UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V
1990 N. CALIFORNIA BOULEVARD
SUITE 202, WALNUT CREEK PLAZA
WALNUT CREEK, CALIFORNIA 94596

November 20, 1979

Docket No. 50-275
50-323

Pacific Gas and Electric Company
77 Beale Street
San Francisco, California 94106

Attention: Mr. Philip A. Crane, Jr.
Assistant General Counsel

Gentlemen:

The enclosed IE Bulletin No. 79-26 is forwarded to you for information. No written response is required. If you desire additional information regarding this matter, please contact this office.

Sincerely,

R. H. Engelken
Director

Enclosures:
1. IE Bulletin No. 79-26
2. List of Recently Issued IE Bulletins

cc w/enclosures:
J. Worthington, PG&E
W. Raymond, PG&E
R. Ramsay, PG&E, Diablo Canyon

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

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November 20, 1979

IE Bulletin No. 79-26

BORON LOSS FROM BWR CONTROL BLADES

Description of Circumstances:

The General Electric Company (GE) has informed us of a failure mode for control blades which can cause a loss of boron poison material. Hot cell examinations of both foreign and domestic blades have revealed cracks near the upper end of stainless steel tubing and loss of boron from the tubes. The cracks and boron loss have so far been confined to locations in the poison tubes with more than 50 percent Boron-10 (B^{10}) local depletion. Observed crack sizes range from a quarter to a half inch in length and from one to two mils in width.

GE has postulated that the cracking is due to stress corrosion induced by solidification of boron carbide (B_4C) particles and swelling of the compacted B_4C as helium and lithium concentrations grow. Once primary coolant penetrates the cladding (i.e., the cracking has progressed through the cladding wall and the helium-lithium pressures are sufficient to open the crack), boron is leached out of the tube at locations with more than 50 percent B^{10} local depletion (local depletion is considered to be twice the average depletion). It was further found with similar cracking but with less than 50 percent local depletion of B^{10}, that leaching did not occur even though primary coolant had penetrated the cladding.

The cracking and boron loss shorten the design life of the control blade. According to the GE criteria the end of design life is reached when the reactivity worth of the blade is reduced by 10 percent, which corresponds to 42 percent B^{10} depletion averaged over the top quarter of the control blade. Because of the leaching mechanism, GE has reduced the allowance for B^{10} depletion averaged over the top quarter of the control blade from the 42 percent value to 34 percent.

The safety significance of boron loss is its impact on shutdown capability and scram reactivity. Although shutdown capability is demonstrated by shutdown margin tests after refueling, the calculated control blade worths used in the tests are based on the assumption that no boron loss has occurred. Reduction in scram reactivity due to boron loss could increase the severity of Critical Power Ratio (CPR) reductions during the plant transients and could increase the consequences of control rod drop accidents.

Because the locations of limiting Linear Heat Generation Rate (LHGR), CPR, and Average Planar LHGR (APLHGR) are
monitoring is not affected by bo

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