



Portland General Electric Company

David W. Cockfield Vice President, Nuclear

October 31, 1989

Trojan Nuclear Plant
Docket 50-344
License NPF-1

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington DC 20555

Dear Sir:

Request for Additional Information Regarding
"Anticipated Transient Without Scram (ATWS)
Mitigating System Actuation Circuitry (AMSAC)"

By letters dated October 30, 1987, April 13, 1988 and October 3, 1988, Portland General Electric (PGE) Company provided Plant-specific design features for the Anticipated Transient Without Scram (ATWS) Mitigating System Actuation Circuitry (AMSAC). Due to problems with the original vendor that was selected, this design has changed.

Attachment 1 provides the details of PGE's proposed AMSAC. This response is formatted to address each of the Plant-specific design elements addressed in the October 30, 1987 submittal. Revision bars indicate new information. Attachment 2 provides a diagram of the general arrangement/configuration of the AMSAC.

PGE's current schedule for installation of the AMSAC is the 1990 refueling outage.

Sincerely,

Attachment

c: Mr. John B. Martin
Regional Administrator, Region V
U.S. Nuclear Regulatory Commission

Mr. David Stewart-Smith
State of Oregon
Department of Energy

Mr. R. C. Barr
NRC Resident Inspector
Trojan Nuclear Plant

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PLANT-SPECIFIC RESPONSE TO
NUCLEAR REGULATORY COMMISSION (NRC) SAFETY EVALUATION
OF WCAP-10858, "ANTICIPATED TRANSIENT WITHOUT SCRAM (ATWS)
MITIGATING SYSTEM ACTUATION CIRCUITRY (AMSAC) GENERIC DESIGN PACKAGE"

Portland General Electric Company (PGE) plans to meet the requirements of Title 10, Code of Federal Regulations, Part 50.62(c)(1) by implementing the Logic 1 conceptual design described in WCAP-10858P-A, Revision 1, "AMSAC Generic Design Package". The Logic 1 design provides for AMSAC actuation on low-steam generator water level.

The AMSAC System is currently in the detailed design stage. The following responses to the Plant-specific design elements denoted in the Nuclear Regulatory Commission's (NRC's) Safety Evaluation on WCAP-10858 are provided.

1. NRC Position - Diversity

The Plant-specific submittal should indicate the degree of diversity that exists between the AMSAC equipment and the existing Reactor Protection System. Equipment diversity to the extent reasonable and practicable to minimize the potential for common-cause failures is required from the sensors output to, but not including the final actuation device, e.g., existing circuit breakers may be used for the auxiliary feedwater initiation. The sensors need not be a diverse design or manufacture. Existing protection system instrument-sensing lines, sensors, and sensor power supplies may be used. Sensor and instrument sensing lines should be selected such that adverse interactions with existing control systems are avoided.

PGE Response

Trojan's Reactor Protection System (RPS) and the proposed AMSAC equipment are tabulated below (i.e., input, output, and logic).

<u>Equipment</u>	<u>Existing</u>	<u>Proposed</u>	<u>Diverse (Yes/No)</u>
Sensor	Barton 763 and 764	Same as existing	No
Instrument Sensing Lines	Class 1E Instrument Lines	Same as existing	No
Sensor Power Supply	Class 1E	Same as existing	No

<u>Equipment</u>	<u>Existing</u>	<u>Proposed</u>	<u>Diverse (Yes/No)</u>
Input Isolation	Westinghouse (W)/ Hagan 7100	Energy, Inc. (EI) Series SCA 100	Yes
Input Isolation Power Supply	W/Hagan 7100	Acopian Model R28M13, +28 VDC output	Yes
Logic System	W/Hagan 7100	Programmable con- troller, Allen Bradley PLC-5	Yes
Output Isolation	Potter-Brumfield rotary-type MDR relay	Potter-Brumfield non-rotary type KUEP*	Yes
Actuating Circuits			
• Auxiliary Feedwater			
A Train	Turbine controls	Same as existing	No
B Train	Diesel controls	Same as existing	No
• Main Turbine			
	Alarm and trip control	Same as existing	No

* Actual manufacturer/type is to be determined after vendor test results acceptance.

The Westinghouse/Hagan 7100 equipment is hard-wired, as compared to EI series SCA 100 which use optical isolation and the programmable controller-based logic. The output isolation devices will be relays which utilize coil-to-contact isolation. All of the AMSAC components will be of a different manufacturer and design principle than the W/Hagan 7100 equipment.

The AMSAC logic is implemented by use of two Allen-Bradley PLC-5 programmable controllers. The PLC-5 are configured in parallel such that a fault in one will not cause a spurious actuation. To improve reliability, each actuation output is from parallel redundant output modules. To receive an equipment actuation, both PLCs must concur.

2. NRC Position - Logic Power Supplies

The Plant-specific submittal should discuss the logic power supply design. According to the rule, the AMSAC logic power supply is not required to be safety-related (Class 1E). However, logic power should be from an instrument power supply that is independent from the reactor protection system (RPS) power supplies. Our review of additional information submitted by the Westinghouse Owners Group (WOG) indicated that power to the logic circuits will utilize RPS batteries and inverters. The staff finds this portion of the design unacceptable; therefore, independent power supplies should be provided.

PGE Response

The logic power supply for AMSAC is an independent uninterruptible power supply (UPS). This UPS is a Sola Model 056-10112-1501-01, rated at 1.5 kVA for 10 minutes. The estimated load should be approximately 0.5 kVA, extending the battery operation to approximately one hour. The input 120-VAC power to the UPS is from two sources, lighting panels L29 and L22. These power sources are fed independently from the two primary distribution buses, and not associated with the diesel generator 4.16-kV buses.

3. NRC Position - Safety-Related Interface

The Plant-specific submittal should show that the implementation is such that the existing protection system continues to meet all applicable safety criteria.

PGE Response

The isolation device is the interface that separates AMSAC from Class 1E equipment. The isolation devices will be designed and qualified consistent with the Institute of Electrical and Electronics Engineers (IEEE) Standard Criteria for Independence of Class 1E Equipment and Circuits, IEEE 384-1977. Environmental qualification will follow PGE Topical Report PGE-1025, "Environmental Qualification Program Manual". Adherence to these guides will ensure that the existing RPS will continue to meet all applicable safety criteria.

4. NRC Position - Quality Assurance

The Plant-specific submittal should provide information regarding compliance with Generic Letter 85-06, "Quality Assurance Guidance for ATWS Equipment That is Not Safety-Related".

PGE Response

The Trojan Nuclear Plant Quality Assurance (QA) Program complies with the guidance in NRC Generic Letter 85-06, "Quality Assurance Guidance for ATWS Equipment That is Not Safety-Related". Appendix G to PGE Topical Report PGE-8010, "Nuclear Quality Assurance Program", describes the QA and administrative controls implemented for nonsafety-related ATWS equipment.

5. NRC Position - Maintenance Bypasses

The Plant-specific submittal should discuss how maintenance at power is accomplished and how good human factors engineering practice is incorporated into the continuous indication of bypass status in the control room.

PGE Response

Maintenance bypasses will not involve lifting leads, pulling fuses, tripping breakers, or physically blocking relays.

A permanent graphic-type test panel, human factors designed, will be installed depicting the two independent logic systems designed. When one logic system is to be tested and/or maintenance performed, the second system will be placed in the bypass condition, disabling any output actuation. Complete testing and/or maintenance of the analog inputs and logic of the first logic system can be accomplished on the first system output without actual complete output actuation. Any test switch in the test position (not normal operational position) will be indicated locally and outputted to the annunciator system. Before the second system can be returned to the non-bypassed condition, all test switches in the first system will be verified that they are in the normal operational position. When the second system is to be tested and/or maintenance performed, a similar test panel sequence will be performed as described above for the first system.

Control room annunciation of the AMSAC bypass shall be consistent with PGE Topical Report PGE-1041, "Detailed Control Room Design Review Report". PGE-1041 includes the human factors design aspects of control room indication. Because Trojan's annunciator system will be replaced in 1990, a revision to PGE-1041 will be made and the new revision followed.

6. NRC Position - Operating Bypasses

The Plant-specific submittal should state that operating bypasses are continuously indicated in the control room; provide the basis for the 70 percent or Plant-specific operating bypass level; discuss the human

factors design aspects of the continuous indication; and discuss the diversity and independence of the C-20 permissive signal (defeats the block of AMSAC).

PGE Response

Operating bypasses will be continuously indicated in the control room and will be consistent with the future revision of PGE-1041 discussed in Item 5. The C-20 permissive signal defeats the block of AMSAC, and its setpoint will be at 40 percent nominal turbine load. The basis for this setpoint is contained in Westinghouse Owner's Group (WOG) letter to the NRC, OG-87-10, dated February 26, 1987.

Diversity and independence of the C20 permissive signal are tabulated in Item 1. Existing sensors, instrument-sensing lines, and sensor power supplies will be used. However, diverse isolators will be used for the input from the turbine impulse pressure and steam generator level sensors. Independence is achieved through the use of diverse Class 1E isolating devices.

7. NRC Position - Means for Bypassing

The Plant-specific submittal should state that the means for bypassing is accomplished with a permanently installed, human factored bypass switch or similar device, and verify that disallowed methods mentioned in the guidance are not utilized.

PGE Response

Means for bypassing and disallowed methods are discussed in Item 5. Bypassing AMSAC will be accomplished with a permanently installed, human-factored bypass switch or similar device.

8. NRC Position - Manual Initiation

The Plant-specific submittal should discuss how a manual turbine trip and auxiliary feedwater actuation are accomplished by the operator.

PGE Response

Manual initiation of turbine trip and auxiliary feedwater (AFW) are both initiated from Panel C05 in the control room. Turbine trip is accomplished by depressing the trip push button. Each safety-related AFW pump is actuated individually. The diesel-driven AFW pump requires placing the control switch in the START position. The steam-driven AFW pump requires opening at least one steam supply valve prior to placing

the pump control switch in START. Emergency Instruction EI-0, "Reactor Trip Safety and Injection and Diagnosis", provides the required instructions.

9. NRC Position - Electrical Independence From Existing RPS

The Plant-specific submittal should show that electrical independence is achieved. This is required from the sensor output to the final actuation device at which point nonsafety-related circuits must be isolated from safety-related circuits by qualified Class 1E isolators. Use of existing isolators is acceptable. However, each Plant-specific submittal should provide an analysis and tests which demonstrate that the existing isolator will function under the maximum worst-case fault conditions. The required method for qualifying either the existing or diverse isolators is presented in Appendix A.

PGE Response

AMSAC electrical independence from the existing RPS will be accomplished by the use of qualified Class 1E isolation devices for interface with Class 1E input and output circuits. These isolators will be Class 1E devices and will isolate Class 1E circuits from credible voltage/current faults which are postulated to exist in non-Class 1E circuits. Item 3 describes the criteria documents that will be followed. The specific information on isolation devices requested by Appendix A of the NRC's safety evaluation will be provided after the equipment is purchased.

10. NRC Position - Physical Separation From Existing RPS

Physical separation from existing reactor protection system is not required unless redundant divisions and channels in the existing reactor trip system are not physically separated. The implementation must be such that separation criteria applied to the existing protection system are not violated. The Plant-specific submittal should respond to this concern.

PGE Response

Trojan's RPS has physical separation between redundant divisions and channels. AMSAC will be located where interactions with the protection set cabinets will not occur. Isolation of inputs will be accomplished external to the associated protection set cabinet to prevent the reduction of RPS reliability. Routing of cables from the protection set cabinets, to where the input isolation devices to AMSAC will be independent of the protection system cable routing. Separation criteria will be applied to the RPS per Institute of Electrical and Electronic Engineers (IEEE) Standard 384-1977.

11. NRC Position - Environmental Qualification

The Plant-specific submittal should address the environmental qualification of ATWS equipment for anticipated operational occurrences only, not for accidents.

PGE Response

Sensors and support cable systems are environmentally qualified for normal as well as design basis accidents. The AMSAC logic unit and isolation devices will be located in a mild environment. The only anticipated operational occurrences that would affect AMSAC are loss of all offsite power and loss of the heating and ventilation system. Since there will be an uninterruptible power supply (UPS) system for AMSAC which is battery-backed, loss of offsite power will not prohibit AMSAC's protective function. Also, AMSAC will be located where there is a redundant-train, Class 1E heating and ventilation system; therefore, loss of offsite power will not affect AMSAC's operation due to high-temperature effects.

AMSAC equipment will be designed to perform its function during normal operating conditions as specified in PGE Topical Report PGE-1025, "Environmental Qualification Program Manual".

12. NRC Position - Testability at Power

Measures are to be established to test, as appropriate, nonsafety-related ATWS equipment prior to installation and periodically. Testing of AMSAC may be performed with AMSAC in bypass. Testing of AMSAC outputs through the final actuation devices will be performed with the Plant shutdown. The Plant-specific submittals should present the test program and state that the output signal is indicated in the control room in a manner consistent with Plant practices including human factors.

PGE Response

Specific information pertaining to AMSAC testing will be provided after the AMSAC detailed design is completed.

13. NRC Position - Completion of Mitigative Action

AMSAC shall be designed so that, once actuated, the completion of mitigating action shall be consistent with the Plant turbine trip and auxiliary feedwater circuitry. Plant-specific submittals should verify that the protective action, once initiated, goes to completion, and that the subsequent return to operation requires deliberate operator action.

PGE Response

Once AMSAC is actuated:

- a. The completion of the mitigating action will be consistent with main turbine trip and AFW circuitry.
- b. The protective action will go to completion.
- c. Subsequent return to operation will require deliberate operator action.

Main turbine and generator trip is accomplished by energizing the master trip bus and mechanical trip solenoid. The output devices will be diverse from the existing turbine trip devices and separated from other AMSAC trip devices that provide Class 1E isolation, since the master trip bus and mechanical trip solenoid circuits are non-Class 1E.

AFW is divided into Trains A and B which are both Class 1E. The output isolation devices will be diverse and separated from each other as well as from the non-Class 1E isolation device. An initiating contact will be installed in parallel with the existing steam generator low-low level RPS initiating contact for each channel.

The A-channel turbine-driven AFW pump circuit performs the following on "AUTO-START":

- a. Opens air-operated steam supply valves, one for each of the four steam generators, CV-1451 through CV-1454.
- b. Opens the turbine trip and throttle valve, MO-3071.
- c. Isolates steam generator blowdown and sampling.
- d. Activates an alarm for "AUX FW AUTO START".

The B-channel diesel-driven AFW pump circuit performs a similar function during "AUTO START":

- a. Energizes diesel-start relay which starts the diesel with a normal control switch lineup.
- b. Opens service water isolation valve, MO-3060B, which supplies cooling water to the diesel lube oil cooler, pump lube oil cooler, diesel engine jacket cooler, and speed increaser lube oil cooler.

- c. Isolates steam generator blowdown and sampling.
- d. Actuates an alarm for "DIESEL AUTO START".

Once the initiating signal is received by the existing start (or trip) circuitry, the signal will seal-in until the operator deliberately takes action to stop the AFW pumps or reset the turbine trip from the normal controls.

14. NRC Position - Technical Specifications

Technical Specification requirements related to AMSAC will have to be addressed by Plant-specific submittals.

PGE Response

For the reasons presented in the WOG letter to the NRC dated February 10, 1986 (OG 171), Technical Specifications for AMSAC are not considered to be necessary. Normal Trojan Nuclear Plant administrative controls will be utilized to address AMSAC operability and surveillance requirements.

