



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

WISCONSIN ELECTRIC POWER COMPANY
POINT BEACH NUCLEAR PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-266 AND 50-301

COMPLIANCE WITH ATWS RULE 10 CFR 50.62

1.0 INTRODUCTION

On July 26, 1984, Title 10 of the Code of Federal Regulations (CFR) was amended to include Section 10 CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants" (known as the ATWS Rule). The requirements of Section 10 CFR 50.62 apply to all commercial light-water-cooled nuclear power plants.

An ATWS is an anticipated operational occurrence (such as loss of feedwater, loss of condenser vacuum, or loss of offsite power) that is accompanied by a failure of the Reactor Trip System (RTS) to shut down the reactor. The ATWS Rule requires specific improvements in the design and operation of commercial nuclear power facilities to reduce the probability of failure to shut down the reactor following anticipated transients and to mitigate the consequences of an ATWS event.

Paragraph (c)(1) of 10 CFR 50.62 specifies the basic ATWS mitigation system requirements for Westinghouse plants. Equipment, diverse from the RTS, is required to initiate the auxiliary feedwater (AFW) system and a turbine trip for ATWS events. In response to paragraph (c)(1), the Westinghouse Owners Group (WOG) developed a set of conceptual ATWS mitigating system actuation circuitry (AMSAC) designs generic to Westinghouse plants. WOG issued Westinghouse Topical Report WCAP-10858, "AMSAC Generic Design Package," which provided information on the various Westinghouse designs.

The staff reviewed WCAP-10858 and issued a safety evaluation of the subject topical report on July 7, 1986 (Ref. 1). In this safety evaluation, the staff concluded that the generic designs presented in WCAP-10858 adequately meet the requirements of 10 CFR 50.62. The approved version of the WCAP is labeled WCAP-10858-P-A.

During the course of the staff's review of the proposed AMSAC design, the WOG issued Addendum 1 to WCAP-10858-P-A by letter dated February 26, 1987 (Ref. 2). This Addendum changed the setpoint of the C-20 AMSAC permissive signal from 70% reactor power to 40% power. On August 3, 1987, the WOG issued Revision 1 to WCAP-10858-P-A (Ref. 3), which incorporated Addendum 1 changes and provided

details on the variable timer and the C-20 time delay. For those plants selecting either the feedwater flow or the feedwater pump/valve status logic option, a variable delay timer is to be incorporated into the AMSAC actuation logics. The variable time delay will be inverse to reactor power and will approximate the time that the steam generator takes to boil down to the low-low level setpoint upon a loss of main feedwater (MFW) from any given reactor power level between 40% and 100% power. The time delay on the C-20 permissive signal for all logics will be lengthened to incorporate the maximum time that the steam generator takes to boil down to the low-low level setpoint upon a loss of MFW with the reactor operating at 40% power. The staff considers the Revision 1 changes to be acceptable.

Paragraph (c)(6) of the ATWS Rule requires that detailed information to demonstrate compliance with the requirements be submitted to the Director, Office of Nuclear Reactor Regulation (NRR). In accordance with paragraph (c)(6) of the ATWS Rule, Wisconsin Electric Power Company provided information by letter dated April 23, 1987 (Ref. 4). The letter forwarded the detailed design description of the ATWS mitigating system actuation circuitry proposed for installation at the Point Beach Nuclear Plant, Units 1 and 2.

The staff held conference calls with the licensee on November 18, 1987 and February 25, 1988 to discuss their AMSAC design. As a result of the conference calls, the licensee responded to the staff concerns by letters dated December 30, 1987 (Ref. 5) and March 3, 1988 (Ref. 6).

2.0. REVIEW CRITERIA

The systems and equipment required by 10 CFR 50.62 do not have to meet all of the stringent requirements normally applied to safety-related equipment. However, the equipment required by the ATWS Rule should be of sufficient quality and reliability to perform its intended function while minimizing the potential for transients that may challenge the safety systems, e.g., inadvertent scrams.

The following review criteria were used to evaluate the licensee's submittals:

1. The ATWS Rule, 10 CFR 50.62.
2. "Considerations Regarding Systems and Equipment Criteria," published in the Federal Register, Volume 49, No. 124, dated June 26, 1984.
3. Generic Letter 85-06, "Quality Assurance Guidance for ATWS Equipment That Is Not Safety Related."
4. Safety Evaluation of WCAP-10858 (Ref. 1).
5. WCAP-10858-P-A, Revision 1 (Ref. 3).

3.0 DISCUSSION AND EVALUATION

To determine that conditions indicative of an ATWS event are present, the licensee has elected to implement the generic WCAP-10858-P-A AMSAC design associated with monitoring the main feedwater (MFW) pumps and the MFW valves for operational status. The AMSAC will be initiated if the MFW pumps are stopped or the MFW valves are closed. As stated in the introduction, WCAP-10858-P-A, Revision 1, calls for a variable timer to be incorporated into the AMSAC actuation circuit. The licensee has elected not to incorporate this function, but has chosen to retain the 30-second fixed time delay. The consequence of the fixed time delay is that at lower power levels AMSAC may cause a turbine trip and subsequent reactor trip prior to an RPS initiated reactor scram at the low-low steam generator level setpoint. The licensee has confirmed that the original plant design basis provides for turbine trip occurring prior to an RPS initiated reactor trip (i.e., actuation of an AMSAC-caused turbine trip will appear no different than any other turbine trip). Also, this event has been analyzed as a loss of electrical load in FSAR Section 14.1.9.

Many details and interfaces associated with the implementation of the final AMSAC design are of a plant-specific nature. In its safety evaluation of WCAP-10858, the staff identified 14 key elements that require resolution for each plant design. The following paragraphs provide a discussion on the licensee's compliance with respect to 13 of the plant-specific elements. The 14th key element, Technical Specifications, will be the subject of future generic action.

1. Diversity

The plant design should include adequate diversity between the AMSAC equipment and the existing Reactor Protection System (RPS) equipment. Reasonable equipment diversity, to the extent practicable, is required to minimize the potential for common-cause failures.

The licensee has committed to implement C-20 instrumentation and AMSAC logic hardware which will be diverse from that used in the reactor trip system. AMSAC will use latching relays and time delay relays that are not used in the RPS. The output isolation relays will also be diverse from the relays used in the RPS. The staff finds the licensee's commitment acceptable subject to the satisfactory implementation of diverse AMSAC logic equipment consistent with the ATWS Rule (10 CFR 50.62).

2. Logic Power Supplies

Logic power supplies need not be Class 1E, but must be capable of performing the required design functions upon a loss of offsite power. The logic power must come from a power source that is independent from the RPS power supplies.

The licensee has provided information verifying that the logic power supplies used for AMSAC are independent and diverse from the RPS power supplies and will function during the loss of offsite power.

3. Safety-Related Interface

The implementation of the ATWS Rule shall be such that the existing Reactor Protection System (RPS) continues to meet all applicable safety criteria.

The proposed Point Beach AMSAC design does not interface with the RPS. Redundant contacts on the pump motor breakers and the MFW valves will be dedicated to the AMSAC. The only safety-related interface will be between the AMSAC and the AFW circuits. The existing Point Beach safety-related criteria, as applicable to the RPS, will continue to be met. Therefore, subsequent to the implementation of AMSAC, the RPS will perform its required safety function without interference from AMSAC. Refer to Item 9 for further discussion on this issue.

4. Quality Assurance

The licensee is required to provide information regarding compliance with Generic Letter (GL) 85-06, "Quality Assurance for ATWS Equipment That Is Not Safety Related."

The criteria of the NRC quality assurance guidance (GL-85-06) were reviewed by the licensee. The licensee stated that the quality assurance practices at the Point Beach plant, as applicable to the nonsafety-related AMSAC equipment, comply with the guidance of GL-85-06.

5. Maintenance Bypasses

Information showing how maintenance at power is accomplished should be provided. In addition, maintenance bypass indications should be incorporated into the continuous indication of bypass status in the control room.

The licensee has stated that, during maintenance or surveillance of the AMSAC system or sensor inputs, the AMSAC output signals will be bypassed using a permanently-installed bypass switch located at the AMSAC control panel. Continuous indication of the AMSAC bypass will be provided by the AMSAC trouble status alarm window which will be located on the main control board.

6. Operating Bypasses

The operating bypasses should be indicated continuously in the control room. Diversity and independence of the C-20 permissive signal should be provided.

The licensee has stated that the C-20 permissive signal will be derived from the turbine first stage impulse pressure. The signal will be provided by a pressure transmitter dedicated to the AMSAC and will be diverse from transmitters used in the RPS. The C-20 signal will disable the AMSAC below 40% reactor power. Above 40% power, the AMSAC will be armed automatically. On decreasing power, the arming signal will be retained for a nominal 60 seconds after power decrease below the 40% power setpoint. The C-20 time delay is consistent with the AMSAC actuation fixed time delay of 30 seconds. The status of the C-20 permissive signal will be continuously indicated in the control room via an annunciator window.

7. Means for Bypasses

The means for bypassing shall be accomplished by the use of a permanently installed, human-factored, bypass switch or similar device. Disallowed methods for bypassing mentioned in the guidance should not be utilized.

The licensee provided information stating that bypassing AMSAC during testing and maintenance will be accomplished with a permanently-installed bypass switch. The disallowed methods for bypassing, such as lifting leads, pulling fuses, blocking relays, or tripping breakers, will not be used.

The licensee has committed to conduct a human-factors review of the bypass controls/indicators consistent with the plant's detailed control room design process.

8. Manual Initiation

Manual initiation capability of the AMSAC function must be provided.

The licensee discussed how manual turbine trip and auxiliary feedwater actuation are accomplished by the operator. The licensee stated that existing manual controls for turbine trip and AFW actuation are located in the main control room and will be used by the operator to manually perform the AMSAC function if necessary. Thus, no additional manual initiation capability is required as a result of installing the AMSAC equipment.

9. Electrical Independence From Existing Reactor Protection System

Independence 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.

The licensee stated that the inputs to AMSAC will be separate from and independent of the RPS. The only safety-related interface associated with the AMSAC will be between the AMSAC and the AFW system. The licensee has informed the staff that the required isolation will be achieved using electrical isolation devices that have been qualified and tested to

Class 1E electrical equipment requirements. In addition, the isolators will be tested as described in Appendix A to the safety evaluation (Ref. 1). The information required by Appendix A is to be compiled by the licensee. This information should be available for staff review during a subsequent site audit to be performed by the NRC in accordance with Temporary Instruction 500/20 (Ref. 7).

10. Physical Separation From Existing Reactor Protection System

The implementation of the ATWS mitigating system must be such that the separation criteria applied to the existing RPS are not violated.

The licensee stated that the AMSAC circuitry will be physically separated from the RPS circuitry. ATWS equipment cabinets will be installed so that there will be no interaction with the protection system cabinets. The existing separation criteria for the RPS will not be compromised as a result of the installation of AMSAC circuitry.

11. Environmental Qualification

The plant-specific submittal should address the environmental qualification of ATWS equipment for anticipated operational occurrences.

The licensee stated that AMSAC mitigation equipment will be environmentally qualified, where required, in accordance with the administrative procedures established at Wisconsin Electric to ensure compliance with the 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants." Other proposed AMSAC equipment does not require explicit environmental qualification since it is either located in a mild environment or is not required to operate during or following exposure to potentially harsh environments resulting from design basis accidents. The AMSAC circuitry will be qualified for all anticipated operational occurrences expected to occur prior to or during an ATWS event.

12. Testability at Power

Measures to test the ATWS mitigating system before installation, as well as periodically, are to be established. Testing of the system may be performed with the system in the bypass mode. The end-to-end testing, i.e., from sensor through final actuation device, should be performed with the plant shutdown.

The licensee stated that a complete end-to-end test of the AMSAC system, including the AMSAC outputs through the final actuation devices, will be performed during each refueling outage. With the plant at power, the system can be tested with the AMSAC outputs bypassed. Testing of the portions of AMSAC that can be tested at power, such as the bistables, time delays, and logic relays, will be performed semiannually. The output latching relays and the switch contacts on the valve stems and circuit breakers do not lend themselves to testing except during plant outages.

The licensee has committed to conduct a human-factors review of the controls and indications used for testing purposes consistent with the plant's detailed control room design process.

13. Completion of Mitigative Action

The licensee is required to verify that (1) the protective action, once initiated, goes to completion; and (2) the subsequent return to operation requires deliberate operator action.

The licensee responded that the system design will be such that AMSAC is consistent with the existing circuitry of the auxiliary feedwater and turbine trip control systems and with the blowdown isolation valve trip system. Once initiated, the design (i.e., latching relays, etc.) will ensure that the protective action goes to completion. Deliberate manual action on the part of the operator will be required to reset the turbine trip circuitry and to restore the AFW pumps to standby status.

4.0 CONCLUSION

The staff concludes, based on the above discussion and pending final resolution of the Technical Specification issue, that the AMSAC design proposed by Wisconsin Electric Power Company for the Point Beach Nuclear Plant, Units 1 and 2, is acceptable and is in compliance with the ATWS Rule, 10 CFR 50.62, paragraph (c)(1). The staff's conclusion is further subject to the successful completion of certain noted human factors engineering reviews and satisfactory completion of isolation device qualification testing to which the licensee has committed. It is the staff's position that the AMSAC should not be declared operational prior to successful qualification of the required electrical isolation devices. Until staff review is completed regarding the use of Technical Specifications for ATWS requirements, the licensee should continue with the scheduled installation and implementation (planned operation) of the ATWS design utilizing administratively-controlled procedures.

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REFERENCES

1. Letter, C. E. Rossi (NRC) to L. D. Butterfield (WOG), "Acceptance for Referencing of Licensing Topical Report," July 7, 1986.
2. Letter, R. A. Newton (WOG) to J. Lyons (NRC), "Westinghouse Owners Group Addendum 1 to WCAP-10858-P-A and WCAP-11233-A: AMSAC Generic Design Package," February 26, 1987.
3. Letter, R. A. Newton (WOG) to J. Lyons (NRC), "Westinghouse Owners Group Transmittal of Topical Report, WCAP-10858-P-A, Revision 1, AMSAC Generic Design Package," August 3, 1987.
4. Letter, C. W. Fay (WEPCo) to U.S. NRC, "ATWS Mitigating System Actuation Circuitry (AMSAC) Final Design and Implementation Schedules," April 23, 1987.
5. Letter, C. W. Fay (WEPCo) to U.S. NRC, "Additional Information ATWS Mitigating System Actuation Circuits (AMSAC)," December 30, 1987.
6. Letter, C. W. Fay (WEPCo) to U.S. NRC, "ATWS Mitigating Systems Actuation Circuits (AMSAC)," March 2, 1988.
7. Temporary Instruction 2500/20, "Inspection to Determine Compliance with ATWS Rule, 10 CFR 50.62," February 9, 1987.

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