



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

April 17, 1984

Docket No. 50-206  
LS05-84-04-035

Mr. Kenneth P. Baskin, Vice President  
Nuclear Engineering  
Licensing and Safety Department  
Southern California Edison Company  
2244 Walnut Grove Avenue  
Post Office Box 800  
Rosemead, California 91770

Dear Mr. Baskin:

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1 - BENT BRACES ON  
SPENT FUEL PIT STORAGE RACKS

By letter dated July 13, 1983, you submitted Licensee Event Report (LER) 83-002, which noted that two upper lateral braces of the spent fuel pit storage racks had been found to be bent. You concluded, based on structural analysis of this configuration, that the storage racks meet the original design criteria (FSAR) in the current "as-loaded" condition but would not in the "fully-loaded" condition. Your calculations were submitted by letter dated October 17, 1983.

The staff has reviewed your analyses and, as discussed in the enclosed Safety Evaluation Report, concurs with your conclusions regarding the spent fuel racks. Therefore, we request that you do the following:

- (a) Propose a program and schedule for repairing the racks for staff review and approval. Justification for the repair schedule should be provided considering anticipated needs for addition of assemblies to the racks.
- (b) If the actual fuel rack load to be imposed before repair will significantly exceed the presently applied load level (the current 96 cells filled), a stress analysis of the fuel rack should be submitted to demonstrate that the rack stresses still remain below the FSAR criteria prior to the actual loading.

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Mr. Kenneth P. Baskin

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

Sincerely,  
Original signed by Walter Paulson  
for  
Dennis M. Crutchfield, Chief  
Operating Reactors Branch #5  
Division of Licensing

Enclosure:  
Safety Evaluation Report

cc w/enclosure  
See next page

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Mr. Kenneth P. Baskin

cc

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REVIEW OF RE-EVALUATION OF SPENT  
FUEL STORAGE RACKS FOR SONGS-1

As reported in LER 83-022/OIT, an inspection of the spent fuel storage racks revealed that the upper grid lateral braces located at the north-east and southeast corners on the east end of the rack were bent and no longer in contact with the spent fuel pool wall. Southern California Edison Company submitted analyses, performed by their contractor, by letter dated October 17, 1983. Bechtel's calculation of the seismic adequacy of the spent fuel storage racks was performed for this damaged condition with two bent braces.

The damage of braces was not caused by earthquakes because no strong ground motion has been recorded since the plant was in operation. It is believed that these braces were accidentally hit by a crane or equipment during a loading operation of spent fuel. In the LER the licensee noted the corrective actions for future operations so that such damage will not happen again. The damaged braces will be repaired eventually but not right away.

The purpose of Bechtel's calculation is to determine the structural integrity of the spent fuel storage racks without the use of the two damaged struts. Its original total of nine struts in the upper grid bracing scheme are then reduced to seven. Two loading conditions have been considered for analysis: the "fully loaded" and the "as loaded".

The seismic civil/structural reanalysis criteria of the spent fuel storage racks at San Onofre Nuclear Generating Station, Unit 1 were based on the design criteria and analysis methodology stated in the FSAR which in many respects differ significantly from the present (1984) SRP requirements,

such as the stipulation of an equivalent static load factor of 1.5 and the need to consider an additional 5% eccentricity for accidental torsion. It is not the intention of the Bechtel re-evaluation to compare or to comply with the present SRP requirements; rather the stress and strain conditions under the design environments are of interest in the reanalysis.

The basic assumptions on physical properties of structural material and systems, such as 7% damping for submerged structures, are reasonable and acceptable. Frictional resistance at the floor is ignored for analysis because of its uncertainty; this would result in conservative calculations. The method of analysis is straight-forward and conventional.

Calculations based on the existing 7 struts are summarized as follows:

A. Racks fully loaded

OBE: 13.3% overstressed\*

DBE: 41.7% overstressed\*

\* Compared with  $F_a=14$  ksi computed for the struts, where  $F_a$  is the axial stress permitted in the absence of bending moment based on Eq 1.5-1 of AISC. Even with end struts undamaged (i.e. 9 struts acting) the safety factor for DBE is marginal; therefore, the DBE condition for the existing 7 struts is unacceptable if racks are fully loaded.

B. Actual loading as of June 1983 when 96 of the 216 cells are filled:

For the existing 7 struts, assuming uniform load distribution, the Factor of Safety (F.S.) is as Follows:

OBE: F.S. = 1.96 (Compared with the computed  $F_a=14$  ksi for both OBE and DBE case)

DBE: F.S. = 1.57

The licensee also performed analyses at the NE and SE corners of the rack assuming interconnection of 2 rows of rack elements and allowing for load redistribution. Two additional analyses were performed at the NE and SE corners assuming 100 percent of the load from the damaged struts being transferred to the next closest strut. The calculations from these analyses showed that the struts analyzed were adequate in meeting the stress requirement for both OBE and DBE.

In summary, the licensee has shown that the damaged fuel racks under the present "as-loaded" condition above do meet the stress criteria of the FSAR. However, under a fully loaded condition, the FSAR stress criteria are not met; therefore, we require a rack repair and strengthening work as soon as practicable in the future.

The licensee may maintain its present usage (96 cells filled) of the damaged fuel racks until such a time that the repair and strengthening of the racks can be implemented without undue hardship,

provided that the following two conditions are met:

- a. The licensee should propose a program and schedule for repairing the racks for staff review and approval. Justification for the repair schedule should also be provided in light of anticipated additional loading of the rack.
  
- b. If the actual fuel rack load to be imposed before repair will significantly exceed the presently applied load level (the current 96 cells filled), a stress analysis of the fuel rack should be submitted to demonstrate that the rack stresses still remain below the FSAR criteria prior to the actual loading.