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January 29, 1988

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

Gentlemen:

Subject: Docket No. 50-206
Plant Specific ATWS Mitigation System Actuation Circuitry (AMSAC) Design
San Onofre Nuclear Generating Station
Unit 1

By letter dated September 22, 1986 the NRC provided to SCE the staff's Safety Evaluation of the Westinghouse Owner's Group (WOG) topical report WCAP-10858 "AMSAC Generic Design Package" submitted in response to 10CFR50.62 "Requirements for Reduction of Risk from Anticipated Transient Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants." The result of the staff's review was that the WOG generic AMSAC design was acceptable; however, licensees must provide plant specific details regarding individual AMSAC designs to ensure full conformance with the rule. The San Onofre Unit 1 plant specific AMSAC design details are provided in the enclosure to this letter.

In addition to the AMSAC design details, the September 22, 1986 letter requested information regarding qualification testing of the AMSAC isolation devices. This information is currently being extracted from vendor documents and will be provided to you by February 29, 1988.

As stated in SCE's letter to the NRC dated November 4, 1987, the schedule for implementation of modifications to complete the ATWS mitigation system requirements is during the Cycle XI refueling outage in accordance with the NRC's letter dated July 24, 1987 from R. F. Dudley to K. P. Baskin. This schedule was determined by the San Onofre Unit 1 Integrated Implementation Schedule.

If you have any questions, or require additional information, please let me know.

Very truly yours,

M.O. Medford

Enclosure

cc: J. B. Martin, Regional Administrator, NRC Region V
F. R. Huey, NRC Senior Resident Inspector, San Onofre Units 1, 2 and 3

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SUBJECT: Forwards plant-specific ATWS mitigation sys actuation circuitry design details, in response to 860922 ltr. Info re qualification testing of isolation devices will be submitted by 880229.

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UNIT 1

PLANT SPECIFIC AMSAC DESIGN

Introduction

In response to 10CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants," Westinghouse on behalf of the Westinghouse Owners Group (WOG) has submitted to the NRC for review WCAP-10858 "AMSAC Generic Design Package." By letter dated September 22, 1986 the NRC issued a Safety Evaluation Report detailing the degree of compliance of the proposed WOG designs with 10 CFR 50.62. The plant specific design details for the San Onofre Unit 1 ATWS Mitigation System Actuation Circuitry (AMSAC) are provided in this document. The AMSAC logic diagram is provided as Attachment 1.

Background

Provisions for automatic initiation of auxiliary feedwater have been installed as part of TMI upgrades for San Onofre Unit 1. Low steam generator level is used as the initiating parameter. This parameter is not an input to the San Onofre Unit 1 Reactor Protection System (RPS) and, therefore, the equipment that initiates AFW is completely independent (from sensor output to final actuating device) from the RPS. No provision for a diverse turbine trip currently exists. It is our intention to provide these provisions in accordance with 10 CFR 50.62 requirements, and ensure the existing AFW system complies with these requirements as well.

General Design Criteria

Equipment, which is diverse from the existing RPS, shall be installed consistent with the ATWS rule to actuate auxiliary feedwater flow and initiate a turbine trip in the event an anticipated transient results in a loss of heat sink while the power level is above a specified value. Diverse actuation of AFW flow and turbine trip will ensure that RCS pressure will remain below the pressure that will satisfy the ASME Boiler and Pressure Vessel Code Level C service limit stress criteria. The criteria for the diverse AFW and diverse turbine trip (DTT) are based on the ATWS Rule (10 CFR 50.62), plant specific design, and good engineering practices.

Plant Specific

The following is a discussion of each of the key elements of the plant specific design for the San Onofre Unit 1 AMSAC. This information includes specific details for the staff to evaluate compliance with the ATWS rule requirements.

o Diversity

The San Onofre Unit 1 AFW instrumentation and logic are not shared with the RPS, and use Foxboro Spec 200 equipment. The Foxboro Spec 200 design is diverse from the design of the existing RPS Foxboro E and H Line instrumentation and logic, and from the Spec 200 Micro that would be expected to be used in any future RPS instrumentation and logic additions

or replacements. The instrumentation and logic that will be added for the DTT and associated permissive function will be compatible with the AFW Foxboro Spec 200 equipment. Also the DTT will not be shared with the RPS.

o Logic Power Supplies

San Onofre Unit 1 has two independent and separate 125 VDC bus/120 VAC vital bus systems. The 120 VAC vital buses 1, 2, 3, 3A and 4 are powered from 125 VDC bus No. 1, while vital busses 5 and 6 are powered from DC bus No. 2. The instrumentation and logic for AFW Train A is powered from Inverter 3 on 125 VDC Bus No. 1. This inverter also provides power for some RPS instrumentation and logic. The AFW Train B power supply, however, is completely independent from the RPS. Since the ATWS rule does not require redundant channels, the independence of Train B satisfies the requirements of the ATWS rule. The DTT shall utilize energize to trip logic from the output of AFW Train B. An RPS permissive shall be utilized to arm the DTT above 10% reactor power. The DTT logic for the output of this permissive shall include a latch circuit and an isolation device qualified to IEEE 384 to preclude potential common mode failures with the RPS. Train B shall remain electrically independent and physically separated from the RPS/AFW Train A. The DTT circuitry shall energize a new turbine trip solenoid from 125 VDC Bus No. 2 causing the turbine governor auto-stop oil to drain which will initiate a turbine trip.

o Safety Related Interface

The existing AFW system is Quality Class Safety-Related (SR) and Seismic Category A. Any changes or additions to the AFW system, including interfaces shall meet this criteria. Although the DTT is not a SR function, the DTT circuitry, from the interface with the AFW system up to and including the interface with the existing non-safety related, Seismic B turbine trip hydraulic manifold shall be designed, constructed and operated as a SR and Seismic Category A system. The solenoid valve will be, as a minimum, commercial grade.

o Quality Assurance

In accordance with the safety-related status of the diverse AFW/DTT circuitry, compliance with Generic Letter 85-06, "QA Guidance for ATWS Equipment that is not safety-related" is not required. As stated above, the existing AFW system is Safety-Related Seismic Category A and any changes, including installation of the DTT interface shall be done in accordance with these criteria.

o Maintenance Bypasses

The AFW circuitry will not be provided with maintenance bypass switches. The system configuration does not allow placing a single channel of an AFW train in the tripped mode. Depending on the type of maintenance

required while at power, the entire train is removed from service. An output signal shall be provided to continuously indicate the out of service condition in the control room. The indication shall meet the human factors guidelines consistent with those developed as part of the San Onofre Unit 1 Control Room Design Review. The DTT circuitry will be provided with a bypass switch to allow AFW system testing while at power. Continuous annunciation of the bypass condition will be provided in the control room consistent with human factors guidelines.

o Operating Bypass

The existing AFW circuitry does not include provisions for an at-power permissive (i.e., operating bypass). The DTT circuitry shall include a permissive that will arm the system above 10% power. The permissive signal will be generated from an existing RPS permissive at 10% reactor power. This RPS permissive is designated as P-7. The DTT permissive signal shall be an isolated P-7 output that automatically sets (arms) and latches within the DTT logic, but must be manually reset. Continuous annunciation of the reset condition (operating bypass disarmed) shall be provided in the control room consistent with human factors criteria.

o Means for Bypassing

Removal of the low steam generator level input channels to the diverse AFW/DTT circuitry for testing shall be accomplished by the use of permanently installed jacks or other similar devices. Currently, leads

must be lifted to insert the test signal. Indication of removal for testing shall be provided by stationing a control room operator and/or an instrument technician at the auxiliary feedwater panel in the control room for the duration of the test.

o Manual Initiation

The diverse AFW/DTT circuitry shall include the capability for manual initiation from the control room in addition to the automatic initiation capability. The existing Train B AFW manual actuation switches and circuitry may be used for this purpose.

o Electrical Independence from the RPS

The diverse AFW/DTT circuitry shall maintain electrical independence from the RPS from the sensor output to the final actuating device. Appropriate combinations of qualified isolation devices (relays, Foxboro isolation modules, etc.) will be used at the interfaces of the AFW Train B circuitry and the DTT, and the RPS P-7 arming signal and the DTT arming latch. A discussion of the isolation devices used in the diverse AFW/DTT circuitry including qualification testing and test results to demonstrate the ability of the isolators to function under the worst case fault conditions will be provided by February 29, 1988.

o Physical Separation from the RPS

The diverse AFW/DTT circuitry shall maintain physical separation from the RPS. Continued application of physical separation criteria to the redundant AFW Trains A and B shall ensure separation between the AMSAC circuitry, which utilizes AFW Train B, and the AFW Train A which shares a common power supply with the RPS. The RPS P-7 permissive is in a physically separate cabinet and will be properly isolated from the DTT circuitry.

o Environmental Qualification

Environmental Qualification for a post-accident environment is not specifically required for the AMSAC design. The existing AFWS, however, is Class 1E (safety-related) and those portions subject to potentially harsh post accident environments are environmentally qualified in accordance with IEEE 323-1974. The design life for the diverse AFW/DTT circuitry shall be at least 35 years.

o Testability at Power

The diverse AFW/DTT circuitry shall have the capability for test and surveillance at power. During surveillance at power, each train of AFW flow is isolated via closed manual valves downstream of the AFW pumps. A low steam generator level signal is then input to each of the three instrument loops in that train. The redundant train of AFW is not

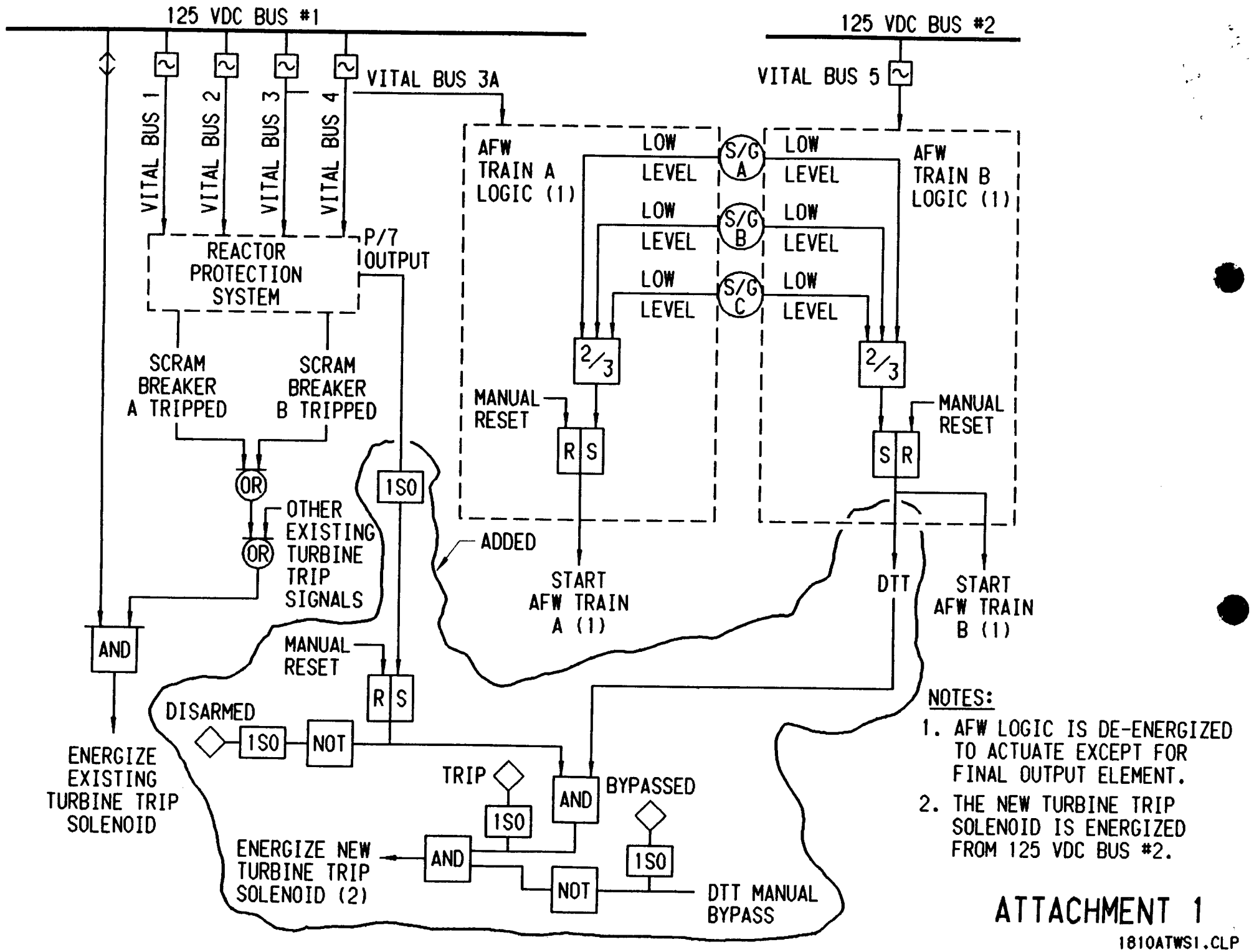
actuated or otherwise affected. Consequently, no system bypasses are utilized for the AFW system. The AFW system, including the final actuating device, is exercised during testing at power. The DTT circuitry, up to but not including the new turbine trip solenoid, shall be tested as part of the AFW Train B surveillance test. A system bypass is used in the DTT circuitry to prevent tripping of the turbine during testing at power. The bypass will block the trip output signal to the new turbine solenoid. Continuous annunciation of the bypass condition will be provided in the control room consistent with human factors guidelines.

o Completion of Mitigative Action

The AFW actuation and diverse turbine trip functions once initiated, shall proceed to completion. A momentary reset switch for unlatching AFW and DTT actuation circuit outputs shall be provided.

MJT:0725P

SONGS 1 AMSAC LOGIC DIAGRAM



NOTES:

1. AFW LOGIC IS DE-ENERGIZED TO ACTUATE EXCEPT FOR FINAL OUTPUT ELEMENT.
2. THE NEW TURBINE TRIP SOLENOID IS ENERGIZED FROM 125 VDC BUS #2.

ATTACHMENT 1

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