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AUTH.NAME AUTHOR AFFILIATION
SCHUYLER,J.O. Pacific Gas & Electric Co.
RECIP.NAME RECIPIENT AFFILIATION
KNIGHTON,G.W. Licensing Branch 3

SUBJECT: Forwards revised Pages 2.3-9,2.3-13 & 2.4-4 of util 830509 response to NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." Rev represents refined PRA of postulated reactor head drop & reactor internals drop accidents.

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PACIFIC GAS AND ELECTRIC COMPANY

PG&E — 77 BEALE STREET • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4211 • TWX 910-372-6587

J. O. SCHUYLER
VICE PRESIDENT
NUCLEAR POWER GENERATION

July 28, 1983

Mr. George W. Knighton
Licensing Branch No. 3
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Docket No. 50-275, OL-DPR-76
Diablo Canyon Unit 1
Control of Heavy Loads (NUREG-0612)

Dear Mr. Knighton:

PGandE has revised pages 2.3-9, 2.3-13 and 2.4-4 of the May 9, 1983 response to NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants", prepared for Diablo Canyon Unit 1. The revised pages represent the results of PGandE's refined probabilistic risk assessment (PRA) of the postulated reactor head drop and reactor internals drop accidents.

In our May 9th submittal, PGandE presented the results of a PRA of the postulated reactor head drop and reactor internals drop accidents. In refining the assessment, several event probabilities were modified. Also, two minimal cut sets (fault tree branches) for the head drop accident were eliminated to more accurately reflect the rigging procedure.

This reassessment has resulted in lower drop probabilities, as shown on revised page 2.3-13 (Table 2.3.3-1). These changes further support the statement on page 2.3-8 that the head and internals "are carried with sufficient design features to make the likelihood of a load drop extremely small".

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

J O Schuyler

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1/1

Enclosures

cc w/enc: Service List

- o Load Hangup: Results from operator attempting to lift the head before the removal of all studs. Basic events include both human errors and equipment malfunction.

- o Overspeed: Results primarily from equipment failure or malfunction. Basic events include both human errors and equipment malfunction.

- o Structural Failure: Results from inadequate structural strength.

Other descriptor events, such two-blocking and load-binding (from catching the head on the alignment pins), were also considered. However, the contribution from these events is insignificant.

The basic event probability data and the associated uncertainties (defined by error factors) were obtained from the following sources:

- o "Control of Heavy Loads at Nuclear Power Plants" (NUREG-0612), USNRC, 1980;

- o Rasmussen et al., "Reactor Safety Study" (WASH-1400), USNRC, 1975;

- o Swain and Guttman, "Handbook of Human Reliability Analysis With Emphasis on Nuclear Power Plant Applications" (NUREG/CR-1278), Sandia National Laboratories, 1980;

- o "System Reliability Service Data Bank" (SYREL), UKAEA.

The structural failure data taken from the above sources include the effects of design/fabrication and other human errors in addition to the effects of inadequate structural strength. These structural failure data were used for computing the load drop probability during the initial lift. The probability of structural failure after the initial lift was computed by performing structural reliability analyses for crane loads associated with the events. These structural reliability analyses were based on the very conservative assumption that ten independent elements, each with the minimum specified design strength, are present in series. Other conservatisms in the PRA analysis are:

- o In most cases, the occurrence of first operator error in a minimal cut set was set to be 10^{-2}/event with an error factor of 10.

- o In many cases, a crane operator error subsequent to the first operator error was assumed to be completely coupled (i.e., dependent in a statistical sense). For example, in a load hangup event or a two-blocking event, it was assumed that the operator would fail, with probability one, to press the stop pushbutton, given that he failed to place the master switch in the off position.

- o No credit was taken for corrective action by the operator during overspeed events.

A total of 77 minimal cut sets for the Vessel Head drop were considered. The results are given in Table 2.3.3-1. The table shows that the probability of this event is sufficiently small that no specific analysis of the consequences is necessary.

TABLE 2.3.3-1

MEAN PROBABILITIES OF LOAD DROPS
(PROBABILITY PER YEAR)

	Reactor Vessel Head Drop	Upper Internals Drop
During Initial Lift	4.5×10^{-5}	6.3×10^{-5}
After Initial Lift (Rest of Removal and Installation)	2.9×10^{-5}	2.9×10^{-5}
Total Probability	7.4×10^{-5}	9.2×10^{-5}

PGandE Response

2.4.1

While the cranes at Diablo Canyon were not designed to satisfy the criteria of NUREG-0612, Section 5.1.6, for all loads to be carried, they are nevertheless designed for high operating reliability. For example, the Containment Polar Crane has been shown in Section 2.3.3 above, to have a reliability of 99.99% per lift. Moreover, in some cases the heavy loads are very light in relation to the crane's design capacity, and all of the major cranes have been modified with fully redundant hoist travel limit switches, so the probability of dropping these "light" heavy loads is negligible. These crane/load combinations are discussed in Section 2.4.2.c.