



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

August 22, 1991

Docket Nos. 50-315
and 50-316

Mr. Gene Fitzpatrick, Vice President *Impr*
Indiana Michigan Power Company
c/o American Electric Power *AEPS*
Service Corporation
1 Riverside Plaza
Columbia, Ohio 43216

Dear Mr. Fitzpatrick:

SUBJECT: ANALOG-TO-DIGITAL INSTRUMENTATION REPLACEMENT UNDER 10 CFR 50.59 -
DONALD C. COOK NUCLEAR PLANT UNITS 1 AND 2 (TAC NOS. 80119 AND 80120)

The staff met with representatives of your staff and representatives from Asea Brown Boveri-Combustion Engineering (ABB-CE) on April 29, 1991. The purpose of the meeting was to discuss your proposed replacement for the D.C. Cook Nuclear Plant of portions of the existing reactor protection and control process instrumentation, as manufactured by Foxboro, with similar instrumentation as manufactured by ABB-CE Taylor under a 10 CFR 50.59 review. The results of the meeting are contained in the staff's May 13, 1991 meeting summary. As stated during the meeting, the staff had intended to audit your 10 CFR 50.59 review of this modification. A copy of your 10 CFR 50.59 Safety Evaluation was requested by the staff. In order to facilitate staff's audit, a visit to the vendor's (ABB-CE) facility was accomplished during the week of July 8-12, 1991.

Following a review of your Safety Evaluation, and based on reviews of similar instrumentation replacements for other utilities, the staff has concluded that analog-to-digital instrumentation replacement is an issue of potential safety and regulatory significance.

Overall, the staff has been encouraging the use of microprocessor based hardware in the nuclear industry due to the reduced drift, enhanced reliability, and flexibility of its operation. However, to obtain these positive attributes, certain design and installation considerations must be addressed "up-front" prior to the actual installation of the equipment. The need for these "up-front" considerations has been evidenced by microprocessor failures experienced internationally and nationally in nuclear and non-nuclear applications.

The most notable areas of concern are in the correct application of software and characteristics of the new digital electronics which could result in new failure modes and system malfunctions that were either not considered as part of initial plant design or may not have been evaluated in sufficient detail to support the qualifications of new digital systems. In the case of software, a comprehensive mechanism must be in place from the early design stages and into the implementation stages, to ensure that the final software package can fully and correctly perform its intended function. Such a mechanism (verification

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Mr. Gene Fitzpatrick
Indiana Michigan Power Company

Donald C. Cook Nuclear Plant

cc:

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and validation) establishes a benchmark for the evaluation of safety system performance and reliability. Additionally, digital (versus analog) system sensitivity to plant environments such as EMI, temperature, power quality and grounding raises questions regarding plant conditions. To date, we do not believe your analysis has fully resolved all of these concerns.

Further, it is the staff's belief that this modification does create the possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report (excluding plants licensed with microprocessor based systems) and is, therefore, an unreviewed safety question. To support the conclusion, the staff examined the history of 10 CFR 50.59 and compared it to the issue at hand. It is clear that a technology change, i.e., analog to digital, will have new potential failure mechanisms (software, EMI, etc.). It is equally clear, that plant safety analyses that were performed prior to the use of microprocessors do not specifically address such failure mechanisms. It is the staff's belief that these potential new failure mechanisms create the possibility of system malfunctions not previously reviewed in the safety analysis.

With respect to your facility, we have determined that a formal staff review will be necessary to address the above concerns and any related concerns which may arise. It is expected that with timely responses to staff requests for additional information from either your organization or the vendor, the staff shall be able to expedite the review process and allow the staff to complete the review prior to your scheduled installation.

If you have any questions, please contact T. Colburn at (301) 492-1341.

Sincerely,

Original signed by
Bruce A. Boger, Director
Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

cc: See next page

*SEE PREVIOUS CONCURRENCE

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1. The first part of the document is a letter from the President of the United States to the Congress, dated January 1, 1863. It is a very important document, as it contains the President's message to the Congress, and it is the first of its kind. It is a very important document, as it contains the President's message to the Congress, and it is the first of its kind.

2. The second part of the document is a letter from the President of the United States to the Congress, dated January 1, 1863. It is a very important document, as it contains the President's message to the Congress, and it is the first of its kind. It is a very important document, as it contains the President's message to the Congress, and it is the first of its kind.

3. The third part of the document is a letter from the President of the United States to the Congress, dated January 1, 1863. It is a very important document, as it contains the President's message to the Congress, and it is the first of its kind. It is a very important document, as it contains the President's message to the Congress, and it is the first of its kind.

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