#### ENCLOSURE 1

# SAFETY EVALUATION REPORT INDIAN POINT 3 NUCLEAR POWER PLANT COMPLIANCE WITH ATWS RULE 10 CFR 50.62 DOCKET NO: 50-286

#### **1.0 INTRODUCTION**

On July 26, 1984, 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 changes associated with a new 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, New York Power Authority (NYPA) provided information by letter dated December 1, 1986 (Ref. 4). The letter forwarded preliminary information on the detailed design of the ATWS Mitigating System Actuation Circuitry (AMSAC) proposed for installation at the Indian Point 3 Nuclear Power Plant.

The staff held several conference calls with the licensee to discuss the AMSAC design and the information contained in Addendum 1 to the WCAP. The last of these calls was held on August 8, 1988. As a result of the conference calls, the licensee responded with additional information on July 6, 1988 (Ref. 5) and September 26, 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.
- "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 WCAP-10858-P-A AMSAC design associated with monitoring the main feedwater (MFW) flow and activating the AMSAC when the MFW flow is below the low-flow setpoint. Also, the licensee will implement the new time delays (described in the introduction timer consistent with the requirements of Revision 1 to the WCAP.

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 each of the plant-specific elements.

# 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 will use diverse MFW flow-sensing instrumentation as input to AMSAC. The licensee has verified that the AMSAC logic system will be diverse from equipment used in the RPS in the areas of design, equipment, and manufacturing. The AMSAC output signals will interface with the existing auxiliary feedwater (AFW) pump and turbine trip circuitry and with the circuits of the steam generator blowdown and sample isolation valves. These interfaces will use an output relay that will be diverse (different make and manufacturer) from the relays used in the RPS.

### 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 power supplies selected for the AMSAC logic circuits will be independent from the RPS power supplies and capable of operation upon a loss of offsite power.

# 3. <u>Safety-Related Interface</u>

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

The proposed AMSAC design interfaces at its input with the existing Class 1E circuits of the turbine first-stage impulse pressure channels within the RPS. At its output, the AMSAC will interface with the Class 1E circuits of the AFW pumps, the turbine trip system, and the steam generator blowdown and sample isolation valves. These connections will be made downstream of approved Class 1E isolation devices. The licensee has informed the staff that the existing safety-related criteria that are in effect at the plant will continue to be met (i.e., the RPS will continue to perform its safety functions without interference from AMSAC). Refer to Item 9 for further discussion.

#### 4. Quality Assurance

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

The licensee stated that the AMSAC equipment will be treated under a quality assurance (QA) program that is consistent with and satisfies the guidance contained in Generic Letter 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 on the AMSAC cabinet test panel. Continuous indication of the AMSAC bypass will be displayed by an AMSAC trouble alarm window that will be located in the main control room. It is the staff's understanding that the licensee will conduct a human-factors review of the subject indication consistent with the plant's control room design process.

#### 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 provided information stating that the AMSAC logic will be armed automatically above 40% reactor power (the C-20 setpoint), as indicated by the turbine first-stage impulse chamber pressure signals. The C-20 signal will block the AMSAC below 40% reactor power to allow plant startups and prevent spurious AMSAC actuations. The AMSAC blocked condition will be continuously indicated by a control room annunciator. The C-20 permissive signal will be derived from existing protection system instrumentation and will be processed by the AMSAC logic circuitry which will be diverse from the RPS logic circuitry. The time delay on de-energization (TDOD) timer associated with the C-20 permissive signal will be set for a time period which will be longer than the actuation variable timer consistent with the requirements of Revision 1 to WCAP-10858-P-A. The C-20 timer will be activated upon a decrease in reactor power below 40%. It is the staff's understanding that the licensee will conduct a human-factors review of the bypass indication consistent with the plant's detailed control room design process.

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#### 7. Means for Bypasses

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

The licensee stated that bypassing AMSAC during testing and maintenance will be accomplished by using 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. It is the staff's understanding that the licensee will conduct a human-factors review of the AMSAC maintenance and test bypass controls and indications consistent with the plant's detailed control room design process.

# 8. Manual Initiation

Manual initiation capability of the AMSAC mitigation function must be provided.

The licensee discussed how manual turbine trip and auxiliary feedwater actuation are accomplished by the operator. The licensee stated that the existing manual controls for turbine trip and AFW actuation are located in the main control room and may 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 discussed how electrical independence is to be achieved. The proposed design requires isolation between AMSAC and the Class 1E circuits associated with the turbine first-stage impulse chamber pressure signals, the AFW pumps, the turbine trip system, and the steam generator blowdown and sample isolation valves. 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 have been tested as described in Appendix A to the safety evaluation (Ref. 1) and are acceptable for use at Indian Point 3 as qualified isolators.

#### 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 logic circuitry will be located in separate cabinets and will be physically separated from the RPS logic cabinets. In addition, the AMSAC cable routing and separation will be maintained consistent with the physical separation criteria originally established at the time of initial plant licensing and as described in the plant's updated final safety analysis report (FSAR), Section 7.2. Thus, the existing separation criteria for the RPS will not be compromised as a result of installing the AMSAC equipment.

# 11. Environmental Qualification

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

The staff was informed that the AMSAC cabinet and equipment will be located in the control room area and other areas within the plant which are considered a mild environment. Based on the information provided, it is the staff's understanding that the equipment will be designed for anticipated operational occurrences that might occur associated with the respective equipment locations.

# 12. Testability at Power

Measures to test the ATWS mitigating system before initial operation, as well as periodically, are to be established. Testing of the system may be performed with the system in the bypass mode. Testing from the input sensor through to the final actuation device should be performed with the plant shut down.

The licensee has provided information to verify that operational testing will be completed prior to placing the AMSAC equipment into initial operation. The AMSAC system will be testable at power in the bypass mode in accordance with plant procedures. Bypassing AMSAC for testing and returning the system to service will be controlled by administrative procedures. The bypassed condition will be continuously indicated in the control room. The licensee has committed to test the AMSAC logic every six months consistent with the manufacturer's recommendations. The end-to-end test (including the AMSAC outputs through to the final actuation devices) will be performed during each refueling outage.

#### 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, once the AMSAC is initiated, the circuits for starting the AFW pump and the turbine trip will go to completion in accordance with the existing plant circuit design. Deliberate manual action on the part of the operator will be required to reset the turbine trip circuits and restore the AFW pumps to standby status.

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#### 14. Technical Specifications

The plant-specific submittal should address technical specification requirements for AMSAC.

The licensee responded stating that no technical specification actions are to be proposed with respect to the AMSAC. The licensee stated that the system does not meet NRC criteria for inclusion in the technical specifications. The surveillance interval and actions required to service the AMSAC will be administratively controlled using station procedures.

The equipment required by the ATWS Rule to reduce the risk associated with an ATWS event must be designed to perform its functions in a reliable manner. A method acceptable to the staff for demonstrating that the equipment satisfies the reliability requirements of the ATWS Rule is to provide limiting conditions for operation and surveillance requirements in the technical specifications.

In its Interim Commission Policy Statement on Technical Specification Improvements for Nuclear Power Plants [52 Federal Register 3788, February 6, 1987], the Commission established a specific set of objective criteria for determining which regulatory requirements and operating restrictions should be included in technical specifications. The staff is presently reviewing ATWS requirements to criteria in this Policy Statement to determine whether and to what extent technical specifications are appropriate. Accordingly, this aspect of the staff review remains open pending completion of, and subject to the results of, the staff's further review. The staff will provide guidance regarding the technical specification requirements for AMSAC at a later date.

# 4.0 CONCLUSION

The staff concludes, based on the above discussion and pending resolution of the technical specification issue, that the AMSAC design proposed by New York Power Authority for the Indian Point 3 Nuclear Power Plant is acceptable and is in compliance with the ATWS Rule, 10 CFR 50.62, paragraph (c)(1). The staff's conclusion is subject to the successful completion of certain noted human-factors engineering reviews. Information to support each plant-specific item discussed in Section 3.0 above should be compiled by the licensee and available for review during a subsequent site audit in accordance with Temporary Instruction 2500/20 (Ref. 7).

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 and provide testing utilizing administratively controlled procedures.

#### 5.0 REFERENCES

- Letter, C. E. Rossi (NRC) to L. D. Butterfield (WOG), "Acceptance for Referencing of Licensing Topical Report," July 7, 1986.
- 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.
- 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.
- Letter, J. C. Brons (NYPA) to Director of Nuclear Reactor Regulation, "Anticipated Transients Without Scram (ATWS) Rule (10 CFR 50.62); ATWS Mitigating Systems Actuation Circuitry (AMSAC) Plant-Specific Design Information, TAC No. 59104," December 1, 1986.
- Letter, J. C. Brons (NYPA) to U.S. NRC, "Anticipated Transients Without Scram (ATWS) Rule (10 CFR 50.62); ATWS Mitigating Systems Actuation Circuitry (AMSAC) Plant-Specific Design Information, TAC No. 59104," July 6, 1988.
- Letter, J. C. Brons (NYPA) to U.S. NRC, "Anticipated Transients Without Scram (ATWS) Rule (10 CFR 50.62); ATWS Mitigating Systems Actuation Circuitry (AMSAC) Plant-Specific Design Information, TAC No. 59104," September 26, 1988.
- 7. Temporary Instruction 2500/20, "Inspection to Determine Compliance With ATWS Rule, 10 CFR 50.62," February 9, 1987.