

# DUKE POWER COMPANY

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NUCLEAR PRODUCTION

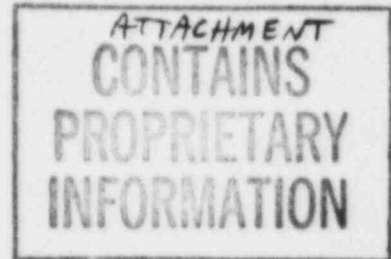
TELEPHONE  
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May 11, 1984

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

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 H. B. Tucker (Duke Power Company) to H. R. Denton (NRC), dated December 20, 1983
  - 2) Generic Letter 84-04, NRC dated February 1, 1984
  - 3) Letter from E. G. Adensam (NRC) to H. B. Tucker (Duke Power Company) dated April 10, 1984
  - 4) Letter from W. H. Owen (Duke Power Company) to W. J. Dircks (NRC), dated September 19, 1983
  - 5) Letter from H. R. Denton (NRC) to W. H. Owen (Duke Power Company), dated October 17, 1983
  - 6) Letter from H. B. Tucker (Duke Power Company) to H. R. Denton (NRC), dated November 18, 1983

Dear Mr. Denton:

Duke Power Company requested in Reference 1 NRC approval for application of the "leak-before-break" concept to the Catawba Nuclear Station to eliminate postulated pipe breaks in the Reactor Coolant System (RCS) primary loop from the plant structural design basis. In Reference 3, the NRC requested additional information to complete the review of this leak-before-break analysis for Catawba Nuclear Station Unit 2. Prior to that, Generic Letter 84-04 (Reference 2) required licensees to request an exemption from General Design Criteria 4 (GDC-4), and to perform a safety balance in terms of accident risk avoidance versus safety gains. This letter is submitted in response to these NRC requests for information.

## Request for Additional Information

Five copies of a revised Westinghouse technical report (WCAP-10546) entitled "Technical Bases for Eliminating Large Primary Loop Pipe Ruptures as the Structural Design Basis for Catawba Unit 1 and 2" are included as Enclosure A to provide technical justification for elimination of RCS pipe breaks for Catawba Nuclear Station and to provide responses to the five items requested in Reference 3.

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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-84-39, and should be addressed to R. A. Weisemann, Manager, Regulatory and Legislative Affairs, Westinghouse Electric Corporation, P. O. Box 355, Pittsburgh, Pennsylvania 15230. 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. Five copies of a non-proprietary version of the specific plant applicability report (WCAP-10547) (Enclosure B) are included.

#### Exemption Request

Pursuant to 10 CFR 50.12(a), Duke Power Company hereby applies for an exemption from the provisions to 10 CFR Part 50, Appendix A, authorizing alternative pipe break analyses utilized in resolution of generic issue A-2, "Asymmetric Blowdown Loads on PWR Primary Systems." The requested exemption is based upon the application of advanced fracture mechanics technology as evaluated in the Westinghouse technical report WCAP-10546 (Enclosure A).

Specifically, we request the elimination of postulated circumferential and longitudinal pipe breaks in the reactor coolant system primary loop from consideration in the structural design basis of Catawba Nuclear Station. The pipe breaks are those identified in Westinghouse topical report WCAP 8172 for the RCS primary loop. 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 affected pipe whip restraints is provided in Attachment 3.

The bases for the requested exemption are as follow:

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 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.
3. If one postulates a through-wall crack, large margins against unstable crack extension exist for certain stainless steel PWR primary coolant 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 the double-ended rupture of the largest pipe of the Reactor Coolant System. To date, use of this advanced fracture mechanics technology has been limited by the definition of a LOCA in Appendix A to 10 CFR 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 primary coolant pipes 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 inspection. 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 RCS primary loop. 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."

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

1. Letter from Darrell G. Eisenhower (NRC) to E. P. Rahe (Westinghouse) dated February 1, 1984.
2. Memorandum from Darrell G. Eisenhower (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 Failures."
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 estimated increase in public accident exposure associated with omitting the RCS primary loop pipe whip restraints is only 0.5 man-rem. This nominal estimate is based on the "Leak-before-Break Valve-Impact Analysis" of Enclosure 2 to Reference 2, with adjustments made for the 40-year life and four loop design of Catawba Unit 2. While Reference 2 data are based on a population density of 340 people per square mile, projected densities within a 50-mile radius of the Catawba site for years 1990 and 2020 are 197 and 225 people per square mile, respectively. Therefore, the 0.5 man-rem risk to public health is conservative due to the lower population densities for the Catawba-specific case. After adjusting Reference 2 data for a 40-year plant life, the estimated increase in occupational accident exposure associated with omitting the RCS primary loop restraints is also low--less than 0.1 man-rem for the nominal case.

The benefit in avoidance of exposures for Catawba Unit 2 associated with the requested exemption is 600 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 avoided accident exposure associated with omitting pipe restraint devices. Duke Power Company estimates cost savings for Catawba Nuclear Station, Unit 2 of at least 2 million dollars, as itemized in Attachment 4.

Additionally, with removal of pipe restraint devices, a substantial improvement in the quality of in-service inspections is anticipated. Also, simplified plant designs will result since removal of these restraints will eliminate potential interferences with other plant structures. Reduced RCS heat loss to containment at whip restraint locations will result. The risks of unanticipated pipe restraint for thermal growth and seismic movement can be avoided. Thus, the exemption will lead to an overall improvement in plant safety.

With these operational benefits and with a net reduction of radiation exposure of 600 man-rem, a net safety gain has been demonstrated for Catawba Unit 2. Also a cost savings of at least two million dollars has been shown, and a technical basis for elimination of RCS primary loop pipe breaks has been demonstrated. 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 RCS primary loop from the plant structural design basis.

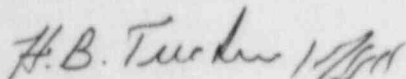


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Enclosure C of Reference 1 consists of the revised Catawba FSAR pages associated with the elimination of RCS primary loop breaks, and it will be included in a future revision to the FSAR. This current request is for implementation on Unit 2 only; Duke Power will submit additional information prior to implementation on Unit 1. Construction completion of the RCS primary loop pipe whip restraints at Catawba Unit 2 is on hold pending an NRC ruling on this proposal. We request a resolution concerning this matter prior to June 8, 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

ROS/KWH/php

Attachments

cc: (w/proprietary attachments)  
Mr. James P. O'Reilly, Regional Administrator  
U. S. Nuclear Regulatory Commission  
Region II  
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(w/o proprietary attachments)  
NRC Resident Inspector

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