



OFFICE OF THE
SECRETARY

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

Attachment 8

February 21, 1992

IN RESPONSE, PLEASE
REFER TO: M920117A

MEMORANDUM FOR:

James M. Taylor
Executive Director for Operations

William C. Parler
General Counsel

David A. Ward, Chairman
Advisory Committee on Reactor Safeguards

FROM:

Samuel J. Chilk, Secretary

SUBJECT:

STAFF REQUIREMENTS - BRIEFING ON STATUS OF
IMPLEMENTATION OF SAFETY GOAL POLICY
STATEMENT (SECY-91-270), 10:00 A.M., FRIDAY,
JANUARY 17, 1992, COMMISSIONERS' CONFERENCE
ROOM, ONE WHITE FLINT NORTH, ROCKVILLE,
MARYLAND (OPEN TO PUBLIC ATTENDANCE)

The Commission was briefed by the NRC staff on the status of
implementation of the Safety Goal Policy Statement.

The staff should review the criteria or method for
reinterpretation of existing regulations. In particular, the
Commission is interested in how such reinterpretations are
controlled to avoid the imposition of essentially new
requirements without the benefit of the analyses conducted on a
new regulation.

(EDO/OGC)

(SECY Suspense: 4/24/92)

The Commission understands that ACRS is in the process of
developing an alternative safety goal implementation plan. The
staff should await completion of this development before
proceeding with further safety goal implementation plans.

With regard to the development of an alternative safety goal
implementation proposal, as recommended by the ACRS, the staff
should coordinate its activities with the ACRS to assess a
possible alternative implementation plan and report to the
Commission on this activity. The staff and the ACRS should
incorporate into this plan the Commission's guidance on "adequate
protection" and the Backfit Rule as contained in an SRM dated
June 15, 1990. In that SRM, the Commission stated:

"The Commission believes that "adequate protection" is a
case by case finding based on evaluating a plant and site

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combination and considering the body of our regulations. Safety goals are to be used in a more generic sense and not to make specific licensing decisions. It is not necessary to create a generic definition of adequate protection, nor is it necessary to amend the Safety Goal Policy Statement in order to provide a direct relationship between the safety goals and adequate protection."

and

"In order to enhance our regulatory process for the current generations of plants, the Commission believes the staff should strive for a risk level consistent with the safety goals in developing or revising regulations. In developing and applying such new requirements to existing plants, the Backfit Rule should apply."

(EDO)

(SECY Suspense: 5/22/92)

Commissioner Remick requested that the staff examine the feasibility of applying the procedures of SECY-91-270 to areas other than cost justified safety enhancements, which apparently constitute a small proportion of the staff's regulatory initiatives. It appears that most regulatory initiatives are taken to obtain compliance with existing regulations (the compliance backfit). It was indicated during the staff presentation that regulatory initiatives that invoke compliance could fall anywhere in a spectrum of possibilities where it may or may not be appropriate to use the procedures developed by the Regulatory Analysis Steering Group.

Commissioner Remick would like the staff to consider the feasibility of using the procedures developed by the Regulatory Analysis Steering Group to compliance backfit.

(EDO)

(SECY Suspense: 5/15/92)

Commissioner Remick would like to be informed of the results from the NRR efforts to rebaseline plant risk levels subsequent to implementation of regulatory initiatives that significantly reduce risk.

(EDO)

(SECY Suspense: 6/26/92)

Commissioner Remick would like to be informed of the results of the staff's reexamination of the averted health effects conversion factor of \$1000 per man-rem and recommends that any changes be considered in a comprehensive context, such as the potential impact on current regulations and past regulatory decisions.

(EDO)

(SECY Suspense: 6/26/92)

cc: The Chairman
Commissioner Rogers
Commissioner Curtiss
Commissioner Remick
Commissioner de Planque
OCAA
OIG
PDR - Advance
DCS - P1-24

DESIGN AND LICENSING BASIS FOR LOSS OF SPENT FUEL POOL COOLING EVENTS
AT THE SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2

1.0 Executive Summary

By letter dated November 27, 1992, two independent contractors working with the Pennsylvania Power and Light Company filed a report under 10 CFR Part 21. The report contended that the design of the Susquehanna Steam Electric Station, Units 1 and 2, (SSES) failed to meet numerous regulatory requirements for loss of normal spent fuel pool (SFP) cooling. The report provided a series of detailed technical and regulatory arguments to support that contention.

The staff developed the SFP Task Action Plan, Revision 1, dated November 15, 1993. Action Item LC-9 required an evaluation of the SSES licensing basis for loss of SFP cooling requirements. The staff has evaluated the design and licensing basis aspects of the loss of SFP cooling scenarios presented in the 10 CFR Part 21 report. This memorandum and its conclusions represent the completion of Action Item LC-9. The staff has concluded that:

1. The offsite dose consequences for a boiling SFP event, considering a seismic event as a causal factor, but not considering a reactor accident as a causal or consequent event, were analyzed by the licensee and reviewed by the staff prior to issuance of the SSES Safety Evaluation Report (SER) NUREG-0776, "Safety Evaluation Report Related to the Operation of Susquehanna Steam Electric Station, Units 1 and 2.". The SER review is silent with respect to the effect, or analysis of a loss of coolant accident, or other design basis event, on the ability to meet the "postulated accident" requirements of GDC 61.
2. Pursuant to 10 CFR 50.109, modification of the design approval for a facility which results from the imposition of a regulatory staff position that is new or different from a previously applicable staff position constitutes a backfit. NUREG-1409, "Backfitting Guidelines," provides guidance on implementation of 10 CFR 50.109 and amplifies the term "applicable staff position" to include positions taken by the staff in issuing the plant license.
3. The operating license Safety Evaluation Report for Susquehanna stated that the SFP cooling system complied with the guidance of Regulatory Guide 1.13 (RG 1.13) and met the requirements of General Design Criteria (GDC) 61.
4. Therefore, the link between loss of SFP cooling events and design basis loss of coolant accidents and/or loss-of-offsite power events postulated by the authors of the Part 21 report cannot be considered within the original licensing basis of SSES.

5. Similarly, the operating license SER noted that the offsite dose consequences of a boiling SFP following a seismic event were below the guideline values of 10 CFR Part 100 and the 1.5 Rem thyroid guideline of Regulatory Guide 1.29. Nevertheless, in the SER, the staff specifically linked the acceptability of the nonseismic Category I SFP cooling and cleanup system to the existence of a seismic Category I standby gas treatment system that met the recommendations of Regulatory Guide 1.52.
6. Therefore, the ability of the standby gas treatment system to ventilate the fuel handling area during a boiling spent fuel pool event following a seismic event is considered within the existing licensing basis of the facility.

The staff's conclusion does not in any way address the safety significance of the issues postulated in the Part 21 report. Similarly, the staff's conclusion regarding the licensing basis of the standby gas treatment system does not represent a conclusion on the operability of that system. Further, the staff may initiate the backfit process should the ongoing review of the Susquehanna spent fuel pool cooling configuration conclude that amendment of the SSES licensing basis is warranted.

The basis for the staff's conclusions is presented in detail below. The staff conducted a methodical evaluation of the licensing basis questions in order to address several specific issues. The authors of the Part 21 report and the licensee have presented conflicting opinions on this question to the staff and have requested the staff's position. A formal determination of the facility licensing basis is a necessary part of an evaluation of the licensee's reportability determination. Finally, a clear position on licensing basis questions forms an essential part of the staff's justification for collecting generic information, proposing regulatory changes or imposing plant modifications. The scope and nature of future staff actions will be determined as part of the November 15, 1993 Task Action Plan on SFP cooling issues and will consider the conclusions reached in this document.

2.0 Regulatory History

The NRC criteria for acceptance of SFP cooling systems has evolved from case-by-case reviews for early plants to the present guidance of the SRP, NUREG-0800, regulatory guides, and the requirements of the GDC of 10 CFR Part 50, Appendix A. Consequently, the design, design basis and licensing basis of SFP cooling systems vary considerably between plants.

The Atomic Energy Commission (AEC) developed design criteria in the mid-1960's that were used as guidance in evaluating plant design. These criteria were continually revised such that a consistent basis for acceptable design practices for the SFP cooling system was not established. For example, Criterion 25 from a version of the AEC Design Criteria dated November 5, 1965, stated:

"The fuel handling and storage facilities must be designed to prevent criticality and to maintain adequate shielding and cooling under all anticipated normal and abnormal conditions, and credible accident conditions. Variables upon which the health and safety of the public depend must be monitored."

These AEC design criteria subsequently evolved into the GDC of 10 CFR Part 50, Appendix A. Criterion 61 of the GDC requires, in part, that the fuel storage system be designed with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual heat removal. In addition, Criterion 44 requires provision of a system to transfer heat from safety-related components to an ultimate heat sink.

In the early 1970's, the AEC developed safety guides (later regulatory guides) to provide guidance on acceptable methods for implementing the various GDC. Several of these regulatory guides (RG), including RG 1.13 and RG 1.29, discuss spent fuel storage and cooling systems.

RG 1.13, "Spent Fuel Storage Facility Design Basis," (Revision 1, 12/75) was used as guidance in the licensing evaluation of many spent fuel storage facilities. RG 1.13 described an acceptable method of implementing GDC 61 in order to:

- (1) Prevent loss of water from the fuel pool that would uncover fuel,
- (2) Protect fuel from mechanical damage, and
- (3) Provide the capability for limiting the potential offsite exposures in the event of a significant release of radioactivity from the fuel.

RG 1.13 does not provide specific guidance for evaluation of SFP cooling systems. However, Section C.6 of RG 1.13 states that systems for maintaining water quality and quantity should be designed so that any maloperation or failure of such systems (including failures resulting from the Safe Shutdown Earthquake) will not cause fuel to be uncovered. It further states that such systems need not otherwise meet Category I seismic requirements. Thus, RG 1.13 suggests that SFP cooling systems need not be designed to seismic Category I requirements. However, in its introduction, RG 1.13 states that fuel handling and storage systems be designed with appropriate containment, confinement and filtering systems, and be designed to prevent significant reduction in the coolant inventory of the storage facility under accident conditions.

RG 1.13 does not offer any additional insight as to what type of accidents need be considered in the design (i.e., accidents involving the SFP and its systems, or accidents triggered by other facility events (LOCA, LOOP)) of the SFP cooling systems. RG 1.13 neither specifically includes nor excludes consideration of LOCA-induced loss of SFP cooling events as within the design basis. However, RG 1.13 does not specifically limit the accidents to be considered in the design basis to seismic events.

Current NRC guidance for SFP cooling systems is provided in Section 9.1.3 of the SRP. This guidance implements the requirements of GDC 44 and 61. The original version of SRP Section 9.1.3 provided in NUREG-75/087 specified a safety-related SFP cooling system in order to comply with GDC 44. GDC 44 specifies that heat transfer capability needs to be met under normal and accident conditions.

However, the current guidance of Section 9.1.3 of the SRP, presented in NUREG-0800, specifies two acceptable design methods of satisfying the requirements of GDC 44 and 61. The first method is based on ensuring that the normal cooling system will be capable of acting as the primary means of SFP decay heat removal under all anticipated operational conditions, assuming a single active component failure. The alternative method relies on provision of a redundant SFP cooling method. In the alternative method, the SFP makeup water system and the SFP building ventilation and filtration system are designed to operate under all anticipated operational conditions, including following a Safe Shutdown Earthquake (SSE) as described in RG 1.29, assuming a single active component failure. This alternative method implicitly relies on SFP boiling as the primary method of SFP decay heat removal under certain limiting operational conditions. Industry guidance provided in ANSI N210-1976/ANS-57.2 specifies spent fuel pool cooling system designs similar to those of the current version of Section 9.1.3 of the SRP.

RG 1.29, "Seismic Design Classification" provides guidance on methods acceptable to the NRC for identifying and classifying features of nuclear plants that should be designed to withstand the effects of an SSE. RG 1.29 is used in evaluating facilities with respect to the requirements of GDC 2 and Appendix A to 10 CFR Part 100. Section C of RG 1.29 designates certain systems as Seismic Category I and states that such systems should be designed to withstand the effects of an SSE and remain functional. Section C.1.d cites "systems or portions of systems that are required for cooling the spent fuel storage pool" as Seismic Category I systems.

RG 1.29 does not state explicitly that the normal spent fuel pool cooling system need be designed as Seismic Category I. It thus implicitly allows the use of other Category I systems to cool the spent fuel pool storage pool following an SSE.

3.0 Review of Susquehanna Final Safety Analysis Report (FSAR) and Safety Evaluation Reports (SER)

3.1 LOCA/LOOP Accident Scenarios

Section 9.1.3 of the SSES FSAR describes the SFP cooling system at Susquehanna. The SFP cooling system itself is of non-Seismic Category I and Quality Group C design and construction. The SFP cooling system is supplied from non-Class 1E power supplies. The emergency service water (ESW) makeup system and the connections to the residual heat removal (RHR) system are Seismic Category 1. Both the ESW and the RHR system have Class 1E power supplies.

Section 9.1.3 does not discuss particular failure modes or scenarios for the SFP cooling system. However, Section 9.1.3 does stipulate that the ESW makeup design is based on replenishing the boil-off following a loss of SFP cooling for 30 days. Section 9.1.3 does not discuss any effects of boiling or condensation on components within the reactor building.

Appendix 9A of the SSES FSAR analyzes the offsite consequences of a boiling SFP. Appendix 9A assumes that the SFP cooling system is lost due to a seismic event. The FSAR does not focus on causes of loss of normal SFP cooling, rather it assumes that the non-Seismic Class 1 system will fail in a seismic event. The analysis does not consider other causes for loss of the SFP cooling system. Appendix 9A does not address the effects of boiling on equipment within the reactor building.

The NRC safety evaluation for Susquehanna stated that the SFP cooling system met the guidelines of RG 1.13. The SER did not specify what scenarios other than a seismic event had been evaluated and reviewed to make that conclusion. The staff concludes that RG 1.13 represents the licensing basis for the SSES SFP cooling system; however, it is clear that the events postulated in the Part 21 report were not recognized or evaluated during the licensing review. In the SER, the staff states:

"To meet the makeup guidelines of Regulatory Guide 1.13, "Spent Fuel Storage Facility Design Basis," redundant seismic Category I sources of water are available, one from each emergency service water train. Based on our review as described above we concluded that the spent fuel pool cooling and cleanup system meets the guidelines of Regulatory Guide 1.13 regarding makeup to the spent fuel pool and the guidelines of Regulatory Guide 1.29 regarding design of nonseismic Category I systems and that the system design is in compliance with General Design Criteria 61 with regard to prevention of uncovering the spent fuel. We, therefore, conclude that the spent fuel pool cooling and cleanup system, is acceptable."

3.2 Seismic Events

Section 3.2.1 of NUREG-0776 evaluated compliance of the SSES design to the requirements of GDC 2 related to seismic events. The SER noted six exceptions to the guidance of RG 1.29. The second of those, in Section 3.2.1(2) of the SER, determined that a nonseismic spent fuel pool cooling loop was acceptable based on the Seismic Category I makeup supply from the emergency service water system. Section 3.2.1(2) of the SER further states:

"The nonseismic Category I classification of the cooling loop at the fuel pool cooling and cleanup system is acceptable since the fuel handling area is ventilated by the seismic Category I standby gas treatment system which has engineered safety feature filters that meet the recommendations of Regulatory Guide 1.52, "Design, Maintenance, Testing Criteria for Atmospheric Cleanup Air Filtration and Adsorption Unit of Light-Water-Cooled Nuclear Power Plants."

Section C.1.a of RG 1.52 states:

"The design of an engineered-safety-feature atmospheric cleanup system should be based on the maximum pressure differential, radiation dose rate, relative humidity, maximum and minimum temperature, and other conditions resulting from the postulated DBA and on the duration of such condition."

As described in Section 3.2 of this memo, Appendix 9A of the FSAR evaluates the offsite dose consequences of a boiling spent-fuel pool. In that analysis, the licensee takes no credit for any filtration of the vapor coming off of the spent fuel pool. The offsite dose consequences are determined to be within the requirements of 10 CFR Part 100. In the SER, the staff acknowledges the acceptable offsite dose consequences evaluated by the licensee. However, the staff clearly links the acceptability of the nonseismic fuel pool cooling loops for a seismic event with the acceptable operation of the SBT system under boiling spent fuel pool conditions.

4.0 Backfit Process

The process by which the staff can revise a facility's licensing basis subsequent to issuance of an operating license is governed by the requirements of 10 CFR 50.109, "Backfitting." Staff guidance for applying the backfit rule is contained in NUREG-1409, "Backfitting Guidelines." Backfitting is defined in 10 CFR 50.109 as:

"the modification of or addition to systems, structures, components, or design of a facility; or the design approval or manufacturing license for a facility...any of which may result from a new or amended provision in the Commission rules or the imposition of a regulatory staff position interpreting the Commission rules that is either new or different from a previously applicable staff position after...(iii) The date of issuance of the operating license for the facility or facilities having operating licenses"

The staff has reviewed the FSAR and SER for Susquehanna and concluded that interpretation of the term "postulated accident" in GDC 61 to include LOCA and/or LOOP effects and consequences represents a staff position that is new or different from the previously applicable position in the SSES SER. The fact that the FSAR describes the design basis for SFP cooling and the SER is silent with regard to the types of accidents reviewed and considered leaves the burden, within the context of defining the licensing basis, on the staff to backfit any scenarios not specifically discussed in the licensee's application or the original SER.

5.0 Conclusion

As stated in Section 1.0 of this report, the staff has concluded that the scenarios described in the November 27, 1992, 10 CFR Part 21 report are not part of the original or current licensing basis of the Susquehanna Steam Electric Station. The staff is careful to note that this is a determination of the facility licensing basis and is not a conclusion on the safety significance of any specific technical issue raised in the Part 21 report or subsequent correspondence. The staff is evaluating the capability of the existing SSES systems and procedures in accordance with the November 15, 1993 Task Action Plan. The staff will initiate a change to the SSES licensing basis, using the backfit process described in 10 CFR Part 50.109 and NUREG-1409, should the staff's ongoing review conclude that such a change is warranted.

The staff also concludes that boiling of the spent fuel pool following a seismic event is within the original licensing basis of the plant. Boiling of the spent fuel pool under those circumstances was acceptable in the original Safety Evaluation Report based on the existence of a Seismic Category I makeup system and on a seismic Category I standby gas treatment system that can operate under boiling spent fuel pool conditions.

