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MAR 01 1988

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-259
Tennessee Valley Authority	)	50-260
		50-296

BROWNS FERRY NUCLEAR PLANT (BFN) - ANTICIPATED TRANSIENTS WITHOUT SCRAM (ATWS) RULE (10 CFR 50.62) - PLANT SPECIFIC DESIGN

In the letter from J. A. Domer to NRC on April 22, 1987, TVA submitted its conceptual design information for BFN's compliance with the ATWS Rule. Since that date TVA and its contractors have further reviewed the proposed design against the NRC staff's safety evaluation of the Boiling Water Reactor Owners' Group (BWROG) ATWS position. From this review, along with the effect that ATWS has on the BFN Probabilistic Risk Assessment and input from the NRC staff, TVA has decided to adopt the BWROG recommendations as described in the BWROG Topical Report (NEDE-31096-P-A). These BWROG recommendations have been accepted by NRC in a letter from Gus Lainas to T. A. Pickens dated October 21, 1986.

This letter supersedes all other submittals pertaining to the BFN ATWS design. The enclosure to this letter discusses key elements to the BFN ATWS design. Based upon the changes in its design, BFN now conforms to the BWROG recommendations and continues to meet the intent of the NRC safety evaluation contained in the October 21, 1986 letter from Gus Lainas to T. A. Pickens. The ATWS modifications are scheduled to be completed by unit 2 restart.

Since TVA has chosen to endorse the BWROG ATWS design recommendations for the BFN ATWS design, TVA requests NRC acceptance of its design.

If you need further information, please telephone J. L. Turner, Site Licensing, BFN, (205) 729-2853.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

M. Ray for

R. Gridley, Director
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Enclosures
cc: See page 2

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U.S. Nuclear Regulatory Commission

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ENCLOSURE

ANTICIPATED TRANSIENTS WITHOUT SCRAM (ATWS) DESIGN INFORMATION BROWNS FERRY NUCLEAR PLANT (BFN)

Introduction

This enclosure defines the BFN ATWS design for meeting the requirements of the 10 CFR 50.62 ATWS rule. The design objective for the standby liquid control (SLC), alternate rod injection (ARI), and recirculation pump trip (RPT) is discussed. References are made to the Boiling Water Reactor Owners Group (BWROG) Topical Report (NEDE-31096-P-A) since the BFN ATWS design meets the recommendations contained therein.

Standby Liquid Control

TVA has chosen to use a boron-10 enriched solution to meet paragraph (c)(4) of 10 CFR 50.62. Implementation will be in accordance with section 2.2.3 of NEDE-31096-P-A.

Alternate Rod Injection

In the unlikely event that the normal method of reactor shutdown does not properly function, the BFN ARI design for the ATWS rule is to be a backup for the reactor trip system (RTS) in order to ensure reactor shutdown. Modifications will be made to meet paragraph (c)(3) of 10 CFR 50.62.

ARI Design Objective: TVA's design will install dedicated block and dump valves to perform the ATWS ARI function. The valves will be electrically and physically separated from the existing RTS backup scram valves. The ARI system will consist of one three-way valve per trip system which will act to block control air upstream of the control rod drive system hydraulic control units (HCUs) while dumping the downstream side to atmosphere when an ATWS initiation signal is present for that train. Loss of air pressure to the HCUs causes control rod insertion. Additionally, each trip system will have dump valves to ensure a rapid blowdown of the air supply to the HCU banks as well as the scram discharge volume vent and drain valve air header branch. The block and dump valves and dump valves are designed to fail so as to avoid spurious actuations. The valves are grouped into two trains which correspond to the two trip systems. Each train contains an equal number of valves. The ATWS initiation signal from one trip system energizes the valves in its corresponding train only. One train of valves will be capable of performing the ARI function thus rendering the design single failure proof. The setpoints chosen for ARI initiation are such that a normal scram should already have occurred. This complies with section 3.2 of NEDE-31096-P-A.

Safety-Related Requirements: The ARI system will be designed such that it is electrically isolated from safety-related systems. Isolation methods will be in accordance with the licensing basis requirements for BFN. Generally, qualified fuses and relay coil-to-contact separation are used. In accordance with section 3.3 of NEDE-31096-P-A, the ARI system itself will not be safety-related.

ATWS CONCEPTUAL DESIGN INFORMATION (Cont'd)

Redundancy: The BFN ARI system will have redundant trains of block and dump valves which will perform their function given the failure of a single train. The ARI trains are redundant to the individual scram pilot valves which normally initiate a scram. This is in accordance with section 3.3 of NEDE-31096-P-A.

Diversity From Existing Reactor Trip System: Each train of ARI and RPT logic uses common sensors and initiation logic. The ARI/RPT logic receives reactor vessel low water level or reactor vessel high pressure signals from transmitters that are electrically independent from the RTS. The ARI/RPT design uses dc power which will enable it to function with a complete loss of offsite power. The trip logic is contained in ECCS instrument cabinets which provides diversity from the RTS. The ARI system uses an energize-to-trip logic signal to actuate the block and dump valves as compared to the deenergize-to-trip logic of the RTS to operate the individual scram pilot valves. This complies with section 3.2 and 3.3 of NEDE-31096-P-A regarding diversity from the existing RTS.

Electrical Independence from the Existing Reactor Trip System: The ARI system will be electrically isolated and independent from the RTS. The ARI is connected electrically to its own dedicated valves which are electrically isolated from the RTS. This arrangement will meet the requirements for electrical independence. This design is in accordance with section 3.3 of NEDE-31096-P-A.

Physical Separation from the Existing Reactor Trip System: BFN will utilize engineered safety feature system analog trip units consisting of four level and four pressure loops total. There will be two independent trip systems consisting of two low reactor water level and two high reactor pressure transmitters in each trip system. A coincident trip of either two low levels or two high pressures in the same trip system will cause an ATWS initiation signal in that train. The ATWS instrument and control power will be supplied by the station batteries which will enable it to function with a complete loss of offsite power. This is in accordance with section 3.3 of NEDE-31096-P-A.

Environmental Qualification: The ARI/RPT system is required to function for anticipated operational occurrences but not for design basis accidents (loss of coolant accident and high-energy line break). All hardware required for the ARI to function properly will be environmentally qualified to conditions during an ATWS event up to the time that the ARI function is completed in accordance with section 3.3 of NEDE-31096-P-A.

ATWS CONCEPTUAL DESIGN INFORMATION (Cont'd)

Quality Assurance: Since 10 CFR 50.62 does not require ATWS equipment to be safety related, implementation of the ATWS system requirements at BFN need not meet all aspects of 10 CFR 50, Appendix B, quality assurance requirements. NRC has recognized that existing industry practices applied to nonsafety related equipment are acceptable for specific application to ATWS equipment. This position is explicitly stated in NRC Generic Letter 85-06. Therefore, the design, installation, preoperational phase testing, and future maintenance or modification of the BFN ATWS equipment will be in accordance with nonsafety related quality assurance practices. This is consistent with the intent of Generic Letter 85-06 and in accordance with section 3.3 of NEDE-31096-P-A.

Safety Related (1E) Power Supply: The ARI/RPT logic utilizes Class 1E 250V dc power. This power will be available if offsite power is lost and is independent of the RTS. This same power source is used for motive power for some ECCS components. For this reason, proper isolation will be used for separation between the ARI and safety-related power supplies where applicable. This is in accordance with section 3.3 of NEDE-31096-P-A.

Testability at Power: TVA has chosen to implement two-out-of-two logic providing an energize-to-trip signal upon reactor vessel low water level or reactor vessel high pressure. With this arrangement, each signal and its associated instrumentation can be tested during plant operation without inadvertent actuation. There will also be a bypass switch for each trip system. This bypass switch is so the logic and final set of relays can be tested while the plant is in operation. This meets the requirements of section 3.3 of NEDE-31096-P-A.

Inadvertent Actuation: A normal reactor scram should already have occurred at the time the ARI reaches its initiation setpoints. The ARI/RPT initiation logic will use coincident logic to minimize the likelihood of inadvertent actuation. This design supports generic industry efforts to reduce unnecessary scrams. This meets the requirements of section 3.3 of NEDE-31096-P-A.

Additional Features in the Design: The ARI system will have the capability of being manually initiated from the control room.

Once the ARI has been initiated, the operations personnel in the control room will have information available that indicates initiation of the ARI, ARI function in progress, and ARI function completed.

Once the ARI is initiated, both the automatic and manual actuation signals will seal-in to assure that all control rods have had adequate time to fully insert. Reset of the ARI will be prohibited for the duration of the seal-in time but afterward can be manually reset if the automatic initiation signals have cleared.

ATWS CONCEPTUAL DESIGN INFORMATION (Cont'd)

The ARI will use two-out-of-two logic and also have a bypass switch. With this arrangement, any circuit up to the final actuation device may be tested or replaced and calibration or maintenance performed. The above additional features are in accordance with section 3.3 of NEDE-31096-P-A.

Recirculation Pump Trip (RPT)

TVA's design will use the BFN end-of-cycle RPT breakers to perform the ATWS RPT function. A spare trip coil in each breaker cubicle will be isolated and wired to one of the ATWS trip systems. The same redundancy scheme utilized for ARI will be used for the RPT logic. An initiating signal from either trip system will open one of two breakers in series for each recirculation pump. The breakers are divided into redundant trains which correspond to each trip system. Since the spare trip coils will be mechanically and electrically isolated from the RTS and powered from a power source other than that in the breaker cubicle, failures in the RTS will have no effect on the ATWS RPT function. The use of redundant trains ensures that the ATWS RPT function will be single failure proof and highly reliable. This and all other aspects of the ATWS RPT design are in accordance with section 4 of NEDE-31096-P-A and the NRC safety evaluation.

The BFN ATWS RPT design to meet paragraph (c)(5) of 10 CFR 50.62 uses the same input sensors, two-out-of-two logic, and bypass switch as the ARI design. Modifications to the existing RPT will be made in conjunction with the ARI modifications in order to have the RPT initiate from the same two-out-of-two logic as the ARI. This modification will reduce the probability of inadvertent tripping of the recirculation pumps as a result of the ATWS modifications.

Summary

Since the BFN ATWS design conforms to the BWROG Topical Report which has been reviewed and accepted by NRC, TVA does not foresee any problems with the acceptance by NRC of the BFN ATWS design.