CENTERIOR ENERGY

Donald C. Shelton
Vice President - Nuclear
Davis-Besse

300 Madison Avenue
Toledo, OH 43652-0001
(419) 249-2300

Docket Number 50-346

License Number NPF-3

Serial Number 1916

April 19, 1991

United States Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: Addition of a Shutdown Bypass to the Davis-Besse Nuclear Power Station (DBNPS) Unit 1 Safety Features Actuation System (SFAS)

Gentlemen:

During the sixth refueling outage, which was completed in July 1990, the Davis-Besse Nuclear Power Station (DBNPS), Unit 1 experienced several inadvertent Safety Features Actuation System (SFAS) actuations. As discussed in the Licensee Event Reports for these SFAS actuations, the unique design of the DBNPS SFAS was a contributing factor for at least three actuations. The relay portion of the DBNPS SFAS is a "de-energize to actuate" system. Consequently, portions of the SFAS instrumentation, not required to be operable by Technical Specifications when the plant is in cold shutdown (Mode 5) cannot be de-energized without actuating engineered safety features equipment.

In the Licensee Event Reports describing these events, Toledo Edison indicated that modification of the SFAS would be evaluated as a means to minimize inadvertent actuations. Toledo Edison plans to modify the SFAS to facilitate bypassing of SFAS actuation signals to equipment not required to be operable when the plant is in a cold shutdown or defueled condition. This will prevent unnecessary actuations of safety-related equipment, associated equipment wear and associated potential personnel hazards.

The purpose of this letter is to describe the SFAS Shutdown bypass modification and Toledo Edison's assessment of its conformance with applicable NRC regulations and guidance. Title 10 of the Code of Federal Regulations, Part 50, Section 55a (10 CFR50.55a), "Codes and Standards," paragraph (h), "Protection Systems," specifies that protection systems shall meet the requirements set forth in the Institute of Electrical and Electronic Engineers Standard; "Criteria for Protection Systems for Nuclear Power Generating Stations," (IEEE-279). IEEE-279 provides design requirements for two types of bypasses; channel bypass or removal from operation, and operating bypasses. Channel bypasses permit any one channel to be maintained, tested or calibrated during operation without initiating a protective action. The modification being proposed for the SFAS is not a channel bypass.

A001
IE22
1/0

Operating bypasses address situations where operating requirements necessitate automatic or manual bypass of a protective function. The bypass of SFAS initiation of safety injection on low Reactor Coolant System (RCS) pressure to allow cooldown and depressurization of the RCS in bringing the plant to cold shutdown is an example of an operating bypass. This bypass deactivates the SFAS low pressure trip in certain operating conditions when Technical Specifications require SFAS to be operable. IEEE-279 requires automatic removal of operating bypasses to be incorporated into the protection system design.

Toledo Edison believes that the SFAS modification to facilitate bypassing of SFAS actuated equipment during cold shutdown operation does not constitute an operating bypass. The bypass being added is not necessitated by operating requirements. It is intended to facilitate bypassing of SFAS actuated equipment when the plant is in cold shutdown to reduce the potential for spurious actuations of equipment not required for that mode of plant operation and associated adverse effects. Since the bypass being added to SFAS cannot be reasonably classified as either of the two types of bypasses described in IEEE-279, it is not subject to specified design requirements for those types of bypasses. A more detailed description of SFAS and the bypass follows.

The safety function of the SFAS is to detect and mitigate the consequences of design basis accidents. The SFAS is separated into four sensing and logic channels, and two actuation channels. Four independent sensor channels are provided to monitor containment vessel (CV) radiation, containment vessel pressure, reactor coolant system (RCS) pressure, and borated water storage tank (BWST) level. The sensor output is received by trip bistables which output to the output modules in all 4 channels. A trip of any two-out-of-four of the trip bistables monitoring the same variable will result in SFAS output module trip in all four channels. The SFAS output modules provide power to the normally energized actuating relays in the redundant safety features actuation channels. In order to initiate a safety actuation channel 1 trip, corresponding output modules in logic channels 1 and 3 must trip. Output modules in logic channels 2 and 4 must trip in order to cause a safety actuation channel 2 trip.

The SFAS output modules provide power to maintain the SFAS actuating relays energized. When an output module trips, the relays are de-energized, resulting in actuation of the appropriate safety-related equipment if the corresponding relays in the complementary channel are de-energized.

During cold shutdown (Mode 5), the portions of the SFAS to be bypassed under this modification are not required to perform a safety function. During periods of SFAS maintenance performed in Mode 5, an individual channel can be de-powered without initiating an SFAS actuation. However, de-powering the cabinet results in the two-out-of-four system logic being reduced to a one-out-of-three logic. As the SFAS is a de-energize to trip system, de-powering the cabinet makes the SFAS susceptible to inadvertent actuation. These spurious actuations result in unnecessary challenges to safety-related equipment. Also, all work associated with the SFAS (for example, essential power source work) done during outages must be strictly coordinated to prevent spurious initiation of SFAS.

Using the installed "Channel Bypass", the capability also exists to bypass a single monitored variable and the associated outputs. Channel Bypass results in the two-out-of-four system logic being reduced to a two-out-of-three logic for the bypassed parameter. However, this still prevents SFAS maintenance or surveillance testing from being performed at the same time on different channels.

The modification will provide a separate bypass for each piece of SFAS actuated equipment. For a total bypass of the SFAS, all such bypass circuits have to be activated. This bypass capability will be installed in all four channels of the SFAS. The bypass will be administratively controlled by locked SFAS cabinets and key switches to "ENABLE" the bypass. One (1) annunciator window will be provided to inform the control room personnel of the bypass condition of the SFAS actuation channels.

To activate this administratively controlled bypass, the alarmed SFAS see-through cabinet door has to be opened. This allows access to the common "ENABLE" and "SET/RESET" key switches and individual push buttons, which are integrated in the data display panels.

In order to individually bypass any SFAS actuated device, the "ENABLE" key switch has to be placed in the "ENABLE" position. This position is maintained and also provides an alarm to the control room alarm panel and plant computer. The key can be removed in the "ENABLE" and "NORMAL" positions. Next the "SET/RESET" key switch has to be held in the "SET" position, while each individual shutdown bypass switch for each actuated component is depressed. The "SET/RESET" key switch has a "SET", "NORMAL" and "RESET" positions. The "SET" and "RESET" positions are momentary with spring return to the "NORMAL" position. The individual shutdown bypass switches for each component are momentary contact push buttons. They are recessed and require use of a pointed object to operate. Depressing an individual shutdown bypass switch actuates a latch type relay which disables the SFAS trip signal for that specific component. By depressing all of the individual shutdown bypass switches, all of the components will be bypassed. The latch type relays were specifically chosen to ensure that the bypass could not be inadvertently initiated. The requirement to have the key switch enabled before the latch type relays have power, also ensures no unwanted change in the relay state.

In order to remove the bypass, the "ENABLE" key switch must be in the "ENABLE" position and the "SET/RESET" key switch has to be held in the "RESET" position, while individual component shutdown bypass switches are depressed. Automatic removal of this bypass is not incorporated in the design because of impracticality of implementation.

The shutdown bypass condition will be indicated by individual indicating lights located on the data display panels inside each SFAS cabinet. These are the same lights being used for the data lights (lights which provide the relay contact status in the two associated SFAS channels as well as control power to the device). These data lights monitor the trip status of each SFAS output. Normally these lights will be green-ON, green-flashing, or off, depending on the trip status. In the shutdown bypass mode the dual color light emitting diodes (LEDs) changes to display red-ON. The OFF data light function is not available

while in the shutdown bypass mode. As long as the bypass is activated, the individual indicating LEDs in the SFAS cabinet will be lit red. Also, as long as any one equipment bypass is activated, the shutdown bypass alarm in the control room remains illuminated.

Based on its design, Toledo Edison does not consider the bypass being added to SFAS to be an operating bypass subject to the automatic removal requirement of IEEE-279. Should the NRC disagree with Toledo Edison's assessment, then this letter constitutes Toledo Edison's request for approval of a proposed alternative to the requirements of 10CFR50.55a(h) as provided by 10 CFR50.55a(a)(3). The SFAS bypass modification satisfies both standards of 10 CFR50.55a(a)(3) in that: (i) it provides an acceptable level of quality and safety, and (ii) incorporation of an automatic bypass removal feature in accordance with IEEE-279 if the bypass were to be considered to be an operating bypass) is impractical and would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety.

As noted above, the DBNPS SFAS design is unique in that the relay portion is de-energize to actuate. Unlike other plants it is not possible to de-power SFAS instrumentation when SFAS is not required to be operable. Doing so would actuate equipment. Using existing SFAS features, one channel at a time can be bypassed. However, de-powering a channel will put the system in a one-out-of-three configuration, increasing the susceptibility to undesired spurious actuations. The existing configuration limits the ability to perform maintenance on SFAS during cold shutdown. An alternative to the proposed modification would be to remove power from each individual actuated component or where this is not possible (e.g., SFAS actuated solenoid valves) add temporary jumpers to prevent actuation. This approach is more cumbersome (more than 200 actuated components are affected) with significant potential for human error. In addition, it does not provide positive control room indication when power is removed or jumpers are installed. The proposed modification is a superior alternative because it incorporates design features to facilitate effective administrative control and high visibility when the bypass is invoked.

Access to the bypasses will be highly controlled. The bypass switches are located in the key locked SFAS cabinets. Keys are required to operate the enable switches and to operate the set/reset switches. Individual actions are required to activate the bypass for each SFAS actuated component. LEDs locally indicate the bypass for each actuated component and activation of the bypass for any component is displayed in the control room alarm panel and plant computer. Additionally for those operating conditions where the affected SFAS functions are required to be operable removal of the bypass will be a signed and verified step on the mode change checklist. With the bypass not removed the applicable portions of SFAS can not be declared operable.

In addition to the design provisions for stringent control of the use of bypass, high reliability has been incorporated into the design. The use of latch type relays ensures that the bypass cannot be inadvertently initiated or released. The normal/enable keyswitch must be in the enable position before the relay can change state. Consequently, there are no single failures or actions which can inadvertently initiate or release the bypass.

Toledo Edison considers that the design of the SFAS bypass discussed above provides an adequate level of quality and safety. The alternative of not having the bypass and individually removing power or jumpering to prevent spurious actuation is administratively cumbersome and is more prone to human error, creating a greater potential for inadvertently leaving an actuated component disabled.

Use of the bypass will improve the maintainability of SFAS, and eliminate associated potential personnel hazards and unnecessary equipment degradation resulting from spurious actuations. The alternative of providing automatic removal would be impractical because there is no existing instrumentation to detect a mode change from Mode 5 to 4 and no practical means of electronically detecting a mode change to Mode 6 (i.e., reactor vessel head detensioned). Additionally, the use of latch type relays for reliability complicates the design of an automatic removal feature. An automatic removal feature would compromise the reliability benefits of using latch-type relays.

In summary, Toledo Edison believes that the SFAS modification described above does not constitute a bypass addressed by IEEE-279. Accordingly, Toledo Edison is proceeding with the design and installation of the SFAS shutdown bypass during the upcoming seventh refueling outage. However, should the NRC consider the proposed SFAS bypass to be an operating bypass requiring an automatic removal feature to conform with IEEE-279, and subsequently not grant approval of the design as an alternative, the schedule for implementation of the SFAS data (status) light modification (Toledo Edison letter Serial Number 1820, dated August 1, 1990, HED 9.2.027) during 7RFO will also be impacted because it is part of the modification package to install the SFAS shutdown bypass.

Toledo Edison is proceeding on the basis that the NRC staff concurs with Toledo Edison's assessment of the conformance of the SFAS bypass modification with 10CFR50.55a(h) and IEEE-279 unless notified otherwise. A response to this letter, if considered necessary by the NRC Staff, is requested by June 19, 1991, to facilitate outage planning.

If you have any questions regarding the information provided by this letter, please contact Mr. R. W. Schrauder, Manager - Nuclear Licensing at (419) 249-2366.

Very truly yours,

PWS/dz

cc: P. M. Byron, DB-1 NRC Senior Resident Inspector
A. B. Davis, Regional Administrator, NRC Region III
J. R. Hall, NRC Senior Project Manager
M. D. Lynch, NRC Senior Project Manager
Utility Radiological Safety Board