JUN 27 1983

Docket Nos.: 50-361
and 50-362

Mr. Robert Dietch
Vice President
Southern California Edison Company
2244 Walnut Grove Avenue
Post Office Box 800
Rosemead, California 91770

Mr. James C. Holcombe
Vice President - Power Supply
San Diego Gas & Electric Company
101 Ash Street
Post Office Box 1831
San Diego, California 92112

Genetlemen:

Subject: Request for Information, TMI Item II.D.1, Performance Testing of Relief and Safety Valves

As a result of our review of your submittal addressing NUREG-0737 Item II.D.1, we and our consultants find that additional information is required to complete our review. We request that you meet with us to discuss your responses to the enclosed questions within 30 days. If you have any questions regarding this request, please contact the staff Project Manager for San Onofre 2 and 3.

Sincerely,

Original signed by
George W. Knighton

George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing

Enclosure:
As stated

cc: See next page

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Mr. Robert Dietch
Vice President
Southern California Edison Company
2244 Walnut Grove Avenue
P. O. Box 800
Rosemead, California 91770

Mr. James C. Holcombe
Vice President - Power Supply
San Diego Gas & Electric Company
101 Ash Street
Post Office Box 1831
San Diego, California 92112

cc: Charles R. Kocher, Esq.
James A. Beoletto, Esq.
Southern California Edison Company
2244 Walnut Grove Avenue
P. O. Box 800
Rosemead, California 91770

Orrick, Herrington & Sutcliffe
ATTN: David R. Pigott, Esq.
600 Montgomery Street
San Francisco, California 94111

Mr. George Caravalho
City Manager
City of San Clemente
100 Avenido Presidio
San Clemente, California 92672

Alan R. Watts, Esq.
Rourke & Woodruff
Suite 1020
1055 North Main Street
Santa Ana, California 92701

Lawrence Q. Garcia, Esq.
California Public Utilities Commission
5066 State Building
San Francisco, California 94102

Mr. V. C. Hall
Combustion Engineering, Inc.
1000 Prospect Hill Road
Windsor, Connecticut 06095

Mr. S. McClusky
Bechtel Power Corporation
P. O. Box 60860, Terminal Annex
Los Angeles, California 90060

Mr. Dennis F. Kirsch
U.S. Nuclear Regulatory Comm. - Reg. V
1450 Maria Lane, Suite 210
Walnut Creek, California 94596

Mr. Mark Medford
Southern California Edison Company
2244 Walnut Grove Avenue
P. O. Box 800
Rosemead, California 91770

Mr. Henry Peters
San Diego Gas & Electric Company
P. O. Box 1831
San Diego, California 92112

Ms. Lyn Harris Hicks
Advocate for GUARD
3908 Calle Ariana
San Clemente, California 92672

Richard J. Wharton, Esq.
University of San Diego School of Law
Environmental Law Clinic
San Diego, California 92110

Phyllis M. Gallagher, Esq.
Suite 222
1695 West Crescent Avenue
Anaheim, California 92701

Mr. A. S. Carstens
2071 Caminito Circulo Norte
Mt. La Jolla, California 92037

Charles E. McClung, Jr., Esq.
Attorney at Law
24012 Calle de la Plata/Suite 330
Laguna Hills, California 92653

Resident Inspector, San Onofre/NPS
c/o U.S. Nuclear Regulatory Commission
P. O. Box 4329
San Clemente, California 92672

Regional Administrator-Region V/NRC
1450 Maria Lane/Suite 210
Walnut Creek, California 94596

Mr. C. B. Brinkman
Combustion Engineering, Inc.
7910 Woodmont Avenue
Bethesda, Maryland 20814

SAFETY EVALUATION QUESTIONS
TMI ACTION NUREG-0737 (II.D.I)
RELIEF AND SAFETY VALVE TESTING
FOR
SAN ONOFRE UNITS 2 and 3

Docket Nos. 50-361 and 50-362

May 1983

Questions related to the selection of transients and valve inlet conditions (Questions 1-14)

1. In the justification presented to show that only steam flow through the safety valves need be considered, no discussion is given on the consideration of single failures after the initiating event. NUREG-0737 requires selection of single failures that produce maximum loads on the safety valves.

   A discussion should be provided describing how the single failure considerations required by NUREG-0737 are met.

2. The peak pressure calculated for FSAR events was 2760 psia. The maximum pressure for the test series with ring settings corresponding to the ring settings of the plant valves was 2667 psia. The conditions used in the analysis for discharge piping loads was saturated steam at 2600 psia. How are these pressures compatible?

   The submittal concludes that blowdowns as high as 12% can be expected with the ring setting used on the plant safety valves compared to 5% considered in the FSAR. A discussion is presented to verify that the pressurizer water level will not rise sufficiently to reach safety valve inlet line. No discussion is given to assure that adequate core cooling will be achieved during the increased blowdown. A discussion should be provided that describes how plant safety is assured with the increased blowdown.

3. During pressurization transients, the pressurizer sprays come on. Since the sprays put water into the steam volume, wet steam will pass through the relief valves. This effect should be included in the evaluation of the discharge piping loads.

4. The feedwater line break is reported as the transient that would produce the largest rise of pressurizer water level and it is used to demonstrate that the level would not rise to the safety valve inlet line. The method of determining that the feedwater line break is the limiting transient is not given. Also no discussion is given on the analysis methods used to compute the rise in the water level. Details of these analyses should be provided or appropriate references cited.

Questions related to the operability of the safety valves (Questions 5-7)

5. The calculated backpressure for the simultaneous lifting of two safety valves exceeds the maximum backpressure for the tests conducted with the ring settings of the plant valves. A linear plot of the limited test data was used to extrapolate to higher backpressure and corresponding smaller blowdowns. The reported blowdown, with 2% tolerance, was 3.5%. Small blowdowns can result in unstable valve operations; therefore, justification should be given for the linear extrapolation. The trend of blowdown versus backpressure as predicted by the methods of the ASME Paper 82-WA/NE-9 would be appropriate.

Also the maximum pressurizer pressure for the FSAR transient is 93 psia higher the maximum pressure for the test series. The rationale for concluding that the tests demonstrate adequate operation for the higher pressure should be provided.

6. During the test series, valve repairs or modifications were made to correct problems related to proper valve operation. The thickness of the disc holder was reduced to reestablish the clearance between the

valve disc and the disc holder. The thrust bearing adapter was remachined to prevent the outer surface of the spacer from contacting the inner surface of the adapter. The lower lip of the disc holder was machined to reestablish the gap between the disc and disc holder. Are similar repairs or modifications necessary to insure reliable operation of the plant valves?

7. The ability of the valves to pass the flow to be compatible with the FSAR analyses that demonstrate the overpressure transients will be limited to 110% of the design pressure is inferred from the data of Tables 3.3 and 3.5 of the submittal. However, no direct comparison was presented and considerable interpretation is required to reach this conclusion. A specific comparison of the measured flow characteristics with the characteristics used in the FSAR should be included in the submittal.

Questions related to the analyses of the discharge piping (Questions 8-13).

8. The Energy Incorporated Version of RELAP4, E115P, was used for the thermal hydraulic analysis. Considerable effort has been expended on RELAP5 to determine the acceptability for use on safety valve piping and the effects of many parameters have been studied to establish proper modeling techniques. The San Onofre submittal does not discuss similar work for RELAP4.

   A comparison of RELAP4 with RELAP5 results is included in the submittal of the analysis of one of the EPRI/C-E tests. The comparison showed reasonable agreement. However, comparison for one test does not, in itself, prove the adequacy of RELAP4. The problem chosen for comparison does not bound the conditions for the San Onofre conditions in that the pressure and flow are less than the maximum values for the San Onofre transients. In addition, significant differences exist in the modeling between the two analyses that could affect the comparison. The node spacing for the RELAP4 solution appear to be relatively long. For example, the first horizontal leg, a 5 foot section, was modeled using one volume node. Studies for RELAP5 indicate 8 nodes should be used for a pipe leg to obtain a reasonable representation.

The conclusion that the RELAP4 force versus time functions are more conservative than RELAP5 is not obvious from the data given in the report. The absolute magnitude of the element forces is not the only parameters that affect the response of the piping system. The difference in forces at various nodes as a function of time and the rate the forces are applied often have a more important effect on the response.

Additional justification for the use of RELAP4 is required before the analysis of the San Onofre safety valve piping can be considered adequate.

9. Adequacy of the thermal hydraulic and the structural analyses could not be verified since sufficient details were not provided in the submittal. To provide for a more complete evaluation, additional discussions should be provided for the rationale used in selecting key parameters such as node spacing, time steps and choked flow nodes for the thermal hydraulic analysis and reduced degrees of freedom and damping for the structural analysis. Computer printouts of input and output for selected key problems should also be provided.

   Key problems for which printouts should be provided should include PIPES solution for San Onofre steam discharge, RELAP4/ANSYR solution for case 3 (San Onofre steam discharge with second valve opening after first valve has reached 50% open) and ANSYS solutions for case 3 and the seismic analysis both without the snubber at node point 60.

A specific concern is the use of saturated steam at 14.7 psia in the downstream piping prior to valve lift. Higher loads may result if air is assumed in the downstream piping. Also the inlet pressure drop and the reported backpressure could not be verified because the details of the analysis were not provided.

10. Three valve opening sequences were considered in the submittal; however, these sequences were not shown to bound the forces for all possible valve opening sequences. The experience of EG&G Idaho indicates the maximum forces are obtained when the sequence of opening is such that the initial pressure waves from the two valves opening reach the tee connection of the branch piping simultaneously. Additional justification should be provided to demonstrate that the sequences considered are adequate.

11. The submittal did not discuss the effect of the safety valve transients on the Section III Class 1 stress analysis of the piping from the pressurizer connections to the safety valve inlets nor did it discuss the effect of the transients on the stress analysis of the safety valve.

    In addition to the primary stresses, of special concern is the large displacement of the piping at the connection to the pressurizer due to the thermal expansion of the pressurizer when heated to operating conditions. The stresses from this displacement, the stresses from the thermal expansion of the safety valve piping and the stresses from the valve discharge should be appropriately combined and compared to the ASME Section III limits.

12. Justification should be provided for the load combination considered in the stress analysis. What is the rationale for not combining an operating basis earthquake with the dynamic loads from the relief valve discharge.

13. The stress analysis used an equation of ANSI B31.1 that considered only the primary stresses in the piping downstream of the safety valve. The rational for not considering the thermal and other secondary stresses should be provided.