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SUBJECT: Final deficiency rept re failure to meet min recirculation flow for DHR pumps. Initially reported on 921218. Caused by failure of orifice sizing calculation to consider associated pipe line head losses. Recirculation lines redesigned.

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H. Fred McCluskey  
Site Vice President, Bellefonte Nuclear Plant

March 5, 1993

BLRD-50-438/93-01  
BLRD-50-439/93-01

10 CFR 50.55(e)

U.S. Nuclear Regulatory Commission  
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Gentlemen:

In the Matter of the Application of )  
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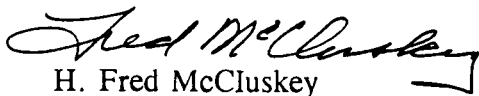
Docket Nos. 50-438  
50-439

BELLEFONTE NUCLEAR PLANT (BLN) - UNITS 1 AND 2 - FAILURE TO MEET  
MINIMUM RECIRCULATION FLOW FOR THE DECAY HEAT REMOVAL PUMPS  
- BLRD-50-438/93-01 AND BLRD-50-439/93-01 - FINAL REPORT

The subject deficiency was initially reported to the NRC in an interim report dated December 18, 1992 and subsequently reported to the NRC Operations Center on February 10, 1993 in accordance with 10 CFR 50.55(e)(3) as Problem Evaluation Report (PER) BLPER920070. This PER was subsequently upgraded to Significant Corrective Action Report (SCAR) BLSCA930001. Enclosed is TVA's final report on this subject.

Should there be any questions regarding this information, please call Bruce Scofield, BLN Site Licensing Manager, at (205) 574-8058.

Very truly yours,

  
H. Fred McCluskey

Enclosure

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U.S. Nuclear Regulatory Commission

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March 5, 1993

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ENCLOSURE  
BELLEFONTE NUCLEAR PLANT (BLN) UNITS 1 AND 2  
FAILURE TO MEET MINIMUM RECIRCULATION FLOW FOR  
THE DECAY HEAT REMOVAL (DHR) PUMPS  
SIGNIFICANT CORRECTIVE ACTION REPORT (SCAR) BLSCA930001  
BLRD-50-438/93-01 AND BLRD-50-439/93-01

FINAL REPORT

DESCRIPTION OF DEFICIENCY

During the design review of the DHR system, it was determined that the "as-built" configuration of the recirculation lines for the DHR pumps does not adequately allow for the design specification of 125 gpm minimum flow through the pump at approximate dead-head conditions. The recirculation line function is to provide a required minimum flow through the pump to prevent overheating and pump damage during operation at a dead-head condition. In the investigation of the problem it was also discovered that no calculation existed for this configuration. Calculation ME-6ND-00046, DHR Pump Minimum Recirculation Flowrate, was performed to determine the actual flow rate for the "as-built" recirculation line configuration. The calculation confirmed the line would only allow approximately 80 gpm at a dead-head condition.

On February 5, 1993, the vendor (Sulzer Bingham) notified TVA that they do not recommend operating the pump at a flowrate of 80 gpm. The pumps involved are:

1ND-MPMP-001-A  
1ND-MPMP-002-B

2ND-MPMP-001-A  
2ND-MPMP-002-B

SAFETY IMPLICATIONS

The primary safety function of the DHR system is to supply low pressure injection to the reactor vessel following a loss-of-coolant accident (LOCA). The amount of time the pump would operate in a low flow condition would vary based on the size of the LOCA. The recirculation line for a pump should be designed to allow the required pump minimum flow to pass through the pump to prevent overheating and pump damage for extended operation. A flowrate below the allowable pump minimum flow could cause pump overheating and damage. The time it takes for this to occur will vary based on the reduced flowrate, temperature of the water, and net positive suction head available. Pump damage could cause a reduction in design flow and possible failure to perform the system design function.

The current minimum flow requirement of 125 gpm is based on the vendor's tests and may not be the actual minimum flowrate required to protect the pump. The vendor does not recommend operating the pump at the current as-built condition flowrate of 80 gpm. The vendor indicated that the pump could suffer internal damage, possibly severe enough to cause failure of the pump. TVA has requested the pump vendor determine the actual minimum flow requirement of the pump.

#### CAUSE

Although a calculation which specifically determined the sizing of the DHR Pump minimum recirculation line has not been located, the calculation for the line's orifice sizing has been reviewed. It appears the line was undersized because the orifice sizing calculation did not consider the associated pipe line head losses. Therefore, the cause of this deficiency is attributed to design error. Based on a review of line and orifice sizing calculations from several other systems, this is considered an isolated incident.

#### CORRECTIVE ACTIONS

To correct the specific deficiencies, TVA has requested the pump vendor to supply a minimum flowrate for the subject DHR pumps. Based on this input, the recirculation lines for the DHR pumps will be redesigned and replaced, as necessary, to support the recommended minimum flowrate. This action is expected to be completed by June 30, 1996.