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LB#1 Rdg
MRushbrook
JStefano
DEisenhut/RPurple
Attorney, OELD
ELJordan, IE
ACRS
JMTaylor, IE
TMNovak
RHouston
WButler
JKudrich
FEltawila
MFields
ANotafrancesco

Mr. Murray R. Edelman
Vice President - Nuclear Group
The Cleveland Electric Illuminating Company
P. O. Box 5000
Cleveland, Ohio 44101

Dear Mr. Edelman:

Subject: Report of Staff Findings Regarding SER Outstanding Issue (9) and Confirmatory Issue (21) Pertaining to Suppression Pool Dynamic Loads and Temperature Limits - Perry Nuclear Power Plant (Units 1 and 2)

The staff has completed its review of the additional information provided in your letters dated January 31, 1983 and June 20, 1983, addressing SER Outstanding Issue (9) - Pool Dynamic Loads, as well as the information provided in your letter June 29, 1983 regarding SER Confirmatory Issue (21) - Pool Temperature Limits. The staff's findings and conclusions on these issues are enclosed and are proposed for inclusion in the next Perry SER Supplement.

With respect to pool temperature limits, the staff finds that the trarsient analysis, temperature monitoring system, local-to-bulk temperature differences, and the single failure analysis performed, conform with the guidelines of NUREG-0783 and are therefore acceptable. As such, we consider SER Confirmatory Issue (21) to be satisfactorily resolved.

With respect to pool dynamic loads, the staff has completed its review of the Perry load specifications against the generic acceptance criteria, pertaining to safety-relief valve dynamics, and concludes that the safety-relief valve pool dynamic loads utilized conform with GESSAR II specifications and are therefore acceptable. However, the staff has not yet completed its review of the LOCA-related hydrodynamic loads in the pool, and because of this, SER Outstanding Issue (9) will continue to remain unresolved. The staff expects to complete its review of the LOCA loads in December 1983 at which time a meeting will be scheduled to discuss the findings.

If there are any questions or clarifications required pertaining to the enclosed staff evaluation findings, please direct them to the Perry Project Manager, John J. Stefano.

Sincerely,

Original signed by:
B. J. Youngblood

B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing

Enclosure:
As stated

CONCURRENCES:

DL:LB#1	CSB/DSI	DL:LB#1
JStefano:es	WButler	BJYoungblood
11/02/83	11/7/83	11/8/83

Mr. Murray R. Edelman
Vice President, Nuclear Group
The Cleveland Electric Illuminating Company
P. O. Box 5000
Cleveland, Ohio 44101

cc: Jay Silberg, Esq.
Shaw, Pittman, Potts & Trowbridge
1800 M Street, N. W.
Washington, D. C. 20006

Donald H. Hauser, Esq.
The Cleveland Electric Illuminating Company
P. O. Box 5000
Cleveland, Ohio 44101

Resident Inspector's Office
U. S. Nuclear Regulatory Commission
Parmly at Center Road
Perry, Ohio 44081

U. S. Nuclear Regulatory Commission
Mr. James G. Keppler, Regional
Administrator, Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Donald T. Ezzone, Esq.
Assistant Prosecuting Attorney
105 Main Street
Lake County Administration Center
Painesville, Ohio 44077

Ms. Sue Hiatt
OCRE Interim Representative
8275 Munson
Mentor, Ohio 44060

Terry J. Lodge, Esq.
618 N. Michigan Street
Suite 105
Toledo, Ohio 43624

John G. Cardinal, Esq.
Prosecuting Attorney
Ashtabula County Courthouse
Jefferson, Ohio 44047

SUPPLEMENT TO THE SER FOR THE PERRY NUCLEAR POWER PLANT
OUTSTANDING ISSUE (9), "POOL DYNAMIC LOADS, AND CONFIRMATORY ISSUE (21),
"SUPPRESSION POOL TEMPERATURE LIMITS"

6.2.1.8 Hydrodynamic Loads

Section 6.2.1.8.3 of the Perry SER NUREG-0887, identified the SRV and LOCA related pool dynamic loads as outstanding items. The staff has completed its review of the SRV related pool dynamic loads. The results of this evaluation are summarized below. Our evaluation of the LOCA related pool dynamic loads is currently underway and will be reported in an upcoming supplement to this SER.

Safety/Relief Valve Dynamics

Actuation of safety/relief valves (SRVs) produces transient loading on components and structures in the suppression pool region. Prior to actuation, the discharge piping of an SRV line contains atmospheric air and a column of water corresponding to the line's submergence. Following SRV actuation, pressure builds up inside the piping as steam compresses the air in the line. The resulting high pressure air bubble that enters the pool oscillates in the pool as it goes through cycles of over-expansion and recompression. The bubble oscillations resulting from SRV actuation and discharge cause oscillating pressures throughout the pool, resulting in dynamic loads on the pool's boundaries and submerged structures.

Severe steam condensation vibration phenomena can potentially occur when high pressure, high-temperature steam is continuously discharged at high mass velocity into the pool, if the pool is at

elevated temperatures. These steam quenching vibrations would result in loads on the pool's boundaries and submerged structures.

The Perry design utilizes the GE X-quencher device to mitigate pool temperature effects and dynamic forces. In NUREG-0802, "Safety/Relief Valve Quencher Loads: Evaluation for BWR Mark II and Mark III Containments," dated October 1982, we set forth the X-quencher generic load specifications and the staff's acceptance criteria. The applicant has performed its evaluation and assessment of the containment design based on these loads.

As indicated in Appendix B to NUREG-0802, the staff concluded that the load definitions for the X-quencher configuration described in Attachment A to Appendix 3B of GESSAR II, Revision 1. are acceptable for evaluating the containment structure, equipment and piping-system response to SRV actuation loads.

In its letter, dated January 31, 1983, the applicant provided a detailed comparison of the Perry design basis to the GESSAR II methodology. We have completed our review of the Perry load specifications against the generic acceptance criteria and conclude that the SRV pool dynamic loads utilized by the applicant are in conformance with GESSAR II specifications and are therefore acceptable.

Pool Temperature Limit

The staff requires that the suppression pool local temperature shall not exceed the limits specified in NUREG-0783 for all

plant transients involving SRV operation. The Perry applicant's compliance with the specific guidelines of NUREG-0783 is discussed below.

a) Transient Analysis

The applicant has provided plant unique analyses for the pool temperature response to all transients involving safety/relief valve operation. Results of the analyses indicate that the plant will operate within the 220 F local pool temperature limit. We have reviewed the applicant's analyses and conclude that the assumptions used by the applicant are reasonably conservative and in agreement with the staff's criteria as set forth in NUREG-0783; they are, therefore, acceptable.

b) Temperature Monitoring System

The Perry design utilizes a two-division temperature monitoring system. Each of the two sub-systems contains eight temperature sensors mounted in the pool. The system design provides the operator with the necessary information regarding localized heatup during safety/relief valve actuation in adequate time to take the necessary action to assure that the local suppression pool temperature will always remain below the limit specified above. Based on our review of the applicant's proposed pool temperature monitoring system, we conclude that the design meets the criteria prescribed in NUREG-0783; we, therefore, find the design to be acceptable.

c) Bulk-to-Local Temperature Difference

The applicant has indicated that using data from a comprehensive safety/relief valve in-plant test, as conducted at Kuosheng, the

diffence between local and bulk pool temperatures was found to be 14 F. This is the value used in all the plant transient analyses for computing the local pool temperature value. Therefore, it was concluded that the maximum local pool temperature specification would not be exceeded. We find the data base used to determine the local-to-bulk temperature difference (Kuosheng SRV inplant test results) is acceptable since the Perry quenchers are similar to those tested at Kuosheng.

Our evaluation of the Kuosheng data revealed that in the absence of pool circulation due to RHR actuation, an acceptable value of local-to-bulk temperature differential is 19 F. This temperature differential can be reduced to 10 F after 9 minutes of operation of the RHR system.

The applicant assumed a 14 F local-to-bulk temperature differential for all transients and concluded that for the worst case (bulk temperature = 181 F), the local temperature of 195 F is well below the local temperature limit of 220 F.

If a 19 F local-to-bulk temperature was assumed, the maximum local temperature at Perry will be 200 F, which is still well below the local pool temperature limit. We, therefore, conclude that the plant will operate within the specified limits.

d) Single Failure Analysis

In NUREG-0783, we state that applicants are required to submit information to demonstrate that no single failure, either in the system design or power, will result in the loss of both RHR heat exchangers in both the shutdown cooling mode and the pool cooling mode.

The applicant indicated that, since Perry is capable of utilizing an alternate shutdown cooling mode via the ADS valves, in addition to the normal shutdown cooling mode through the recirculation and RHR loops, no single failure will result in the loss of the RHR heat exchanger pool cooling mode and shutdown cooling mode. The alternate shutdown mode has been reviewed and found acceptable by the Reactor Systems Branch. Therefore, we conclude that the applicant has satisfied the single failure analysis requirement as stated above.

Based on our evaluation of the applicant's analysis, we conclude that it conforms with the guidelines of NUREG-0783; they are, therefore, acceptable.