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May 31, 1996

1CAN059607

U. S. Nuclear Regulatory Commission
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Subject: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Proposed Technical Specification Changes Extending The Surveillance Test Interval For The Reactor Trip Breakers, Reactor Trip Modules, And Electronic Trip Relays

Gentlemen:

Attached for your review and approval are proposed changes to the Arkansas Nuclear One - Unit 1 (ANO-1) Technical Specifications (TSs) and NUREG-1430, Revision 1, "Standard Technical Specifications For B&W Plants" that revise the surveillance test interval for the reactor protection system reactor trip breakers, reactor trip modules, and electronic trip relays from the currently specified monthly interval to a six-month interval. This change is being proposed because the current TS required surveillance interval, which places the unit in a test configuration susceptible to a spurious reactor trip, has been determined to be unduly restrictive. The technical justification for this proposed change is provided in Babcock & Wilcox Owners Group (BWOG) Topical Report BAW-10167, Supplement 3, "Justification For Increasing The Reactor Trip System On-Line Test Intervals," dated January, 1995.

As this submittal is part of a joint submittal by the participating B&W utilities (ANO-1, Crystal River, Oconee 1, 2, and 3, and Davis-Besse), proposed changes to NUREG-1430, "Standard Technical Specifications - Babcock and Wilcox Plants," are attached.

The proposed change has been evaluated in accordance with 10CFR50.91(a)(1) using criteria in 10CFR50.92(c) and it has been determined that this change involves no significant hazards considerations. The bases for these determinations are included in the attached submittal.

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Entergy Operations requests that the effective date for this change be within 30 days of approval. Although this request is neither exigent nor emergency, your prompt review is requested.

Very truly yours,

Jerry W Yelverton

JWY/cws
Attachments

To the best of my knowledge and belief, the statements contained in this submittal are true.

SUBSCRIBED AND SWORN TO before me, a Notary Public in and for Hinds **County and the State of Mississippi, this** 30th **day of** May**, 1996.**

Janie C. Lee
Notary Public
My Commission Expires NOTARY PUBLIC STATE OF MISSISSIPPI AT LARGE MY COMMISSION EXPIRES: August 10, 1997 BONDED THRU HEIDEN-MARCHETTI, INC.

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ATTACHMENT

TO

1CAN059607

PROPOSED TECHNICAL SPECIFICATION

AND

RESPECTIVE SAFETY ANALYSES

IN THE MATTER OF AMENDING

LICENSE NO. DPR-51

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT ONE

DOCKET NO. 50-313

DESCRIPTION OF PROPOSED CHANGES

- The Bases associated with Technical Specification (TS) 4.0.5 have been revised to reflect the proposed change in test interval from monthly to semi-annually,
- The test intervals associated with TS Table 4.1-1 item 1, "Protective Channel Coincidence Logic," item 2, "Control Rod Drive Trip Breaker," and item 62, "Electronic (SCR) Trip Relays" have been increased from monthly to semi-annually.

BACKGROUND

The rod drive control system (RDCS) provides for withdrawal and insertion of the control rod assemblies (CRAs) to maintain the desired reactor output and is described in ANO-1 SAR Section 7.2.2. The RDCS consists of three basic components: (1) control rod drive (CRD) motor power supplies, (2) system logic, and (3) trip breakers. The power supplies consist of four group power supplies, an auxiliary power supply, and two holding power supplies. The group and auxiliary power supplies are of a redundant, 6 phase, half-wave rectifier design. In each half of a group power supply, rectification and switching of power is accomplished through the use of Silicon Controlled Rectifiers (SCRs). This switching sequentially energizes first two, then three, then two of the six CRA motor stator windings in stepping motor fashion to produce a rotating magnetic field for the CRA motor to position the CRA. Switching is achieved by gating the six SCRs on for the period each winding must be energized. Six gating signals are required since 6 phase AC is rectified to produce the DC output to each winding.

Gating signals for the group power supplies are generated by a solid state programmer consisting of input interfacing relays, a programmed microcomputer, and output drivers. The insert and withdraw commands and the driver outputs are redundant, thus providing separate but synchronized gating signals to the dual power supply units.

Identical type power supplies are used for the regulating (control) groups and for the auxiliary power supply. Each half of each group power supply is capable of driving up to 12 drive mechanisms, the maximum number that may be in any group. The power supplies have dual power inputs, each half fed from separate power sources and capable of carrying the full load.

Unlike the control group power supplies, the holding power supply is used to maintain the safety rods fully withdrawn; consequently, switching is not required. A 6-phase rectified power supply is used for this purpose. Two holding power supplies are provided. Each is rated to furnish power to one winding of 48 mechanisms.

The auxiliary power supply is used to position the safety rod groups and to provide single rod control. The safety groups are maneuvered with the auxiliary power supply and then, when fully positioned, are transferred to the holding buses described above. After positioning the safety rods, the auxiliary power supply is available to the regulating groups, through transfer relays, to serve either as a single rod controller, should repositioning of a single rod be necessary, or as a spare group controller, should one of the group control power supplies

require maintenance. The auxiliary power supply cannot be used to control more than one group at a time.

RDCS trip breakers and electronic trip contactors are provided to interrupt power to the control rod drive motors. When power is removed, the roller nuts disengage from the leadscrew and a gravity free-fall trip of the CRA occurs. Two series trip methods are provided for removal of power to the CRA motors. First, a trip is initiated when the reactor protection system (RPS) logic interrupts power to the undervoltage trip circuit of the main AC feeder breakers (reactor trip breakers). Secondly, a trip is initiated when the silicon control rectifier (SCR) gating power and the DC holding power are interrupted. As parallel power feeds are provided on both holding and gating power, interruption of both feeds is required for trip action in either method of trip. The RDCS and associated trip circuitry are shown as simplified block diagrams in ANO-1 SAR Figures 7-9 and 7-10.

AC power feed breakers are of the 3-pole, stored energy type, each housed in a separate metal clad enclosure. Each breaker trip mechanism provides diverse tripping action by utilizing an instantaneous undervoltage trip device and a backup shunt trip actuated by an undervoltage relay. The secondary trip breakers, mechanically gauged for DC service, are also of the stored energy type and utilize the same type diverse trip circuitry parallel connected to each breaker pair of common supply. The undervoltage relays and trip devices are operated by the RPS as are the 2-pole gating power contactors.

The RPS monitors parameters related to safe operation and trips the reactor to protect the reactor core against fuel rod cladding damage as described in the ANO-1 Safety Analysis Report (SAR) Section 7.1.2. It also assists in protecting against reactor coolant system (RCS) damage caused by high system pressure by limiting energy input to the system through reactor trip action. The RPS consists of four identical protection channels, each terminating in a trip relay within a reactor trip module (RTM). In the normal, untripped state, each protection channel passes current to the terminating trip relay and holds it energized as long as all inputs are in the normal energized (untripped) state. Should any one or more inputs become de-energized (tripped), the terminating relay in that protective channel de-energizes (trips).

Each protection channel trip relay has four logic controlling contacts, each controlling a logic relay in one RTM. Therefore, each RTM has four logic relays controlled by the four protection channels. The four logic relays combine to form a 2-out-of-4 coincidence network in each RTM. The coincidence logics in all RTMs trip whenever any two of the four protection channels trip. The RTMs are given the same designation as the protection channel whose trip relay they contain and in whose cabinet they are physically located. Thus, the protection channel "A" RTM is located in protection channel "A" cabinet, etc. The coincidence logic in each RTM controls one or more breakers in the control rod drive power system. A block diagram of the RTMs is shown in ANO-1 SAR Figure 7-1 and a simplified block diagram of the trip logic has been included in this submittal as Figure 1.

The coincidence logic contained in the RPS channel "A" RTM controls breaker "A" in the control rod drive power system, channel "B" RTM controls breaker "B", channel "C" RTM controls breaker "C" and electronic trip contactor "E", and channel "D" RTM controls breaker "D" and electronic trip contactor "F". Breakers "A" and "B" control all the 3-phase primary power to the control rod drives (CRDs); breakers "C" and "D" control the DC power to rod groups 1 through 4; and electronic trip contactors "E" and "F" control the gating power to rod groups 5 through 8.

The RDCS circuit breaker and electronic trip contactor combinations that initiate a reactor trip can best be stated in logic notation as:

(A and B) or (A and DF) or (B and CE) or (CE and DF).

This is a 1-out-of-2 logic used twice and is referred to as a 1-out-of-2 x 2 logic. When any 2-out-of-4 protection channels trip, all RTM logics trip, commanding all control rod drive breakers to trip.

The undervoltage coils of the control rod drive breakers receive their power from the protection channel associated with each breaker. A redundant shunt trip coil will also receive a breaker trip input from its associated RPS channel. The manual reactor trip switch is interposed in series between each RTM logic and the assigned breaker's undervoltage coil.

RTMs, reactor trip breakers (RTBs), and electronic trip relays are currently tested once per month, in conjunction with the monthly RPS channel test. This testing includes channel trip as well as coincidence logic functions. The tests are staggered so that one channel is tested each week. Separate testing of the RTB shunt trip devices and undervoltage devices is also performed. These tests trip the associated RTB and therefore have the effect of causing a "half-trip" of the CRDs, which can result in a reactor trip if another RPS channel trips (via RTB or electronic trip).

TS 3.5.1.6 requires that in the event that one of the trip devices in either of the power sources to the CRDs fails in the untripped state, the power supplied to the CRDs through the failed trip device shall be manually removed within 30 minutes of detection. The condition must be corrected and the remaining trip devices shall be tested within eight hours of detection, or be in the hot shutdown condition within an additional four hours.

DISCUSSION OF CHANGE

This proposed change to the surveillance test interval for the RTMs, RTBs, and electronic trip relays is based on Supplement 3 to Topical Report BAW-10167, "Justification For Increasing The Reactor Trip System On-Line Test Intervals." The methodology used in Supplement 3 is the same as used for the BWOG submittal on reactor protection system instrument string test intervals, BAW-10167A (Volume 1&2, and Supplements 1&2), which the NRC has reviewed and approved in Safety Evaluation Reports dated December 5, 1988 and July 8, 1992.

For RTBs, operating experience indicates an improvement in reliability since Topical Report BAW-10167 was originally submitted. This improvement is due primarily to upgrades installed in response to Generic Letter 83-28, "Required Actions Based On Generic Implications of Salem ATWS Events." NRC sponsored research, reported in NUREG-1366, "Improvements to Technical Specifications Surveillance Requirements," supports the assertion that improved RTB reliability can be attributed to Generic Letter 83-28 improvements, and also found that a primary stress mechanism for the breakers is routine mechanical cycling associated with testing.

B&W Owners Group Topical Report BAW-10167, Supplement 3, January 1995, "Justification For Increasing The Reactor Trip System On-Line Test Intervals," provides the analysis and technical justification for increasing the reactor trip devices' test interval. ANO-1 uses General Electric manufactured model AK breakers as analyzed in BAW-10167. The results of the analysis show that the test interval extension is not a significant contributor to system unavailability or core damage risk. For the Oconee design group, which includes ANO-1, described in the topical report the incremental change in unavailability is shown to be 2.9×10^{-7} failure/demand and the net incremental risk (difference between the reduction of spurious trips and reactor trip system failure to trip probability) is shown to be 2.6×10^{-8} frequency of core damage/reactor year. Entergy Operations has reviewed BAW-10167 and found it applicable to ANO-1.

Entergy Operations has also reviewed the surveillance test history of the ANO-1 reactor trip devices for the last five years. This review found two failures of the RTBs. One failure to trip occurred in 1991 and was attributed to internal binding. In 1993, an RTB failed on response time criteria, but did trip. This failure was attributed to paint residue in the trip mechanism. The proposed increase in surveillance interval will not contribute to the frequency of these types of failures since neither one is considered to be time-related. Programmatic controls introduced following the 1991 failure to trip have resulted in a reduced probability of these types of failure mechanisms. Data searches in support of BAW-10167 found 14 events at B&W and CE plants in which RTBs of the General Electric model AK manufacture failed to trip or were slow to trip. These events were sorted to discriminate those failures caused by cyclic stress from those caused by time-related stress. These were then included in the topical report considerations of RTB reliability.

Based on the good performance of these components, the results of BAW-10167, the low potential for significant increase in failure rates of the components under a longer test interval, and the introduction of no new failure modes, it is concluded that there is no adverse effect on nuclear safety by increasing the surveillance test interval to six months. Furthermore, it remains acceptable to allow the continued application of TS 4.0.2 (interval extension of 25%) when it is utilized on a non-routine basis.

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

An evaluation of the proposed change has been performed in accordance with 10CFR50.91(a)(1) regarding no significant hazards considerations using the standards in 10CFR50.92(c). A discussion of these standards as they relate to this amendment request follows:

Criterion 1 - Does Not Involve a Significant Increase in the Probability or Consequences of an Accident Previously Evaluated.

The accident mitigation features of the plant are not affected by the proposed test interval extension. The results of the B&W Owners Group Topical Report BAW-10167, Supplement 3, "Justification For Increasing The Reactor Trip System On-Line Test Intervals," show that the test interval extension of the reactor protection system trip devices is not a significant contributor to trip system unavailability or the risk of core damage.

Therefore, this change does not involve a significant increase in the probability or consequences of any accident previously evaluated.

Criterion 2 - Does Not Create the Possibility of a New or Different Kind of Accident from any Previously Evaluated.

The reactor trip device surveillance test interval is not, in and of itself, considered to be an accident initiator. Failure of a trip device to function is an analyzed condition and does not constitute a new or different kind of accident.

Therefore, this change does not create the possibility of a new or different kind of accident from any previously evaluated.

Criterion 3 - Does Not Involve a Significant Reduction in the Margin of Safety.

The results of the B&W Owners Group Topical Report BAW-10167, Supplement 3, "Justification For Increasing The Reactor Trip System On-Line Test Intervals," show that the test interval extension of the reactor protection system trip devices is not a significant contributor to trip system unavailability or the risk of core damage. In addition, the uncertainty analysis contained in BAW-10167 confirms the robustness of the results by demonstrating that even with an order of magnitude change in the failure data, the incremental increase due to an increased test interval is insignificant. Entergy Operations has reviewed BAW-10167 and found it applicable to ANO-1.

Therefore, this change does not involve a significant reduction in the margin of safety.

Therefore, based upon the reasoning presented above and the previous discussion of the amendment request, Entergy Operations has determined that the requested change does not involve a significant hazards consideration.

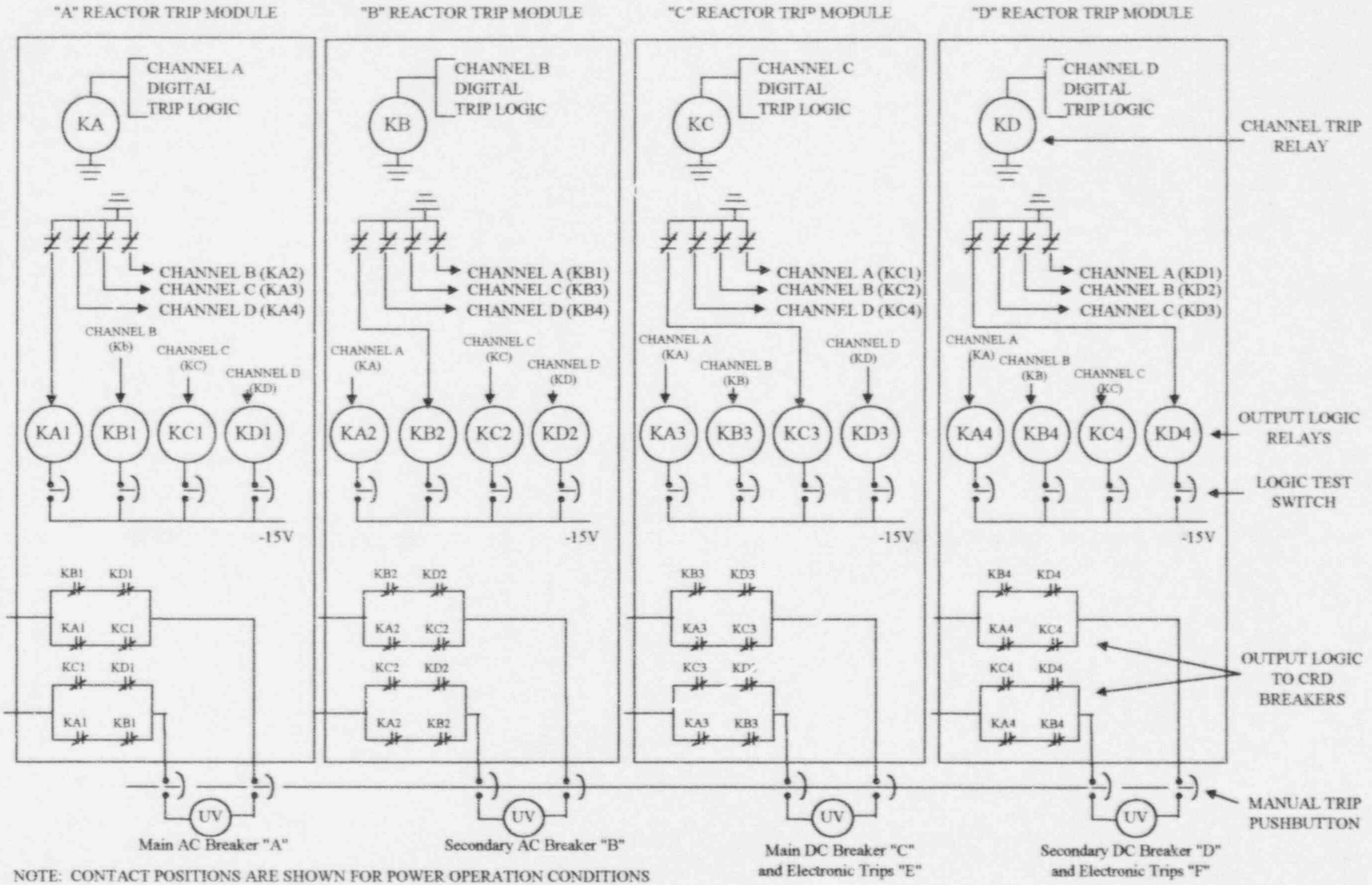

Figure 1 - Reactor Protection System Trip Logic

PROPOSED TECHNICAL SPECIFICATION CHANGES