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October 31, 1995
NG-95-3122

Mr. William T. Russell, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-37
Washington, DC 20555-0001

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
Request for Reduced Inspections due to
Implementation of Hydrogen Water Chemistry

Reference: Letter from G. Kelly (NRC) to L. Liu (IES) dated January 24, 1995;
Subject: Safety Evaluation of Duane Arnold Energy Center
Request for Reduced Inspection due to Implementation of
Hydrogen Water Chemistry

File: A-101b, A-286a, B-31c, B-31f

Dear Mr. Russell:

In the referenced letter, your Staff provided their Safety Evaluation (SE) of our request for a reduction in frequency of inspections for intergranular stress corrosion cracking (IGSCC) in the reactor recirculation piping. This relief request was in accordance with positions outlined in Generic Letter 88-01 and based on the implementation of Hydrogen Water Chemistry (HWC) at the Duane Arnold Energy Center (DAEC).

In the SE, the Staff concluded that the DAEC had implemented an acceptable HWC program and could reduce IGSCC inspections during refueling outage 13, which was completed in April, 1995. The Staff stated that in order to continue the reduced inspection frequency in future refueling outages, the DAEC should meet a calibration requirement for electrochemical potential (ECP) measurement and that "such calibration should be performed at least once every fuel cycle to ensure the coolant in the external autoclaves is representative of that in the recirculation piping system."

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We performed such a comparison of autoclave and in-pipe ECP measurements in 1989. This testing verified that the design of the DAEC external monitoring system does not produce measurement errors during HWC conditions. No changes have been made to the monitoring system which would invalidate the previous comparison. Therefore, the external ECP monitoring at the DAEC continues to provide accurate information representative of the recirculation piping.

IES Utilities therefore requests that the NRC eliminate the requirement for in situ verification of ECP each fuel cycle, as imposed by the referenced SE. As discussed in the attachment, this requirement is not technically justified and would be excessively burdensome.

Should you have any questions regarding this matter, please contact this office.

Sincerely,

Gary D. Van Middlesworth for JFF

John F. Franz
Vice President, Nuclear

JFF/CJR/cjr
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Attachment

cc: C. Rushworth
L. Liu
B. Fisher
G. Kelly (NRC-NRR)
H. Miller (Region III)
NRC Resident Office
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Validation of ECP Measurements

By letter dated January 24, 1995, the Staff provided a Safety Evaluation (SE) of the Duane Arnold Energy Center (DAEC) request to reduce inspection frequencies in accordance with Generic Letter 88-01, based on the implementation of a Hydrogen Water Chemistry (HWC) program. The SE concluded that the DAEC had implemented an acceptable HWC program and allowed a reduced inspection scope for the recirculation piping during refueling outage (RFO) 13 provided the plant had met the NRC criteria for HWC availability. To continue the reduced inspection frequency in subsequent refueling outages, however, the NRC stated that the DAEC should meet "the ECP calibration requirement, as well as the other parts of the HWC availability criteria" delineated in the NRC's SE of the Boiling Water Reactor Owners' Group (BWROG) topical report NEDC-31951P, *Implementation of Improved Water Chemistry and Technical Basis for Revised Piping Inspection Schedules.*

The NRC's evaluation of that topical report provided several criteria that an acceptable HWC program should meet. It stated that the "licensee must demonstrate that the sample used in the external measurements [of electrochemical potential (ECP)] is representative of the coolant in the piping system being monitored. Therefore, the measurements from the sampling system should be calibrated against the in situ measurements at various operating modes and power levels to ensure there are no significant differences between the two measurements. The measurements should be calibrated at least once each refueling cycle."

As part of a 1989 Electric Power Research Institute (EPRI) study, the DAEC verified that ECP measured in an external autoclave during HWC conditions compared very well with ECP measured in situ using electrodes mounted inside the reactor recirculation piping. The Staff's evaluation of the topical report refers to the DAEC's comparison of autoclave and in situ ECP measurements as indicating "excellent agreement."

Thus the 1989 EPRI comparison of autoclave and in-pipe measurements verified that the design of the DAEC external monitoring system does not produce measurement errors during HWC conditions. This good comparison continues today, because the essential design requirements for the monitoring system have not been changed. The length and diameter of the sample pipe remain the same as originally installed. The temperature and flow rate of water supplied to the autoclave have not changed. No components have been altered which could be expected to cause such a sample measurement error during typical plant operation. The only change in plant chemistry that could affect ECP has been a slight increase in the rate of hydrogen addition (6 to 9 scfm), in order to extend protection, as much as currently possible, to the vessel.

The quality control function of calibration of the ECP measurement system at the DAEC is fulfilled through monitoring, as well as diagnosis and replacement, as needed, of the various ECP electrodes. The standard calibration for most types of devices is to perform a comparison with a second or similar device of known accuracy. Unfortunately, such a standard calibration device is not readily available to make this comparison for ECP measurements at process water conditions. The ECP is specifically dependent on material and chemical environment. Comparisons must be performed on similar materials, with similar levels of oxidizing chemical species, and at process temperature. Such a comparison is accomplished at the DAEC by delivering the same process water sample to multiple working and various reference electrodes. By monitoring each ECP electrode in relation to several other types of electrodes, inaccurate electrodes are detected and replaced. The replacement electrodes are verified by General Electric prior to installation at the DAEC and the electrometer is periodically calibrated to ensure proper measurement of the potential. This method provides the calibration function for the external ECP monitoring.

Another in situ validation of ECP measurement would be excessively burdensome to perform. An in situ validation would require the installation of an electrode assembly in the recirculation system decontamination flange and would require an opening of the reactor recirculation boundary. The cost of installing such a probe could exceed the potential savings of reduced inspections during a refueling outage. These costs would include the in situ electrode assembly, a modification package, preplanning to ensure proper quality control and to maintain radiation exposure ALARA (as low as reasonably achieveable), as well as personnel manhours and radiation exposure during installation. Personnel exposure resulting from installation of the electrode assembly has been estimated at 3 Rem.

Since the typical lifetime of in situ ECP electrodes is only a portion of a fuel cycle, a new in situ electrode assembly would be required each refueling outage to accomplish a cyclic in situ verification. Each installation or replacement would require an opening of the reactor recirculation piping boundary. This would be a dose-intensive task inside the drywell.

As the DAEC external ECP monitoring system was previously verified correct during the 1989 EPRI study, and as essential design variables of the monitoring system have not been changed, the current monitoring system continues to provide measurements which are representative of the typical HWC conditions within the reactor recirculation piping. Regular monitoring of, and comparison between, the various ECP electrodes fulfills the quality control function of calibration. Inaccurate electrodes are identified and replaced, as needed. Verification of monitoring system design, and regular monitoring and replacement, as needed, of ECP electrodes meets the Staff's requirement that external monitoring of ECP must be representative of coolant conditions inside the system piping, without further costly and dose-intensive verification by in situ monitoring.