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Subject: Reactor Coolant System (RCS) Makeup System Upgrades for Feed and Bleed

Gentlemen:

Following the loss of all feedwater event at the Davis-Besse Nuclear Power Station on June 9, 1985, Toledo Edison (TE) made numerous improvements to enhance the reliability of the feedwater systems. These modifications have included control system changes to both turbine driven main feedwater pumps and both turbine driven auxiliary feedwater pumps, installation of new auxiliary feedwater pump steam admission valves, installation of a new control room actuated motor driven feedwater pump, and installation of a revised Steam and Feedwater Rupture Control System. These modifications have greatly enhanced the reliability of both main and auxiliary feedwater systems.

Despite comprehensive feedwater system improvements, and despite the fact that analysis had shown the previously existing makeup system to be capable of successfully providing feed and bleed cooling in the event of a sustained loss of all feedwater, TE made a long term commitment in previous submittals (Serial Numbers 1207 and 1382, dated November 4, 1985 and June 25, 1987, respectively) to enhance the existing primary system feed and bleed cooling capability.

The enhancements proposed in Serial Number 1382 were to be implemented in two phases. Flow enhancements, consisting of new piping and valves, were to be installed during the fifth refueling outage (5RFO) so that successful feed and bleed cooling could be achieved with a single failure of either a makeup (MU) pump or the Pilot Operated Relief Valve (PORV). Toledo Edison also committed in Serial Number 1382 to upgrade the MU system, where possible, to nuclear safety-related during the sixth refueling outage (6RFO). These upgrades were intended to ensure that the feed and bleed system would remain operational during loss of offsite power and seismic events, and in general, to reduce common mode failure probability. The purpose of this letter is to provide the NRC with a review of the changes implemented during 5RFO, the design philosophy with which TE intends to meet the remaining Serial Number 1382 commitments, and the proposed schedule for implementation.

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Completed Work - Phase I

Flow enhancements to provide a functional system were completed during 5RFO. These modifications included:

1. Reduction in flow resistance. This included installation of new injection and suction piping and valves for MU pump #1 (Previously the system consisted of common suction and injection headers for both pumps). High flow resistance in MU train #2 due to throttle valve MU-32 was reduced by installation of a motor operated bypass valve around this valve. A discharge piping cross-tie with motor operated dual isolation valves was also added.

2. Discharge head-flow capability of the MU pumps was increased by rerouting the pumps' suction from the Borated Water Storage Tank to the High Pressure Injection (HPI) pumps suction lines. This permitted the suction pressure to be boosted by the Low Pressure Injection (LPI) pumps.

3. Solenoid valves were added to the minimum recirculation lines on each MU pump. This permits control room isolation of recirculation flow to maximize injection flow when necessary.

4. The PORV power source was reconfigured to be supplied from the essential DC D2N Bus. The solenoid coil on the PORV was qualified for the Containment atmosphere as calculated for the feed and bleed event.

5. The Safety Features Actuation System (SFAS) signal was removed from the Containment isolation valve on MU injection line #2 (License Amendment Number 112).

6. The LPI-MU interlock was modified. A MU pump was previously tripped when the associated LPI pump was running on a bus being supplied by an Emergency Diesel Generator. The MU pump will no longer be tripped if an SFAS level 3 actuation occurs and the LPI pump is already running. This ensures continued availability of feed and bleed cooling once initiated.

7. Class 1E isolation circuitry was added between the MU pump 3-way suction valves and the common MU tank level interlock circuits.

8. The Reactor Coolant Pump seal injection and MU flow test line was relocated from MU train #2 to the cross-tie between MU trains.

9. Flow indication on each train was upgraded with dual range digital meters.

Design Philosophy for Planned Upgrades - Phase II

Upgrading of the MU system to "as Nuclear Safety-Related (Q) as possible" is being pursued for 6RFO. The upgrades will not provide substantial functional improvement in MU system performance, but are intended to improve the system reliability. Upgrades to the MU system will be made where a lack of the upgrade could negate the capability of the MU system to inject cooling into the RCS for events or conditions postulated to occur concurrent with feed and bleed cooling. The events or conditions include:

1. Loss of offsite power
2. Seismic events
3. Single failures (as described in Serial Number 1382 dated June 25, 1987)

Events which have been specifically excluded from consideration in the feed and bleed scenario include:

1. Fires
2. Missiles
3. High or moderate energy line breaks and critical cracks
4. Simultaneous failure of both DC MCC D2P and DC MCC D2N (as described in Serial Number 1382, dated June 25, 1987)

The design criteria will require modifications to protect against single failures in support systems which could affect both MU pumps. This includes installation of new essential cooling water piping from both essential component cooling water loops for the MU pump cooling water supply. Qualification of required MU pump room equipment to operate at elevated temperatures after failure of the single non-essential room cooler is also included. In accordance with Serial Number 1382, new components and piping will be installed as nuclear safety-related, Seismic Category I. Existing piping and valves which are necessary for feed and bleed cooling are either currently Seismic Category I or will be upgraded to Seismic Category I. The Seismic Qualification Utility Group (SQUG) guidelines will be used to seismically qualify the MU pumps, MU pump motors, and necessary lube oil system components where Seismic Category I upgrades are not feasible or cost effective. In general, existing non-"Q" equipment will be upgraded as necessary to meet design requirements, but will not necessarily be upgraded to "Q" status.

Power supplies and control logic which are necessary for manual operation of the MU pumps, MU pump oil system, and motor operated valves in the injection flow path are necessary to ensure MU system capability. While capability of the MU system to inject water is not directly dependent upon control room and other indication, improper operator action could occur based upon failed instrumentation. Therefore, instrumentation which is considered necessary for operation of the MU system to support feed and bleed cooling will be upgraded as necessary to meet the design criteria.

Toledo Edison has studied several design alternatives for electrical cable upgrades with the intent of satisfying design objectives and utilizing resources effectively. While the MU system and the PORV are currently supplied from Class 1E busses and would therefore be operational following a loss of offsite power, the majority of electrical cables, conduits, and cabinets associated with feed and bleed cooling are neither Class 1E nor

Seismic Category I. A complete upgrade of required cables and conduits to Class 1E is estimated to require approximately 16,000 feet of new cable and 1,800 feet of new conduit runs. Class 1E cable upgrades, if performed, would include the desired seismic upgrade and would also include separation of channels. Based on the fact that separation of channels is not considered to be necessary for feed and bleed because fires, pipe breaks, and missiles are not postulated concurrent with a feed and bleed event, the MU system design requirements would be adequately served solely by seismic qualification of existing cables, trays, and conduits. However, existing cable routing is often in areas with other non-seismic components which impose Seismic Category II over Seismic Category I (II/I) conflicts. A large effort would need to be expended in identification, design, and installation of required supports and for rerouting of selected cable runs. However, application of SQUG guidelines to electrical components has the potential to remove most of the II/I concerns, reduce both engineering and implementation expenditures, and ensuring design requirements are met.

While the Generic Inspection Plan (GIP) has incorporated SQUG criteria for a number of component types, it should be noted that the GIP does not currently include sufficient guidelines for application of SQUG methods to conduits and cable trays. However, guidelines for cable trays and conduits have been developed in large part by EQE Engineering, Inc. for the Seismic Qualification Utility Group. It is anticipated that the guidelines will be approved for use in Revision 2 of the GIP following the NRC/NRR review process. Because SQUG methodology was developed for upgrading existing components of nuclear safety-related systems, TE is confident that existing SQUG methodology will provide adequate assurance of reliable operation following a seismic event.

EQE Engineering, Inc. has performed a preliminary walkdown of the Davis-Besse MU system. Based on this walkdown, EQE Engineering has estimated that at least 90 percent of the MU system electrical components would be amenable to seismic upgrade by SQUG methods. A portion of MU system cables are currently routed through the Non-Seismic Category I turbine building. Such cables should be rerouted to avoid turbine building hazards. Therefore, TE estimates that the SQUG methodology will be used for seismic qualification of 50 - 90 percent of the total electrical cable trays and conduits required for feed and bleed cooling.

In summary, cables which are routed in existing cable trays and conduits will be upgraded through application of either the SQUG guidelines or completion of a seismic analysis. Rerouted cables or portions of cables which require new cable trays/conduits are planned to be either upgraded to Class 1E or will be installed in Seismic Category I cable trays/conduits.

Implementation Schedule

The following major items are planned to be completed during 6RFO:

1. The MU pump cooling water supply will be modified to provide independent essential cooling water to both MU pumps. This will prevent a single failure in the Component Cooling Water system from rendering both MU pumps inoperable.

2. PORV wiring for manual control will be upgraded to Class 1E because of the significance of PORV operation to successful feed and bleed cooling.

3. The MU system will be environmentally qualified for operation in the feed and bleed scenario with a loss of MU pump room cooling. (Qualification of the AC lube oil pump motors, which may not be procured in time for 6RFO, will require deferral to 7RFO.)

4. Electrical/I&C components and cables will be seismically qualified using the SQUG method where it can be successfully applied.

While application of SQUG methodology should allow a large portion of electrical upgrades to be completed during 6RFO, limitations in manpower may not allow completion of electrical upgrades within the scheduled time frame of 6RFO. Electrical upgrades remaining to be completed following the 6RFO will be completed prior to the end of 7RFO.

Conclusion

Toledo Edison believes that implementation of Phase II of the MU system upgrades for feed and bleed capability as described satisfies the intent of the commitment contained in Serial Number 1382. Any comments on planned implementation of Phase II is requested to be provided to Toledo Edison by May 24, 1989, to avoid potential impact on design and procurement schedules.

If you have any questions concerning the above, please contact Mr. R. W. Schrauder, Nuclear Licensing Manager, at (419) 249-2366.

Very truly yours,

RMC/dlm

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