Consumers Power Company

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January 30, 1981

Mr J G Keppler, Regional Director
Office of Inspection and Enforcement
US Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

MIDLAND PROJECT -
DOCKET NOS 50-329, 50-330
COMPONENT COOLING WATER DESIGN
FILE: 0.4.9.43 UFI: 73*10*01, 10111(S) SERIAL: 11173

Reference: J W Cook letter to J G Keppler; Same Subject; Serial 10053; Dated November 7, 1980

The referenced letter was an interim 50.55(e) report, as is this letter, concerning the effect of a failure of a nonessential portion of the component cooling water (CCW) on the essential (safety-related) portion of the CCW.

The attachment to this letter provides the status of actions to be taken concerning this item.

Another report, either interim or final, will be sent on or before March 31, 1981.

James W. Cook

JLW/lr

Attachment: MCAR-43, Interim Report 2, Component Cooling Water System Susceptibility to Loss-of-Coolant Accident-Induced Failures, dated January 20, 1981

CC: Director of Office of Inspection & Enforcement
Att: Mr Victor Stello, USNRC (15)

Director, Office of Management
Information & Program Control, USNRC (1)

RJCook, NRC Resident Inspector - Midland Plant (1)

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CC: CBechhoefer, ASLB Panel
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Great Lakes QA Managers

SUBJECT: MCAR 43 (issued 10/10/80)

Component Cooling Water System Susceptibility to Loss-of-Coolant Accident-Induced Failures

INTERIM REPORT 2

DATE: January 20, 1981

PROJECT: Consumers Power Company
Midland Plant Units 1 and 2
Bechtel Job 7220

Introduction

This report describes the interim status of project activities concerning component cooling water (CCW) system susceptibility to loss-of-coolant accident (LOCA)-induced failures.

Description of Deficiency

The Midland Units 1 and 2 CCW system is a dual-purpose system serving both safety and nonsafety-related equipment. For each unit, redundant CCW pump trains supply cooling water to the associated high-pressure injection (HPI) makeup pump lube oil coolers, reactor building spray pump, decay heat removal (DHR) pump seal coolers, and DHR heat exchangers following a LOCA; and to safety-related fuel pool heat exchangers, and other nonsafety-related heat exchangers during normal power operation. The nonsafety-related loads and fuel pool heat exchangers are supplied by either CCW train during normal power operation while the redundant CCW pump train is on standby. The 16- and 18-inch motor-operated butterfly valves isolating nonsafety-related loads from the CCW pump trains have a valve closing time of 60 to 75 seconds, exclusive of delay in the control signal to activate them. Each CCW pump train has a CCW surge tank with a total capacity of 1,000 gallons and a nominal minimum operating level of 300 gallons, with a nonseismic makeup from the demineralized water storage and transfer system.

Nonseismic CCW piping to the reactor coolant pump motor coolers, letdown coolers, and control rod drive mechanism in the reactor building may not be adequately protected from LOCA-induced failures such as jet impingement or pipe whip. Other CCW piping to the radwaste evaporator condenser in the auxiliary building is not designed as Seismic Category I. Therefore, the piping may not retain its integrity under LOCA-induced failures or during a seismic event.

If a pipe break were to occur in CCW piping because of LOCA-induced failures or a seismic event where the line is not specifically designed to withstand such an event and its consequences, the CCW surge tank level would drop. For Unit 1, CCW train A, the CCW surge (1T-73A) low-low level signal will trip its associated CCW pump (P-73A) and initiate closure of its associated motor-operated safety-related loop isolation valves (1M-1610A and 1MO-1623A) isolating all nonessential components and fuel pool heat exchangers from the CCW system. This scenario is analogous for each CCW train in both units. If an emergency core cooling actuation signal (ECCAS) occurs, the CCW surge tank low-low level trip signal to the CCW pump will be bypassed, the CCW pump will start, and the safety-related loop isolation valves will close.

With a pipe break in a line not specifically designed to withstand the postulated seismic event, the operating CCW surge tank level could drop to the low-low level setpoint and closure of the safety-related loop isolation valves would then be initiated. However, because of the slow (60 to 75 seconds) closure time of the isolation valves, enough water could be lost from the CCW system before the valves completely close so that the net positive suction head (npsh) available to the CCW pump would be inadequate. An ECCAS signal would restart the tripped CCW pump, which could result in loss of CCW flow and pump cavitation because of low npsh availability. The standby CCW train is postulated to be unavailable because of a concurrent single active component failure. Thus, the unit would have lost CCW heat transfer capability.

One fuel pool heat exchanger train is connected to the CCW system of each unit. The CCW to fuel pool heat exchangers are supplied by a common safety-related portion of the piping including the common non-safety-related heat loads by motor-operated valves 1MO-1610A and B (2MO-1710A and B) and 1MO-1623A and B (2MO-1723A and B). During a pipe break due to a LOCA-induced failure or seismic event along with a loss of offsite power, the motor-operated butterfly valves (for Unit 1, 1MO-1685A and B and 1MO-1687), which are powered from a non-Class 1E power source, do not receive an isolation signal and may fail to close. With a low point in the nonseismic portion of the ruptured pipe, the CCW pipes to and from the fuel pool heat exchanger may be drained. The net effect is that capability to provide CCW to the spent fuel pool heat exchanger is lost. Closing the common safety grade valves, 1MO1685A and B and 1MO-1687, reestablishes the CCW pressure boundary to the spent fuel pool heat exchanger. Filling and venting of that pipe may be required prior to establishing CCW flow to the fuel pool heat exchangers.

Potential Safety Implications

The design deficiency has no effect on the normal safe operation of the plant. However, following a LOCA, CCW capability is required to transfer heat from the DHR heat exchangers within approximately 22 minutes, and from the DHR pump seal coolers, reactor building spray pump seal coolers, and HPI makeup pump lube oil coolers within approximately 30 minutes. It cannot be ensured that these requirements allow sufficient time following a LOCA to restore the level in the surge tank and restore flow to required components. The capability of the engineered safety features pumps to operate without cooling water has not been evaluated. The capability of the containment air coolers to remove heat is not affected by this scenario.

With total loss of CCW to the fuel pool heat exchangers from both units, the fuel pool water temperature will increase at a rate of 8.7F/hr and the water will start boiling within a minimum of 10 hours. This condition can occur only when a seismic event and a CCW system pipe rupture occur simultaneously in both units.

Because the current design is a significant deficiency in final design, as approved and released for construction, such that the design does not conform to the criteria and bases stated in the safety analysis report and could have an adverse impact on plant safety throughout the expected life of the plant, the design deficiency is reportable under 10 CFR 50.55(e).

Corrective Action

Corrective action has been initiated to ensure that the CCW system surge tank level is maintained (to ensure an adequate npsh for safe operation of the CCW pumps) and that the design conforms to the design basis stated in the final safety analysis report (FSAR). The surge capacity will be increased from 1,000 gallons to at least 2,500 gallons; the size of the pipe connecting the CCW surge tank to the CCW pump suction may be increased to preclude cavitation at the CCW pump suction during an event resulting in significant water loss rates from the CCW system. Faster motor operators with a closure time of approximately 5 seconds will replace the existing motor operators on 16- and 18-inch butterfly valves 1MO-1610A and B (2MO-1710A and B) and 1MO-1623A and B (2MO-1723A and B) to isolate safety-related CCW pump trains from the nonsafety-related CCW loads. This will ensure the availability of at least one CCW train following a LOCA and/or a seismic event concurrent with a single active failure.

The fuel pool heat exchangers are located on the common safety-grade portion which also serves the common nonsafety-related heat loads. The motor-operated butterfly valves serve to isolate common nonsafety-related loads (e.g., letdown coolers, reactor coolant pump motor coolers, control rod drive mechanisms, and radwaste evaporator condenser) from a common safety-related load (e.g., fuel pool heat exchangers) are 1MO-1685A and B (2MO-1785A and B) and 1MO-1687 (2MO-1787). These valves receive non-Class 1E power and can be closed manually, either locally or remotely from the motor control center or control room. With loss of offsite power, these valves may remain open. Operator action can be initiated with sufficient time available to close the failed-as-is valves manually, and to establish CCW flow to the fuel pool heat exchangers by adding service water (SW) makeup hose connections near the CCW piping to and from the fuel pool heat exchangers to refill the drained portion of the CCW piping. One hose station from each SW train (A and B) in the auxiliary building will be provided. Approximately 2 hours could be required to refill this part of the system and reestablish CCW flow to the fuel pool heat exchangers if completely drained. Because the spent fuel pool will not boil for at least 10 hours, manual action is considered adequate to reinstate CCW to the spent fuel pool cooling system.

Because the above corrective actions will ensure that the design conforms to the design bases stated in the FSAR, further high-energy line break analysis and seismic analysis of the nonseismic CCW system piping under question will not be pursued as a resolution of the design deficiency. Incidental benefits gained from seismically analyzing and supporting nonseismic CCW system piping for reasons other than resolution of this discrepancy will be acknowledged in implementation of corrective action.

It has been determined, after reviewing other systems, that similar problems would not occur in other systems because the CCW system is the only closed-loop, dual-purpose system serving both safety-related and non-safety-related loads in the Midland plant.

Design implementation of the above corrective action is proceeding. Additional details of the design implementation and scheduling information will be provided in the next report. Investigation of the cause of the deficiency is still underway. The results of this investigation will be discussed in the next report, which will be provided by March 20, 1981.

Prepared by TBallweg
for D.R. Anderson

Approved by EMHughes
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Concurrence by KCBailey