Docket No.
50-133

APR 18 1975

K. R. Goller, Assistant Director for Operating Reactors

FUEL DENSIFICATION ANALYSIS FOR OLDER PLANTS (TAR-1520)

| | |
|---|---|
| Plant Name: | Humboldt Bay |
| Licensing Stage: | OR |
| Docket No.: | 50-133 |
| Responsible Branch and Project Manager: | ORB-2<br>F. Anderson |
| Technical Review Branch Involved: | Core Performance Branch |
| Status of Review: | Current Phase Complete |

With reference to the December 24, 1974 AEC order for license modification, the Pacific Gas and Electric Company provided information on the important issue of possible cladding collapse. We have reviewed the cladding collapse calculations, and other LOCA related evaluations, and find that the Humboldt Bay plant is being operated in compliance with the Interim Acceptance Criteria, (IAC) including the effects of fuel densification. Further details are contained in the enclosure.

Original Signed by
Victor Stello

Victor Stello, Jr., Assistant Director
for Reactor Safety
Division of Technical Review
Office of Nuclear Reactor Regulation

Enclosure:
As Stated Above

cc: S. Hanauer
F. Schroeder
A. Giambusso
W. McDonald
D. F. Ross
S. Varga
E. Leins
L. Rubenstein
R. Meyer
D. Ziemann
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|---|---|---|---|---|---|---|
| SURNAME | RMeyer:sd | LRubenstein | DFRoss | VStello | | |
| DATE | 4/10/75 | 4/14/75 | 4/14/75 | 4/16/75 | | |

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

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ENCLOSURE

1. Cladding Collapse

Cladding collapse for the G.E. fuel has been evaluated with the G.E. code SAFE-COLAPS and shown to be uncollapsed for at least six years. We have recently reviewed and approved the SAFE-COLAPS model (see memorandum Stello to DeYoung, 3-13-75) and find this >6 year value to be a reliable prediction. Since fuel residence time will be only 3.4 year, cladding collapse is not expected in Humboldt Bay.

Using the Exxon code COLAPX, cladding collapse is not expected for the Exxon fuels during their residence in Humboldt Bay. The Exxon cladding is 10 to 40% thicker than the GE cladding and, therefore, should be even more resistant to collapse than the GE cladding.

2. Power Spike

The maximum axial densification gap for GE Type III fuel was calculated with an acceptable equation and the estimated spiking penalty of <2.5% at the top of the core is an expected value. Since power spike evaluation is not an integral part of LOCA analysis for BWRs, an estimated value, which is typical of calculated values for other BWRs, is acceptable temporarily. The calculational details that "will be available from GE in the near future," however, should be submitted prior to start-up of the next operating cycle (Cycle 11).

The axial gap for Exxon Type IV fuel was also calculated with an acceptable equation and the resulting gap size was significantly larger than the value for Type III fuel. In view of this, the calculated power

spike penalty of 0.75% is much smaller than we would expect, although approved models were reportedly used. Since the power spike penalty does not impact LOCA analysis, clarification of this point is not a priority item. However, prior to startup of Cycle 11, details of this power spike analysis should be provided for our review.

3. Stored Energy

Densification has a strong effect on stored energy through its influence on gap conductance. PG&E has employed a constant and conservative value of 300 Btu/hr · $ft^2$ · $F^o$ for gap conductance, and this value is especially conservative now for the partly burned fuel in Cycle 10. We can thus be assured that the peak cladding temperatures of 2269°F (Type III) and 2270°F (Type IV), which are below the IAC limit, include the effects of fuel densification. Prior to start-up of Cycle 11, however, LOCA analysis utilizing explicit calculations with the approved GEGAP and GAPEXX codes should be reported. In addition, a more complete description of the effects of fuel densification on transients (other than LOCA) should be provided at that time since the brief description provided by PG&E in their February 24, 1975 submittal is inadequate.