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SUBJECT: Forwards response to NRC 840508 request for addl info re electrical isolation of safety parameter display sys SAR & implementation plan.

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Iowa Electric Light and Power Company

July 6, 1984
NG-84-2724

Mr. Harold Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
Safety Parameter Display System (SPDS)

Reference: Letter, D. B. Vassallo to L. Liu, dated May 8, 1984

Dear Mr. Denton:

The attachment to this letter provides the information requested by the referenced letter regarding our SPDS Safety Analysis Report and Implementation Plan.

If you have any additional questions, please contact us.

Very truly yours,

R. W. McDaughy

Richard W. McGaughy
Manager, Nuclear Division

RWM/SLS/dmb*

Attachment: Response to NRC Safety Evaluation Report - DAEC SPDS

cc: S. Swails
L. Liu
S. Tuthill
M. Thadani
NRC Resident Office
Commitment Control No. 840119

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Attachment
NG-84-2724
July 6, 1984

Response to
NRC Safety Evaluation Report
Duane Arnold Energy Center Safety Parameter Display System

Request for Further Information Concerning
Electrical Isolation

Electrical isolation between the SPDS and the plant safety systems is provided with fiber optic communication links between the Division I and Division II remote Data Acquisition Subsystem (DAS) cabinets and the SPDS host processor (see Figure 1 below). The DAS cabinets provide analog to digital conversion and prepare all data (analog and digital) for transmission to the SPDS host processor over the fiber optic link. The divisional DAS cabinets, including all equipment within the cabinets, will be Class 1E qualified. These divisional DAS cabinets will be located in the Control Room area and will be used for termination of safety system signals. The divisional DAS cabinets are physically and electrically separated from each other as well as being separated from the SPDS host processor. Divisional separation of safety system signals will be maintained between existing plant sensors and the divisional DAS cabinets using electrical cable and raceway which will be installed per the guidance of Reg. Guide 1.75, rev. 2. With the above as background information, each of the six points of information requested by the Commission are addressed individually on the following pages.

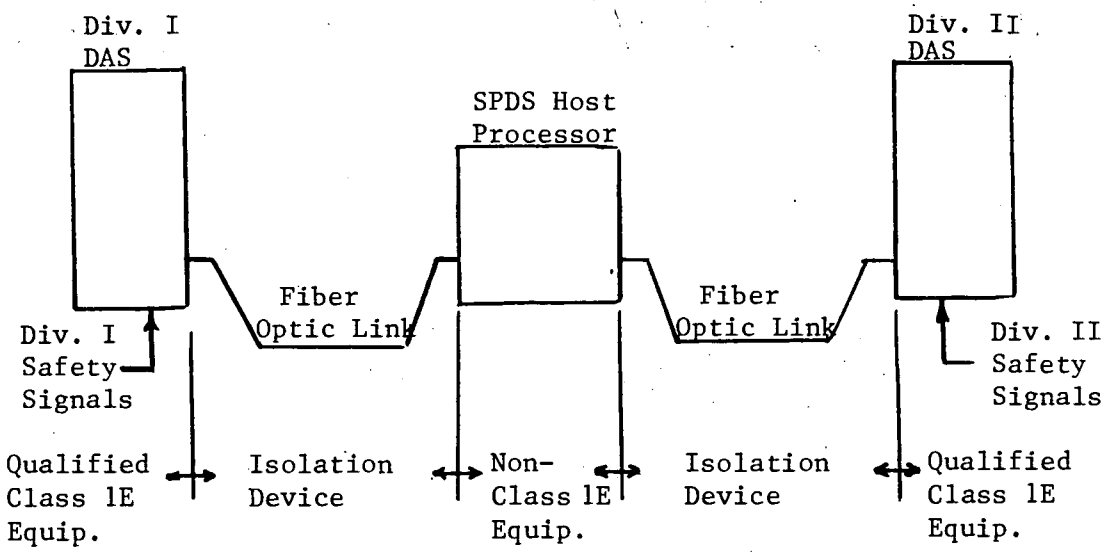

Figure 1

a. For each type of device used to accomplish electrical isolation, describe the specific testing performed to demonstrate that the device is acceptable for its application(s). This description should include elementary diagrams when necessary to indicate the test configuration and how the maximum credible faults were applied to the devices.

Response: Electrical isolation between safety systems and the SPDS will be accomplished with the optical transmission of digital data from each of the divisional DAS cabinets to the SPDS host processor via fiber optic communication links. The fiber optic links are constructed of silica glass fiber surrounded by a Kevlar buffer tube and jacketed with Tefzel. These materials cannot propagate voltage or current transients or any electrical signal, and provide complete electrical isolation between the SPDS and the safety systems. Reg. Guide 1.75 separation criteria between the input terminals and output of the isolation device have been met with the use of optic links which are terminated in two physically separate locations. Since the fiber optic links are physically unable to support electrical transients, the links are not required to be electrically tested.

b. [Provide] Data to verify the maximum credible faults applied during the test were the maximum voltage/current to which the device could be exposed, and define how the maximum voltage/current was determined.

Response: The fiber optic links will be constructed from materials that cannot conduct electricity. The fiber optic links will not be tested against electrical transients.

c. [Provide] Data to verify that the maximum credible fault was applied to the output of the device in the transverse mode (between signal and return) and other faults were considered (i.e., open and short circuits).

Response: Per the responses to item "a" and "b" above, the fiber optic links cannot support electrical transients and are not required to be tested in this manner. Similarly, other faults normally considered with an electrical interface (i.e., shorts, open circuits, and grounds) will not affect the safety systems which will interface with the fiber optic link.

d. Define the pass/fail acceptance criteria for each type of device.

Response: With regard to electrical isolation, there are no pass/fail acceptance criteria for the fiber optic link used as the isolation device between the SPDS and the plant safety systems. The materials used to construct the fiber optic links are known electrical insulators and cannot conduct electrical transients. The fiber optic links are not required to be electrically tested.

e. Provide a commitment that the isolation devices comply with the environmental qualification (10 CFR 50.49) and the seismic qualifications which were the basis for plant licensing.

Response The divisional DAS cabinets and the fiber optic communication links are located in the Control Room area which is a mild environment and are therefore exempt from the environmental qualification requirements of 10 CFR 50.49. The divisional DAS's will be seismically qualified to perform their function during and after the design basis seismic event used as the basis for plant licensing.

f. Provide a description of the measures taken to protect the safety systems from electrical interference (i.e., Electrostatic Coupling, EMI, Common Mode and Crosstalk) that may be generated by the SPDS.

Response The fiber optic communication link between the SPDS processor and the DAS cabinets effectively isolates the nonsafety portion of the SPDS from the Class 1E divisional DAS cabinets. Within the Class 1E divisional DAS cabinets, the manufacturer employs transformer isolation coupling of the input for analog signals and optical isolation of the input for digital signals primarily for noise reduction and isolation of the incoming signals. These same features reduce the possibility of the SPDS contributing electrical or electronic interference to the existing safety systems.

Cabling and shielding techniques will be used to reduce electrical interference induced by signal cables between safety system sensors and the DAS cabinet terminals. Electrical interference between redundant divisional signals will be avoided both by physical separation of the sensors and cabling to the DAS cabinets and by separation of the DAS cabinets themselves per Reg. Guide 1.75. Two types of sensor signals will be brought to the DAS cabinets: (1) low level analog signals from process instrumentation sensors, and (2) low level digital contact closure signals which are interrogated from a 48 VDC, Class 1E power supply within each DAS cabinet. The analog signals will be shielded and routed in raceway separate from the unshielded low level digital signals per the guidance of IEEE 422-1977 and Reg. Guide 1.75. Upon entering the DAS cabinets, separation of the shielded analog and unshielded digital signals will be maintained.

The plant safety systems will be protected from electrical interference generated by the SPDS through the use of approved cabling and shielding techniques, filtering at the analog signal inputs, physical separation, and optical isolation of digital inputs.