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TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
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NOV 14 1986

U.S. Nuclear Regulatory Commission
Region II
Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Dear Dr. Grace:

IE COMPLIANCE BULLETIN NO. 86-03, POTENTIAL FAILURE OF MULTIPLE ECCS PUMPS DUE TO SINGLE FAILURE OF AIR-OPERATED VALVE IN MINIMUM FLOW RECIRCULATION LINE

Enclosed is TVA's response to the subject bulletin for Browns Ferry (BFN), Sequoyah (SQN), Watts Bar (WBN), and Bellefonte (BLN) Nuclear Plants. As requested, we have reviewed the design and the pertinent administrative controls for the minimum flow recirculation lines of the emergency core cooling system (ECCS) pumps at each of our nuclear facilities. We have concluded that the single failure vulnerability discussed in this bulletin does not exist at any of the our nuclear facilities.

A brief description of the ECCS and the basis for our conclusion at each of our plants is enclosed. This information is contained in enclosures 1 and 2 for the BFN and BLN, respectively. Due to the similar design, we have combined this information for WBN and SQN in enclosure 3.

If there are any questions concerning this response, please get in touch with M. K. Brandon at (615) 751-8076.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R. L. Gridley

R. L. Gridley, Director
Nuclear Safety and Licensing

Enclosures
cc: See page 2

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IE COMPLIANCE BULLETIN NO. 86-03, POTENTIAL FAILURE OF MULTIPLE ECCS PUMPS DUE TO SINGLE FAILURE OF AIR-OPERATED VALVE IN MINIMUM FLOW RECIRCULATION LINE

cc (Enclosures):
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ENCLOSURE 1
BROWNS FERRY NUCLEAR PLANT (BFN)

The emergency core cooling systems (ECCSs) consist of two high-pressure systems: the high-pressure coolant injection systems (HPCI) and the auto-depressurization system (ADS), and two low-pressure systems: the low-pressure coolant injection (LPCI) mode of the residual heat removal system (RHRS) and the core spray system. The ECCS systems evaluated against this bulletin were RHRS, HPCI, and core spray. Reactor core isolation cooling (RCIC) is also addressed in this response.

The minimum flow recirculation lines in RCIC and HPCI are essentially identical by design. They each employ a single line that routes the flow from the pump through a check valve and a motor-operated flow control valve and then to the RHR pump test piping to the suppression pool. There are no shared valves between the HPCI and RCIC minimum flow valves and the suppression pool. HPCI and RCIC minimum flow valves are powered by different 250V dc power supplies. The motor-driven valves are normally closed and fail "as-is." The HPCI system only uses a single train minimum flow design because its backup system, ADS, allows use of LPCI if HPCI has failed. Therefore, HPCI does not have to be able to function with a single failure. RCIC is technically not part of ECCS; as such, a redundant train is not provided.

The minimum flow recirculation systems for RHR and core spray also are essentially identical to each other by design. Each system has a total of four pumps which are divided into two loops with two pumps each. Each loop of the RHR and core spray system is equipped with a separate minimum flow path to the suppression pool and separate motor-operated minimum flow valve. The minimum flow valves are powered by two independent 480V ac power supplies. Failure of one power supply will only affect one loop of each system. Therefore, failure of one of these power supplies will not result in a loss of an entire system. The flow control valves are normally open and fail "as-is."

All minimum flow valves fail "as-is" on loss-of-power. The control logic as well as power supplies to the control logic for each ECCS system's minimum flow valve are separated such that a single control power failure will not result in a failure of an entire system's minimum flow capability with the exception of HPCI or RCIC (each system has only one minimum flow path).

Based on the discussion above, the single failure vulnerability discussed in the bulletin does not exist at BFN.

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ENCLOSURE 2
BELLEFONTE NUCLEAR PLANT (BLN)

The following ECCS system were evaluated:

1. Auxiliary Feedwater (AFW)
2. Makeup and Purification/High Pressure Injection (MuP/HPI)
3. Decay Heat Removal/Low Pressure Injection (DHR/LPI)
4. Reactor Building Spray (RBS)

The DHR, RBS, and AFW systems are redundant (i.e., dual-trained) safety systems with separate miniflow lines for each system pump. There are no powered or air-operated valves in the miniflow lines. Manually-operated valves are installed in some miniflow lines; however, they are normally open and administratively-controlled. Therefore, these systems do not represent a concern in this area.

The MuP/HPI has two trains. Train A, which is used for normal makeup and seal injection as well as emergency high pressure injection (HPI), has a motor-operated isolation valve in its minimum flow recirculation line which leads back to the makeup tank. Train B line, which is used for HPI or to provide redundant RCP seal injection, has cross-trained motor-operated isolation valves in its recirculation line which leads to the borated water storage tank (BWST). These valves serve an automatic isolation function when an engineered safety features actuation system (ESFAS) signal is generated. These valves can also be remote-manually operated from the main control room (MCR). On an ESFAS signal, these normally open valves will close. At this time, HPI must be maintained by the operator until he decides that he should override the isolation function and throttle or stop HPI flow.

Babcock and Wilcox (B&W) Plant Limits and Precautions document specifies that (1) the recirculation flowpath for each makeup pump should be open at all times except when operating in the HPI mode of operation, and (2) the minimum allowable makeup pump flow is 100 gallons per minute per pump. Each makeup pump's circulation line is equipped with a pressure switch located upstream of the recirculation isolation valve. This pressure switch is provided so that if the recirculation flow is restricted within 60 seconds of pump start, and the stagnation pressure in the line increases, an alarm will be acuated in the MCR and the operating pump will shut off. However, in the event of an ESFAS signal, the high pressure trip will be overridden and the pump will run until it is manually shut off. This does not represent a challenge to the MuP/HPI pumps since the pump discharge pressure exceeds that required to open the RCS safety valves.

In summary, the single failure vulnerability discussed in the subject bulletin does not exist at BLN.

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ENCLOSURE 3
WATTS BAR (WBN) AND SEQUOYAH (SQN) NUCLEAR PLANTS

The active ECCS consists of the safety injection system (SIS), residual heat removal system (RHRS), and the centrifugal charging portion of the chemical and volume control system. Each ECCS systems minimum flow recirculation line will be discussed separately.

The SIS has two safety injection pumps; each pump has a minimum flow recirculation line connected to a common return line to the refueling water storage tank (RWST). A motor-operated flow control valve is located in the recirculation line for each pump and in the common return line to the RWST. The valve (FCV-63-3) on the common return line to the RWST is normally open and fails "as-is". FCV-63-3 is remote-manual controlled, powered from the reactor MOV board 1A1-A. Because FCV-63-3 is the only isolation valve on the common return line from the safety injection pump discharge to the RWST (minimum flow recirculation line), the design of the control circuit is such that no spurious actuation will be able to energize the opening and closing coils for the valve operator. Emergency instructions call for the valve to be closed before transferring SI pump suction to the containment sump during recirculation mode of accident mitigation to prevent transfer of radioactively contaminated water to the RWST. As such, this system does not represent a concern in this area.

The RHRS has two trains and each train has its own separate and redundant minimum flow recirculation line. Each recirculation line has its own normally-closed, fail "as-is," motor-operated globe valve (Train A, FCV-74-12; Train B, FCV-74-24). The control logic for each valve is identical. With the respective RHRS pump running and switches in the normal/auto position, the valve will automatically open for flow below a prescribed setpoint. The valve can also be opened remote manual.

Two centrifugal charging (CC) pumps share a common minimum flow recirculation line which has two motor-operated globe valves in series (Train A, FCV-62-98; Train B, FCV-62-99). At SQN, these valves are normally open with the power removed to satisfy 10 CFR 50 Appendix R requirements. At WBN, these valves are normally open, remote manual controlled, and fail "as-is." As such, the single failure vulnerability discussed in the bulletin does not exist.

For your information, a modification to these valves is being considered at WBN as the result of a recent separate review. The proposed modification would remove the power from the operator motor on these valves. The control circuit would remain intact, thus continuing to provide valve position indication in the main control room.

In summary, the single failure vulnerability discussed in this bulletin does not exist at SQN or WBN.

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