the final arbiter. Thus, staff RAIs, in response to licensee-initiated license amendment requests or exemptions, do not constitute backfits.

2. Level of detail of review conducted by the staff

I have reviewed the issues associated with the level of detail of the staff's review and I have concluded that when the MYAPCo exemption request was submitted, the licensee did not provide an adequate deterministic or probabilistic basis for approving the exemption. Thus, the staff had to request additional information from MYAPCo. When responses to some of the staff's questions were not provided by MYAPCo, the NRR staff developed a technical basis that was adequate for approval of the exemption. However, to avoid the need for issuing similar exemptions in future situations, I have directed the staff to undertake a risk-informed rulemaking effort to establish integrated requirements for decommissioning reactors in the areas of emergency preparedness, onsite and offsite insurance, and safeguards. We expect to be able to provide the Commission with a technical framework and schedules for resolution of these issues by June 18, 1999. The establishment of risk-informed regulations for decommissioning reactors in these areas could eliminate the need for routine staff reviews of exemptions and allow licensees to reduce expenditures as soon as possible while ensuring adequate protection of public health and safety. Predictability is a key element in developing risk informed regulations.

3. Timeliness of the staff review

In its February 10, 1999, response to the backfit review panel's report, the staff explained that licensing action timeliness for recent decommissioning plants met the current NRR goals for timeliness. However, I believe that decommissioning licensing action timeliness can still be improved. Promulgation of new regulations as described above could eliminate the need for

many routine NRC reviews in these areas. Thus, limited staff and licensee resources could be redirected to other areas requiring licensing reviews, such as decommissioning technical specifications. As the need to review and approve exemptions is reduced, the timeliness of other reviews will be enhanced.

4. Applicability of certain technical conclusions relied upon by the backfit review panel

After reviewing the information available in this area at the time the issue was under consideration, I have concluded that for a high-density spent fuel pool drained of all coolant, rapid zircaloy fuel cladding oxidation could occur for at least 2 to 3 years after plant shutdown. The staff was justified in requiring site-specific analyses before approving the emergency preparedness exemption requests. However, as concluded by the backfit review panel, requiring licensees to perform and the NRC to review such analyses is burdensome and time consuming for both licensees and the NRC. The risk-informed rulemaking effort that I have initiated is intended to result in new decommissioning regulations that will better define the extent to which plant-specific heatup analyses will be required.

Another technical issue raised by the staff is the expected consequences of rapid zircaloy oxidation (zircaloy fire) if it should occur. Information in NUREG-1353, "Beyond Design Basis Accidents in Spent Fuel Pools," appears to conflict with information in NUREG/CR-6451, "A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants." The staff's technical review will also examine the consequences of rapid zircaloy oxidation and this will be used to develop the new risk-informed regulations for permanently shutdown plants.

Conclusion

I reviewed the staff's February 10, 1999, analysis of the backfit review panel's findings and have concluded that when the staff reviewed the exemption request, the available guidance appropriately led the staff to conclude that a site-specific analysis considering the zircaloy fire scenario was needed before the exemption could be granted. Although the existing information regarding the possible consequences of a zircaloy fire is conflicting in certain areas, the studies that I have initiated will clarify these uncertainties and will lead to new risk-informed decommissioning regulations.

Docket No. 50-309

Attachments: As stated (2)

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ATTACHMENT 1

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

October 28, 1998

MEMORANDUM TO: Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

FROM: Backfit Review Panel:

John A. Zwolinski, Acting Director
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

Gus C. Lainas, Acting Director
Division of Engineering
Office of Nuclear Reactor Regulation

Frank J. Congel, Director
Incident Response Division
Office of Analysis and Evaluation
of Operational Data

SUBJECT: RESULTS OF BACKFIT REVIEW PANEL REGARDING EMERGENCY PREPAREDNESS REQUIREMENTS FOR MAINE YANKEE

On June 9, 1998, the Backfit Review Panel (Panel) was appointed to determine if the criteria being used by the staff in evaluating a Maine Yankee request for relief from offsite emergency preparedness requirements of 10 CFR 50.54(q) constitute a backfit. The results of the Panel's efforts are attached. The Office of the General Counsel has reviewed the Panel's report and has no legal objection to the Panel's findings.

The Panel reviewed numerous documents with varying degrees of relevancy to this matter. Also, on July 9, 1998, the Panel met with key Office of Nuclear Reactor Regulation (NRR) staff involved in the processing of the emergency preparedness exemption request. On July 10, 1998, the Panel met with the licensee to discuss its backfit appeal in a meeting open for public observation. The meeting was transcribed. The Panel has followed the guidance contained in NRR Office Letter No. 901, "Procedures for Managing Plant-Specific Backfits and 10 CFR 50.54(f) Information Requests." The licensee argues that the criterion being imposed for review of its emergency preparedness exemption request is a backfit as the accident being postulated is considered to be outside the Maine Yankee licensing basis and, in addition, is a beyond-design-basis event. The licensee has also brought into question other issues such as backfit protection when seeking to amend its license.

The Panel has determined that the staff has not imposed a backfit on the licensee. However, the Panel has concluded that the criterion being used by the staff appears to be overly conservative, seeking to achieve a safety finding that is much more conservative than a traditional risk-informed reasonableness threshold. The basis for this conclusion is contained in

the attached report. Other issues, which arose during the Panel's deliberations, are identified. These include the applicability of 10 CFR 50.109 to plants in a decommissioning mode and protection provided all licensees when exemption/amendment requests are made of the staff. The attachment has been developed such that it is in a format to transmit to the licensee in response to its letter of May 6, 1998.

The Panel is available to meet with you should questions exist.

Attachment:
Maine Yankee Backfit Review Panel Results

MAINE YANKEE BACKFIT APPEAL
PANEL RESULTS

TABLE OF CONTENTS

BACKFIT REVIEW PANEL RESULTS ON THE APPROPRIATE USE OF A POSTULATED ZIRCONIUM FUEL CLADDING FIRE IN A SPENT FUEL POOL AS THE CRITERION TO FORM THE BASIS TO GRANT EMERGENCY PLANNING EXEMPTIONS

I. BACKGROUND

On November 6, 1997, Maine Yankee Atomic Power Company (the licensee) submitted an exemption request to allow Maine Yankee to discontinue certain aspects of offsite Emergency Planning (EP). At a meeting with the licensee on November 25, 1997, the staff informed the licensee that a finding would have to be made that Maine Yankee was no longer vulnerable to an event that could exceed the Environmental Protection Agency's (EPA's) Protective Action Guides (PAGs) and that spent fuel pool heat up analysis would be part of the review.

On February 17, 1998, the licensee transmitted a letter to the staff claiming the staff was using acceptance criteria and taking positions more stringent than those previously accepted in the Maine Yankee licensing basis, thus, claiming a backfit existed. The staff responded to the licensee in a letter dated April 21, 1998, from Jack Roe, the Acting Director, Division of Reactor Program Management, to Mr. Meisner, President, Maine Yankee Atomic Power Company, denying the licensee's claim of backfit. The staff concluded that the "Backfit Rule was intended to assure that once the Nuclear Regulatory Commission (NRC) issued a license, the terms and conditions for operating under the license and regulations at the time of initial licensing are not arbitrarily changed *post hoc* by the Commission." Further, that when a licensee seeks an exemption, the licensee "is requesting authority to do what is not currently permitted under its license" and the licensee "has no valid expectations protected by the backfit rule regarding the terms and conditions for obtaining the new authority which is not permitted under the regulations." Additionally, the letter stated that "to grant the exemption is discretionary...and would not be considered backfitting so long as: (I) there is a rational basis for the new requirements and (ii) there is reasonable nexus between the new requirements and the subject matter of the exemption"--that is, that staff has a fully rational basis for seeking new information to make a finding that an appropriate basis exists to grant the exemption. The staff believed that the analysis it requested from Maine Yankee was necessary to provide assurance that the radiation doses would not exceed the alert emergency classification, thus, obviating the need for offsite emergency response capability.

On May 6, 1998, Maine Yankee sent a letter to the Executive Director of Operations appealing the staff's findings contained in the April 21, 1998, letter. Subsequently, that matter was referred to the Office of Nuclear Reactor Regulation (NRR).

On June 9, 1998, senior NRC managers were appointed to a Backfit Review Panel (Panel) to evaluate the criteria being used by the staff to render a finding in support of a Maine Yankee-proposed exemption regarding EP. On July 9, 1998, the Panel met with key NRR staff involved in the processing of the exemption request. On July 10, 1998, the Panel met with Maine Yankee to discuss its backfit appeal in a meeting open for public observation. Three members of the public provided additional comments. The meeting was transcribed. The Panel has followed the guidance contained in NRR Office Letter No. 901, "Procedures for Managing Plant-Specific Backfits and 10 CFR 50.54(f) Information Requests." The primary issue of concern is the

criterion being applied by the staff in order to make a safety finding and, thus, develop a basis to grant an exemption to 10 CFR 50.47. The licensee argues that the criterion being imposed is a backfit as the accident being postulated is considered outside the Maine Yankee licensing basis and, in addition, is a beyond-design-basis event. The licensee has also brought into question another issue regarding backfit protection when seeking to amend its license and other concerns.

II. BACKFIT APPEAL

In its May 6, 1998, letter and in the subsequent interactions with the staff, the licensee appealed the staff's decision based largely on the following assertions:

1. The backfit rule should apply to decommissioning plants.

2. The backfit rule should not distinguish between licensee-initiated requests and NRC-initiated actions.

3. It is a violation of the backfit rule to review an exemption request against accident sequences and associated assumptions beyond those considered in the existing licensing basis.

4. A NUREG cannot be used as the basis to impose new or additional requirements on licensees.

5. The licensee further characterized another regulatory burden imposed by the staff to be a backfit; viz., the licensee was required not only to perform an acceptable analysis, but also to provide the NRC with information, support, and assistance, as necessary, to allow the NRC to perform its own analysis verifying the licensee's fulfillment of the new criterion.

The Panel reviewed the licensee's request, the arguments presented in the materials provided, information obtained in the meetings conducted with the staff, and the history of the staff's disposition of similar requests.

III. THE LICENSEE'S ASSERTIONS AND THE PANEL'S CONCLUSIONS

The licensee's backfit claim and subsequent appeal grew from its perception of the bases that the staff proposed to use to grant the exemption. Therefore, before discussing Maine Yankee's assertions, it is appropriate to discuss exemptions. Pursuant to 10 CFR 50.12(a), the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of the regulations that are (1) authorized by law, will not present an undue risk to public health and safety, and are consistent with the common defense and security, and (2) present special circumstances. The underlying purpose of Section 50.54(q) from which Maine Yankee sought exemption is to ensure that licensees follow and maintain in effect emergency plans that provide reasonable assurance that adequate protective measures can and will be taken in the event of an emergency at a nuclear reactor. The regulations are intended to provide protection from generally credible beyond-design-basis accidents. To grant an exemption from offsite EP requirements, the NRC must find that the proposed exemption does not compromise public health and safety in the event of these beyond-design-basis accidents.

Assertion 1: The backfit rule as it applies to decommissioning plants.

The licensee argued that the explicit terms of the backfit rule apply to plants undergoing decommissioning because these plants are required to adhere to the provisions of 10 CFR Part 50. The licensee further stated that decommissioning plants need and are entitled to the same predictability, stability, and protection from arbitrary actions as operating plants.

The Panel reviewed the history of similar requests and the staff's granting of EP exemptions to Rancho Seco, Yankee Rowe, and Trojan.

Rancho Seco

The EP was revised to reflect the shutdown and defueled status of the reactor. The licensee's submittal included several attachments to justify the proposed changes to the EP and a request for an exemption to cease offsite emergency response and preparedness activities.

The staff reviewed the EP based on the standards of 10 CFR 50.47(d), which state the requirements for a license authorizing only fuel loading and low-power testing. The standards of 10 CFR 50.47(d) recognize the lower risk associated with low-power operation and were considered by the staff to be generally appropriate for reviewing the offsite aspects of the defueled EP. The staff determined that the radioactive source terms for an accidental release were greatly reduced by radioactive decay with time.

Based on a review of the Sacramento Municipal Utility District's analysis of possible events at Rancho Seco, the staff concurred with the licensee's analysis and concluded that there is no credible accident for Rancho Seco in the defueled condition that could result in the release of radioactive materials to the environment in quantities that would require prompt protective actions for the public.

Yankee Rowe

The staff used the same acceptance criteria for the review as was used to evaluate the adequacy of onsite emergency plans for operating nuclear power reactors, taking into consideration the current shutdown status and inherent low risk of Yankee Rowe. The radioactive source terms for an accidental release had been greatly reduced by radioactive decay. The staff independently evaluated the offsite radiological consequences of the maximum credible accident in a defueled state.

Based on the staff's review of the Yankee Rowe analysis, the staff concurred with the licensee's accident analysis and concluded that there is no credible accident in the defueled condition that could result in the release of radioactive materials to the environment in quantities that would require prompt protective actions for the public.

Trojan

The staff determined that the most significant potential accident associated with a permanently defueled and shutdown reactor involves the spent fuel stored on site. The postulated accident sequence involved the complete or partial loss of water from a spent fuel pool containing recently off loaded fuel. This beyond-design-basis accident sequence could result in a zirconium fuel cladding fire that could propagate through the spent fuel storage pool and result in significant

offsite consequences. Although such an accident is beyond the design bases, it was considered within the spectrum of accidents that might be reasonably credible and that could require continuance of the offsite EP. It is also within the spectrum of beyond-design-basis accidents considered in NUREG-0396, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants," that formed the basis for NRC's emergency planning regulations from which the licensee sought exemption. A description of the accident sequence and estimates of impact are contained in NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, 'Beyond Design Basis Accident in Spent Fuel Pools.'" Consideration of this accident scenario was limited to the period of time that the spent fuel was thermodynamically capable of a cladding fire. This time period of concern had been estimated by the staff to be about 1 to 3 years following final shutdown depending on fuel burn-up and the spent fuel storage configuration.

The licensee subsequently justified to the staff's satisfaction that its spent fuel pool was designed to seismic criteria that essentially precluded a credible event that would lead to the loss of coolant inventory, thus, making the review criterion of a zirconium cladding fire moot.

Panel Conclusions on Assertion 1

The Panel finds that the Commission did not appear to explicitly consider the applicability of the backfit rule to decommissioning reactors. The staff is preparing a Commission paper that will address the applicability of the backfit rule to decommissioning plants. The Panel believes action on this Commission Paper should afford plants the same predictability, stability, and protection as operating reactors. Thus, the Panel has chosen to defer a conclusion on this matter on a generic basis. For the purposes of this appeal, the Panel simply assumed that the backfit rule applies to this specific licensee request. .

Assertion 2: The backfit rule should not distinguish between licensee initiated requests and NRC initiated actions.

The licensee stated that the backfit rule and its Statement of Considerations do not make the distinction in applicability based on the source of the proposed action. The licensee indicated that the backfit rule, by definition, relates to the imposition of new or additional requirements by the NRC. The licensee asserted that the NRC's position with respect to the Maine Yankee issue creates a distinction that does not exist in the backfit rule.

The Panel reviewed the applicable regulations and the staff's approach to evaluating the exemption request.

Panel Conclusion on Assertion 2

The Panel agrees with the licensee that the application of the backfit rule should not depend on whether the change comes from an NRC initiative or a licensee application.

Assertion 3: It is a violation of the backfit rule to review an exemption request against accident sequences and associated assumptions beyond those considered in the existing licensing basis.

In order to evaluate this assertion, the Panel reviewed several relevant documents. These included NUREG-1353, the staff's efforts in granting EP exemptions for Rancho Seco, Yankee

Rowe, and Trojan (described above), and the agency's bases for imposing offsite EP regulations (including NUREG-0396 and NUREG-0654). Also, the Panel reviewed SECY 93-127 (regarding Price-Anderson Exemptions) and its associated Staff Requirements Memorandum, and the ongoing staff efforts related to the proposed draft rulemaking on EP (SECY 97-120). The Panel's findings and analysis are summarized as follows.

1. Basis for Offsite EP Requirements

NUREG-0396, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants," and NUREG-0654, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," discuss radiological emergency preparedness and the basis for planning response actions in the event of nuclear power plant accidents. These documents include consideration of generic beyond-design-basis accidents. The underlying purpose of the offsite requirements is to ensure licensees follow and maintain in effect emergency plans that provide reasonable assurance that adequate protective measures can and will be taken in the event of an emergency at a nuclear reactor. To grant an exemption from the regulations, the staff need only conclude that reasonably credible beyond-design-basis accidents will not require offsite response capabilities.

2. NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, 'Beyond Design Basis Accidents in Spent Fuel Pools'"

The risk of beyond-design-basis accidents in spent fuel storage pools was examined in WASH-1400. It was concluded that these risks were orders of magnitude below those involving the reactor core because of the simplicity of the spent fuel storage pool design; in particular, (1) the coolant is at atmospheric pressure, (2) the spent fuel is always subcritical and the heat source is low, (3) there is no piping that can drain the pool, and (4) there are no anticipated operational transients that could interrupt cooling or cause criticality.

The methods used to provide cooling for the removal of decay heat from the stored assemblies vary from plant to plant. The safety function to be performed remains the same; the spent fuel assemblies must be cooled and must remain covered with water during all storage conditions. Assuming that the water is drained or boiled off, the fuel rods will heat up until the buoyancy-driven air flow is sufficient to prevent further heat up. If the decay heat level is high enough to heat the fuel rod cladding to about 900 °C (1650 °F), the oxidation becomes self-sustaining, resulting in a zirconium cladding fire. Propagation of the zirconium cladding fire to older adjacent assemblies is likely if the decay heat level in an older adjacent assembly is high enough to heat that assembly to within 100 to 200 °C (200 to 400 °F) of the self-sustaining oxidation temperature. Although propagation of a zirconium cladding fire to 1- to 2-year old fuel by only thermal radiation can occur, the older fuel would have to be next to the hottest assemblies.

The risk from the storage of spent fuel in the spent fuel storage pool at light-water reactors is dominated by the beyond-design-basis earthquake accident scenario. The seismic capacities, or fragility, of two older spent fuel pools indicate that the high confidence of low probability of failure (HCLPF) is about three times the safe-shutdown earthquake (SSE) design level. The HCLPF values are estimated to be in the 0.5 to 0.65 g range. The median peak ground acceleration needed to fail these pools is estimated to be in the 1.4 to 2.0 g range, nearly a factor of ten higher than the SSE design value. A report prepared by the American Society of Civil Engineers

also concluded that, in general, the seismic design of nuclear facility structures result in median factors of safety on the order of 4 to 19 based on post-1973 design criteria.

The structural capacity of the elevated boiling-water reactor (BWR) pool is lower than that for the pressurized-water reactor (PWR) pool located at ground level; however, the lower conditional probability of a zirconium cladding fire for the BWR fuel assembly design offsets the higher seismic failure frequency. The probability of a zirconium cladding fire, resulting from the loss of water from the spent fuel pool, is estimated to have a mean value of 2×10^{-6} per reactor year for either the PWR or the BWR spent fuel pool. The seismic event contributes over 90 percent of the PWR spent fuel damage probability, and nearly 95 percent for the BWR.

The source term for the spent fuel pool accident is not the same as the source term associated with core damage accidents. The consequences of a spent fuel pool accident, which results in the complete loss of water, are dominated by the long lived isotopes such as cesium and strontium. The health consequences are dominated by the risk of latent cancer fatalities due to long-term exposures.

The risk and consequences of a spent fuel pool accident appear to meet the Safety Goal Policy Statement objectives. The study concluded that most of the spent fuel pool risk is derived from beyond-design-basis earthquakes, and that this risk is no greater than the risk from core damage accidents due to seismic events beyond the SSE. Therefore, reducing the risk from spent fuel pools due to events beyond the SSE would still leave at least a comparable risk due to core damage accidents. Because of the large inherent safety margins in the design and construction of the spent fuel pools, no action was deemed justified. Key facts from NUREG-1353:

- For a zirconium clad fire to occur, the fuel must be recently discharged (between 30 and 180 days in a cylindrical BWR configuration, and between 30 and 250 days in a cylindrical PWR configuration).

- For a less severe accident in which the fuel is exposed to air, but does not reach temperatures high enough to ignite the zirconium cladding, fuel pin failure could occur, resulting in a release of the noble gases and halogens.

- For spent fuel accidents, there are no "early fatalities" and the risk of early injury is negligible. For a severe core damage accident, early fatalities and early injury are part of the risk due to the presence of short-lived isotopes. For the long-lived isotopes (predominately cesium), the exposure is due mainly to exposure after the area is decontaminated and people return to their homes.

Most of the spent fuel pool risk is derived from beyond-design-basis seismic events. For operating plants, the spent fuel pool risk is no greater than the risk from core damage accidents due to seismic events beyond the SSE. Potential improvements to the spent fuel pool cooling and make-up systems were also examined. The potential risk to the general public is estimated to be very small, on the order of three to four person-rem, given a loss of cooling event, which results in failure of the spent fuel cladding, but not a cladding fire. Reducing the spent fuel pool risk would not affect the overall risk of an operating plant to any significant degree.

The Panel believes that in the circumstances of this case, a zirconium cladding fire resulting from a drain down of the spent fuel pool is so unlikely, especially after significant decay time, that it need not be considered in acting on Maine Yankee's exemption request.

3. Price-Anderson Exemptions

The staff stated the following in SECY 93-127, "Financial Protection Required of Licensees of Large Nuclear Power Plants During Decommissioning:" "...the most significant accident sequence for a permanently defueled and shutdown reactor involves the complete loss of water from a light water reactor spent fuel pool. This beyond design basis accident could result in a zirconium fuel cladding fire that could propagate through the spent fuel storage pool and result in significant off site consequences....Although such an accident is beyond the design bases, it may be considered 'reasonably credible' and could warrant requiring substantial financial protection. Such an accident is possible during the first year after reactor shutdown for a low density spent fuel storage configuration and during the first 2 to 3 years after shutdown for spent fuel stored in certain high density configurations."

The Commission's response to SECY 93-127 required the staff to issue Price-Anderson exemptions for permanently shutdown plants after a case-by-case review.

The Panel notes that the criteria used by the staff for granting relief from Price-Anderson may be different than the criteria used in granting exemptions to EP. The protection afforded by offsite EP may be relaxed well before the financial protection associated with Price-Anderson.

4. EP Draft Rulemaking

The staff has undertaken rulemaking that will simplify the review and approval process for EP regulations. On July 10, 1997, the Commission approved Option 2 of SECY 97-120, "Rulemaking Plan for Emergency Planning Requirements for Permanently Shutdown Nuclear Power Plant Sites 10 CFR Part 50.54(q) and (t), 10 CFR 50.47, and Appendix to 10 CFR Part 50." The proposed rulemaking would allow power reactor licensees to obtain relief from EP requirements during permanent shutdown. Under specified conditions and subject to NRC approval, licensees would be allowed to modify their EP requirements if they met the following conditions: (1) the reactors onsite are defueled and permanently shutdown; (2) spent fuel in the spent fuel pools is no longer susceptible to a zirconium cladding fire or gap release caused by an incipient fuel cladding failure in the event the spent fuel pool is drained accidentally; and (3) a site-specific analysis of the onsite inventory of radioactive material has determined that in the event of a release, no member of the public would be exposed to doses in excess of the EPA PAGs. After spent fuel has cooled down to a point where the spent fuel cladding temperature would not exceed 565 °C following an accidental draining of the spent fuel, licensees would be allowed to modify their EP requirements. The cladding temperature limit of 565 °C would be reached after a decay period of 17 months for PWRs and 7 months for BWRs (according to NUREG/CR-6451, "A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants," prepared by Brookhaven National Laboratory).

The Panel notes the efforts of the staff appear to support a time-sensitive criteria in lieu of a comprehensive case-by-ease technical evaluation. This approach will significantly reduce staff and licensee time and effort and result in a fully predictable process.

<u>Panel Conclusion on Assertion 3</u>

The staff first used the spent fuel pool fire as a limiting safety concern during the review of the Trojan EP exemption request. Subsequent to the Trojan review, spent fuel pool fires were used

by the staff in proposals to the Commission for Price-Anderson exemptions and in generic rulemaking for processing EP exemptions for decommissioning plants.

The Panel finds, in addition to the history associated with the use of the subject criteria, that no backfit occurred when this criterion was used by the staff in evaluating Maine Yankee's exemption request. Indeed, Maine Yankee recognized the need for this analysis and included such an analysis in its January 20, 1998, submittal. However, the Panel believes that the staff sought to develop an absolute safety finding rather than a risk-informed reasonable assurance finding.

While the use of the zirconium clad fire is a conservative criterion for evaluating EP exemption requests for decommissioning plants, it remains unclear that this is the appropriate criterion in all circumstances. Maine Yankee argued that sufficient technical bases exist to grant the EP exemption shortly after off-loading all fuel to the spent fuel pool. A reasonableness test along with a risk-informed perspective and a realistic consideration of the likelihood that the spent fuel pool could be drained in the first place appears to justify this view. NUREG-1353 provides a quantitative analysis of the potential radiological impact of radioactivity released to the environs from a burning spent fuel versus the number of days fuel has been stored. The impact of radioactivity releases decreases from about 2,600,000 to 4 person-rem (whole body dose) over a 1-year period. Thus, a simplistic and quantifiable figure of merit already exists, which is clear and easily understood. Additional complex analyses of heat-up rates and extensive reviews of computer codes as the staff initially requested in this case are not required.

In addition, the NUREG-1353 analysis did not assume a prompt, planned evacuation. It did assume that after 1 day of radioactivity releases associated with the spent fuel fire, people would be relocated. The analysis also indicated that no substantial acute individual doses would occur. There is not a clear nexus that relates the need for the comprehensive EP with the characteristics of a spent fuel pool fire. The Panel concludes that the staff had ample opportunity to establish reasonable assurance that the public health and safety was protected without going into such technical depth.

Assertion 4: A NUREG cannot be used as the basis to impose new or additional requirements for licensees.

Panel Conclusion on Assertion 4

It is well known by the staff that NUREGs do not themselves impose requirements on licensees. There are internal NRC procedures that must be followed before any requirements can be imposed. Technical insights and analyses contained in NUREGs can be used by the staff to support evaluations that are part of the staff's routine functions and could form the foundation for the imposition of a requirement through other appropriate means.

In this case, the Panel notes that NUREG-1353 was used by the staff to identify accidents that could have offsite radiological impact justifying the continuation of offsite emergency preparedness while undergoing decommissioning. The Panel agrees that the staff appropriately used some of the analyses in NUREG-1353; viz., in identifying potentially significant safety concerns while undergoing decommissioning. However, as previously discussed, the staff could have relied on NUREG-1353 and concluded that EP is no longer required at a finite period of time after the reactor was completely defueled and, thus, had sufficient information to make the findings required to grant an exemption.

Assertion 5: The licensee further characterized another regulatory burden imposed by the staff to be a backfit: viz., the licensee was required not only to perform an acceptable analysis but also to provide the NRC with information, support, and assistance, as necessary, to allow the NRC to perform its own analysis verifying the licensee's fulfillment of the criterion.

Panel Conclusion on Assertion 5

The staff can always seek information needed to evaluate licensee requests with the condition that the information requested must have a reasonable nexus to the findings that the NRC must make to act on the licensee's request. Management must ensure that information requests meet this standard. This conclusion was confirmed by the Office of the General Counsel.

In processing exemption requests, the underlying regulation, 10 CFR 50.12, states, among other things that "[a]pplication of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule." The staff, therefore, must make a fundamental finding that circumstances have changed sufficiently to warrant consideration of the exemption and a technical argument exists which provides sufficient justification to support the proposed exemption.

To reach a determination that sufficient basis exists to meet the requirement of 10 CFR 50.12, the staff may need to seek information necessary to make a safety finding. In cases involving offsite EP requirements, the requirement of ensuring adequate public health and safety may result in evaluations that go beyond the design basis because the offsite EP requirements are based on beyond design basis accidents. Design basis events are typically postulated in performing plant reviews with the distinction that these events do not yield releases to the environs which exceed Part 100 limits.

Therefore, the staff's use of a postulated zirconium clad fire is appropriate to ensure that even under the most challenging potential "worst-case scenarios," the public health and safety remain protected as long as the zirconium clad fire remains as a reasonably credible event.

IV. SUMMARY

The Panel finds that the staff acted prudently and appropriately in applying criteria deemed necessary to make a safety finding to develop rationale and basis to support an exemption to 10 CFR 50.47. Based on the preceding discussion, the Panel finds no inconsistency with the application of 10 CFR 50.109 to the extent that a zirconium clad fire was reasonably credible.

The Panel believes that the concerns and questions raised by the staff in response to the request made by the licensee were appropriate. The Panel believes the criteria are defensible, albeit overly conservative. Management oversight, accountability and related NRC expectations should be focused to ensure staff questions and positions are germane to the topic. The scope and depth of technical reviews are management issues and management must ensure that absolutes are not the goal of the technical reviews but risk-informed reasonableness tests are maintained.

However, the most compelling observation was the lack of staff sensitivity to elapsed time and schedules confronting decommissioning nuclear power plants. Time-sensitive review criteria will focus the staff on issues of higher safety concern and allow the NRC to be a predictable

regulator. If done effectively, the NRC will be consistent and predictable in the decommissioning area. In this case, the staff should have considered whether the zirconium clad fire was reasonably credible in view of either the seismic design of the spent fuel pool (as it did in Trojan) or the time elapsed since the reactor was permanently shut down.

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

February 10, 1999

MEMORANDUM TO: Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

FROM: David B. Matthews, Director
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

SUBJECT: NRR STAFF RESPONSE TO BACKFIT REVIEW PANEL FINDINGS

On October 28, 1998, the backfit review panel (the Panel) appointed to review a Maine Yankee backfit appeal issued its report. The report concluded that the NRC did not impose a backfit on the Maine Yankee licensee. However, the Panel's report discussed several additional issues regarding the process and criteria being used by the NRC staff in its evaluation of emergency planning (EP) exemption requests submitted by licensees of permanently shutdown reactors. The Panel's findings formed the basis for the Director's Decision you issued to Maine Yankee on November 6, 1998, regarding their backfit appeal. Subsequent to issuance of the Director's Decision, you requested the NRR staff to assess the findings of the backfit review panel. The staff reviewed the Panel's conclusions and identified the following three areas for comment: (1) the level of detail of the review conducted by the staff, (2) the timeliness of the review, and (3) the applicability of certain technical conclusions relied upon by the Panel. The staff also noted that the panel agreed with Maine Yankee's claim that the application of the backfit rule should not depend on whether a change comes from an NRC initiative or a licensee application. This position contradicts OGC's current view on this issue.

1. Level of detail of review conducted by the staff

The Panel concluded that "the staff sought to develop an absolute safety finding rather than a risk-informed reasonable assurance finding" in granting an exemption from certain requirements of offsite EP to Maine Yankee. In addition, based on the amount of time that Maine Yankee had been shut down, the panel stated that "complex analyses of heat-up rates and extensive reviews of computer codes as the staff initially requested in this case are not required" and concluded that "the staff had ample opportunity to establish reasonable assurance that public health and safety was protected without going into such technical depth."

The staff's practices regarding EP exemptions at permanently shutdown reactors evolved from SECY 93-127, "Financial Protection Required of Licensees of Large Nuclear Power Plants During Decommissioning," dated May 10, 1993, and its associated Staff Requirements Memorandum (SRM), issued on July 13, 1993. In the SRM, the Commission directed the staff to "allow, after a requisite minimum spent fuel pool cooling period has elapsed, a reduction in the amount of financial protection required" at permanently shutdown facilities. In addition, the

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Commission directed the staff to proceed with rulemaking "to determine more precisely the appropriate spent fuel cooling period after plant shut down" beyond which offsite liability insurance coverage could be reduced. In SECY 93-127, the staff identified that the zirconium fuel cladding fire was possible for "the first two to three years after shut down for spent fuel stored in certain high density configurations." Although this accident scenario is a beyond-design-basis event, in SECY 93-127, it was determined to be the most "significant accident sequence" for a permanently shutdown reactor and was found to be "reasonably conceivable" for the purposes of evaluating the need for offsite liability insurance. The need for offsite emergency preparedness is based on a spectrum of severe accidents which is not limited to design basis events. The mean probability of the spent fuel pool draindown scenario is 2×10^{-6} per reactor year and its consequences, if a zirconium fire results, would be extensive. Thus, since the issuance of the SECY 93-127 SRM, the staff's review of decommissioning EP exemptions for permanently shutdown reactors has considered the complete loss of spent fuel pool water and subsequent heatup of the fuel as one of the accidents that must be evaluated to show that the facility does not pose any undue risk to the public. Licensees have performed calculations to determine the plant-specific spent fuel pool cooling periods necessary to preclude a zirconium cladding fire. The staff reviewed these submittals to confirm that a zirconium fire was not possible before approving the exemption requests.

The Commission, in the SRM on SECY 93-127, directed the staff to proceed with rulemaking to determine the appropriate spent fuel cooling period after shutdown to preclude a zirconium fire. The staff initiated a rulemaking effort with the Office of Nuclear Regulatory Research that included technical support from Brookhaven National Laboratory (BNL). BNL was tasked to identify existing codes that could perform these calculations or to develop a code that the staff and licensees could use to determine appropriate plant-specific spent fuel cooling periods. BNL concluded that existing codes were not sufficient and that a new code must be developed for this specific use. The staff planned to use the new code to perform sensitivity analyses to establish "generic" spent fuel cooling periods for use in an emergency planning rulemaking which would eliminate the need for EP exemptions at permanently shutdown plants.

While code development was ongoing at BNL, the staff went ahead with rulemaking efforts and on June 16, 1997, forwarded SECY 97-120, "Rulemaking Plan for Emergency Planning Requirements for Permanently Shutdown Nuclear Power Plant Site 10 CFR 50.54(q) and (t); 10 CFR 50.47; and Appendix E to 10 CFR Part 50" to the Commission for review. Option 2 of the Rulemaking Plan proposed that the reduction in offsite EP would occur when "the spent fuel in the spent fuel pool is no longer susceptible to a zirconium cladding fire . . . in the event the spent fuel pool is drained." The Commission directed the staff to proceed with this option in its SRM of July 10, 1997. Thus, in approving the rulemaking plan, the Commission also endorsed the criteria that the staff had been using since July 1993 for EP exemptions.

In August 1997, in response to an allegation related to the Haddam Neck facility (NRR-97-A-0048) regarding the safety of spent fuel storage after permanent reactor shutdown, the NRC staff replied to a member of the public stating that "the staff will require the licensee to submit analysis of the worst case radiological event and determine the level of emergency preparedness required at the site to handle this worst case scenario. The safety analyses will ensure that spent fuel pool water loss scenarios for shutdown power plants will be analyzed in establishing the worst case radiological event." This letter was shared by the alleger with other active members of the public in the vicinity of the Maine Yankee plant. Several of those individuals then contacted the NRC and requested that the staff ensure the same level of

protection for the Maine Yankee residents as was afforded to persons living near Haddam Neck. The discussion of this topic with stakeholders in the public domain underscored the need for the staff to maintain a reasonably consistent position on this issue in all exemptions and safety evaluations issued for emergency planning at shutdown plants.

Also, in August 1997, the staff published contractor report NUREG/CR-6451, "A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants," which provided an assessment of risk at permanently shutdown plants and recommendations for an appropriate level of regulatory requirements and potential reduction of those requirements over time following shutdown. This report was based on the new code developed by Brookhaven and was part of the effort to calculate spent fuel cooling time periods beyond which the spent fuel would lack sufficient decay heat to cause cladding oxidation. The Brookhaven analysis suggested that the critical decay time was 17 months for the "representative" PWR and 7 months for the "representative" BWR[1], but cautioned that the "representative" geometries analyzed did not necessarily include the most limiting configurations.

On November 6, 1997, Maine Yankee submitted a request seeking exemption from certain offsite emergency preparedness requirements. In its request, Maine Yankee indicated that it had undertaken a plant-specific analysis of the susceptibility of its spent fuel to an accidental radiological release in the event that the spent fuel pool is drained. On January 20, 1998, Maine Yankee submitted a request seeking exemption from the insurance requirements of 10 CFR 50.54(w) (onsite liability) and 10 CFR 140.11 (offsite liability). The submittal stated an analysis of the Maine Yankee spent fuel indicated that after January 16, 1998 (approximately 13 months after final reactor shutdown), natural circulation of air was sufficient to keep the cladding temperature below 565°C. This temperature (565°C) represents the onset of early clad failure and was the point at which significant reductions in insurance coverage were to be granted by the proposed rule on insurance requirements for permanently shutdown reactors approved by the Commission and published in Federal Register on October 30, 1997 (62FR58690). Staff review of the licensee's analysis identified non-conservative modeling errors and inconsistencies that could significantly increase the actual cladding temperature. The staff asked the licensee to address these issues in two requests for additional information (RAI). Maine Yankee never provided a response to the second RAI, issued on July 6, 1998. To this date, the accuracy of their heatup analysis remains an unresolved issue.

On February 17, 1998, Maine Yankee filed its backfit claim. On March 24, 1998, the staff briefed the NRR Office Director on the process it was using to evaluate the three active EP exemption requests (Haddam Neck, Maine Yankee, and Big Rock Point).

The staff continued to review the Maine Yankee EP exemption in accordance with the approved Option 2 of SECY 97-120; i.e., that the reduction in EP could occur when "the spent fuel in the spent fuel pools is no longer susceptible to a zirconium cladding fire . . . in the event the spent fuel pool is drained." The review plan was consistent with criteria and objectives previously outlined to the Commission, NRR management, and the public. Since the licensee became unresponsive to staff questions intended to verify the accuracy of the Maine Yankee heatup analysis, NRR managers and staff met to develop an approach to complete the evaluation without licensee input. As part of the effort, the staff performed its own simplified heatup

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[1]The NRC staff has recently identified some modeling and code errors in the Brookhaven report. Preliminary assessment indicates that the critical decay times may increase significantly.

analysis of the Maine Yankee spent fuel pool in order to expedite the approval process. Once the staff's own heatup analysis was completed, the staff moved quickly to finalize the review and develop a rationale for accepting the exemption, which was issued on September 3, 1998. The exemption could not have been issued before the staff completed its analysis because neither the NRC staff nor the licensee could provide a technical basis (either plant-specific or generic) to show that the zirconium fire scenario was not still a reasonably conceivable event. Thus, the staff believes it used an approval process with the appropriate depth of review regarding this issue.

2. Timeliness of the staff review

The Panel concluded that "the most compelling observation was the lack of staff sensitivity to elapsed time and schedules confronting decommissioning power plants."

The staff performed a review of all decommissioning licensing actions performed for plants that entered the decommissioning process during the last 5 years: Haddam Neck, Big Rock Point, Maine Yankee, and Zion Units 1 and 2. The staff determined that 31 of 36 completed or open licensing actions (86 percent) are less than 1 year old, 36 of 36 total licensing actions (100 percent) are less than 2 years old, and no licensing action is more than 2 years old. These data compare with the Fiscal Year (FY) 1998 - 1999 NRR timeliness goals of 80 percent of actions less than or equal to 1 year old, 95 percent of actions less than or equal to 2 years old, and all licensing actions less than or equal to 3 years old. It is also important to note that 4 of the 5 actions that exceeded 1 year of age were for the Haddam Neck facility. The completion of these actions was delayed in order to address offsite release of radioactive material issues that arose at Haddam Neck and caused the staff to respond by diverting substantial project management resources that otherwise would have been used to process licensing actions. In the specific case of Maine Yankee's EP exemption, the elapsed time from the date of their request to issuance of the exemption was slightly less than 10 months. To ease the burden for future licensees and reduce the amount of time required for a review, the staff is attempting to establish criteria during the current decommissioning rulemaking that would not require a licensee to submit an analysis to demonstrate that the zircaloy fire was no longer a reasonably credible event.

3. Applicability of certain technical conclusions relied upon by the Panel

A number of characterizations in the Panel's report did not reflect all of the information available to the staff regarding spent fuel pool heatup scenarios. Discussions of specific examples are provided below.

The panel's review relied upon the following information from NUREG-1353: "[f]or a zirconium clad fire to occur, the fuel must be recently discharged (between 30 and 180 days in a cylindrical BWR configuration, and between 30 and 250 days in a cylindrical PWR configuration)." However, this conclusion is applicable only to cylindrical (low-density) PWR spent fuel storage configurations. Most facilities, including Maine Yankee, utilize high density storage racks. The staff is unaware of any power reactor facilities that continue to store all their fuel in a cylindrical configuration. (Note that NUREG-1353 was published in 1989 before many plants completed re-racking their spent fuel pools.) For the Maine Yankee high density spent fuel pool configuration, Table 4.5.1 of NUREG-1353 lists the critical spent fuel cooling time to preclude a zirconium fire as 360 to 700 days (roughly 1 to 2 years). Thus, the data contained in

NUREG-1353 does not support a conclusion that a zirconium fire was not "reasonably credible"[2] at Maine Yankee which had been shut down only 11 months at the time the EP exemption request was submitted to the NRC. The staff's approval of the Maine Yankee exemption on September 3, 1998, about 21 months after plant shutdown, could not have been granted by using available generic data; the plant-specific heat up analysis required by the staff was judged to be essential to provide reasonable assurance of public health and safety.

The Panel stated a conclusion derived from NUREG-1353 that 1 year after shutdown, the population dose resulting from a spent fuel pool draindown scenario decreases from 2,600,000 person-rem to 4 person-rem. However, this statement compares a zirconium fire release 30 days after shutdown to a gap release of 50 percent of the fuel with no fire at 1 year after shutdown. While the Panel's conclusion might be appropriate for the cylindrical PWR storage configuration after 1 year, it is not applicable to the high density racks at Maine Yankee as discussed in the previous paragraph. Because it is still possible to have a zirconium fire beyond 1 year after shutdown when spent fuel is stored in high density racks, actual dose consequences of such a draindown at Maine Yankee would be much higher that the 4 person-rem value cited by the Panel.

The Panel cited a conclusion from NUREG-1353 that "for spent fuel pool accidents, there are no 'early fatalities' and the risk of early injury is negligible." The Panel is correct that NUREG-1353 makes this statement. However, there is no reference data in NUREG-1353 that supports the assertion. Another analysis was completed in 1997 by Brookhaven National Laboratory and documented in NUREG/CR-6451. When BNL analyzed the consequences of a spent fuel pool fire, it found that early injury could occur and calculated prompt fatalities ranging from 0.2 to 101 deaths within a 500-mile radius (NUREG/CR-6451; Tables 4.1 and 4.2). For perspective, BNL then compared these consequences with previously published consequences of core melt accidents. For a major core melt accident with prompt evacuation, 88 prompt fatalities were calculated within a 500-mile radius (NUREG/CR-6451; Table 4.3). Thus, the consequences of a spent fuel pool fire could be significant.

While the Panel's report did not specifically address what offsite dose criteria should be used for determining whether a reasonably conceivable event has consequences that require offsite emergency planning, the Panel's discussion of early fatalities and risk of early injury might imply that emergency planning is not needed unless early injury is expected. In reviewing the Maine Yankee exemption, the staff used the EPA Protective Action Guidelines (1 rem whole body, 5 rem thyroid) as the threshold for determining the need for offsite EP. These EPA guidelines have been used since 1978 by the NRC when evaluating emergency plans to determine when offsite protective actions are needed.

The Panel stated that the mean probability of a seismic event leading to a complete draindown (and assumed zirconium clad fire) is 2×10^{-6} per reactor year. Although accurate as the mean value, this single number does not account for the range of uncertainty in the probabilistic data. These uncertainties should be considered when using probabilistic data to make risk-informed judgements. In this case, Table S.1 of NUREG/CR-4982 specifies the range of uncertainty which is from 2.6×10^{-4} to 1.6×10^{-10} for PWRs and 6.5×10^{-5} to 4×10^{-11} for BWRs. These very large uncertainties associated with the estimated frequency of seismic-induced spent fuel pool failure led the staff to conclude that the risk of a spent fuel pool fire was significant enough to ask the licensee to perform an analysis.

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[2]In its report, the panel used the term "reasonably credible" event. For the purposes of this paper, the staff has interpreted "reasonably credible" to be synonymous with "reasonably conceivable" as used in SECY 93-127.

The Panel's report noted that the Trojan licensee justified that its pool was designed to seismic criteria that essentially precluded a credible seismic event that would lead to a loss of water inventory. The report implies that the NRC staff should have concluded that the Maine Yankee spent fuel pool had similar margins. However, to demonstrate the robust seismic design of the Trojan spent fuel pool, its licensee submitted a seismic margins assessment that quantitatively demonstrated that it could withstand a seismic event eight times greater than the design basis seismic event. The NRC staff could not have made a similar finding on Maine Yankee without a seismic margins assessment of the pool. No such analyses were performed or submitted by Maine Yankee.

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