TOLEDO EDISON

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

Dear Mr. Stolz:

This letter is being submitted to request a NRC review and approval of the Startup Feed Pump (SUFP) operation practice at the Davis-Besse Nuclear Power Station Unit No. 1.

A recent review, performed on SUFP, revealed that portions of the suction, discharge and cooling water piping associated with the SUFP met hazard criteria not previously looked at. The specific details of the situation that existed prior to discovery are as follows:

SUFP Discharge Piping

The SUFP discharge piping qualifies under Davis-Besse's high energy line criteria since the piping configuration is such that Main Feedwater, with pressure of greater than 275 psig and temperature of greater than 200°F, is present downstream of the SUFP discharge check valve. When the SUFP is operating, this line upstream of the check valve is also a high energy line.

SUFP Suction Piping

The SUFP normally receives its suction from the Deaerator Storage Tanks (DST). The normal full power operating conditions for the DST are 50 psig and approximately 400°F. The SUFP suction, therefore, qualifies as a moderate energy line.

SUFP Cooling Water Piping (Turbine Plant Cooling Water (TPCW))

The TPCW lines associated with the SUFP are of sufficient size to be considered a potential flooding hazard in the event of a pipe break.

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All of the above piping is non-seismic and, therefore, the integrity of this pipe cannot be assured following a seismic event. Since the SUFP shares a compartment with the No. 2 Auxiliary Feed Pump (AFP) and portions of the SUFP suction and cooling water piping are routed through or into the No. 1 AFP room, both AFPs are potentially threatened by certain pipe break scenarios, which were not previously analyzed. Upon discovery of the above situation, Toledo Edison initiated several actions including filing Licensee Event Report No. 84-009. These actions taken are summarized below:

Immediate Action

The SUFP suction, discharge, and cooling water piping were isolated, by valve closures, outside the AFP rooms. Administrative Controls have been placed on the appropriate isolation valves such that these lines are not pressurized and, therefore, do not represent a hazard to the AFPs. Procedures that call for the operation of the SUFP for shutdown and startup have been modified to accommodate this lineup change.

Technical Evaluation

In order to quantify the risk to the AFW availability due to a SUFP related pipe rupture in the AFW rooms, a Probabilistic Risk Assessment (PRA) was performed utilizing data from WASH-1400 and a previous analysis on Davis-Besse AFW reliability.

This evaluation, which took into account the limited periods of time the SUFP is utilized for normal operational evolutions and zero power physics testing, resulted in a probability of 3.2×10^{-6} per year that an AFW train would not be available on demand due to a rupture of the SUFP suction, discharge or cooling water piping. Coupled with the previously calculated single train unavailability for AFW of 10^{-2} it has been determined that the contribution of a pipe rupture to overall AFW availability can be neglected.

A synopsis of results of the technical evaluation and the safety evaluation resulting in an unreviewed safety question by the NRC are attached to this letter.

Additional Measures

In spite of the fact that the risk to AFW of a SUFP associated pipe rupture is negligible Toledo Edison has instituted the following precautionary measures:

1. The appropriate sections of SUFP suction and discharge piping including, as a minimum, the piping inside the two AFP rooms will be hydrostatically tested to the ANSI B31.1 pressure. This will demonstrate the existing integrity of the affected piping and ensure compliance with the original standard until such time that appropriate modification to the SUFP system are completed.

2. In the unlikely event of a pipe rupture during the minimal periods of time the SUFP is in operation, it is recognized that leakage through the impending rupture point will occur prior to the actual rupture. Therefore, during SUFP operation, Toledo Edison will station an operator in the SUFP/AFW area to monitor piping status. In the event of pipe leakage the operator will either trip the SUFP locally or notify the Control Room operator to trip the pump from the Control Room. The operator will also immediately isolate the SUFP associated piping outside the SUFP/AFW area, thus minimizing the effects of the pipe break on the Auxiliary Feedwater System.

3. Toledo Edison will continue to exercise administrative control to isolate the SUFP related piping from outside the AFW rooms until such time as the pipe break consideration issue is resolved.

4. Toledo Edison met with the NRC on September 19, 1984 and proposed a modification to the SUFP system. A new SUFP, associated piping and valves will be located outside the AFW pump rooms and thereby negating the M/HELB concern. The proposed system will be the subject of another letter to be submitted to the NRC.

It is emphasized that the SUFP system provides a significant operational function at Davis-Besse. Although other systems could be used, use of this system when feedwater demand is low allows much better control over steam generator levels and reduces the possibility of steam generator feedwater excursions that could challenge the auxiliary feedwater system. Given the facts that the SUFP system provides more precise operating capabilities and that the increase in risk to nuclear safety is negligible, Toledo Edison hereby requests:

1. Approval for the interim use of the SUFP system, as required by plant operational circumstances.

2. Expedient review by the NRC of this question and allow the continued use of the SUFP system until such time as the pipe break hazard question can be resolved.

Enclosed is a check of $150 per 10 CFR 170.12.c for review of the safety question.

Should you have any questions, please feel free to contact Toledo Edison.

Very truly yours,

RPC:lah
attachments

cc: DB-1 NRC Resident Inspector

SAFETY EVALUATION

This evaluation is to perform a 10 CFR 50.59 review of the startup feedwater pump (SUFP) system. This review is being conducted to resolve a previously unanalyzed situation and obtain NRC concurrence to allow the continued startup and shutdown of the reactor utilizing the SUFP system until long term corrective actions can be implemented.

The SUFP system itself performs no safety function. It is, however, used as a backup to the main and auxiliary feedwater systems for supplying water to the steam generators in case of the total loss of all of these systems.

The SUFP is located in Room 238 which is the same room as one of the auxiliary feedwater pumps (AFP), pump 1-2. During the review of the high/moderate energy line break criteria as it relates to the AFW rooms, it was discovered that the SUFP system can jeopardize AFP pump 1-2 due to a pipe leak or rupture.

The SUFP system is non-seismic downstream of valve FW91. The suction of the SUFP system utilizes the Deaerator or the Condensate Storage Tank (CST) as its water source. The normal source is the Deaerator. It also uses the non-seismic Turbine Plant Cooling Water (TPCW) system for pump cooling. The line from the Deaerator to the SUFP also runs through Room 237. Room 237 contains AFP 1-1. The discharge line from the SUFP is aligned to the inlet of the high pressure feedwater heaters. In the past, these systems were not valved off so as to provide immediate backup for the Main Feedwater System (MFWS) if needed.

Since this problem was identified, the SUFP system and the TPCW system in Rooms 237 & 238 has been isolated. It has been isolated by closing valve FW91 from the CST, valve FW32 from the Deaerator, valves CW196 and CW197 used for pump cooling, and valve FW106 in the discharge line.

The main concern with the location of the SUFP is the potential for pipe whip and jet impingement in Room 238 and flooding and high temperature in Room 237 or 238. The main concern with the TPCW system is the potential for flooding these rooms. These concerns will only be realized when the SUFP system is in operation, i.e., during startup and shutdown of the reactor.

During the period that the startup pump is running, the suction piping to the SUFP is a moderate energy line based on the criteria in USAR Section 3.6 which states that a line outside containment operating above 275 psig or 200°F is a moderate energy line. The discharge piping from the SUFP is a high energy line based on the USAR Section 3.6 which states that a line outside containment operating both above 275 psig and 200°F is a high energy line. If a high energy line is in service more than six hours, Section 3.6 requires that it must be analyzed for pipe rupture. The SUFP system could be in operation for as long as 72 hours for one reactor startup and shutdown cycle but can be in operation for as long as 168 hours during zero

power physics testing. The total number of reactor trips in a year is conservatively assumed to be 8 times. The TPCW system supply and return piping are neither moderate nor high energy lines but, since the lines are non-seismic, a flooding concern remains.

It has been postulated that during a seismic event the pipes would rupture in such a manner as to damage AFP 1-2 or possibly AFP 1-1 due to flooding. It has also been postulated that with a high energy pipe break the sheared pipe could damage AFP 1-2 due to jet impingement or pipe whip and would cause high temperatures and pressure in Room 238. A moderate energy pipe break could damage either AFP 1-1 or 1-2 due to flooding and high temperature in either Room 237 or 238. A rupture/break in the TPCW piping could damage either AFP 1-1 or 1-2 due to flooding in either Room 237 or 238.

A Probability Risk Assessment (PRA) study has been performed since this situation was discovered. The attached memo (Attachment A) documents that the worst case probability for a rupture/break in the SUFP and the TPCW piping causing the failure of AFP 1-2 is of the order of 3.2×10^{-6}/yr. The probability for failure of AFP 1-1 in Room 237 is smaller due to less SUFP piping in the room. The probability for failure of the AFWS due to pipe rupture/break in the SUFP and the TPCW system is documented in calculation number C-NSA-45.02-2. This probability is insignificant in light of the AFWS unavailability on the order of 10^{-2}/yr. for each train which was developed by EDS (now Impell) and submitted to the NRC in December, 1981.

Although these risks to the AFWS from the SUFP system are considered insignificant, certain precautions will be observed during SUFP system operation. First, the SUFP suction and discharge piping will be hydrotested to original hydrotest pressure. This will ensure the current pressure integrity of the SUFP system piping. Second, an operator shall be positioned at AFP Room area when the SUFP is running in modes 1 thru 3. Upon indication of a pipe leak the operator will either trip the SUFP locally or contact the control room to trip the SUFP. This may not reduce the probability for a pipe break in the SUFP system, however, it will reduce significantly the impact of SUFP system failure causing a AFWS failure. He would then close all SUFP isolation valves which are external to the AFP rooms. This operator action is being taken since normally piping leaks are expected to occur prior to a complete piping rupture.

Pursuant to the above it has been determined that the use of the SUFP system on an interim basis, until final corrective actions can be completed, does not significantly increase the probability of the loss of the AFWS until permanent corrective actions can be taken. However, it is an unreviewed safety question unreviewed by the NRC which will require NRC approval.

PRA Based Justification for Continued Operation of the SUFP System

During SUFP operation, a portion of the SUFP discharge line and the minimum recirculation line renders itself to consideration as a high energy line. Similarly, a portion of the suction piping because of use with the deaerator storage tank water requires consideration as a moderate energy line. The immediate safety impact of lack of such high/moderate energy line considerations is on the Auxiliary Feedwater System (AFWS) since the SUFP is housed in the same room as Auxiliary Feedpump (AFP) 2. A portion of the discharge and minimum recirculation lines is routed in this same room. In addition, the suction path from the deaerator runs through both AFP rooms. With SUFP in operation while taking suction from the deaerator the following lengths of pipes may pose a challenge to the AFWS in view of the high/moderate energy line breaks. Further, the non-seismic TPCW piping, in AFP rooms (as noted below) poses a potential flooding concern.

17 feet of 4" discharge line in AFP Room 2
18 feet of 1½" minimum recirculation line in AFP Room 2
27 feet of 6" suction line in AFW Room 2
27 feet of 6" suction line in AFP Room 1
62 feet of 4" TPCW line in AFP Room 1
40 feet of 4" in AFP Room 2
24 feet of ≦2" in AFP Room 2

The SUFP may be operated continuously for a period of approximately 72 hours every reactor shutdown/startup. In a year with a fuel reload, the SUFP system may be operated for as long as 168 hours continuously during zero power physics testing. Based on the expected number of reactor trips in a year (conservatively assuming ten trips per non-refueling year and eight trips in a refueling year) the maximum number of hours per year that the SUFP system would be in operation for any year is of the order of 744 hours.

The overall figure of merit for any one train of the Davis-Besse AFWS is of the order of 10^{-2} per year as deduced from the EDS (now Impell) AFWS PRA study (EDS Report No. 02-1040-0195, Revision 1) submitted to the NRC in December 1981. This implies that one train of the Davis-Besse AFWS will be unavailable with a frequency of 10^{-2} per year for all initiating events which may require availability of AFWS.

Assuming the duration of SUFP operation per year presented above, the total worst case probability of any break (whether high energy, moderate energy or seismic) in the unanalyzed piping which may challenge the availability of an AFW train is of the order of 3.2×10^{-6} per year. The worst case probability is for AFW train 2 because of significantly larger overall length of piping in this room. This evaluation conservatively assumes that any rupture of this non-seismic piping will flood the room to the extent of causing train inoperability with a probability of unity.

Since the SUFP system failure as postulated above poses a challenge to the AFW train at a frequency of 3.2×10^{-6} per year, the probability of such SUFP system ruptures/breaks leading to inoperability of an AFW train is insignificant as compared to other failures that may render the AFW system inoperable. It is, therefore, concluded that the above issue poses a very minimal risk to the accomplishment of the safety function of the AFWS and an extremely negligible risk to public health and safety. Continued operation of the SUFP system in the mode evaluated above is, therefore, adequately justified.