



U.S. NUCLEAR REGULATORY COMMISSION
STANDARD REVIEW PLAN
OFFICE OF NUCLEAR REACTOR REGULATION

15.8 ANTICIPATED TRANSIENTS WITHOUT SCRAM

REVIEW RESPONSIBILITIES

Primary - Reactor Systems Branch (RSB)

Secondary - None

I. AREAS OF REVIEW

Anticipated transients are transients expected to occur during the life of the plant. Anticipated transients without scram (ATWS) are those low probability events in which an anticipated transient occurs and is not followed by an automatic reactor shutdown (scram) when required. The failure of the reactor to shut down quickly during these transients can lead to unacceptable reactor coolant system pressures and to fuel damage. Typical transients that may have unacceptable consequences in a PWR if there is a scram failure are: loss of feedwater, loss of load, turbine trip, inadvertent control rod withdrawal, loss of ac power, loss of condenser vacuum. For a boiling water reactor (BWR), unacceptable consequences may occur for a closure of main steamline isolation valves with failure to scram. The NRC staff's studies and findings regarding ATWS are presented in References 1 and 2.

The Commission is presently considering rulemaking on the ATWS issue, which would determine what plant modifications are required to mitigate ATWS consequences to acceptable levels. Prior to completion of Commission rulemaking, the following interim requirements are in effect.

The RSB will coordinate the other branch reviews that interface with the overall review. The ICSB reviews the adequacy of the design of the BWR recirculation pump trip as part of its primary review responsibility of SRP Section 7.2. The PTRB reviews the emergency procedures for ATWS as part of its primary responsibility of SRP Section 13.5. The OLB reviews the operator training program for ATWS events as part of its primary review responsibility of SRP Section 13.2.

II. ACCEPTANCE CRITERIA

The following design criteria apply:

Rev. 1 - July 1981

USNRC STANDARD REVIEW PLAN

Standard review plans are prepared for the guidance of the Office of Nuclear Reactor Regulation staff responsible for the review of applications to construct and operate nuclear power plants. These documents are made available to the public as part of the Commission's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Standard review plans are not substitutes for regulatory guides or the Commission's regulations and compliance with them is not required. The standard review plan sections are keyed to the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants. Not all sections of the Standard Format have a corresponding review plan.

Published standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555.

- a. Criterion 10, which requires the reactor protection system to be designed with appropriate margin to assure that acceptable fuel design limits are not exceeded during normal operation including anticipated transients.
- b. Criterion 15, which requires that the reactor protection system be designed with sufficient margin to assure that the design conditions of the reactor coolant pressure boundary are not exceeded during normal operations including anticipated transients.
- c. Criterion 26, which requires two independent reactivity control systems.
- d. Criterion 27, which requires that the reactivity control systems have the combined capability of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods the core can be cooled.
- e. Criterion 29, which requires that the protection and reactivity control systems shall be designed to assure an extremely high probability of accomplishing their safety functions in the event of anticipated operational occurrences.
- f. The BWR recirculation pump trip is acceptable if it meets the criteria provided in Section IV-4 of Volume 2 of NUREG-0460 (Ref. 2).

III. REVIEW PROCEDURES

The reviewer confirms that the reliability and performance of the reactor protection and reactivity control systems during normal operation, including anticipated transients, meets the requirements of the referenced GDC.

The review procedures described below are used during the operating license (OL) review. The review procedure during a construction permit (CP) review is limited to assuring that the applicant commits to meeting the acceptance criteria.

The reviewer verifies that a recirculation pump trip that is initiated by high pressure or low level in the reactor pressure vessel is provided on boiling water reactor.

The reviewer verifies that emergency procedures are provided for a failure to scram after the following transients:

- Loss of feedwater
- Loss of load
- Turbine trip
- Loss of condenser vacuum
- Loss of offsite power
- Closure of main steamline isolation valves
- Inadvertent control rod withdrawal

The reviewer verifies that the emergency operating procedures for an anticipated transient without scram event consider indicators of a failure to scram, including rod position, neutron flux, reactor coolant pressure and level, relief and safety valve position, turbine stop and main steamline isolation valve position, and feedwater and steam flow.

The reviewer verifies that the emergency procedures for ATWS events describe the actions to be taken including manually scrambling the reactor, prompt actuation of the turbine trip (PWRs), the auxiliary feedwater (PWRs), and the reactor core isolation cooling (BWRs), and the high pressure coolant injection/spray (BWRs). These actions should also include the prompt initiation of boration by actuation of the High Pressure Safety Injection (PWR)/Standby Liquid Control (BWR) System if methods to scram the reactor cannot secure a fast reactor scram. Actions should also include prompt initiation of the Residual Heat Removal System in the suppression pool cooling mode and the limiting of actuation of the Automatic Depressurization System and the Low Pressure Injection System (BWR).

The BWR recirculation pump trip is acceptable if the same as the Hatch or Monticello designs.

IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information has been provided and his review supports conclusions of the following type, to be included in the staff's safety evaluation report.

"Anticipated transients without scram (ATWS) are events in which the scram system (the reactor protection and reactivity control systems) is postulated to fail to operate as required following anticipated transients such as a loss of feedwater or a turbine trip. The Commission is currently engaged in a rulemaking to determine what additional modifications, if any, should be required to reduce the probability of unacceptable consequences resulting from ATWS events. It is expected that the necessary plant modifications will be installed within one to four years following a Commission decision on anticipated transients without scram. As a prudent course, to further reduce the risk from anticipated transient without scram events during the interim period before completing the plant modifications that the Commission may find to be necessary, we require that a recirculation pump trip be installed (BWRs) and that an emergency operating procedure for anticipated transient without scram events be developed.

Early operator action as would be specified in the emergency operating procedure and the recirculation pump trip would provide significant protection for those ATWS events that occur (1) as a result of common mode failure of the reactor trip system and some portions of the control rod drive system and (2) at less than full power where the existing Standby Liquid Control System capacity would be sufficient to limit suppression pool temperature rise to an acceptable level (BWR).

Early operator action as would be specified in the emergency operating procedure would provide significant protection for most ATWS events (Westinghouse)/for all but the initial part of a refueling cycle when the moderator temperature coefficient is least negative (B&W and CE).

Our review of the applicant's recirculation pump trip design criteria (BWR) and emergency procedure for anticipated transient without scram

provides a basis for licensing and interim operation of the _____ plant pending the outcome of the Commission rulemaking in ATWS in accordance with General Design Criteria 10, 15, 26, 27, and 29 of Appendix A to 10 CFR Part 50. The Commission will, by rulemaking, determine any future modifications necessary to resolve the Anticipated Transient Without Scram concerns and the required schedule for implementation of such modifications.

REFERENCES

1. Regulatory Staff, "Technical Report on Anticipated Transients Without Scram for Water Cooled Power Reactors," WASH-1270, U.S. Atomic Energy Commission.
2. Office of Nuclear Reactor Regulation, "Anticipated Transients Without Scram for Light Water Reactors," NUREG-0460, Vols. 1-4, U.S. Nuclear Regulatory Commission.

APPENDIX
STANDARD REVIEW PLAN SECTION 15.8
RADIOLOGICAL CONSEQUENCES OF AN ATWS EVENT

REVIEW RESPONSIBILITIES

Primary - Accident Analysis Branch (AAB)

[Appendix to 15.8 has been deleted.]