Commonwealth Edison Company

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August 12, 1971

Regulatory File Cy.

RECEIVED AUG 16 1971 U.S. ATOMIC ENERGY COMMISSION Regulatory Mail Section

Dr. Peter A. Morris, Director
Division of Reactor Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Subject: Additional information concerning fuel inspection and evaluation, Dresden Unit 3, DPR-25, AEC Dkt 50-249

Dear Dr. Morris:

On March 25, 1971, we informed you by telephone of a problem which had occurred with the Dresden Unit 3 fuel. A status report of this problem was given to you by letter dated April 28, 1971 from Byron Lee to Harold Price. In this letter we indicated we would submit a report concerning the Dresden Unit 3 fuel problem when all information was available.

The purpose of this letter is to transmit to you Special Report No. 16 entitled "Fuel Inspection and Evaluation-Dresden Unit 3." This report provides the background of the fuel problem, the scanning methods and procedures used in the inspection of the fuel, and the results and conclusions of the inspection.

In addition to three signed originals, 19 copies of this report are also submitted.

Very truly yours,

Byron Lee Jr.

Byron Lee, Jr.
Assistant to the President

SUBSCRIBED and SWORN to
before me this 12th day
of August, 1971.

Patricia A. Nelson

Notary Public

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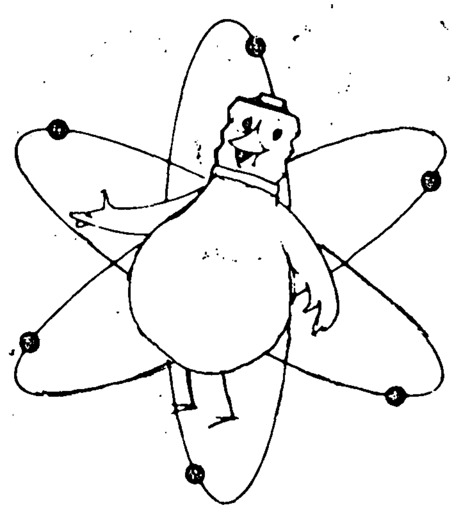
Received w/Ltr Dated 8/12/71

DRESDEN NUCLEAR POWER STATION
UNIT 3

Special Report

August 12, 1971



Commonwealth Edison
Company

REPORT NO. 16

FUEL INSPECTION AND EVALUATION

DRESDEN UNIT 3

August 12, 1971

Commonwealth Edison Company

FUEL INSPECTION AND EVALUATION - DRESDEN UNIT 3

BACKGROUND

The initial Quality Control Plan for enrichment control at the new GE - Wilmington facility was patterned after the system used at the former San Jose complex. The plan within the pellet handling area was administrative with a system of checks each time a tray of pellet was placed into or removed from the pellet storage cabinets, and each time a tray of pellets was placed on the rod loading station. The results of periodic audits of enrichment control procedures demonstrate that such procedures effectively prevented the cross mixing of the various enriched pellets in fuel produced prior to March 1, 1970.

However, later in 1970, manufacutring errors involving inclusion of incorrect enrichments in fuel rod loads did occur. Existence of such errors was detected during an audit conducted during the last quarter of 1970. This audit employed gamma scanning techniques which had been recently developed. It was determined that the Dresden 3 fuel was subject to these errors and scanning of all D3 fuel except the spacer capture rods was subsequently performed. The major portion of this work was done at the Wilmington facility with the remainder being scanned at the Dresden site.

The fuel bundles for the Dresden 3 reactor have been designed to limit the local power peaking factor to not more than 1.30.

Enrichment deviations will cause a departure from the designed power distribution and could cause local peaking factors in excess of the expected value if no corrective action were taken.

Positive deviations would cause an increase in specific power in the deviating pellets which would be proportional to the amount of enrichment deviation. Negative deviations can also affect the power distribution by perturbing the neutron flux in the region surrounding the deviation, however, the effect of this perturbation on specific power is much smaller in magnitude than that caused by positive deviations.

Inasmuch as the presence of negative deviations has less effect on power distribution than would positive deviations, it is permissible to use some fuel rods containing negative deviations in certain locations. The criteria for selecting permissible locations for these rods was compliance with the design heat flux limits. This is possible because the power distribution within a fuel bundle is such that many rods are normally operating below design heat flux values and thus some margin exists in these rods to accommodate a moderate perturbation in power.

The use of fuel rods having negative enrichment deviation has been carefully limited as to amount and extent of deviation permitted and the locations where deviating rods may be used. The conditions under which such rods may be used have been evaluated on a conservative basis. With these limitations on their use, the presence of fuel rods having negative deviations does not degrade in any way the thermal capability of the fuel bundle.

DRESDEN 3 SCANNING METHODS AND PROCEDURES

The method used to inspect the rods was that of scanning the rods with a gamma detecting and recording system. The procedures used were established and implemented through special Quality Control instructions. The equipment was designed and calibrated so that the "trace" profile on the recorder was proportional to enrichment distribution along the rod. During the examination of the trace, deviant pellets could be detected. "Standard" rods with known pellet enrichment deviations were used for standardization and verification of deviant pellet trace shapes. Limits for enrichment deviations were established such that a particular rod could be accepted or referred at the scanner, for further review depending upon the value of the pellet deviation as observed on the trace. In case of referral for review, the trace was submitted for Materials Review Board (MRB) action. At this review, the final decision was made as to whether the rod was to be scrapped or returned to a permissible location within the bundle.

RESULTS AND CONCLUSIONS

A total of 35,027 D3 fuel rods have been scanned for enrichment deviations including 29,651 scanned at Wilmington and 5,376 at the D3 site. A total of 542 fuel rods were detected as having one or more pellets of incorrent enrichment.

As a result 454 of these rods have been replaced. Eighty-eight deviating rods have been used in the D3 fuel bundles in locations such that their presence will not cause any departure from the design local peaking factor. The deviating rods which have been reused contain only negative deviations and the number of deviating pellets as well as the magnitude of deviation is restricted so that only a small flux perturbation results.

The complete gamma scan of the Dresden 3 fuel provides assurance that these assemblies now meet the design local peaking factor requirements.