TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

5N 157B Lookout Place

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10 CFR 50.62

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Attention: Mr. B. J. Youngblood

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT - 10 CFR 50.62 - PLANT-SPECIFIC DETAILS

In a letter dated October 31, 1986, from me to you, TVA committed to provide plant-specific details identified in the generic Safety Evaluation Report (SER) from the Westinghouse Owners Group (WOG) topical report, WCAP-10858, "AMSAC Generic Design Package," by February 15, 1987.

Enclosed are detailed responses to the 14 plant-specific questions and an interpretation of the Sequoyah design criteria in light of the SER. WOG is to provide the basis for the generic C-20 setpoint.

If you have any questions concerning this matter, please call R.W. Meadors at (615) 870-6649.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R. Gridley, Director
Nuclear Safety and Licensing

Enclosure
cc: See page 2

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U.S. Nuclear Regulatory Commission

FEB 17 1987

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

Mr. J. J. Holonich
Sequoyah Project Manager
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20814

Mr. G. G. Zech, Director
TVA Projects
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Sequoyah Resident Inspector
Sequoyah Nuclear Plant
2600 Igou Ferry Road
Soddy Daisy, Tennessee 37319

ENCLOSURE
PLANT SPECIFIC DETAILS
SEQUOYAH NUCLEAR PLANT
(SQN)

DIVERSITY - Identify degree of diversity from Reactor Protection System (RPS).

The requirements of the ATWS rulemaking are such that AMSAC equipment be diverse to a reasonable and practicable extent to minimize the potential for common cause failures. To achieve this diversity, the SQN AMSAC design requires that equipment be diverse from the existing RPS from sensor output to, but not including, the final actuation device

This diversity is ensured in the SQN design in the following manner:

- Logic Technologies - The RPS utilizes solid-state logic while AMSAC utilizes relay logic.

- Manufacturers - The RPS is supplied by Westinghouse while the inputs used for AMSAC are derived from Bailey Co. relay racks.

- Sensors - The sensors for RPS and AMSAC are not the same and are separated physically.

- Location - The RPS cabinets and the Bailey relay racks are in separate locations.

LOGIC POWER SUPPLIES - Identify independence from RPS power supplies.

The SQN AMSAC design requires power which is ultimately derived from the uninterruptable power supply (UPS) in order to provide high reliability for system function. While it is acknowledged that one channel of the RPS is also ultimately tied back to the UPS, the use of fuse and breaker coordination effectively sectionalizes the distribution bus to prevent the loss of the board due to a single branch failure. Therefore, the necessary independence between the RPS and AMSAC is achieved and the SQN AMSAC design provides both high reliability and independence. See FSAR figures 8.1.2-1 and 8.1.2-2 for the existing layout of the SQN UPS.

The power supplies to the RPS logic cabinets are RPS channel I-120-V ac Vital Power Board 1-I, breaker 5; RPS channel II-120-V ac Vital Power Board 1-II, breaker 5; RPS channel III-120-V ac Vital Power Board 1-III, breaker 5; RPS channel IV-120-V ac Vital Power Board 1-IV, breaker 5. The power supply for the AMSAC relay logic is nondivisional, Train A associated, power 120-V ac Vital Board 1-III, breaker 26. The AMSAC test relay circuits are powered from - Train A--120-V ac Vital Power Board 1-I, breaker 27; Train B--120-V ac Vital Power Board 1-II, breaker 27; and Train S--120-V ac Vital Power Board 1-III, breaker 8 or 120-V ac Vital Power Board 1-IV, breaker 8. Unit 2 power supplies are similar. The power supplies are battery backed and fed from individual breakers.

All IE signal/AMSAC interfaces are separated by qualified relay and/or fuse isolation.

SAFETY-RELATED INTERFACE - Confirm that RPS continues to meet all applicable safety criteria.

The SQN AMSAC design requires (see design criteria) that implementation of the AMSAC shall be such that it will not degrade the RPS, auxiliary feedwater system, or other safety-related systems. This is understood to mean that the design basis for isolation, independence, wiring, and physical separation as set forth in the AMSAC design criteria shall be met such that the RPS (or other safety-related systems) performance will not be degraded in any way by the AMSAC implementation. In order to comply with these design bases, the SQN AMSAC design employs the use of separate steam generator level instrument loops from the RPS. The AMSAC control circuit and turbine impulse chamber pressure switch loops are non-1E and also have no interface with the RPS. Other design objectives to this end are found under response to items 9 and 10.

QUALITY ASSURANCE - Provide information regarding compliance with Generic Letter 85-06.

Standard Practice SQA-172 has been prepared to address the quality assurance requirements for ATWS equipment that is not safety related. This standard practice was prepared to meet the requirements from Generic Letter 85-06 and NQAM Part I, Section 1.3, "Limited QA Program Requirements." Attachment 1 provides a copy of SQA-172. Compliance with SQA-172 will ensure compliance with Generic Letter 85-06.

MAINTENANCE BYPASSES - Provide information of test bypass design including human factor evaluation of control room indication.

Maintenance bypasses for the component AMSAC controls are accomplished by placing the appropriate train of equipment into the testing mode by way of permanently-mounted hand switches clearly labeled for this purpose.

These test bypass switches are located in the auxiliary control room and auxiliary instrument control room of SQN. While in the testing (maintenance) mode, the main control room annunciation system indicates that the AMSAC is in testing. For the human factors evaluation of test/maintenance bypasses see attachment 2. Testing can be performed in any mode of operation and is governed by paragraph 5.0 of the SQN detailed design criteria for AMSAC (SQN-DC-V-20.0, attachment 3).

OPERATING BYPASS - Provide information on arming circuit design, including human factor evaluation of control room indication.

The SQN AMSAC design utilizes a permissive signal, designated as C-20 (see figure 1) to defeat the block of the AMSAC system (arm the AMSAC) as stated in the design criteria. This design requires that if two out of two turbine impulse chamber pressure bistables are actuated indicating that the plant is at or above 70 percent of full power then the AMSAC will be

automatically armed. Continuous indication that the AMSAC system is armed is provided in the control room when the C-20 permissive is actuated. The human factors evaluation of this indication is provided in attachment 2. Additional features of this permissive signal, as required by design criteria, are that removal of the C-20 permissive signal shall be delayed by approximately 120 seconds, and the C-20 signal is isolated from the RPS by qualified Class 1E isolators.

MEANS FOR BYPASSING - Provide information on test bypass design.

The SQN AMSAC design incorporates permanently-mounted hand switches to accomplish control circuit bypass in order to test system components. These hand switches are located in the auxiliary control room and in the auxiliary control instrument rooms. All testing and maintenance bypasses of the SQN AMSAC will be annunciated in the main control room. Human factors evaluation of these annunciations is contained in attachment 2 of this response. (Also, see item 5).

MANUAL INITIATION - Discuss how a manual turbine trip and auxiliary feedwater (AFW) actuation are accomplished by the operator.

The turbine and AFW pumps can be manually actuated in the horseshoe of the main control room by the following hand switches:

EQUIPMENT	HAND SWITCH	LOCATION
Main Turbine	1-HS-47-24	Panel M-2
Motor-Driven AFW Pump 1A	1-HS-3-118A	Panel M-4
Motor-Driven AFW Pump 2A	1-HS-3-128A	Panel M-4
Turbine-Driven AFW Pump	1-HS-46-56A	Panel M-3

Note: After initiation of AFW the pumps will operate in the recirculation mode until the steam generator level is below 33 percent.

Based on discussion with operations personnel, the operator action required to manually trip the turbine and actuate AFW should take a maximum of 8-10 seconds. The manual hand switches for turbine trip and AFW actuation are approximately 10 feet apart.

ELECTRICAL INDEPENDENCE FROM RPS - Provide information on electrical independence from RPS. Provide an analysis of isolators in accordance with Appendix A of the NRC SER. (Similar to item 2.)

The SQN specific AMSAC design does not utilize RPS sensors nor RPS isolators. Therefore, SER Appendix A is not applicable to SQN's design. See additional discussion of safety-related interface in item 3.

PHYSICAL SEPARATION FROM RPS - Provide information on physical separation from RPS.

The SQN AMSAC design requires that all field wiring associated with AMSAC shall be implemented in accordance with TVA detailed design criteria for "Separation of Electrical Equipment and Wiring" (SQN-DC-V-12.2) such that separation criteria for safety-related systems are not violated. The SQN RPS cabinets are located in the auxiliary room on elevation 685'-0" in the control building, while the AMSAC control relays are located in the auxiliary control room and adjacent instrument rooms on elevation 734'-0" and outside the auxiliary feedpump turbine room on elevation 669'-0" in the auxiliary building. In addition, AMSAC circuits and instruments are physically separate and diverse from RPS.

ENVIRONMENTAL QUALIFICATION - Provide necessary environmental qualification information.

As referenced in Design Criteria, SQN-DC-V-20.0, paragraph 3.6, "Environmental Requirements," the AMSAC system equipment qualification shall be consistent with the nonsafety-related equipment qualification licensing basis for the plant during anticipated operational occurrences only. AMSAC system design shall, therefore, meet plant normal and abnormal condition parameters as specified in WCAP-10858.

EQUIPMENT	CONTRACT	ENVIRONMENT	REPORT
Relays TDPU Agastat-E7012AE-002 E7012PF-002	8038407	Mild-47E235-7	ES1000
Switches Cutler-Hammer 10250T-Series	838348	Mild-47E235-7	Wyle Test 43583-1
Relays Potter-Brunfield MDR134-1	838291	Mild-47E235-7 Harsh-47E235-65	Nutherm 51091R
Westinghouse ARD440SR	838336	Mild-47E235-17	Wyle Test 17525-1
Press Switches SOR 5NN-K45-N4-FIA-TT	838290	Mild-47E235-22	Turb. Bldg

TESTABILITY AT POWER - Provide information on the planned test program. Provide discussion on output signal indication in the control room, including human factors evaluation.

Each test on the AMSAC system is annunciated in the main control room. Also, see the human factors evaluation on attachment 2.

Testing of AMSAC circuit is done by first putting XS-3-319, -320, and -321 in the test position. This will annunciate in the control room that the system is in test and blocks start/trip signals to the motor-driven feedwater pumps, turbine-driven feedwater pump, main turbine trip bus, and steam generator blowdown and sample line isolation valves.

The turbine impulse pressure switches, PS-1-81 and -82 can be tested using the applicable sections in Instrument Maintenance Instruction, IMI-99, (CC 10.3 and CC 10.4).

The steam generator level switches test can be performed by using the applicable sections in Surveillance Instruction, SI-75. The above tests can be performed to test input signals to AMSAC control circuit.

To test the load permissive relay, select test position of XS-3-318. This will be annunciated in the main control room as AMSAC armed. With XS-3-318 in test position, select test position of XS-3-317 to test the level initiation (red test light will glow) relay. Once the selector switches are returned to the normal position, the AMSAC system will return to service. This testing of outputs through final actuation devices will be done during plant shutdown. For logic sequence to AMSAC see figure 1.

COMPLETION OF MITIGATIVE ACTIONS - Discuss mitigative action and operator action to return system to normal status.

The AMSAC circuitry ties into the same circuitry used to close the breaker and start the motor-driven AFW pumps. (See figure 2.) Detail A of figure 2 shows the breaker closing circuit for the motor-driven AFWPs. Once voltage is sensed at node 7, the 52X relay is energized and the breaker is closed. After the breaker is closed all 52a and 52b fingers swap position. Likewise, the breaker spring limit switches see the discharged spring, and the 52 LSs swap to the position now shown. This gives a straight path for the 52Y relay to energize and seal itself in at 14-15. The 52X relay was deenergized when the 52b finger at 7-8 swapped position. Loss of voltage at node 7 will deenergize the 52Y relay, and the breaker will go back to its original state once the trip signal is received.

Figure 2 also shows the circuitry and operator action to trip the breaker open. The breaker can be tripped manually using HS-3-128A in the main control room or locally at the breaker using the test trip button. The protection circuitry (instantaneous overcurrent relay, ac time overcurrent relay, or the undervoltage relay) is the only other mechanism that will trip the breaker open. Removal of the AMSAC signal will not cause the breaker to trip open.

Once the turbine has been tripped, specific operator action is required to return to operation. Removal of the AMSAC signal will not restart the turbine.

TECHNICAL SPECIFICATIONS - Provide information to establish that technical specifications are not required.

WOG has taken the position that technical specification are unnecessary and do not enhance the overall safety of the plant (CF OG-171 dated February 10, 1986). SQN agrees with this position and will use plant procedures and administrative controls to ensure reliable AMSAC operation.

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