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ENCLOSURE 1

CRITERIA FOR RECIRCULATION PUMP TRIP (RPT) IN OPERATING BWR'S

A. General Functional Requirement

The RPT system shall automatically initiate the appropriate action whenever the conditions monitored by the system reach a preset level.

B. Independence and Integrity

The RPT system and components shall be independent and separate from components and/or systems that initiate the anticipated transient(s) being analyzed and diverse from the normal scram system (postulated to fail) to minimize the probability of the ATWS disabling the operation of the mitigating system. Diversity can be achieved by incorporating as many of the following methods as is practicable:

- (1) Use of components from different manufacturers.
- (2) Use of electromechanical devices versus electronic devices.
- (3) Use of energized versus deenergized trip status. (For some components, such as relays, this alone may not be acceptable).
- (4) Use of AC versus DC power sources.
- (5) Use of sensors employing different principles for measuring the same parameters.

Tests and/or analyses shall be performed to demonstrate that the function of the RPT system and components will not be disabled as a consequence of the ATWS event being analyzed.

C. RPT System Interaction with Control Systems and Scram Systems

Any control systems or control equipment and components that are used for both normal control functions and as part of the RPT system shall be classified as part of the RPT system and shall meet all the requirements for the RPT system, including independence from the scram system. For shared components, test and/or analyses shall be performed to demonstrate that no credible failures exist in the portions of the control systems which interface with the shared system that could disable the RPT system.

D. Equipment Qualification

The RPT system equipment and components shall be tested to verify that the system will provide, on a continuing basis, its functional capability under conditions relevant to the postulated ATWS, including extremes of conditions (as applicable) relating to environment, which are expected to occur in the lifetime of a plant.

E. Periodic Surveillance and Preventative Maintenance Testing and Calibration

Periodic surveillance and preventative maintenance tests and calibration requirements shall be identified to provide continuing assurance that the RPT system, including sensors and actuated equipment, is capable of functioning as designed and that system accuracy and performance have not deteriorated with time and usage. These requirements shall be particularly directed toward the detection of those failures or degradation of accuracy and performance which would not otherwise be likely to be detected during the course of normal operations. Integrated system testing shall also be performed to verify overall system performance. The frequency of testing and calibration shall be determined and justified in accordance with the availability and reliability requirements of the system.

F. Quality Assurance

A quality assurance program in conformance with the requirements of 10 CFR 50 Appendix B shall be applied to the RPT system design and equipment.

G. Administrative Controls

Administrative controls shall be established to control the access to all set point adjustments, calibration and test points.

H. Information Readout

The RPT system shall be designed to provide the operator with accurate, complete and timely information regarding its status. For those functions, including operations, test or maintenance, and calibration, which require direct operator interaction, human engineering factors such as information displays (e.g., display formats, layout and controls) and functional controls (e.g., methods, location and identification) shall be included in the design.

I. Maintainability

The design shall include measures which enhance maintainability to reduce mean-time-to-repair and to assure the continued availability and reliability of the system for the life of the plant. The system design shall include features which facilitate the recognition, location, replacement, repair and/or adjustment of malfunctioning equipment, and components or modules.

J. Availability and Reliability

Two options are provided. Fulfilling the requirements of either (1) or (2) below will provide the reliability appropriate for the RPT system.

Option 1

The RPT system shall satisfy all requirements for a safety system in the nuclear power plants of IEEE-279, dated 1971 and supplemented by paragraph (A) through (I) above.

Option 2

The RPT system shall satisfy (A) through (I) above and in addition for all initiating events except loss of offsite power shall have a calculated unavailability of approximately 10^{-3} per demand at the 50% confidence level. Reliability calculations similar to the reactor safety study (WASH 1400) shall include consideration of human errors, common-mode failures and test and maintenance outages. Applicable failure rates from the Reactor Safety Study shall be used unless similar analyses are performed using more current data base. For loss-of-offsite-power transients, the unavailability limit is 5×10^{-2} at the 50% confidence level.