50-528/529/530

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

June 25, 1998

Mr. James M. Levine
Senior Vice President, Nuclear
Arizona Public Service Company
Post Office Box 53999
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SUBJECT: COMPLETION OF LICENSING ACTION FOR NRC BULLETIN 96-02, "MOVEMENT OF HEAVY LOADS OVER SPENT FUEL, OVER FUEL IN THE REACTOR CORE, OR OVER SAFETY-RELATED EQUIPMENT," DATED APRIL 11, 1996, FOR THE PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3 (TAC NOS. M95620, M95621 AND M95622)

Dear Mr. Levine:

On April 11, 1996, the U.S. Nuclear Regulatory Commission (NRC) issued NRC Bulletin (NRCB) 96-02, "Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment," to all holders of operating licenses. The NRC issued NRCB 96-02 for three principal reasons:

1. Alert addressees to the importance of complying with existing regulatory guidelines associated with the control and handling of heavy loads at nuclear power plants,

2. Request that all addressees review their plans and capabilities for handling heavy loads in accordance with existing regulatory guidelines and within their licensing basis as previously analyzed in the final safety analysis report, and

3. Require addressees to report to the NRC whether and to what extent they have complied with the actions requested in this bulletin.

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Also the bulletin requested that licensees determine whether current activities for their plants were within the licensing basis and to submit a license amendment request as necessary.

In response to NRCB 96-02, Arizona Public Service Company provided a letter dated July 16, 1996, for Palo Verde Nuclear Generating Station, Units 1, 2 and 3. This submittal provided both the information requested and the responses required by NRCB 96-02. NRC staff review of the responses to NRCB 96-02 finds that, overall, the responses are acceptable; therefore, TAC Nos. M95620, M95621 and M95622 are closed. A summary of the staff's review of licensee responses to the bulletin is provided in the enclosure.

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The NRC will continue to review the issue of heavy loads through an ongoing Task Action Plan for heavy loads. Any additional information required for the completion of the Task Action Plan will be obtained on a plant-specific basis.

If you have any questions regarding this matter, please contact me at (301) 415-3062.

Sincerely,

Original Signed By

Mel B. Fields, Project Manager
Project Directorate IV-2
Division of Reactor Projects - III/IV
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-528, STN 50-529
and STN 50-530

Enclosure: Review Summary

cc w/encl: See next page

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SUMMARY OF THE STAFF'S REVIEW OF LICENSEE RESPONSES

TO NRC BULLETIN 96-02

Introduction

The following summarizes the results of the staff's review of licensees' responses to NRC Bulletin (NRCB) 96-02, "Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment," dated April 11, 1996, and its associated Requests for Additional Information (RAI). The bulletin reminded licensees of their responsibilities for ensuring that heavy load-handling operations are performed safely. It also requested that licensees review their plans and capabilities for handling heavy loads, and ensure that their load-handling operations are in accordance with existing regulatory guidelines and the plant's licensing basis. Also requested was that licensees identify and present schedules for licensing actions needed to support implementation of their heavy load-handling operations involving spent fuel dry storage casks. The licensees also were to provide schedules for moving dry storage casks. The RAI requested that selected licensees evaluate the hazards associated with an in-plant tip-over of spent fuel dry storage casks that could dislodge the cask lid and spent fuel elements.

This summary closes the staff's review of licensee responses to both the bulletin and the associated RAI. Future issues regarding the handling of heavy loads will be addressed generically under the Heavy Loads and Crane Issues Task Action Plan (TAP) and on a plant-specific basis as needed. Plant-specific reviews needed in the future may require the staff to obtain additional information from individual licensees.

Background

NRCB 96-02 was issued as an urgent generic communication that requested licensees' responses to the following:

(1) For licensees planning to carry out activities involving the handling of heavy loads over spent fuel, fuel in the reactor core, or safety-related equipment within the next 2 years from the date of the bulletin, provide the following: A report within 30 days of the date of the bulletin that addresses the licensee's review of its plans and capabilities to handle heavy loads while the reactor is at power (in all modes other than cold shutdown, refueling, and defueled) in accordance with existing regulatory guidelines. State whether the activities are within the licensing basis and, if necessary, submit a schedule for requesting a license amendment. Additionally, indicate whether changes to Technical Specifications (TSs) are required.

(2) For licensees planning to perform activities involving the handling of heavy loads over spent fuel, over fuel in the reactor core, or over safety-related equipment while the reactor is at power (in all modes other than cold shutdown, refueling, and defueled) that involve a potential load drop accident that was not previously evaluated in the Updated Final Safety

Analysis Report (UFSAR), submit a license amendment request 6-9 months in advance of the planned movement of the loads to give the staff sufficient time to perform an appropriate review.

(3) For licensees planning to move dry storage casks over spent fuel, over fuel in the reactor core, or over safety-related equipment while the reactor is at power (in all modes other than cold shutdown, refueling, and defueled) include, in item 2 above, a statement of the capability of performing the actions necessary for a safe plant shutdown in the presence of a radiological source term that may result from a breach of the dry storage cask, damage to the fuel, or damage to safety-related equipment due to a load drop inside the facility.

(4) For licensees planning to perform activities involving the handling of heavy loads over spent fuel, over fuel in the reactor core, or over safety-related equipment while the reactor is at power (in all modes other than cold shutdown, refueling, and defueled), determine whether changes to the TSs will be required to allow the handling of heavy loads (e.g., the dry storage canister shield plug) over fuel assemblies in the spent fuel pool and submit the appropriate information 6-9 months in advance of the planned movement of the loads for NRC review and approval.

Discussion

The levels of detail in the licensees' responses to NRCB 96-02 varied significantly. Although some licensees presented detailed information about their heavy load-handling operations, some licensees (Catawba, Crystal River, Farley, Indian Point 2, Salem, St. Lucie, Summer, Dresden, Fitzpatrick, Hope Creek, LaSalle, Quad Cities, and WNP-2), either omitted information pertinent to the staff's review in their submittal or referenced previous submittals associated with NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." However, all of the licensees responded to the bulletin.

In response to the bulletin, all the licensees reviewed their plans and capabilities to handle heavy loads and indicated that their plans and capabilities are adequate. Some discussions about licensees' plans and capabilities to move heavy loads addressed the plant mode of operation (at power or during shutdowns), the type of crane used (non-single-failure-proof, single-failure-proof, or upgraded cranes), and the methods and procedures for implementing the guidelines in NUREG-0612, Phase I. All the licensees indicated that their load-handling operations are in accordance with the guidelines in NUREG-0612, Phase I.

The bulletin requested that licensees determine whether their load-handling operations are within the licensing basis of the plant. Some licensees stated that their operations are within the licensing basis; other licensees committed to evaluate their licensing basis. Some licensees identified issues to be addressed with the NRC through licensing actions (amendment requests or 10 CFR 50.59 evaluations), and projected schedules for submitting the actions for NRC review. Following the responses to the bulletin, a few licensing actions have been reviewed and approved by the NRC concerning the bulletin. The issues involve proposed changes to TSs,

scope changes to accident analyses, changes in loads and load paths, and updates to UFSAR requirements.

The bulletin also asked licensees to determine if their movement of heavy loads involves potential load drop accidents that were not evaluated previously in the UFSAR and, if needed, submit a license amendment request. Most licensees stated that they move only analyzed loads. Some licensees indicated that they performed load drop or consequence analyses or both though the guidance in Generic Letter (GL) 85-11 cancelled the need to perform any analyses. Some licensees committed to evaluate the heavy loads identified previously when they responded to NUREG-0612. Despite the analyses performed, all the licensees stated that they satisfy the recommended guidelines in Section 5.1.1 of NUREG-0612.

Licensees moving heavy loads at power and using load drops and consequence analyses indicated that they have adequate capabilities to safely shut down the plant if a heavy load drop occurs causing a release of radiation or damage to safety-related equipment.

The bulletin also requested that licensees identify plans and schedules for moving spent fuel dry storage casks. Some licensees stated that they planned to move casks in the near future; other licensees indicated that they had not yet considered onsite dry cask storage.

Based on requests in the bulletin, the staff reviewed the licensees' responses to identify: (1) plant mode during the handling of heavy loads (at power or during plant shutdowns); (2) type of crane used to lift heavy loads; (3) evaluation of the licensing basis for handling heavy loads, including planned licensing actions associated with heavy loads (i.e., license amendment requests); (4) plans and schedules for moving heavy loads (particularly spent fuel dry storage and transportation casks); and (5) the type of analysis performed (load drop analysis or consequence analysis or both). Although the bulletin did not specifically request this information, the staff believes that this type of information covers the areas of concern about the licensees' heavy load-handling operations. On the basis of its review, the staff noted the following points.

(1) Plant Mode During Load-Handling Operations

Review of the responses to the bulletin revealed that approximately 38 percent of the plants (21 PWRs and 20 BWRs) plan to move heavy loads at power. Some of these plants indicated that they move analyzed heavy loads at power and unanalyzed heavy loads during plant shutdowns. These plants also indicated that heavy load movements over safety-related equipment are minimized to the extent practicable, and their procedures do not allow movements of heavy loads over fuel or over the reactor core in accordance with NUREG-0612. Some PWR licensees (i.e., Callaway, Shearon Harris, and Calvert Cliffs) indicated that their heavy load movements involve casks moved within a separate fuel building. As indicated by the licensees, the movement of casks in PWRs that have a separate fuel building involves little or no cask travel over systems needed for safe shutdown functions. As a result, a dropped cask would not cause significant damage to

safe shutdown equipment and, therefore, would have negligible effect on the licensees' ability to shut down the plant safely.

Approximately 39 percent of the plants (28 PWRs and 15 BWRs) indicated that they move heavy loads at plant shutdowns, and about 23 percent of the plants (23 PWRs and 2 BWRs) did not clearly indicate the plant status when heavy loads are moved. A few of these licensees (e.g., Oyster Creek) that plan to move heavy loads during plant shutdowns also indicated that they plan to perform dry runs at power, before initially loading the cask.

The staff finds that although some licensees have committed to move only analyzed loads at power, they may not adequately consider the adverse safety consequences of a load drop during the movement of heavy loads. Some licensees' analyses consider methods that may be used to preclude a load drop (e.g., enhancements to the load handling system, including upgrades to brakes, instrumentation, and controls, and the use of energy-absorbing structures throughout the load path). However, they may not consider the adequacy of their capabilities needed to mitigate or manage the adverse consequences of a load drop. Some examples of such capabilities are the abilities to shut down the plant safely, continue normal operation, maintain personnel access to various areas in the plant, and mitigate potential accidents that could expose individuals to releases.

The staff is also concerned that some licensees may not adequately address the potential consequences of a load drop during practice runs of cask movements while the reactor is at power. A drop of an empty cask during practice movements could result in similar adverse consequences to the operation of the plant as does the actual movement of a fully loaded spent fuel cask. Therefore, it is the staff's view that activities involving actual heavy load movements or practice runs of moving spent fuel dry storage casks are to be evaluated by the licensee for potential accidents and consequences.

In addition, the staff is concerned with BWR licensees that move heavy loads while the reactor is at power because, in general, the safety-related systems required for safe shutdowns are susceptible to damage from a dropped heavy load. These licensees should exhaust all options of establishing safe load paths to minimize the risk of affecting safe shutdown equipment in the event a heavy load is dropped.

(2) Types of Cranes Used

In the responses to the bulletin, approximately 27 percent of the plants (6 PWRs and 23 BWRs) indicated that they use single-failure-proof cranes to lift heavy loads; 14 percent of the plants (12 PWRs and 3 BWRs) indicated that they have upgraded the reliability of their load-handling system in accordance with NUREG-0612, Section 5.1.6 (see explanation below); and about 8 percent of the plants (5 PWRs and 4 BWRs) indicated that their crane

is non-single-failure-proof. However, almost half the plants (49 PWRs and 7 BWRs) did not clearly indicate the type of crane they use.

NUREG-0612, Section 5.1.6, "Single Failure Handling System," provides the alternative of upgrading an existing crane in lieu of complying with certain recommendations of NUREG-0554, "Single Failure Proof Cranes for Nuclear Power Plants," to achieve improved reliability in load-handling systems. Accordingly, several licensees have upgraded their overhead load-handling crane to single-failure-proof status, or they have improved reliability by increasing the factors of safety or by providing redundancy in certain active components of the cranes. A few licensees (i.e., Oyster Creek, Dresden, Yankee Rowe) have indicated that they are considering upgrading their cranes or installing new cranes to achieve single-failure-proof capability.

Licensee information regarding the types of overhead cranes used at the plants indicates that many plants have either single-failure-proof cranes in accordance with NUREG-0554, "Single-Failure-Proof Cranes for Nuclear Power Plants," or cranes upgraded in accordance with guidelines in NUREG-0612 (Section 5.1.6, and Appendix C, "Modification of Existing Cranes)." Although several plants were not clear about the type of crane they possess, none of the plants indicated that they have cranes and lifting systems that were inadequately designed, installed, and tested.

The staff concludes that many licensees previously performed adequate evaluations of their crane design for lifting heavy loads and the evaluations were accepted by the staff. However, the staff is concerned that some facilities could have weaknesses in their load-handling operations. These weaknesses may include insufficient training of personnel involved in the lifting and rigging procedures, procedures lacking in requirements for evaluating loads and ensuring that the design limitations of the hoisting system are not exceeded, insufficient inspection and preventive maintenance of cranes and lifting devices, and inadequate review of loading capacities. The staff's view is that the potential exists for any of these weaknesses to result in a single failure involving heavy loads being dropped and causing adverse consequences. As a result, future staff reviews will be focused on licensees' evaluations of their cranes and lifting devices, and related methods and procedures used for complying with the requirements of NUREG-0612.

(3) Evaluation of Licensing Basis for Handling Heavy Loads

Review of the responses to the bulletin indicated that all of the licensees believe that their heavy load-handling operations are in accordance with the licensing basis of the facility. Approximately 24 percent of the plants (10 BWRs and 16 PWRs) did not address the licensing basis in their responses. The staff is concerned that some plants that believe their load-handling operation is within the plant's licensing basis may, in fact, be outside the licensing basis. For example, the staff's reviews of Oyster Creek's (OC's) load-handling operations determined that OC would have operated beyond its licensing basis. This is because OC was planning to move loads that exceeded the size of the loads previously.

evaluated in the UFSAR. Approximately 10 percent of the licensees indicated that they will review and modify their licensing basis as needed. As indicated in the submittals, licensees' reviews of the licensing basis resulted in one or more of the following:

- identification and analysis of new heavy loads beyond the loads previously addressed in the licensing basis,
- commitments to only move heavy loads that were previously analyzed,
- determinations that heavy load-handling operations deviated from previous commitments and the licensing bases, and
- determinations that change the TSs are needed.

Licensees' reviews of their plans and capabilities to handle and control heavy loads have resulted in some licensees undertaking licensing actions to implement their load-handling operations. The following are examples of planned licensing actions noted in the responses to NRCB 96-02:

Licensee	Planned Licensing Actions
Brunswick	License amendment request to make the UFSAR consistent with actual plant operations (completed).
Fitzpatrick	Changes to the TSs to allow the movement of spent fuel dry storage casks at power (schedule TBD).
Nine Mile Point	Design change involving reracking of the spent fuel pool (schedule TBD).
North Anna	Various license amendments regarding heavy load-handling issues (schedule TBD).
Oyster Creek	TS changes to remove the weight restriction for lifting the dry storage canister (DSC) shield plugs over fuel in the DSC (completed).
Watts Bar	Design change for reracking of the spent fuel pool (currently under review).

The staff's review of the information submitted indicates that some licensees' load-handling operations may have been implemented inconsistently with the licensing basis of the facility. Some plants either have inadvertently deviated from their load-handling procedures, implemented procedures that are inconsistent with the licensing basis, or misinterpreted the design features of their load-handling system. The staff also believes that since the issuance of NUREG-0612, many changes have evolved in licensees' plans to

handle heavy loads. As a result, several licensees have identified changes in their load-handling operations that were not previously addressed in their licensing basis. Therefore, on an "as needed" basis, the staff will continue to perform audits and inspections in order to evaluate licensees' movement of heavy loads.

(4) Plans for Moving Spent Fuel Dry Storage Casks

Approximately 17 percent of the plants (10 PWRs and 9 BWRs) indicated that they plan to store spent fuel dry storage casks. Most of these plants plan to move casks within 2 years from the date of the bulletin. The remainder of the licensees either did not address the issue or have not yet begun planning for the storage of spent fuel.

(5) Load Drop and Consequence Analysis Performed

Approximately 33 percent of the plants indicated that they have performed load drop and consequence analyses in support of their plans to move heavy loads. The remaining plants did not show that any analysis exists. In the future, the staff will review the load drop and consequence analyses on an as-needed plant-specific basis. The staff has found that several licensees have done load drop and consequence analyses though Generic Letter 85-11 cancelled Phase II of NUREG-0612, and dismissed the need for licensees to perform these analyses. The results of the analyses have led some licensees to modify their load-handling operations, including upgrading the crane and associated components of the lifting system, and modifying the load paths.

Conclusion

The staff finds that NRC Bulletin 96-02 achieved its objective of getting licensees to evaluate their load-handling activities to ensure that they are performed safely and in the best interest of protecting the health and safety of the public. The bulletin was very effective in getting licensees to review their plans and capabilities, licensing bases, and regulatory guidelines for carrying out activities involving the movement of heavy loads. Although the licensees' responses to the bulletin contained various levels of detail regarding load-handling operations at their plants, sufficient information was available to enable the staff to reach the conclusions noted below.

Although several licensees have increased the reliability of their load-handling systems, the staff will continue to review load-handling operations, on an as-needed basis, to ensure that licensees adequately address their ability to preclude load drop accidents. As determined through earlier NRC reviews, licensees have reliable lifting systems as required by NUREG-0612. However, licensees need to continue to address other activities surrounding the crane operation that could help to minimize weaknesses in their load-handling operations that may contribute to load drop accidents. Such weaknesses could include insufficient training of personnel involved in applying the lifting and rigging procedures, procedures lacking in requirements for evaluating loads and for ensuring that the design limitations of the load-lifting system are not exceeded, insufficient inspection and preventive maintenance of cranes and

lifting devices, and inadequate review of loading capacities.

Also, the staff finds that because some licensees plan to move heavy loads at power, they may need to assess their capabilities to both mitigate and manage the adverse consequences of a heavy load drop. Licensees should consider, among other things, possible plant shutdowns during the movement of heavy loads, limiting personnel exposure from required entry into contaminated plant areas following an accident, and recovering from the adverse conditions caused by an accident. Accordingly, the staff is particularly interested in future evaluations of load drops and consequences associated with the load-handling operations of the licensees.

The staff also finds that several licensees have determined, after reviewing their licensing basis, that their load-handling operations may be inconsistent with their licensing basis. Consequently, several licensees have undertaken actions to correct or resolve this condition, including reviewing the UFSAR, TS requirements, and procedures governing the conduct of operations involving the movement of heavy loads. The staff will pursue enforcement actions for matters involving a noncompliance with regulatory requirements as appropriate.

On the basis of the preceding discussion, the staff will continue to review issues regarding the handling of heavy loads on a plant-specific basis as needed. Generic issues regarding this subject will be addressed through an ongoing TAP for Heavy Loads. Any additional information required for the completion of the TAP will be obtained on a plant-specific basis.

Principal Contributor: Brian E. Thomas