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Docket No. 50-346
License No. NPF-3
Serial No. 745

50-346

September 15, 1981

Director of Nuclear Reactor Regulation
Attention: Mr. John F. Stolz
Operating Reactors Branch No. 4
Division of Operating Reactors
United States Nuclear Regulatory Commission
Washington, D. C. 20555



Dear Mr. Stolz:

This is in response to your letter dated August 12, 1981 (Log No. 782) relating to the inadvertent Safety Features Actuation System (SFAS) actuation which occurred at the Davis-Besse Nuclear Power Station on December 5, 1980. Enclosure 1 to your letter listed three items requiring Toledo Edison response. Attachment 1 to this letter summarizes our response to these items.

Very truly yours,

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Attachment

cc:
DB-1 NRC Resident Inspector

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Attachment 1 to Toledo Edison Response to NRC Request
For Information on Electrical Connections Between Actuation
System Channels

Item 1: Review the ESFAS detailed electrical schematic/elementary and wiring diagrams for your facility and identify all power supply returns which are shared (electrically interconnected between) any redundant portions of ESFAS instrument/sensing and actuation/logic channels. (SIC)

Response: A review of the Davis-Besse SFAS detailed electrical schematic/elementary and wiring diagrams has been performed. This review reveals that the $\pm 15V$ DC and 24V DC power supplies are designed to include floating returns. In addition, the floating returns for the $\pm 15V$ DC and 24V DC power supplies associated with SFAS channels 1 and 3 are interconnected electrically (hardwired) by design so as to form common power supply returns. Similar interconnections exist between SFAS channels 2 and 4. The "floating common return" is normally isolated from the cabinet structure (i.e. chassis) ground. In the Davis-Besse SFAS design, the $\pm 15V$ DC power supplies provide power to the instrument/sensing channels and the 24V DC power supplies provide power to the actuation/logic output channels. A separate 15 VDC power supply provides power to the output modules and the logic portion of actuation channels.

Item 2: State whether there are specific design requirement(s) which necessitated each interconnection identified in Item 1, and describe these design requirements.

Response: The SFAS design including these interconnections was developed with complete cognizance, and under the guidelines of IEEE-279-1971. The particular configuration was adopted to reduce the number of contacts from SFAS relays and the control switches for several SFAS actuated equipment. This configuration also resulted in significant reduction in field run wiring into the control room SFAS (and SFRCS) cabinets. In addition, for SFAS actuated equipment which also get actuation signal from a separate remote switch, the number of contacts from that switch was also minimized if the above configuration was used. The minimization of contacts from these switches results in a reduced dead band for actuation of these switches. Toledo Edison considers the as-built design as an acceptable engineering design of the Davis-Besse Safety Features Actuation System.

Item 3: Such interconnections do not conform to the requirements of Section 4.6 (Channel Independence) of IEEE Standard 279-1971. Provide a commitment and schedule for removing these intercon-

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nections, or provide a detailed analysis supporting their retention.

Response: Toledo Edison does not agree with the NRC conclusion of nonconformance of Davis-Besse SFAS with IEEE 279-1971 Section 4.6. Section 4.6 of this standard states: "Channels that provide signals for the same protective function shall be independent and physically separated to accomplish decoupling of the effects of unsafe environmental factors, electric transients, and physical accident consequences documented in the design basis, and to reduce the likelihood of interactions between channels during maintenance operations or in the event of channel malfunction."

"Channel" as used in IEEE-279-1971 is defined in IEEE-380-1975 (Definition of terms used in IEEE Standards on Nuclear Power Generating Stations) as being "an arrangement of components and modules as required to generate a single protective action when required by a generating station condition. A channel loses identity where single action signals are combined." IEEE-380-1975 identifies this definition to be applicable to IEEE-279.

In the Davis-Besse SFAS, a single sensing or logic channel does not generate a protective action signal when required by a generating station condition. It is a combination of two channels (logic channels 1 and 3 or 2 and 4) which produces a signal for a protective action. The description of Section 4.6 of IEEE-279-1971 is therefore adequately complied with by the Davis-Besse SFAS.

With the interconnections existing, a particular channel of SFAS could be subjected to a 120 VAC RMS potential under a faulted power supply condition. This faulted condition is similar to the one experienced during the December 5, 1980 event. It is emphasized that the Davis-Besse SFAS has been designed and tested to withstand, without voltage degradation, fault voltages in excess of 120 VAC applied between the system DC common and the cabinet structure.

To reduce the probability of recurrence of an inadvertent SFAS actuation (similar to the one which is the subject of this letter), Toledo Edison has instituted monthly surveillance testing to determine the presence of an extraneous voltage or grounds on the SFAS common. This will reduce the probability of spurious operation of SFAS due to an existing fault.

From the subject NRC letter and the foregoing discussion, it appears that the NRC has a different interpretation of IEEE 279-1971, Section 4.6. To address the NRC's interpretation, Toledo Edison has satisfactorily completed the functional

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testing of the SFAS after connecting the floating common to the instrument ground. This was done to investigate a possible resolution of the common tie between the sensing/logic channels. The above configuration, however, results in significant potential hazards relating to system reliability. Specifically, ground faults or stray voltages that could occur subsequent to grounding of the system common can potentially damage a sensor sub-channel and/or may result in inadvertent actuation of a half channel. This configuration also poses greater potential for SFAS damage on a fault condition. Based on the above, such a modification is considered to be highly undesirable.

In light of the above, Toledo Edison has determined that the Davis-Besse SFAS complies with Section 4.6 of IEEE 279-1971 and no modifications are considered to be required or practical and realistically desirable for reliable and safe operation of SFAS.

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