SNUPPS

Standardized Nuclear Unit
Power Plant System

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Nicholas A. Petrick
Executive Director

May 31, 1984

SLNRC 84- 0088 FILE: 0278
SUBJ: Request for Partial Exemption from Provisions of GDC-4

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docket Nos.: STN 50-482 and STN 50-483

References: 1. SLNRC 83-0045, 08/03/83: Alternate Pipe Break Criteria
2. SLNRC 84-0054, 02/17/84: Reactor Cavity Shielding

Dear Mr. Denton:

In accordance with 10 CFR Part 50.12(a), exemption from the provisions of 10 CFR 50, Appendix A, is requested for the SNUPPS plants (Callaway and Wolf Creek) which would authorize utilization of the alternative pipe break criteria that have been employed in resolution of generic issue A-2 "Asymmetric Blowdown Loads on PWR Primary Systems." The requested exemption is based on the application of advanced fracture mechanics technology as evaluated in WCAP 10500 dated February 1984 entitled "Technical Bases for Eliminating Large Primary Loop Pipe Ruptures as the Structural Design Basis for Callaway and Wolf Creek Plants" (enclosed).

Specifically, it is requested that the postulated circumferential and longitudinal pipe breaks in the reactor coolant system primary loop be eliminated from consideration in the structural design basis of SNUPPS plants. The pipe breaks are those identified in Westinghouse topical report WCAP-8172 for the RCS primary loop.

The bases for the requested exemption are as follows:

1. Extensive operating experience has demonstrated the integrity of the RCS primary loop including the fact that there has never been a leakage crack.

2. In-shop, pre-service, and in-service inspections performed on piping for the SNUPPS plants minimize the possibility of flaws existing in such piping. The application of advanced fracture mechanics has demonstrated that if such flaws exist they will not grow to a leakage crack when subjected to the worst case loading condition over the life of the plant.

Change: BNL DMB/DSS FEMA LPDR PDR NTIS NSIC
New Prop Binding!
300' 1:1 Prop Prop 1, Non Prop

3. The application of advanced fracture mechanics technology has demonstrated that small flaws or leakage cracks (postulated or real) will remain stable and will be detected either by in-service inspection or by leakage monitoring systems long before such flaws can grow to critical sizes which otherwise could lead to large break areas such as the double-ended rupture of the largest pipe of the reactor coolant system.

4. The SNUPPS plants leak detection system satisfies Regulatory Guide 1.45 dated May 1973, entitled "Reactor Coolant Pressure Boundary Leakage Detection Systems" as documented in SNUPPS FSAR (Table 5.2-6).

As support for this request, in addition to the SNUPPS plants letter reports referred to above, consideration should be given to the following correspondence on this issue:

1. Letter from Darrell G. Eisenhut (NRC) to E. P. Rahe (Westinghouse) dated February 1, 1984.

2. Memorandum from Darrell G. Eisenut (NRC) to All Operating PWR Licensees, Construction Permit Holders and Applicants for Construction Permits dated February 1, 1984 - Subject: Safety Evaluation of Westinghouse Topical Reports Dealing with Elimination of Postulated Pipe Breaks in PWR Primary Main Loops (Generic Letter 84-04).

3. Committee for the Review of Generic Requirements resolution of generic issue A-2.

4. ACRS letter dated June 14, 1983, re "Fracture Mechanics Approach to Pipe Failure".

5. Memorandum from William J. Dircks, EDO, to ACRS dated July 29, 1983, re "Fracture Mechanics Approach to Postulated Pipe Failure".

6. Memorandum from Harold Denton (NRC) to Murray Edelman (AIF), dated May 2, 1983.

The principal thrust of this correspondence in the short term is to prepare for exemption requests to existing criteria and in the long term to modify the criteria relative to postulated pipe failure and subcompartment pressurization.

Initial actions to be taken by the SNUPPS utilities upon granting of this exemption request will be limited to changing the shielding for the reactor cavity as described in the reference letters. Advantages to be realized by use of reusable rigid shielding in lieu of water bags include (1) a reduction of personnel exposure of approximately 2 man-rem per each refueling, (2) reduction of low level waste since the water bags are to be disposed of at each refueling, (3) potentially shortened refueling cycle due to easier water filling operations, (4) potentially lower dose rates in containment during operation because rigid shielding provides a more uniform thickness of shielding material and eliminates the potential for failure of a water bag, and (5) reduced plant operating costs since bag procurements, shipping, warehousing, inventory control, etc. costs would be eliminated. These advantages and estimated savings are based on actual experience at Calvert Cliffs, which employs generally similar water bags for reactor cavity shielding. A Safety Balance for this proposed change is enclosed.

At some later date, the SNUPPS Utilities may utilize the exemption to remove permanently some of the RCS pipe-whip restraints, in order to reduce the occupational exposures associated with in-service inspections. Prior to doing this, a specific description of the proposed actions, technical justification, and a Safety Balance will be submitted to the NRC for review.

As the submittal contains information proprietary to Westinghouse Electric Corporation, it is supported by an affidavit signed by Westinghouse, the owners of the information. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.790 of the Commission's regulations.

Accordingly, it is respectfully requested that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10CFR Section 2.790 of the Commission's regulations. Correspondence with respect to the proprietary aspects of this application for withholding or the supporting Westinghouse affidavit should reference CAW-82-67 and should be addressed to R. A. Wiesemann, Manager, Regulatory and Legislative Affairs, Westinghouse Electric Corporation P.O. Box 355, Pittsburgh, PA. 15230

Very truly yours,

F. Schwoerer
for Nicholas A. Petrick

REK/FS/mjd/1a20
Enclosures: See page four

Enclosures: Safety Balance for Change of Reactor Cavity Annulus shielding.

WCAP-10500 and WCAP-10501 "Technical Bases for Eliminating Large Primary Loop Pipe Ruptures as the structural Design Basis for Callaway and Wolf Creek Plants" (Both proprietary and non-proprietary versions).

Westinghouse Letter "Application for Withholding Proprietary Information from Public Disclosure (CAW-84-16)".

cc:	D. F. Schnell	UE
	G. L. Koester	KGE
	D. T. McPhee	KCPL
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Safety Balance for Change of Reactor Cavity Annulus Shielding

Introduction

The scope of the change is limited to the shielding provided at the top of the reactor cavity to attenuate the neutron flux from the cavity annulus to the upper containment. The existing shielding (ref: FSAR Section 3.8.3.1.4) consists of 30 water bags. The reasons for utilizing water bags for shielding are that (1) 12" of water is effective shielding for high energy neutrons and (2) water bags would disperse and disintegrate following a postulated primary system pipe break in the reactor cavity (ref: FSAR Section 6.2.1.2.3), so that subcompartment pressures and asymmetric pressure loadings on the reactor vessel would remain within acceptable limits.

If the need to postulate a primary system pipe break in the reactor cavity is eliminated, it is acceptable to provide some type of rigid shielding instead of the water bags. One design under consideration by SNUPPS consists of thin-walled stainless steel cans containing 12" depth of water, which would be placed in the same location as the water bags. Alternative designs consist of solid shielding (e.g., Reactor Experiments Type 277, which is used in many power reactor applications) located either in the same location as the water bags or further down within the reactor cavity annulus. This Safety Balance justifies the use of any of these configurations of rigid shielding.

Advantages of Rigid Shielding

Rigid shielding has a projected lifetime of at least 40 years. The existing water bags have a projected lifetime of one fuel cycle. The water bags removed at each refueling outage must be disposed of as low level radwaste. Replacement bags must be procured and stored under strict controls.

Rigid shielding, if placed in the same location as water bags, will be easier to remove and replace at refueling outages. It is anticipated, based on prototype development and pilot-type manipulation operations performed by SNUPPS, that rigid shielding can be handled using long-handled tools, whereas water bags require hands-on handling. As a result, radiation exposures to operations personnel will be lower for rigid shielding and the durations of refueling outages are expected to be shorter. Based on actual experience with handling water bags at Calvert Cliffs the estimated saving in occupational radiation exposure is 2 man-rem per refueling outage.

Rigid shielding, by virtue of providing a uniform shielding thickness and better dimensional controls than water bags is expected to be a more effective shielding medium. This will mean lower neutron dose rates in containment. In addition, rigid shielding is expected to be less prone to failure during operation than water bags.

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Safety Assessment

In the absence of a postulated primary system pipe break, the need for a rigorous subcompartment pressure analysis is eliminated. The effect on reactor cavity subcompartment pressure has been estimated as follows. The Westinghouse analyses show that a through wall crack with a leakage rate of 10 gpm, which is readily detectable by leakage detection systems, is well below the size of a crack that could propagate to a RCS piping failure. To be conservative, a leakage 25 times higher or 250 gpm, has been postulated to flow directly into subcompartment subvolume (#42) used in the FSAR analysis of a postulated pipe break within the reactor cavity. As a leak rate of 250 gpm is approximately one one-thousandth of the break flow postulated in the FSAR, pressurization of the reactor cavity subcompartment is negligible, i.e., less than 0.5 psi. Therefore subcompartment pressurization is not a safety issue.

Since potential pressurization of the reactor cavity is negligible, the rigid shielding can not be displaced upwards to become potential missiles. Therefore, missiles are not a safety issue.

The alternative shielding design under most serious consideration is thin-walled stainless steel water cans. Since most of the weight is water, the total weight is only 0.2 % greater than that of the water bags. The dead-weight and seismic loadings on the supports have been evaluated and determined to be within acceptable limits. Therefore, the existing supports are adequate and there is no need to evaluate postulated failures of the supports. If, in the future, the alternative of all solid shielding is pursued, a comprehensive analysis of the supports will be performed and the support structures(s) will be modified as necessary to provide acceptable design margins.

Conclusion

On balance, replacement of water bags with rigid shielding will provide significant advantages, in respect to reduced occupational exposures, reduced radwaste, and shorter refueling outages, with no reduction in safety.

FS/REK/mjd/la25-26