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Docket Nos. 50-259/260/296

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Mr. Hugh G. Parris
Manager of Power
Tennessee Valley Authority
500 A Chestnut Street, Tower II
Chattanooga, Tennessee 37401

Dear Mr. Parris:

SUBJECT: NUREG-0737, TMI ACTION PLAN ITEM II.K.3.22 - AUTOMATIC SWITCHOVER OF REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM SUCTION

Re: Browns Ferry Nuclear Plant, Units 1, 2 and 3

We have reviewed the information presented in your letter of November 23, 1983 on the above subject. Your letter reiterated your previous position that considering the design of the Browns Ferry units, the modification to provide automatic RCIC suction switchover is of marginal safety benefit and that an objective cost-benefit analysis would show the modification to be unnecessary.

Based on the enclosed Safety Evaluation, we find the manual switchover of the RCIC suction on low water level in the condensate storage tank to be an acceptable design for the Browns Ferry units. This resolves Item II.K.3.22 of NUREG-0737.

Sincerely,

Original signed by:
Domenic B. Vassallo, Chief
Operating Reactors Branch #2
Division of Licensing

Enclosure:
As stated

cc w/enclosure

DL:ORB#2	DL:ORB#2	DL:ORB#2	DL:ORB#2
SNorris:jk	WLong	DClark	DVassallo
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Docket Nos. [illegible]

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Mr. Hugh G. Parris
Manager of Power
Tennessee Valley Authority
[illegible] Chestnut Street Tower II
Chattanooga, Tennessee 37401

Dear Mr. Parris:

SUBJECT: [illegible] - AUTOMATIC SWITCHOVER [illegible]

[illegible]

We have reviewed the information presented in your letter dated [illegible] 1975 on the above subject. Your letter requested [illegible] to provide automatic ECCS suction switchover [illegible] show the justification [illegible] unnecessary.

Based on the [illegible] Safety Evaluation, we find the manual switchover of the ECCS suction on low water level in the [illegible] storage tank to be acceptable [illegible] Browns Ferry units. [illegible]

Sincerely,

[illegible] Vassallo, Chief
[illegible] Branch [illegible]
Division of Licensing

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	Vassallo
[illegible]	[illegible]	[illegible]	[illegible]

Mr. Hugh G. Parris
Tennessee Valley Authority
Browns Ferry Nuclear Plant, Units 1, 2 and 3

cc:

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNIT NOS. 1, 2 AND 3

DOCKET NOS. 50-259/260/296

NUREG-0737; II.K.3.22

1.0 Introduction

NUREG-0737, TMI Action Plan Item II.K.3.22 requires the automatic switchover of the Reactor Core Isolation Cooling (RCIC) system suction from the Condensate Storage Tank (CST) to the suppression pool. Part "a" of this item required, as an interim measure, that existing procedures for manual switchover be verified to assure that clear and cogent procedures existed. Part "b" of the item proposed that plant modifications for automatic switchover be completed by January 1, 1982. By letter dated September 1, 1981, we approved TVA's interim procedures for manual switchover.

By letter dated December 23, 1980, TVA informed us of its decision to not incorporate the automatic switchover feature and provided supporting information. TVA concluded that the addition of an automatic switchover of RCIC was unnecessary and that existing procedures were fully adequate. Our Generic Letter 82-05, dated March 17, 1982, again requested TVA's schedular commitment for completion of these modifications. By letter dated April 22, 1983, TVA reaffirmed its decision to not implement the requested modification.

Our letter of October 20, 1983 requested TVA to either provide additional justification for its position or to provide plans and schedules for implementing the modification. In a letter dated November 23, 1983 the licensee provided a discussion of why they concluded the modification was not necessary or cost-benefical considering the design of the Browns Ferry facilities.

2.0 Evaluation

In the letter of November 23, 1983, the licensee provided several reasons (numbered (1) through (6) below) for not implementing the modifications recommended in Item II.K.3.22. Each reason is given below followed by an evaluation of the reason.

(1) "RCIC is an auxiliary system designed primarily to provide relatively low flow (rated 600 gpm) vessel makeup during isolation events when normal feedwater supply is unavailable. During events that require significant amounts of high-pressure coolant injection, the 5000-gpm safety-grade HPCI system is relied upon. Failure of HPCI to operate during these events would result in operation of the ADS and LPCI systems; therefore, RCIC is not needed or useful during events requiring large amounts of high-pressure coolant injection."

The staff agrees with the statement that RCIC is not needed but disagrees with the statement that it is not useful. The Browns Ferry FSAR discusses the relative importance of the RCIC system in preventing the excessive release of radioactive materials to the environs.

The Browns Ferry FSAR states in Section 4.7.2 (Safety Objective) that the RCIC system provides makeup water to the reactor vessel during shutdown and isolation and following certain pipe break accidents to prevent the excessive releases of radioactive materials to the environs as a result of inadequate core cooling.

Furthermore, the system shall operate automatically in time to maintain sufficient coolant in the reactor vessel so that the integrity of the radioactive material barrier is not compromised. Piping and Equipment, including support structures, shall be designed to withstand the effects of an earthquake without a failure which could lead to a release of radioactivity in excess of the guideline values given in 10 CFR 100. The pump suction is normally lined up to the condensate storage tank which is a non-seismic category I suction source. The modifications recommended by Item II.K.3.22 would automatically provide a seismic category I suction source (e.g., suppression pool).

(2) "It should be understood that the above condition of remaining on full 600-gpm RCIC flow for such an extended period of time is highly unlikely. The only required injection is that necessary to provide makeup for the inventory lost due to decay heat and pressure relief to the suppression pool. The 135,000 gallons are sufficient to provide for makeup for more than seven hours. With the normal water level of greater than 344,000 gallons, makeup is available for approximately 35 hours. These times are within the recovery mode of operation, and the operator will be under low stress conditions."

This statement tends to ignore the high pressure coolant injection (HPCI) and its somewhat larger flow capacity. However, the staff agrees that other systems which use the condensate storage tank as a water source are restricted by a standpipe to the use of water in the upper portion of the tank.. About 135,000 gallons are below the standpipe in each condensate tank. This quantity represents the conservatively calculated amount of water required to maintain reactor vessel level for at least 8 hours in hot shutdown conditions. A level indicator for each of the three tanks is located on panel 9-20 in the Unit 1 control room. The technical specification minimum level for the CST is 135,000 gallons at which a low-level alarm (non-Class 1E) is annunciated in the control room. The FSAR states that standard practice is to maintain a reserve of 135,000 gallons per operating reactor and that the only normal requirements drawn from this reserve volume are a substantially continuous flow of about 300 gpm for the control rod drive pumps.

Using these figures and assuming HPCI doesn't operate, RCIC would have approximately 2 1/2 hours of suction supply at the CST. Therefore, there is adequate time for the operator to perform the manual alignment of suction from the suppression pool. Although not absolutely required, the modification would be a desirable improvement in plant operations, eliminate the probability of an operator error and minimize the number of actions the operator had to perform.

(3) "In addition to the above discussion, if only RCIC were running and the water level decreased in the CST suction supply, HPCI would realign to the suppression pool at the switchover setpoint. In the event of RCIC trip, there would be several hours before the water level decreased to the HPCI initiation point again. HPCI would then begin injecting to the vessel from the suppression pool if RCIC were not manually realigned to the suppression pool and restarted."

The staff is in agreement with the information discussed above. However, it should be noted that the RCIC system is the preferred system that is used by the operator to control reactor vessel level because RCIC flow more nearly matches boil-off due to decay heat than does HPCI flow. Therefore, vessel water level control is easier with RCIC than with HPCI. Thus, RCIC is the preferred make-up system for isolated conditions and automatic suction switchover would facilitate continuous operation.

(4) "Further analysis of long-term events in NUREG/CR-2973, "Loss of Decay Heat Removal (DHR) Sequences at Browns Ferry Unit 1 - Accident Sequence Analysis," and NUREG/CR-3719, "The Effect of Small Capacity, High-Pressure Injection Systems on TQUV Sequences at Browns Ferry Unit 1," show that after approximately four hours, RCIC is no longer needed and CRD flow will maintain sufficient injection to the vessel. In practice, RCIC would probably be tripped off or realigned to the CST-to-CST test mode for pressure control with CRD supplying makeup after several hours. This would therefore negate the necessity for a RCIC suction siwtchover."

The staff generally agrees with this comment. We have not verified the four hour time requirement but, on a realistic basis, it appears to be reasonable.

(5) "We additionally believe that it is more prudent to rely on the suction switchover only for HPCI to prevent a potential common mode failure causing both high pressure systems to inadvertently and irreversibly realign from the available CST to the suppression pool which could be at an elevated temperature. The desirability of protecting the condensate storage system as an external coolant source is clearly recommended in the NRC Severe Accident Sequence Analysis (SASA) program using Browns Ferry Unit 1 as the model plant."

The staff believes that design criterion number (7) that was transmitted (Memorandum from D. B. Vassallo to the Tennessee Valley Authority dated August 1982) to the licensee would preclude any potential common mode failures causing both high pressure injection systems to inadvertently and irreversibly realign from the CST to the suppression pool.

Design Criteria 7 states that the design shall be such that no single failure within any equipment added to accomplish the automatic switchover of RCIC will interfere with operation of the HPCI system or interfere with the transfer of HPCI suction from the condensate storage tank to the suppression pool.

(6) "Finally, the costs associated with performing this modification cannot be justified since any safety benefit derived can only be classified as marginal if not nonexistent."

Without available cost figures to utilize in a cost-benefit analysis, it is difficult to refute this particular justification. However, because the time available for operator action is long, the risk is small.

CONCLUSION

Automatic switchover of the RCIC suction on low water level in the condensate storage tank would be a desirable feature because of the frequent use of the system. However, because of the time available for operator action, there is no basis for requiring the switchover to be automatic. We agree with TVA that manual switchover of the RCIC suction is adequate.