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SUBJECT: Forwards plant-specific details for ATWS mitigating sys actuation circuitry (AMSAC), in response to NRC safety evaluation of WCAP-10858-A, "AMSAC Generic Design...." Util selected Option 1, steam generator low level logic design.

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JAMES D. SHIFFER
VICE PRESIDENT
NUCLEAR POWER GENERATION

October 30, 1987

PG&E Letter No.: DCL-87-258

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

Re: Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Plant-Specific AMSAC Design

Gentlemen:

To meet the requirements of 10 CFR 50.62, PG&E is purchasing and installing Anticipated Transient Without Scram Mitigation System Actuation Circuitry (AMSAC) manufactured by Westinghouse. This letter provides design details for the AMSAC in response to the NRC safety evaluation of Westinghouse's topical report WCAP-10858-A, "AMSAC Generic Design Package," which was approved by the NRC in a letter from Charles E. Rossi (NRR) to L. D. Butterfield (Westinghouse Owner's Group) dated July 7, 1986.

PG&E has selected Westinghouse's Option 1, the Steam Generator Low Level Logic, for the Diablo Canyon Power Plant design. This logic will actuate a turbine trip and initiate auxiliary feedwater flow upon indication that the steam generator inventory is below the AMSAC low level setpoint.

Responses to the plant-specific questions that are required to supplement the previously reviewed and approved standard Westinghouse hardware system are provided in the Enclosure.

PG&E plans to install AMSAC at DCPP Units 1 and 2 during the third and second refueling outages tentatively schedule for the Fall of 1989 and 1988 respectively. This schedule is consistent with the schedule noted in PG&E Letter DCL-85-323, dated October 14, 1985, which specified installation during the second refueling outage after the NRC Staff's acceptance of WCA-10858 "AMSAC Generic Design Package."

A055
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Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

cc: J. B. Martin
M. M. Mendonca
P. P. Narbut
B. Norton
B. H. Vogler
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Diablo Distribution

1557S/0052K/DJH/1705

ENCLOSURE

PLANT-SPECIFIC DESIGN DETAILS REGARDING ATWS MITIGATING SYSTEM ACTUATION CIRCUITRY (AMSAC) FOR DIABLO CANYON POWER PLANT

INTRODUCTION

WCAP-10858P-A, "AMSAC Generic Design Package," provided generic design options for use by Westinghouse plants in addressing the requirements of 10 CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants." The NRC Safety Evaluation of Topical Report WCAP-10858, "AMSAC Generic Design Package," reported the completion of an NRC Staff review of the generic design information and identified plant-specific design information required by the NRC Staff to verify compliance with 10 CFR 50.62. The plant-specific information applicable to Diablo Canyon Power Plant (DCPP) is provided in the following paragraphs.

AMSAC DESIGN OPTION 1

The DCPP AMSAC design employs Option 1 of WCAP-10858P-A, "AMSAC Generic Design Package." The design will use existing steam generator level transmitters to actuate a turbine trip and initiate auxiliary feedwater flow. The motor driven auxiliary feedwater start will also initiate closure of steam generator blowdown isolation and sample isolation valves outside containment. The auxiliary feedwater (AFW) pump will also start if the main feedwater pumps trip.

ATWS is defined in 10 CFR 50.62 as "an anticipated operational occurrence as defined in Appendix A of this part followed by the failure of the reactor trip portion of the protection system specified in General Design Criterion 20 of Appendix A of this part." The existing turbine trip on reactor trip signal is the P-4 permissive generated by opening the reactor trip breakers.

For the DCPP AMSAC design, an AMSAC logic cabinet will be installed. Existing narrow-range steam generator level transmitters will provide signals to the non-Class-1E AMSAC circuits via qualified isolation devices. The coincidence logic for AMSAC initiation is three out of four low steam generator level signals with one channel provided for each of the four steam generators.* The AFW pump breaker close signal will also close steam generator blowdown and sample isolation valves outside containment. AMSAC will also provide a signal to the main turbine electrohydraulic control (EHC) system to initiate a turbine trip. The AFW flow response time and turbine trip response time are consistent with requirements of ULNRC-1189, "Response to Final ATWS Rule 10 CFR 50.62," dated October 14, 1985. Figure 1 provides the conceptual design and layout of the DCPP AMSAC.

The main control board alarms have been designed to employ the "dark board" concept to improve human factors performance of the plant operators. This principle requires, to the extent possible, that alarm windows illuminate to show an abnormal condition. If conditions are normal, the windows remain darkened. AMSAC system trouble or an AMSAC trip signal will light a window near the existing turbine trip window. In addition to the alarms, a permissive light is illuminated when the AMSAC system is armed (turbine above 40 percent power, C-20).

PLANT-SPECIFIC QUESTIONS

The following are responses to those plant-specific questions noted by the NRC Staff in its approval of WCAP-10858.

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* The AMSAC low level setpoint is below the reactor protection system (RPS) low-low level setpoint, consistent with ULNRC-1189, "Response to Final ATWS Rule 10 CFR 50.62," dated October 14, 1985.

Question 1

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 of 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.

Response 1

The diversity that exists between the AMSAC equipment and the existing reactor protection system is shown in Figure 1 and described below.

The existing reactor protection system is a Westinghouse solid state protection system (SSPS) based upon digital logic using discrete electronic components. Its inputs are isolated by C. P. Clair or similar relays, and its outputs are isolated by Potter and Brumfield relays.

The AMSAC system is a microprocessor-based system also provided by Westinghouse. Its analog inputs are isolated by Westinghouse Model 131-110 isolation amplifiers, which ensure that adverse interactions with existing systems are avoided. There are no digital inputs. The AMSAC outputs to the final actuation devices which initiate auxiliary feedwater flow are isolated by Struthers Dunn relays to ensure that credible failures within AMSAC will not degrade the AMSAC-actuated circuits below an acceptable level. All setpoints, time delays, logic functions, etc. pertinent to AMSAC are generated internally based upon the isolated analog inputs. These features provide additional diversity and independence from the reactor protection system.

The AMSAC system is comprised of three independent microprocessors, each of which monitors all input signals. The microprocessor output signals are routed to two independent logic networks, one designated channel "A", the other designated channel "B". In order for any final AMSAC output to occur from either channel "A" or channel "B", two of the three microprocessors must request that output to occur. This arrangement minimizes the potential for common cause failures to the extent reasonable and practical, and also minimizes the potential for spurious AMSAC actuations.

AMSAC sensors have been selected from existing sensors, one from each of the four available protection groups within the analog process protection system. Existing protection system instruments, sensing lines, sensors, and sensor power supplies are used. All AMSAC inputs are isolated by qualified isolation amplifiers as described above to ensure that adverse interactions with existing control and protection systems are avoided to the extent reasonable and practical.

This arrangement ensures that credible failures within AMSAC will not degrade safety or control systems below an acceptable level. The arrangement also minimizes the potential for spurious AMSAC actuations resulting from credible failures during normal plant maintenance or surveillance operations, for example, an inverter failure while a redundant channel is being maintained or tested.

Question 2

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 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.

Response 2

The AMSAC system in both units will be powered from the chem lab and counting room inverter. This inverter can be powered from non reactor protection system power supplies in either Unit 1 or 2. It has its own set of batteries for continued operation in the event of loss of input AC power.

Question 3

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.

Response 3

The AMSAC system interfaces with the reactor protection system through qualified isolation amplifiers on the input side and through IEEE-279-1974 qualified isolation relays on the output side. The design of the isolation amplifiers on the input side ensures that any credible electrical fault generated within the AMSAC system will not unacceptably affect any equipment upstream of the isolation amplifiers. The output relays from the AMSAC system isolate the AMSAC system from the output relays of the solid-state protection system.

Question 4

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."

Response 4

The AMSAC equipment from Westinghouse is being furnished in accordance with Westinghouse's quality assurance program described in WCAP-8370, Revision 10,

dated August 1984. All other equipment is being procured from suppliers listed on the PG&E qualified suppliers list, which have been determined to have quality assurance programs that meet the requirement of 10 CFR 50 Appendix B. These requirements envelope the requirements of NRC Generic Letter 85-06, "Quality Assurance Guidance for ATWS Equipment That Is Not Safety Related."

Generic Letter 85-06 states that observed industry practices are acceptable for non-safety-related ATWS equipment. Accordingly, the non-safety-related ATWS equipment for DCPP will be operated and maintained with a QA program that is consistent with current plant practices for non-safety-related equipment. These practices are sufficient to assure that the original design intent of AMSAC will be preserved. Similarly, safety-related portions of the ATWS equipment will be operated and maintained with a QA program that is consistent with current plant practices for safety-related equipment.

Question 5

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.

Response 5

The Westinghouse AMSAC system is equipped with a test/maintenance processor which provides a means for performing maintenance with the reactor at power.

This system has been described to the NRC in Westinghouse's WCAP-10858-A. Maintenance will be performed in accordance with Diablo Canyon Power Plant maintenance procedures. Maintenance will be performed with the AMSAC system in the bypass mode, in which the logic output block switch is put into the block position. With the output blocked, it will be possible to test, repair, and calibrate the system without affecting plant operation.

There are no new controls installed in the control room for the DCPP AMSAC system. There is an AMSAC annunciator window indicating trouble, bypass for maintenance or actuation, and a C-20 permissive status light to indicate that the AMSAC control interlock has been activated above 40 percent turbine power. The output for the AFW pump start is wired in parallel with the main control board start switches.

To incorporate good human factors engineering practice, the AMSAC status window is normally dark. The window is lighted to continuously indicate the occurrence of any of its activating conditions. The C-20 permissive status light is lit to indicate that turbine power is above 40 percent in order to be consistent with the DCPP permissive indication philosophy. Permissive indication windows are in a dedicated area of the main control board and are a distinctive color (amber).

Question 6

Operating bypasses

The plant specific submittal should state that operating bypasses are continuously indicated in the control room; provide the basis for the 70% 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).

Response 6

The C-20 permissive signal is the only AMSAC operating bypass and is continuously indicated in the control room when plant power is above the C-20 operating bypass level.

The following provides the basis for the C-20 operating bypass level. The generic ATWS analysis for Westinghouse-designed plants was provided in NS-TMA-2182, "Anticipated Transients Without Scram for Westinghouse Plants," dated December 1979, and Westinghouse Owners Group (WOG) letter OG-87-10, dated February 26, 1987. These results show that AMSAC is required to actuate

only for a complete loss of normal feedwater or a loss of load resulting in a loss of the main feedwater pumps. This was necessary to limit the RCS pressure to less than the ASME Boiler and Pressure Vessel Service Level C stress limits. For all other ATWS events, no automatic mitigation was necessary. The peak reactor coolant system (RCS) pressures predicted are 2848 psia and 2974 psia for the complete loss of normal feedwater and the loss of load reference cases, respectively. Also, a small amount of voiding of the RCS was predicted to occur prior to effective heat removal being restored. These reference cases assumed a 3423 MWt four-loop plant with a Model 51 steam generator and a moderator temperature coefficient valid for 95 percent of core life. Sensitivity studies (Westinghouse letter NS-TMA-2182, T. M. Anderson to S. H. Hanauer of the NRC, December 1979) have shown that this plant configuration yields the highest pressures during the unlikely occurrence of an ATWS.

As part of the WOG Generic AMSAC design program, WCAP-10858P-A, conservative analyses were performed consistent with those documented in Westinghouse letter NS-TMA-2182, to demonstrate that AMSAC is not required to be actuated for an ATWS occurring at or below 70 percent of rated thermal power. The analysis was performed at 70 percent power and assumed that no reactor trip, turbine trip, or auxiliary feedwater flow actuation occurred.

Figure 2 shows that the peak pressurizer pressure on loss of feedwater at 70 percent without AMSAC is 2715 psia (with 2822 psia peak RCS pressure), which was less than the ASME Service Level C stress limit, 3200 psig. Thus, AMSAC is not required to actuate at or below 70 percent power to limit peak pressure in the unlikely event of a loss of normal feedwater ATWS event. However, in order to limit the amount of RCS voiding to that predicted, the C-20 power level will be reduced to 40 percent power. This is discussed in WCAP 10858P-A, Addendum 1, dated February 1987.

Similar results were obtained for the loss of load ATWS. That is, the peak pressurizer pressure for a loss of load ATWS occurring at or below 70 percent of rated thermal power without AMSAC is 2694 psia (with a 2785 psia peak RCS pressure), which was less than the ASME Service Level C stress limit. The

analysis was also performed at 70 percent rated thermal power and assumed no reactor trip or auxiliary feedwater flow.

These analyses are applicable to all the Westinghouse-designed plants.

The Westinghouse generic AMSAC system and the DCPP-specific interface were designed with the applicable human factors considerations described in NUREG-0700 taken into account. Also considered was the DCPP philosophy concerning indication of operating permissives. Specifically, the C-20 interlock indication is continuously illuminated when turbine power is above the C-20 interlock operating bypass level. Permissive indication windows are in a dedicated area of the main control board and are a distinctive color (amber).

Diversity and independence for the C-20 interlock are provided as described in the response to Question 1. All setpoints, time delays, logic functions, etc. associated with the C-20 interlock are generated from within AMSAC based on the inputs from the sensors. The C-20 interlock is derived from existing sensors, sensing lines, and instrument power supplies from each of the two available protection channels in the process protection system. All AMSAC inputs are isolated by qualified isolation amplifiers as described in the response to Question 1.

Question 7

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.

Response 7

The maintenance bypassing of the AMSAC system is controlled by a permanently installed key interlock and a plant maintenance procedure. Maintenance bypass will not involve lifting leads, pulling fuses, tripping breakers, or physically blocking relays.

Question 8

Manual initiation

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

Response 8

Guidance for the initiation of a manual turbine trip and actuation of the auxiliary feedwater system is outlined in DCPP Emergency Procedure FR-S.1, "Response to Nuclear Power Generation/ATWS." The manual turbine trip control is located in the main control board. Start controls for the auxiliary feedwater pumps are also located in the main control room. The valving in the auxiliary feedwater system is such that starting the pumps automatically delivers auxiliary feedwater to the steam generators.

Question 9

Electrical independence from existing reactor protection system

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 non-safety-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 demonstrates 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.

Response 9

The electrical power for the AMSAC system is from a different power source than for the reactor protection system. The inputs are isolated from the reactor protection system by qualified isolation amplifiers, as discussed in the response to Question 1. The outputs are isolated from the reactor protection system by output relays as discussed in the response to

Question 1. This design provides complete electrical independence of the AMSAC system from the reactor protection system. For additional information on the DCPP AMSAC isolation devices, refer to Appendix A.

Question 10

Physical separation from existing reactor protection system

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.

Response 10

The existing solid-state protection system is located on the 140 foot elevation of the auxiliary building to the north and south of the main control room. The AMSAC system is located on the 128 foot elevation of the auxiliary building just below the main control room. All wiring from the control and protection racks to the AMSAC system is separated from the wiring between the control and protection racks and the solid-state protection system. The AMSAC equipment cabinets are located such that there is no physical interaction with the protection racks. The AMSAC equipment cabinets are located adjacent to the control racks on the 128 foot elevation, and are seismically qualified not to be a source of seismic interaction under the existing Diablo Canyon seismically-induced systems interaction program.

Question 11

Environmental qualification

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

Response 11

All AMSAC equipment is located in the cable spreading room of the auxiliary building. This area is classified as a mild environment and will not be exposed to environmental conditions more severe than those occurring during normal plant conditions. The Westinghouse electronics are designed to operate in an environment with temperatures from 5 to 50 degrees centigrade and 0 to 95 percent humidity (non-condensing). They are qualified for the normal plant environmental condition, which is enveloped by the above design conditions.

Question 12

> Testability at power
>
> Measures are to be established to test, as appropriate, non safety 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.

Response 12

AMSAC will be shop tested prior to installation and will be subjected to a postinstallation startup test prior to operation. AMSAC will also be tested periodically during the life of the plant. AMSAC is designed to be tested at power in bypass mode. AMSAC output devices are tested in the normal mode. Testing of the outputs through final actuation devices will be done only during plant shutdowns to prevent spurious actuations. PG&E is currently writing both startup and periodic test procedures. The procedures will include the above requirements and will conform to the standard plant test procedure format to ensure complete testing of the AMSAC circuitry.

When AMSAC is being tested during plant operations, the system will be in the bypass mode and annunciated in the control room, as discussed in the response to Question 5. Indication of an AMSAC bypass is provided on the control room

annunciator, as discussed in the response to Question 5. The human factors aspects of bypass indication are also discussed in the response to Question 5. The Westinghouse AMSAC electronics are designed to be testable at power with AMSAC in bypass mode. As stated above, a plant test procedure will be prepared before the system is placed into operation.

Question 13

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 actions.

Response 13

Once actuated, AMSAC initiates the same turbine trip and AFW initiation signals as the SSPS (refer to Figure 1). This assures that actuation of the turbine trip and AFW circuitry is consistent with the existing plant design and that the protection system will operate to conclusion. Once the AFW flow has been initiated and the turbine tripped, deliberate operator action is required to override the actuation signals and return the plant to operation.

Question 14

Technical specifications

Technical specification requirements related to AMSAC will have to be addressed by plant specific submittals.

Response 14

Technical Specification requirements for AMSAC are unnecessary, as they would not enhance overall plant safety beyond that afforded by planned administrative controls. In addition, AMSAC should not be included in the Technical Specifications because the system does not meet the Atomic

Industrial Forum (AIF) or NRC Staff criteria for inclusion in the Technical Specifications. The surveillance interval and actions required by an AMSAC failure will be administratively controlled by means of plant procedures. This position is consistent with the WOG position on this issue, as discussed in OG-171, "WOG Comments on Proposed AMSAC Technical Specification," dated February 10, 1986, and OG-87-10, Addendum 1 to WCAP-10858-P-A and WCAP-11293-A, "AMSAC Generic Design Package," dated February 26, 1987.

FIGURE 1

AMSAC System
Diablo Canyon Power Plant

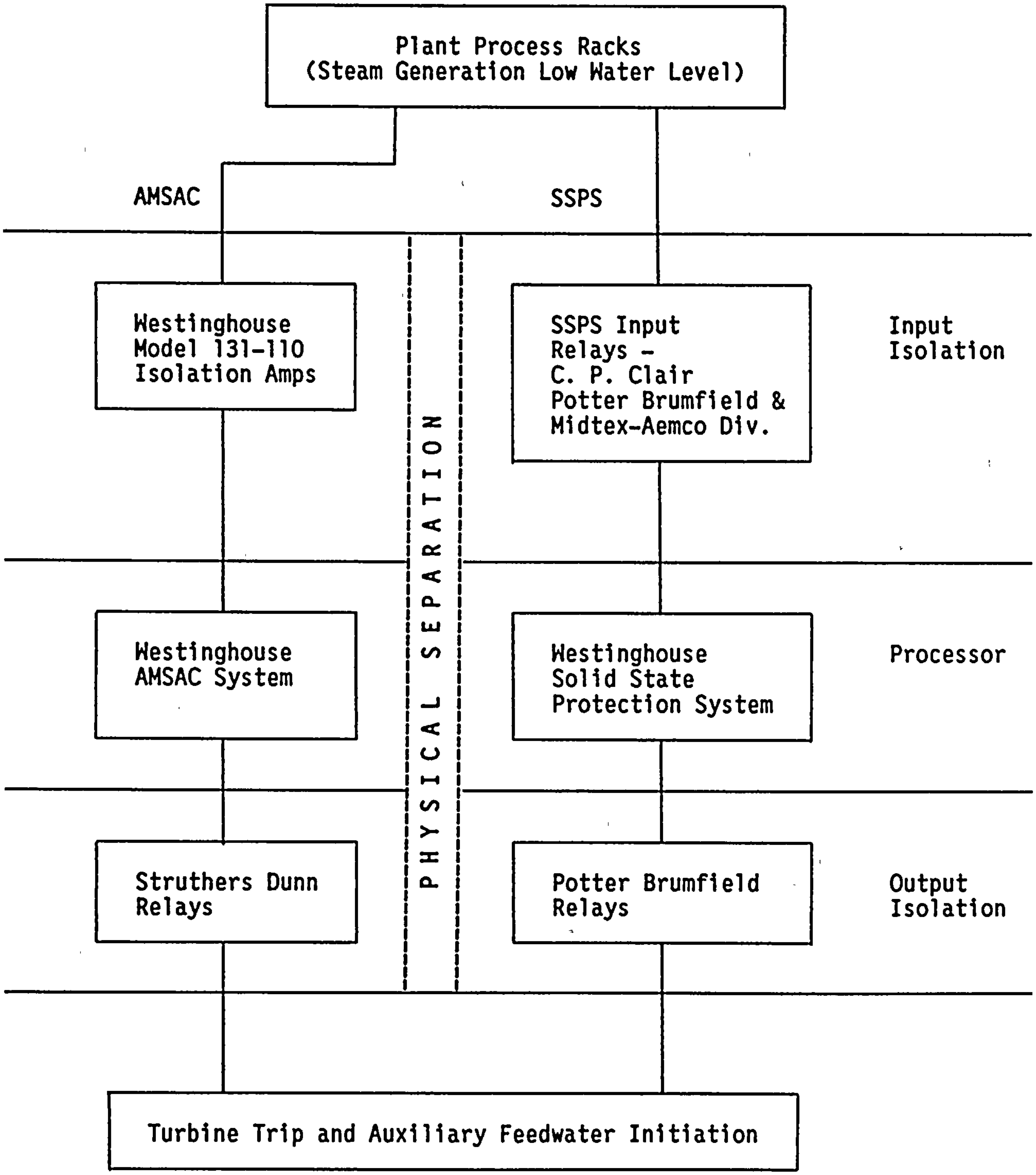

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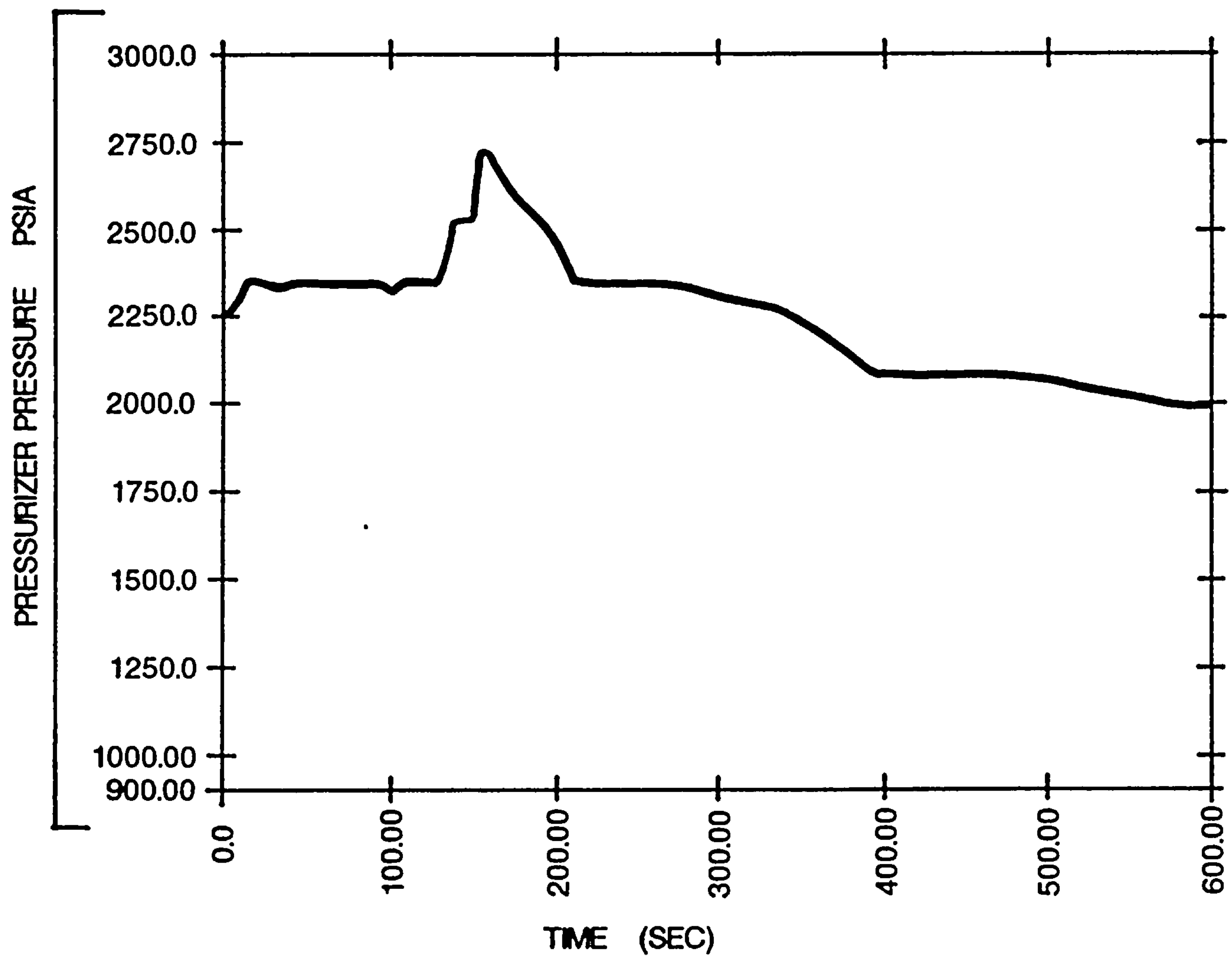
FIGURE 2

Loss of Normal Feedwater ATWS at 70 Percent Power
Without AMSAC - Pressurizer Pressure vs Time



APPENDIX A

ADDITIONAL INFORMATION ON DCPP AMSAC ISOLATION DEVICES

The NRC Staff, in Appendix A of the Staff's acceptance of Westinghouse's Topical Report WCAP-10858, requested additional information on the isolation devices being utilized in the AMSAC. Provided below is PG&E's response to those questions for DCPP.

Question a.

> For the type of device used to accomplish electrical isolation, describe the specific testing performed to demonstrate that the device is acceptable for its application(s). This description should include elementary diagrams when necessary to indicate the test configuration and how the maximum credible faults were applied to the devices.

Response a.

A detailed description of the testing performed on the Westinghouse Model 131-110 isolation amplifier is provided in WCAP-7509-L.

Westinghouse is currently testing the Struthers-Dunn output relays. Upon completion of this testing, a WCAP that describes the testing performed will be provided by Westinghouse.

Question b.

> Data to verify that the maximum credible faults applied during the test were the maximum voltage/current to which the device could be exposed, and define how the maximum voltage/current was determined.

Response b.

The Westinghouse Model 131-110 isolation amplifiers were generically tested by Westinghouse Electric Corporation as described in WCAP-7509-L. These isolators are the same devices as those used to provide isolation of Class 1E circuits from non-Class 1E circuits throughout the analog reactor protection

system at DCPP. As stated in the DCPP Final Safety Analysis Report (FSAR), the maximum credible faulted voltage to which the Westinghouse isolation amplifiers can be subjected is 120 Vac or 140 Vdc. The output impedance of the isolation amplifiers inherently limits the maximum fault current to much less than credible values. Accordingly, the isolation amplifier fault current was not monitored.

The fault tests to which the Struthers-Dunn output relays were subjected will be described in Westinghouse's WCAP, referenced in Response a. above.

Question c.

> Data to verify that the maximum credible fault was applied to the output of the device in the transverse mode (between signal and return) and other faults were considered (i.e., open and short circuits)

Response c.

As described in WCAP-7509-L, The Westinghouse Model 131-110 signal isolators were subjected to maximum credible fault voltage testing in both the common and transverse modes at the device output. Open and shorted output circuit conditions were also tested.

Question d.

> Define the pass/fail acceptance criteria for each type of device.

Response d.

The acceptance criteria for the Westinghouse Model 131-110 signal isolators, defined in WCAP-7509-L, are no more than 20 mV deviation at the device input for any of the tested fault configurations.

Question e.

> Provide a commitment that the isolation devices comply with the environment qualifications (10 CFR 50.49) and with the seismic qualifications which were the basis for plant licensing.

Response e.

The isolation devices comply with the environmental qualifications (10 CFR 50.49) and seismic qualifications which were the basis for plant licensing to the same extent as the Westinghouse 7100 (Hagan) equipment which is used for all safety-related process protection instrumentation. These isolation devices are located in the cable spreading room of the auxiliary building. This area is classified as a mild environment and would not be exposed to environmental conditions more severe than those occurring during normal plant conditions.

The Westinghouse Model 131-110 isolation amplifiers and the Struthers-Dunn output relays, which were supplied by Westinghouse, have been seismically qualified by Westinghouse to a seismic response spectrum that envelops the design requirements for the 128 foot elevation of the auxiliary building.

Question f.

> Provide a description of the measures taken to protect the safety systems from electrical interference (i.e., Electrostatic Coupling, EMI, Common Mode and Crosstalk) that may be generated by the ATWS circuits.

Response f.

The safety systems are protected from electrical interference that may be generated by the ATWS circuits by the isolation amplifier and by wiring techniques such as shielded cables, rigid steel conduit, etc., that will effectively shunt the EMI and RFI to ground. Since the safety systems are current-loop based, they are also inherently resistant to common mode effects such as EMI, RFI, and crosstalk.

Question g.

Provide information to verify that the Class 1E isolator is powered from a Class 1E source.

Response g.

The Westinghouse Model 131-110 isolators are powered from the nuclear instrument system inverters which are used to power the Diablo Canyon protection racks. These inverters are the Class 1E source used to power the reactor protection system.