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

February 12, 1987

Edwin F. Lowry, Esq.
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345 Franklin Street
San Francisco, CA 94102

In the Matter of
PACIFIC GAS AND ELECTRIC COMPANY
(Diablo Canyon Nuclear Power Plant, Units 1 and 2)
Docket Nos. 50-275 OLA and 50-323 OLA (Spent Fuel Pool)

Dear Mr. Lowry:

As I indicated in our telephone conference on February 10, 1987 concerning information in the Byron Station docket regarding multi-rack impact analyses, enclosed please find a copy of an NRC Staff Memorandum dated January 27, 1987, from Hans Ashar, Structural and Civil Engineering Section to Lenny Olshan, Senior Project Manager, as well as copies of two proposals from Sargent & Lundy, one dated January 6, 1987 and one dated January 13, 1987.

Sincerely,

Henry J. McGurren
Counsel for NRC Staff

Enclosures: As Stated

cc w/enclosures: Service List

D503

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JAN 27 1987

MEMORANDUM FOR: Lenny Olshan, Sr. Project Manager
PWR Project Directorate No. 5
Division of PWR Licensing-A

THRU: David Jeng, Section Leader
Structural and Civil Engineering Section
Division of PWR Licensing-A

FROM: Hans Ashar
Structural and Civil Engineering Section
Division of PWR Licensing-A

SUBJECT: HIGH DENSITY SPENT FUEL RACKS, BYRON UNITS 1 AND 2, COMMENTS ON THE PROPOSED ADDITONAL ANALYSIS

We have reviewed the proposed additional analysis (sent to us by Sargent & Lundy on January 13, 1987) to resolve the concerns regarding multi-rack impact and effects of variation in gap sizes between racks, in consultation with the Brookhaven National Laboratory. The following are our comments:

1. The proposed approach could be acceptable if it can be shown that seismic acceleration levels are below the threshold necessary for large sliding motion and the results of additional analysis demonstrate significant safety margins.

2. The statement that the maximum displacement of an isolated rack is only 0.122 inches appears inconsistent with previous results which had shown maximum displacements of 0.1722 inch for the 12X14 rack, and 0.8012 inch for 8X14 rack. Explain the discrepancy. How will fluid coupling be treated in the isolated rack model?

3. If the proposed additional analysis is performed:
a) The 8X14 rack should also be analyzed since previous analyses showed that this rack experienced both - maximum displacements and maximum impact loads.
b) The zero initial gap conditions should also be analyzed since it is the nominal condition.

4. Provide a list of additional cases proposed to be analyzed. Will both interior and edge racks be analyzed? For edge racks, will gaps to the pool wall be reduced as gaps between racks increase?

JAN 27 1987

5. Provide the minimum safetv margins including the margins on girdle bar impact.

Hans Ashar

Hans Ashar
Structural & Civil Engineering Section
Engineering Branch
Division of PWR Licensing-A

cc: C.E. Rossi
V. Noonan
R.L. Ballard
D. Jeng
G. Degrassi, BNL

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Proposed Response to NRC Question on Multirack Behavior During a Seismic Event

Question #4

How was the conservatism of the single rack model demonstrated? The model appears to limit the amount of sliding and tilting of the rack between small gaps. This would not account for potential pileup of racks against the pool wall. Has this possibility been investigated?

Response

Additional analysis designed to obtain enveloping rack responses in terms of impact force between racks and the liner is proposed to respond to this question. Multiple single rack analysis may be used to maximize the impact force between racks. The boundary conditions in single rack analysis simulate the condition where the racks are out of phase. The rigid stop springs at the end of the gap stop the rack and allow little energy to be absorbed by the boundary and maximizes impact force. In reality the adjacent rack will not be exactly out of phase and will absorb some energy tending to reduce impact force. The impacts between adjacent racks may tend to separate the racks thus increasing rack to rack spacing. This condition may be simulated through analysis considering larger gaps than previously assumed so that the single rack analysis impact force bound the impacts which may occur in the pool.

If the racks spread apart in the pool they may come in contact with the pool wall liner. The pool liner is backed by concrete and is stronger than the rack structure and thus is capable of resisting blows larger than the rack can deliver.

Accordingly, the rack which produces the highest impact force (12x14) will be reanalyzed considering an increase in gap size. The gap size will be varied in 1/4" increments starting at 1/4" until racks do not impact. In order to maximize rack response the fully loaded rack case and the eccentric half loaded rack case will be analyzed. The above analyses will be carried out for the limiting coefficients of friction; μ = 0.2 and 0.8. The above set of parameters will yield an upper bound on impact force. The maximized impact force will be used to evaluate the racks and pool wall liner.

H. Asher - NRC telecopy
K. Singh - Holtec telecopy
K. Ainger - 34FNE
S. Gubin - 35FNW
T. J. Ryan - 28
R. Salsbury - 22

Proposed Response to NRC Question on Multirack Behavior During a Seismic Event

Question #4

How was the conservatism of the single rack model demonstrated? The model appears to limit the amount of sliding and tilting of the rack between small gaps. This would not account for potential pileup of racks against the pool wall. Has this possibility been investigated?

Response

Rack pile up will not occur because seismic acceleration levels are below the threshold necessary for the large sliding motion of the racks necessary for that pile up. It may be seen from the analysis of an individual isolated rack that the input acceleration levels are low enough so that sufficient displacement does not occur to obtain the free sliding behavior necessary to produce such a pileup. The maximum displacement, including sliding and tilting of an isolated rack, is 0.122 inches. However, multiple rack behavior may tend to separate the racks.

This condition may be simulated through analysis considering larger gaps than previously assumed so that the single rack analysis impact force bound the impacts which may occur in the pool.

Additional analysis designed to obtain enveloping rack responses in terms of impact force between racks and the liner is proposed to respond to this question. Multiple single rack analysis may be used to maximize the impact force between racks. The boundary conditions in single rack analysis simulate the condition where the racks are out of phase. The rigid stop springs at the end of the gap stop the rack and allow little energy to be absorbed by the boundary and maximizes impact force. In reality, the adjacent rack will not be exactly out of phase and will absorb some energy tending to reduce impact force.

If the racks spread apart in the pool, they may come in contact with the pool wall liner. The pool liner is backed by concrete and is stronger than the rack structure and thus is capable of resisting blows larger than the rack can deliver.

Accordingly, the rack which produces the highest impact force (12 x 14) will be reanalyzed considering an increase in gap size. The gap size will be varied in 1/4" increments starting at 1/4" until racks do non impact. In order to maximize rack response, the fully loaded rack case and the eccentric half loaded rack case will be analyzed. The above analyses will be carried out for the limiting coefficients of friction; μ= 0.2 and 0.8. The above set of parameters will yield an upper bound on impact force. The maximized impact force will be used to evaluate the racks and pool wall liner.

SP:atk
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