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June 18, 1984

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

ATTACHMENT CONTAINS PROPRIETARY MATERIAL

Attention: Ms. E. G. Adensam, Chief
Licensing Branch No. 4

Re: Catawba Nuclear Station
Docket Nos. 50-413 and 50-414

References: 1) Letter from W. H. Owen (Duke Power Company) to W. J. Dircks (NRC), dated September 19, 1983

2) Letter from H. R. Denton (NRC) to W. H. Owen (Duke Power Company), dated October 17, 1983

3) Letter from H. B. Tucke. (Duke Power Company) to H. R. Denton (NRC), dated November 18, 1983

4) Generic Letter 84-04, NRC, dated February 1, 1984

5) Letter from H. B. Tucker (Duke Power Company) to H. R. Denton (NRC), dated February 29, 1984

Dear Mr. Denton:

References 1 and 3 informed the NRC that Duke Power Company was evaluating the technical feasibility and potential benefits of eliminating postulated pipe breaks in the Class 1 Accumulator Injection Lines from the structural design basis of the Catawba Nuclear Station. As a result of efforts by Westinghouse, the NRC, and Duke Power, we have concluded that it is technically feasible to eliminate these postulated pipe breaks. In accordance with the statement in Reference 2 that applications related to the leak-before-break pipe failure concept will be permitted prior to the NRC completing all of the changes in regulatory requirements, this letter is submitted.

Duke Power herein requests an exemption from General Design Criterion 4 to apply the "leak-before-break" concept to the Catawba Nuclear Station to eliminate postulated pipe breaks in the Class 1 Accumulator Injection Lines from the plant structural design basis. Additionally, a safety balance in terms of accident risk avoidance versus safety gain will be demonstrated. The Westinghouse technical report (WCAP-10537) entitled "Technical Basis for Eliminating Class 1 Accumulator Line Rupture as the Structural Design Basis for Catawba Units 1 & 2" is included as Enclosure A to provide technical justification for elimination of accumulator line breaks for Catawba. Because of the proprietary nature of this report, Enclosure A has been provided only to the addressee and Mr. James P. O'Reilly of the NRC. A non-proprietary version of the specific plant applicability

B001
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Prop Encl
TO: RM-ACRS
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report (WCAP-10538) is included as Enclosure B and has been provided to others on the attached distribution list.

As Enclosure A contains information proprietary to Westinghouse Electric Corporation, it is supported by the attached letter (Attachment 1) and affidavit signed by Westinghouse, the owner 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 10 CFR Section 2.790 of the Commission's regulations. Correspondence with respect to the proprietary aspects of the Application for Withholding or the supporting Westinghouse affidavit should reference CAW-84-41, and should be addressed to R. A. Wiesemann, Manager, Regulatory and Legislative Affairs, Westinghouse Electric Corporation, P. O. Box 355, Pittsburgh, Pennsylvania 15230.

Exemption Request

Pursuant to 10 CFR 50.12(a), Duke Power Company hereby applies in connection with the Catawba Nuclear Station license for an exemption from the provisions to 10 CFR Part 50, Appendix A, authorizing alternative pipe break analyses for the Catawba Nuclear Station Class 1 Accumulator Injection Lines. The requested exemption is based upon the application of advanced fracture mechanics technology as evaluated in the Westinghouse technical report WCAP 10537 (Enclosure A).

Specifically, we request the elimination of postulated circumferential and longitudinal pipe breaks in the Class 1 Accumulator Injection Lines from consideration in the structural design basis of Catawba Nuclear Station. The impact on important design aspects of implementing leak-before-break on Catawba Nuclear Station has been evaluated by Duke Power and is summarized in Attachment 2. A detailed list of previously postulated pipe breaks and associated rupture devices is provided in Attachment 3.

The bases for the requested exemption are as follow:

1. In-shop, pre-service, and in-service inspections performed on piping for the Catawba Nuclear Station 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.

2. If one postulated a through-wall crack, large margins against unstable crack extension exist for certain stainless steel piping when subjected to the worst case loading conditions over the life of the plant.

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 a double-ended rupture of the Accumulator line. To date, use of this advanced fracture mechanics technology has been limited by the definition of a LOCA in Appendix A to 10CFR Part 50 as including postulated double-ended ruptures of piping regardless of the associated probability. Application of the LOCA definition without regard to this advanced technology to large diameter thick-walled piping such as the Class 1 Accumulator Injection lines of a PWR imposes a severe penalty in terms of cost and occupational exposure because of the massive pipe whip restraints it requires which must be removed for in-service inspections. This penalty is unreasonable because these pipes do not have a history of failing or cracking and are conservatively designed. Accordingly, for design purposes associated with protection against dynamic effects, we request this exemption from the regulations to eliminate the need to postulate circumferential and longitudinal pipe breaks. This exemption request does not extend to specifying design bases for containment, the emergency core cooling system, or environmental effects.

We request that the exemption authorize, with respect to the plant structural design basis, the elimination of pipe breaks in the Class 1 Accumulator Injection lines. Thus, the use of advanced fracture mechanics permits a deterministic evaluation of the stability of postulated flaws/leakage cracks in piping as an alternative to the current mandate of overly conservative postulations of piping ruptures.

This exemption request is consistent with the provisions of footnote 1 to 10 CFR Part 50, Appendix A, which refers to the development of "further details relating to the type, size and orientation of postulated breaks in specific components of the reactor coolant pressure boundary." The Class 1 portion of the Accumulator Injection line is a part of this boundary.

As support for this request, in addition to the previously specified information, we would request consideration of the following:

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

2. Memorandum from Darrell G. Eisenhut (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. CRGR 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.

Safety Balance

Further, pursuant to 10 CFR 50.12 (a), we believe the requested exemption will not endanger life or property or the common defense and security and is in the public interest. The total increase in public and occupational accident exposure associated with omitting the Class 1 Accumulator Injection line whip restraints and jet deflectors is estimated to be less than .5 man-rem for the nominal case with 40-year plant life. This estimate is based on an analysis similar to that for the primary loop in the "Leak-Before-Break Value-Impact Analysis" of Enclosure 2 to Reference (4), but performed specifically for the Class 1 Accumulator Injection lines. The major difference in the analysis is that an Accumulator Injection line break will not contribute to asymmetric blowdown; therefore no LOCA is assumed to occur in the reactor cavity for the Accumulator Injection line break. A reactor cavity LOCA leads to a majority of the potential accident risk for the primary loop; and thus, a Class 1 Accumulator Injection line break would result in a lower risk than a primary loop break.

The benefits in avoidance of exposures for Catawba Unit 2 associated with the requested exemption are estimated to be 114 man-rem of occupational exposure over plant life, based on Duke Power studies. This eliminated radiation exposure is related to pipe whip restraint inspection tasks, restraint disassembly/reassembly for pipe weld inspections, and improved personnel access for operation and maintenance. Consequently, the savings in exposure by granting the exemption far exceed the potentially small increase in public risk and occupational accident exposure associated with deleting restraint devices. Duke Power Company estimates cost savings for Catawba Nuclear Station, Unit 2 of a least 921,000 dollars as given in Attachment 4. Benefits with regard to plant safety, operation, and design are given in Attachment 4.

With these benefits and with a net reduction of radiation exposure of 114 man-rem, a net safety gain has been demonstrated for Catawba Unit 2. Also, a cost savings of at least 921,000 dollars has been shown, and a technical basis for elimination of Class 1 Accumulator Injection line breaks has been demonstrated. Implementation of the leak-before-break concept will thus be cost-effective as well as technically justifiable while resulting in improved overall plant safety. Therefore, Duke Power Company hereby requests NRC approval of an exemption to GDC-4 in order to apply the leak-before-break concept to Catawba Nuclear Station to eliminate postulated pipe breaks in the Class 1 Accumulator Injection line from the plant structural design basis.

Enclosure 3 of Reference (5) consisted of the revised Catawba FSAR pages associated with the elimination of pressurizer surge line breaks. Attachment 5 to this letter includes additional changes to the FSAR associated with the elimination of the Accumulator Injection line breaks. These changes will be included in a future revision to the FSAR. This current request is for implementation on Unit 2 only; Duke Power will submit additional information prior to implementation on Unit 1.

Construction completion of the Class 1 Accumulator Injection line devices at Catawba Unit 2 is on hold pending an NRC ruling on this proposal. We request a resolution concerning this matter prior to July 16, 1984.

If I can be of further assistance, or if a meeting with the staff is deemed beneficial for a final resolution of this matter, please contact me.

Very truly yours,

Hal B. Tucker

Attachments

cc: Mr. James P. O'Reilly, Regional Administrator
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Region II
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NRC Resident Inspector
Catawba Nuclear Station

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ATTACHMENT 2

Impact of Elimination of Postulated
Circumferential and Longitudinal Pipe Breaks
in the Class 1 Accumulator Injection Lines

Structures, Systems, Components, Programs Considered for Impact	Impact
Class 1 Accumulator Injection Line Pipe Whip Restraints and Jet Barriers	Deleted from Design
Primary Shield Wall/Crane Wall/ Operating Floor	Reduction in pressurization loading
RCS Pressure Boundary Leakage Detection Systems	No Change
Environmental Qualification Program	No Change

ATTACHMENT 3

Postulated Class 1 Accumulator Injection Line Pipe Breaks and Associated Rupture Devices

Postulated Break Location	Devices Associated with Break	Erection Status Catawba Unit 2
1. Terminal end at RCL Cold Leg 2A	3 pipe whip restraints and 1 jet deflector	Not installed
2. Terminal end at RCL Cold Leg 2B	4 pipe whip restraints	Not installed
3. Terminal end at RCL Cold Leg 2C	1 pipe whip restraint	Not installed
4. Terminal end at RCL Cold Leg 2D	4 pipe whip restraints and 1 jet deflector	Not installed

The total number of devices being deleted is 12 pipe whip restraints and 2 jet deflectors.

ATTACHMENT 4

Summary of Benefits from the
Elimination of Class 1 Accumulator Injection Line
Pipe Breaks on Catawba Nuclear Station Unit 2

Category	Benefit
1. Design, material and erection costs associated with 14 rupture devices.	$644,000*
2. Plant design	Simplifies overall plant design by elimination of potential interferences with piping, hangers, impulse tubing, etc.
3. Relief of congestion, improving access for operation and maintenance.	114 man-rem reduction in radiation exposure over life of Unit 2 ($277,500)
4. Reduction in piping heat loss at whip restraint locations.	Not quantitatively assessed. Insulation can be installed on piping at current locations of Class 1 Accumulator Injection Line pipe whip restraints.
5. Improvement in overall plant safety (NUREG/CR-2136).	Improvement in ISI quality. Elimination of potential for restricted thermal or seismic movement.

*Current (1984) dollars.

ATTACHMENT 5

Table 3.6.1-4

Piping Systems For Application of
"Leak Before Break" Concept

System	Math Model	Line Description
Reactor Coolant	--	Reactor Coolant Loops
Reactor Coolant	NC-201	Pressurizer Surge Line
Safety Injection	NI-204	10" Accumulator Injection Line-Loop A (Class 1)
Safety Injection	NI-205	10" Accumulator Injection Line-Loop B (Class 1)
Safety Injection	NI-206	10" Accumulator Injection Line-Loop C (Class 1)
Safety Injection	NI-207	10" Accumulator Injection Line-Loop D (Class 1)