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SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards marked-up Section 6.2 of FSAR re annulus pressurization load evaluation,per 831027 telcon request. Info will be incorporated into next FSAR rev.

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November 4, 1983
G02-83-1025

Docket No. 50-397

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Schwencer:

Subject: NUCLEAR PROJECT NO. 2
ANNULUS PRESSURIZATION (AP) LOAD
ADEQUACY EVALUATION, NEDO 24548

Per the telephone request of R. Auluck and R. Li (NRC) on October 27, 1983, attached is a copy of the changes to Section 6.2 of the FSAR regarding AP Load Evaluation (GE document NEDO 24548). Final submittal of the changes will be made in the next amendment to the FSAR.

If there are any questions, please contact Mr. P. L. Powell, Manager, WNP-2 Licensing.

Very truly yours,

GC Sorensen

G. C. Sorensen, Acting Manager
Nuclear Safety and Regulatory Programs

BDP/tmh
Attachment

cc: R Auluck - NRC
WS Chin - BPA
R Li - NRC
AD Toth - NRC Site

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Current state-of-the-art industry methods were used for these annulus pressurization calculations. These methods result in more realistic prediction of pressures as compared to the more conservative calculations discussed previously. Each of the three changes employed are described below:

a. Annular Volume

The current industry approach is to utilize the annular volume excluding the RPV insulation volume which is conservatively assumed not to be available. This approach is conservatively assumed not to be available. This approach is conservative but more realistic than previous analyses where only the annular volume on one side of the RPV insulation was available.

b. Finite Time Dependent Blowdown

The blowdown loading values given in Reference 6.2-11 were derived with the assumption that the pipe break would occur instantaneously and that the annulus area would see the maximum blowdown instantaneously. Actually, the full flow from the severed pipe can not be realized until the severed pipe ends separate a distance equal to one half (1/2) the pipe diameter. Movement actually occurs in a finite time and is a function of the stiffness characteristics of the pipe and the restraining capability of the pipe whip restraints. (NEDO 24548)

Current industry practice was used to develop displacement versus time data for a finite break opening; the General Electric analytical method was used for determining the short-term mass and energy release ~~was used~~. The analysis was utilized for the recirculation loop break, but not for the feedwater line since it was determined that the small precentage reduction for the feedwater would not warrant the additional calculations.

c. Feedwater Break Blowdown Data

The blowdown analysis for the postulated feedwater line break was based on a comprehensive model developed for the entire feedwater system from the condenser to the reactor vessel. This model, in conjunction with the RELAP4/MOD5 computer program (Reference 6.2-14) was used to calculate the transient and energy blowdown data.

static loads, utilizing the appropriate dynamic load factors. The components stresses were found to be within the values specified in the appropriate Codes, however, after a LOCA, refueling a bulkhead would require requalification prior to use. This is considered acceptable since the refueling bulkhead does not perform a safety-related function and would not become a missile during the postulated LOCA.

The analyses for the annulus were reported in full detail in References 5.2-9 through 6.2-11. All potential pipe breaks within the sacrificial shield wall have been evaluated. The information is contained in References 3.8-5, 3.8-6, 3.8-7, and 3.8-24. These references have been previously submitted to the NRC. The result of the case of a 60-node model of the shield wall annulus for pressure transient calculation was confirmed by the NRC, and the analysis was considered acceptable for the shield wall base design and the design of the shield wall above the base, as stated in NRC letters (References 6.2-12 and 6.2-13).

Peak and transient loading used to establish the adequacy of the sacrificial shield wall, including the time/space dependent forcing functions are presented in References 6.2-9 through 6.2-11 and 3.8-24.

Subsequently, a more realistic approach was used in determining loads from postulated pipe breaks within the annulus area. These loads were used to produce response spectra for use in evaluating the secondary effects (the dynamic effects on piping systems, equipment, and components attached to the sacrificial shield wall of the RPV). Three principal changes were made in the assumptions used in the previous more conservative sacrifical shield wall analysis. Namely:

a. The volume in the annulus was utilized to receive the blowdown with the RPV installation volume conservatively assumed not to be available.

b. A finite time dependent blowdown was used for the recirculation break, utilizing NSSS supplier methodology (NEDO 24548). The effect of subcooling has been taken into account.

c. The feedwater pressurization analysis was developed utilizing blowdown values developed by detailed computer analysis rather than the previous hand calculation method.

6.2-11 Washington Public Power Supply System, Nuclear Project No. 2, Report No. WPPSS-74-2-R2-B, "Sacrificial Shield Wall Design Supplemental Information", August 19, 1975.

6.2-12 Letter from R. C. DeYoung of NRC to J. J. Stein of WPPSS, dated August 13, 1975. Subject: Sacrificial Shield Wall Design.

6.2-13 Letter from R. C. DeYoung of NRC to J. J. Stein of WPPSS, dated October 15, 1975. Subject: Sacrificial Shield Wall Design.

6.2-14 ANCR-NOREG-135, "RELAP4/MOD5 - A Computer Program for Transient Thermal-Hydraulic Analysis of Nuclear Reactor and Related Systems Users Manual" - 3 volumes, September, 1976.

6.2-15 AEC-TR-6630, "Handbook of Hydraulic Resistance, Coefficients of Local Resistance and of Friction", by I. E. Idel'Chick, 1960.

6.2-16 Bilanin, W. J., "The General Electric Mark III Pressure Suppression Containment System Analytical Model," June 1974, (NEDO-20533).

6.2-17 "Loss-of-Coolant Accident and Emergency Core Cooling Models for General Electric Boiling Water Reactors", Licensing Topical Report NEDO-103 9, General Electric, April 1970.

6.2-18 A. K. Post and B. M. Johnson, "Containment Systems Experiment Final Program Summary", BNWL-1592, Battelle Northwest, Richland, Washington, July 1971.

6.2-19 J. G. Knudsen and R. K. Hilliard, "Fission Product Transport by Natural Processes in Containment Vessels", BNWL-943, Battelle Northwest, Richland, Washington, Jan. 1969.

6.2-20 R. K. Hilliard and L. F. Coleman, "Natural Transport Effects on Fission Product Behavior in the Containment Systems Experiment", BNWL-1457, Battelle Northwest, Richland, Washington, Dec. 1970.

6.2-21 R. K. Hilliard, "Removal of Iodine and Particles from Containment Atmospheres by Sprays -- Containment Systems Experiment Interim Report", BNWL-1244, Battelle Northwest, Richland, Washington, Feb. 1970.

6.2-22 D.K. Sharma, "Technical Description Annulus Pressurization Load Adequacy Evaluation", GENERAL ELECTRIC, January 1979 (NEDO 24548).