GENERAL ELECTRIC

NUCLEAR ENERGY
DIVISION

GENERAL ELECTRIC COMPANY, 175 CURTNER AVENUE, SAN JOSE, CALIFORNIA 95125
Mail Code 682 Phone (408) 297-3000, TWX NO. 910-338-0116

BWR PROJECTS DEPARTMENT

March 10, 1975

Mr. R. L. Tedesco
Assistant Director For
Containment Safety
Directorate of Licensing
Office of Regulation
U.S. Nuclear Regulatory
Commission
Washington, D. C. 20555

Dear Mr. Tedesco:

Subject: RELIEF VALVE VENT CLEARING AND STEAM QUENCHING VIBRATIONS

Reference: 1) letter to I. F. Stuart from R. L. Tedesco, January 17, 1975
2) letter to R. L. Tedesco from I. F. Stuart, February 14, 1975

Reference 1 indicated that due to the generic nature of concerns relative to the initial safety/relief (S/R) valve discharge clearing dynamic loads and the steam quenching vibrations from continued S/R valve blowdown into a suppression pool at an elevated temperature, you are interested in what is being considered for Mark II and III containments. In each of these areas of concern you identified the kind of information that you would need for your review.

GE has no contractural involvement in either the design or supply of Mark II containments within the U.S. However, all BWR projects were notified of these phenomena. The following is a general description of the work GE is doing and the schedule for providing 1) an analytical model for predicting loads from S/R valve clearing that are appropriate for use in initial structural design or design evaluation of Mark III and 2) to define specific temperature limits that are needed to assure that the steam condensation instability conditions are not encountered during S/R valve blowdown:

Relief Valve Vent Clearing

In topical report NEDO-10859 GE presented a model for predicting the applied loads on the boundaries of the Mark I suppression pool due to the initial

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clearing of the discharge pipe when S/R valves opened. In a letter from W. R. Butler to I. F. Stuart dated September 12, 1974 this topical report was rejected for reference on licensing applications, however, the attached evaluation stated that this "model generally represents a valid and sufficiently complete method of generating a pressure loading prediction for relief valve action" but that "a determination of the adequacy of the model to determine a universally applicable forcing function would have to be supported by larger data base."

The model currently being used as a tool for predicting loads for Mark III uses the same basic technique as that presented in NEDO-10859. Several changes have been made to address the deficiencies that have been identified with the NEDO-10859 version and to reflect the Mark III configuration. A test program has been set up and GE will shortly begin a series of tests which are aimed at 1) verifying the method of images (single bubble tests) and 2) the superposition method (two bubble tests). These tests plus the data from the testing reported in NEDO-10859 will be used to justify the model for Mark III dynamic loads with a rams head configuration on the end of the discharge pipe.

The following information will be submitted to document the model verification program that GE has instituted as well as address the specific items identified in your letter:

- A description of the preliminary relief valve discharge pipe air clearing pressure response model currently being used for predicting loads for Mark III will be transmitted to you by May 9, 1975.

- A description of the test program that has been established together with a statement of objectives, description of the test facility, and schedule for reporting of results will be transmitted to you by April 11, 1975.

- The identification and location of components in the suppression pool will be added to GESSAR in the form of an arrangement drawing by April 11, 1975.

- The specific load definition and the expected number of single and multiple relief valve opening events will be included in a report for standard 238 BWR-6 Mark III plant together with the definition of LOCA related loads. This report will be completed by July 1, 1975.

Steam Quenching Vibrations

The steam quenching vibrations occur when the pool in the vicinity of the relief valve discharge pipe is at an elevated temperature and the discharge from the pipe is at sonic velocities. The vibrations are attributed to steam condensation instability. Using the analysis performed for Mark I as a base and considering the mass of suppression pool water in Mark III containments together

with the rates of energy addition to the pool, GE has made a preliminary determination that it is possible to provide operational controls that will avoid the plant conditions for the region of condensation instability in the same manner as that identified for Mark I. A similar determination could be made for Mark II containment. This phenomena has never been reported by any operating BWR plants in the U.S.

Configurations other than the rams head have an effect on the threshold temperature for vibrations and thus impact the operational restrictions that may have to be employed. These configurations also affect the relief valve vent clearing loads. Because the immediate need for containment design is to define the clearing loads, emphasis has been placed on insuring that the model verification program has progressed to the point that the pressure amplitudes for Mark III design are confirmed before beginning an effort to define the specific operating procedures, pool temperature limits, etc. Transient thermal analysis for Mark III containment will be performed at a later date.

Please call me or Bert Sobon (Ext. 3495) if you have any questions or comments regarding this schedule.

Sincerely,

Ivan F. Stuart, Manager
Safety and Licensing
Mail Code 682, Ext. 2791

IFS:smk

cc: Dr. D. F. Knuth (NRC)

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TAR NO.: 1306
REQ. BR.: ORB3

U. S. ATOMIC ENERGY COMMISSION

TECHNICAL ASSISTANCE REQUEST CONTROL FORM

REPARED BY: R. L. Tedesco DATE PREPARED: 03/17/75

ACTION:

NEW ASSIGNMENT ☐ NEW INFORMATION ☐ CANCELLATION ☐ COMPLETION ☒

GENERAL DESCRIPTION/TITLE: G.E. Letter on proposed Suppression Pool Temperatures Limits

YPE OF REQUEST:

TECH. ASSIST ☐ TOPICAL REPORT ☐ REG. GUIDE ☐ STANDARD ☐ OTHER ☐

REQUEST FROM: _____ DATE: / /

REQUEST CONTACT: _____ ADDRESSED TO DDTR ☐ OTHER: _____

REQUESTING TARGET DATE: / / DATE RECEIVED: / /

ASSIGNED ASSISTANT DIRECTOR:

REACTOR SAFETY ☐ ENGINEERING ☐ CONTAINMENT SAFETY ☐ SITE SAFETY ☐

RSB ☐ CPB ☐ EICB ☐ OSB ☐ MEB ☐ MTEB ☐ SEB ☐ APB ☐ ETSB ☐ CSB ☐ QAB ☐ AAB ☐ SAB ☐ RAB ☐ CBB ☐ ESB ☐

ESTIMATED COMPLETION DATE: / / ☐ RESPOND INDIVIDUALLY:

☐ ADDITIONAL INFORMATION REQUESTED ☐ COORDINATED RESPONSE BY: _____

REMARKS: Completed by memo to K. Goller from R. Tedesco dated 12/13/74.
Subject: SUPPRESSION POOL TEMPERATURE LIMITS (TAR-1306)

SYSTEM CONTROL DATA

Copies to:
1. Requestor
2. OPS
3.-8. Assigned A/D's
9.-10. Deputy Director, TR

K. Goller/C. DeBevec
R. Tedesco
F. Schroeder
G. Lainas
J. Kudrick
L. Slagers

FACILITY NAME(S)	DOCKET(S)
(1)	050-00
(2)	050-00
(3)	050-00
(4)	050-00
(5)	0

TOPICAL REPORT REVIEW NUMBER: _____
ORB ACTIVITY NO.: _____
ORB ISSUE MILESTONE NO.: _____

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