Docket Nos. 50-348 and 50-364

June 2, 1984

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Mr. R. P. McDonald
Senior Vice President
Alabama Power Company
Post Office Box 2641
Birmingham, Alabama 35291

Dear Mr. McDonald:

SUBJECT: REQUEST FOR INFORMATION ON NUREG-0737 ITEM II.D.1, PERFORMANCE TESTING OF RELIEF AND SAFETY VALVES JOSEPH M. FARLEY NUCLEAR PLANT UNITS 1 AND 2

As a result of our review of your letters dated September 30, 1981, and April 1, July 1 (two letters), and November 4, 1982 relating to the subject testing, we need additional information. Our consultant, EG&G Idaho, reviewed these submittals and developed questions identified in the enclosure.

We request that your staff prepare responses to the questions and be prepared to meet with our staff and consultant within 60 days of the date of this letter. Please advise the NRC Project Manager of a proposed date for the requested meeting.

The reporting and/or recordkeeping requirements of this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

/s/SVarga

Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing

Enclosure:
As stated

cc w/enclosure:
See next page

ORB#1:DL	C-ORB#1:DL	AD/OR/DL
EReeves;ps	SVarga	GLainas
6/29/84	6/2/84	6/ /84

Mr. R. P. McDonald
Alabama Power Company

Joseph M. Farley Nuclear Plant
Units 1 and 2

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ENCLOSURE

SAFETY EVALUATION QUESTIONS TMI ACTION NUREG-0737 II.D.1

FOR FARLEY UNITS 1 AND 2

Questions related to the selection of transients and valve inlet conditions.

1. The submittal identifies the feedwater line break (FWLB) accident as one which causes liquid water flow through the safety valves. The EPRI tests under similar conditions were performed for only a few seconds. If the plant FWLB accident causes water flow through the valves for a time period greater than that tested, provide information that demonstrates that the plant safety valves can perform their pressure relief function and the plant can be safely shut down.

2. Results from the EPRI tests on the Crosby 3K6 and 6M6 safety valves with loop seal internals and utilizing upstream piping loop seals indicate that blowdowns may exceed the design blowdown of 5%, depending on the safety valve ring settings used (see related question 4). The consequences of potentially higher blowdowns are not addressed in the Farley 1 and 2 submittal. Blowdowns in excess of the design blowdown of 5% could cause the pressure to be sufficiently decreased such that adequate cooling might not be achieved for decay heat removal. Discuss the consequences of higher blowdowns if blowdowns in excess of 5% are expected.

Questions related to valve operability:

3. The Farley plant Crosby 6M16 safety vales was not tested by EPRI. Results from EPRI tests on the Crosby 3K6 and 6M6 safety valves were used to evaluate performance of the Crosby 6M16 valve of Farley Units 1 and 2. The EPRI test results indicate that the 6M6 valve achieved rated flow for steam flow. Though the submittal states that the 3K6 valve also achieved rated flow, the EPRI test results show that this valve had not achieved rated flow at 3% accumulation for the loop seal tests at certain ring settings. Provide a further evaluation as to whether the test results sufficiently show that the 6M16 valve will pass rated flow. A further consideration is that the safety valve flow rate depends on the specific ring settings used. Demonstrate that the safety valves will pass their rated flow with the plant ring settings.

4. The submittal indicates that the EPRI tests on the Crosby safety valves were conducted at varying ring settings. The submittal does not clarify, though, whether any of these ring settings corresponds with those used at the Farley plant. If the plant current ring settings were not used in the EPRI test, the test results may not be directly applicable to the Farley

plant valves. The submittal did not state if either the valve manufacturer (Crosby) or the NSSS supplier (Westinghouse) were reviewing the Farley plant ring settings. Identify the ring settings to be used in the Farley plant safety valves. Identify the equivalent ring settings for the Crosby 3K6 and 6M6 test valves. If the plant-specific ring settings were not tested in the EPRI program, explain how the expected values for blowdown and resulting back pressure, corresponding to the plant-specific ring settings, were extrapolated or calculated from the EPRI test data. Identify these values for backpressure and blowdown so determined. Evaluate and discuss the effects of the expected backpressures and blowdowns on valve behavior.

5. Bending moments are induced on the safety valves and PORVs during the time they are required to operate because of discharge loads and thermal expansion of the pressurizer tank and inlet piping. Make a comparison of the predicted plant-specific valve bending moments to the tested valve bending moments to demonstrate that the operability of the valve will not be impaired.

6. During an EPRI loop seal steam-to-water transition test on the Crosby 3K6 valve, the valve fluttered and chattered when the transition to water occurred. The test was terminated after the valve was manually opened to stop chattering. The Crosby 6M6 valve exhibited similar behavior on two loop seal-steam tests and one subcooled water test. Again, these tests were terminated after the valve was manually opened to stop chatter. Justify that the valve behavior exhibited in these tests is not indicative of the performance expected for the Farley Unit 1 and 2 valves.

<u>Questions related to the thermal hydraulic analysis:</u>

7. The adequacy of the thermal hydraulic analysis could not be verified since sufficient detail is not presented in the submittal. Provide a thermal hydraulic report which discusses the detailed descriptions of the methods and computer programs used to perform this analysis. Identify these programs and how these programs were verified. The thermal hydraulic report should include a description of the methods used to generate fluid

pressures and momenta over time and the methods used to calculate the resulting fluid forces on the system. Also identify important parameters used in the thermal hydraulic analysis and discuss rationale for their selection. These include timestep, valve flow area, peak pressure and pressurization rate, choked flow junctions, node spacing, valve opening time, and fluid conditions upstream and downstream of the safety valve at the time the valve pops open.

8. The submittal does not describe the method used of treating valve resistance in the analysis and does not report flow rates corresponding to the resistance used. The ASME Code requires derating of the safety valves to 90% of expected flow capacity to obtain the ASME rated flow capacity. The EPRI safety valve data indicated that steam flow rates in excess of rated flows are attainable. Therefore the piping analysis should be based on a flow rating equal to 111% of the safety valves rated flow unless another flow rate can be justified. Provide further explanation on how derating of the safety valves was handled and the methods used to establish flow rates for the safety valves and PORVs in the thermal hydraulic analysis.

Questions related to structural analysis:

9. The adequacy of the structural analysis could not be verified since sufficient detail is not presented in the submittal. The submittal does state that the dynamic solution was obtained using a modified predictor-correction integration technique and normal mode theory. Provide a structural analysis report describing in greater detail this solution technique and the computer program used to perform the analysis. Identify the program(s) and how the program(s) was verified. Identify important parameters used in the structural analysis and the rationale for their selection. These include lumped mass spacing, solution time step, damping, and cutoff frequencies (if applicable). Also describe the methods used to model the connections to the pressurizer and relief tanks, and the safety valve bonnet assemblies and relief valve actuators.

10. The submittal does not describe the methods used to apply the fluid forces to structural model. Since the forces acting on a typical pipe segment are composed of a net, or "wave", force and opposing "blowdown" forces, describe the methods used in applying both types of forces to the model.

11. According to results of EPRI tests, high frequency pressure oscillations of 170-260 Hz typically occur in the piping upstream of the safety valve while loop seal water passes through the valve. The submittal refers to an evaluation of this phenomenon that is documented in the Westinghouse report WCAP 10105 and states that the acoustic pressures occurring prior to and during safety valve discharge are below the maximum permissible pressure. The study discussed in the Westinghouse report determined the maximum permissible pressure for the inlet piping and established the maximum allowable bending moments for Level C Service Condition in the inlet piping based on the maximum transient pressure measured or calculated. While the internal pressures are lower than the maximum permissible pressure, the pressure oscillations could potentially excite high frequency vibration modes in the piping, creating bending moments in the inlet piping that should be combined with moments from other appropriate mechanical loads. Provide one of the following: (1) a comparison of the allowable bending moments established in WCAP 10105 for Level C Service Conditions with the bending moments induced in the plant piping by dynamic motion and other mechanical loads or (2) justification for other alternate allowable bending moments with a similar comparison with moments induced in the plant piping.

12. The submittal indicates that the thermal hydraulic loads were recalculated subsequent to the EPRI tests to reflect results of the tests. A letter from F. L. Clayton, Jr., to S. A. Varga, dated November 4, 1982, states that the new loads caused overstresses in the discharge piping to the safety valves. The letter contends that the pressurizer, pressurizer nozzles, valve inlet piping, and operability of the safety valves would not be affected by a rupture in the discharge piping. The submittal does not, however, present any specific results of the analysis to support this contention. The November 4th letter mentions an attached report that evidently contains stress results but this report was not actually

included in the submittal. So that the effects of the overstresses identified in the analysis can be better evaluated, provide the mentioned report and other reports that contain specific results of the stress analysis and that evaluate the consequences of overstresses for the specific piping location that are overstressed. Specifically provide a report that demonstrates that the overstress in the discharge piping will not impair the ability of the safety valves to operate and will not deform the piping in a manner that will restrict flow.

Question on PORV Circuitry

13. NUREG-0737, Item II.D.1 requires that the plant-specific PORV control circuitry be qualified for design-basis transients and accidents. Please provide information which demonstrates that this requirement has been fulfilled.