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COMBUSTION ENGINEERING, INC.

END OF CYCLE 4 EDDY CURRENT INSPECTION RESULTS:
CONTROL ELEMENT ASSEMBLIES (CEA's) AND GUIDE TUBE SLEEVES
1980 CALVERT CLIFFS I REFUELING OUTAGE

CEN-146(B) NP

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A. CEA EDDY CURRENT INSPECTION

{ } CEA's, which have experienced four cycles of irradiation, were eddy current tested during the Calvert Cliffs I, EOC-4 refueling outage in November, 1980. The purpose of the eddy current inspection was to quantify and locate wear at the { }

The testing was performed in accordance with approved C-E procedures for the detection of CEA wear. The lower portion of each CEA finger was inspected with an encircling eddy current coil.

Of the { } CEA's tested, CEA's { } were eddy current tested and visually examined by TV after Cycle 3. CEA's { } were selected for examination after Cycle 4 as being from potential { } positions based on Cycle 1/Cycle 2 guide tube wear data. Figure 1 shows the locations of each CEA during the first 4 cycles.

Most wear indications were observed on all CEAs tested between { } The signal { } and location of these indications are summarized in Table I. In order to determine the magnitude of wear associated with a given indication, the signal { } for that indication must be compared to that obtained from testing of a standard with wear simulations of known geometry. A description of the wear standards used in this program and the corresponding signal { } is presented in Table II. Note that the signal { } depends on the { }

Standard #1 consists of { } and was used in the EOC 4 testing so results could be evaluated against those obtained following Cycle 3 using the same standard. Since the EOC 3 testing performed in 1979, a new standard was prepared which { }

{ } The simulated wear patterns on this new standard are { } Based on the use of this new standard, the estimates of wear { } This factor applies to both the EOC 3 and EOC 4 inspection results.

The () of the average wear indication, per CEA following Cycle 4 ranges from () CEA () also exhibits the maximum wear signal of () which corresponds to a wear value of approximately ()

The measurements of CEA's () taken in 1979 following Cycle 3 have been reported in Reference 1. The average indication () for these CEA's following Cycle 3 was () which corresponded to () The maximum indication was () which corresponded to approximately ()

Measurements taken on these same CEA's following Cycle 4 resulted in an average indication () of about () with a maximum of () These signals correspond to an average wear estimate of () and a maximum wear estimate of approximately () Considering the estimated overall measurement uncertainty of the CEA eddy current test system of () comparison of the EOC-3 and EOC-4 results on these () CEA's indicate that no () This degree of wear is acceptable for continued CEA operation since the wear is () (Reference 1). It should be added that comparison of data between different inspection programs must be based on () This is because instrument () can vary slightly from one test series to another resulting in different ()

B. SLEEVE WEAR

() discharged Batch D fuel assemblies, from core locations shown in Figure 2, were eddy current tested to determine the presence and extent of sleeve wear. These assemblies were chosen on the basis of operation in () All assemblies were sleeved in the () condition prior to operation under CEA's.

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The results of the sleeve wear testing, summarized in Table III, show no indication of sleeve wear in any of the fuel assemblies tested. It should be noted that the eddy current test method utilized is capable of detecting sleeve wear to a minimum of ()

Reference 1. "Response to Request for Additional Information CEA Guide Tube Inspection Program Calvert Cliffs Unit No. 2, Docket No. 50-313", CEN-116 (B)-P, dated October 8, 1979.

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TABLE I

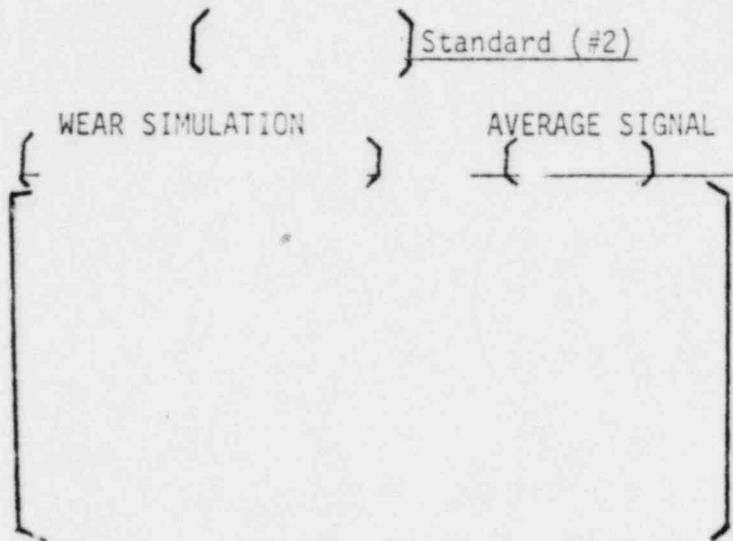
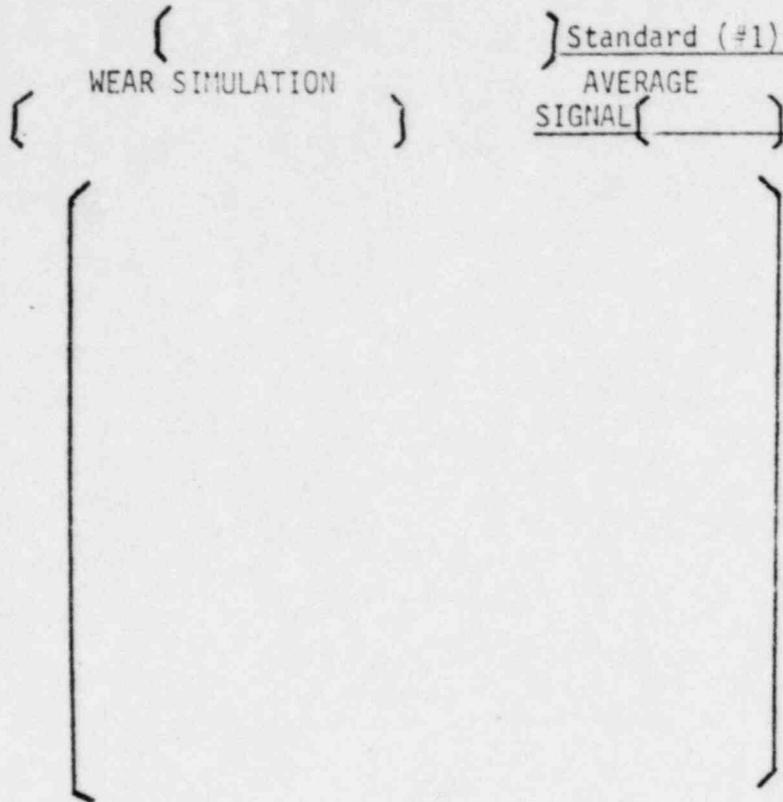
BG&E UNIT 1 END-OF-CYCLE 4 CEA WEAR TESTING RESULTS

<u>CEA NO.</u>	<u>RESULTS</u> ()	<u>APPROXIMATE LOCATION</u> (INCHES FROM CEA BOTTOM)

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TABLE II

CORRELATION: EDDY CURRENT TEST STANDARD SIGNAL () VS. WEAR*



* correlations apply to EOC 4 inspection only

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TABLE III

EDDY CURRENT TEST RESULTS
BG&E 1 SLEEVE WEAR
1980 REFUELING OUTAGE

<u>FUEL ASSEMBLY</u>	<u>GUIDE TUBE*</u>	<u>INDICATION</u>

*Fuel assembly serial number is North

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Note: Bank 5 is the
regulating CEA
Bank

(X) CEA bank Identity

Figure 1 Core Locations of CEA's
During Cycles 1 thru 4
for CEA's that were
eddy current tested
following Cycle 4

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Figure 2 Cycle 2, 3, and 4
Locations of D
Assemblies Tested for
Grate Tube Sleeve Wear