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U.S. ATOMIC ENERGY COMMISSION

REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

REGULATORY GUIDE 3.22

PERIODIC TESTING OF FUEL REPROCESSING PLANT PROTECTION SYSTEM ACTUATION FUNCTIONS

A. INTRODUCTION

Section 50.34, "Contents of applications: technical information," of 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires, among other things, that each application for a construction permit or operating license for a fuel reprocessing plant include a discussion of how the applicable requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 will be satisfied. As used in Appendix B, "quality assurance" comprises all those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service. Quality assurance requirement XI, "Test Control," of Appendix B requires a test program that includes operational tests during fuel reprocessing plant operation. Protection systems are designed to initiate action important to safety and are therefore designed to permit periodic in situ testing of their functioning while the plant is in operation to provide adequate confidence that they will perform satisfactorily in service. The ability of the protection system to initiate the operation of safety systems depends on the proper performance of actuation devices and actuated equipment, and it is therefore necessary that these be tested. This regulatory guide describes methods acceptable to the Regulatory staff of including the actuation devices and actuated equipment in the periodic tests of the protection system during plant operation. It does not address the frequency of such testing.

B. DISCUSSION

One function of the protection system is to initiate the operation of systems and components important to safety. The protection system must be designed to permit periodic testing of its functions while the plant is in operation. The Regulatory staff has concluded that the preferable method of implementing this requirement is to design the protection system so that the actuation devices and actuated equipment are periodically tested with the protection system during plant operation.

In the case of some process safety feature systems, testing the operation of the entire group of actuated equipment associated with a protective function may damage plant equipment or disrupt plant operation. In these cases, acceptable methods of including the actuation devices and actuated equipment in periodic tests of the protection system but avoiding the undesirable effects of operation of the actuated equipment are (1) testing the actuation devices and the actuated equipment individually or in judiciously selected groups and (2) preventing the operation of certain actuated equipment during a test of their actuation devices. Examples of tests using these methods are, respectively, (1) testing the actuation device for a standby blower separately from the alternate ventilation valving and (2) positioning the starting switch for an emergency diesel power generator to a test position that prevents diesel startup during a test of its starting device.

Compared to a design that permits testing the operation of all devices associated with each protection system output signal, the methods discussed above can have three disadvantages. First, the ability of a system to respond to a bona fide accident signal may, during the test, be partially or completely bypassed. Second, the systems may not be restored to a respondable state following test. Third, certain actuated equipment may not be tested during plant operation. For these cases, it should be shown that there are valid reasons for not testing the actuated equipment and that the probability

that the protection system will fail to initiate their operation is acceptably low. For these systems, tests should be performed when the affected part of the plant is in a shutdown status.

C. REGULATORY POSITION

1. The protection system should be designed to permit periodic testing to extend to and include the actuation devices and actuated equipment.

2. The periodic tests should duplicate, as closely as practicable, the performance that is required when protection system action is called for.

3. To the maximum extent practical, the protection system and the systems whose operation it initiates should be designed to permit testing during plant operation.

4. Acceptable methods of including the actuation devices and actuated equipment in the periodic tests of the protection system are listed below, the first being the preferable method. It should also be noted that the acceptability of each of these four methods is conditioned by Regulatory Positions 5 and 6 below.

a. Testing simultaneously all actuation devices and actuated equipment associated with each protection system output signal;

b. Testing all actuation devices and actuated equipment individually or in judiciously selected groups;

c. Preventing the operation of certain actuated equipment during a test of their actuation devices; and

d. Providing the actuated equipment with more than one actuation device and testing each actuation device individually.

5. Where the ability of a system to respond to a bona fide accident signal is intentionally bypassed for the purpose of performing a test during plant operation:

a. Positive means should be provided to prevent expansion of the bypass condition to redundant or diverse systems;

b. Each bypass condition should leave intact a system which, with prescribed administrative control, satisfies the safety requirements for the system; and

c. Redundant checks should be provided to verify restoration of service and clearing of bypass at conclusion of test.

6. Where actuated equipment is not tested during plant operation, it should be shown that:

a. The actuated equipment can be routinely tested, preferably with the protection system, when the plant is not in operation;

b. The probability that the protection system will fail to initiate the operation of the actuated equipment is, and can be maintained, acceptably low without testing the actuated equipment during plant operation; and

c. There is no practicable system design that would permit operation of the actuated equipment without adversely affecting the safety or operability of the plant.