U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

BRANCH TECHNICAL POSITION (BTP) 8-4

APPLICATION OF THE SINGLE FAILURE CRITERION TO MANUALLY CONTROLLED ELECTRICALLY OPERATED VALVES

REVIEW RESPONSIBILITIES

Primary - Organization responsible for electrical engineering

Secondary - None

A. BACKGROUND

When a single failure in an electrical system can result in a loss of capability to perform a safety function, the effect on plant safety must be evaluated. This is necessary regardless of whether the loss of safety function is caused by a component failing to perform a requisite mechanical motion or by a component performing an undesirable mechanical motion.

This position establishes the acceptability of disconnecting power to electrical components of a fluid system as one means of designing against a single failure that might cause an undesirable component action. These provisions are based on the assumption that the component is then equivalent to a similar component that is not designed for electrical operation (e.g., a valve that can be opened or closed only by direct manual operation). These provisions also assume that no single failure can both restore power to the electrical system and cause mechanical motion of the components served by the electrical system. The validity of these assumptions should be verified when applying this position.

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B. BRANCH TECHNICAL POSITION

1. Failures of components in electrical systems, including valves and other fluid system components, in both the “fail to function” sense and the “undesirable function” sense, should be considered in designing against a single failure, even though the valve or other fluid system component may not be called upon to function in a given safety operational sequence.

2. When it is determined that failure of an electrical system component can cause undesired mechanical motion of a valve or other fluid system component, and this motion results in loss of the system safety function, it is acceptable, in lieu of design changes that also may be acceptable, to disconnect power to the electric systems of the valve or other fluid system component. The plant technical specifications should include a list of all electrically operated valves, and the required positions of these valves, to which the requirement for removal of electric power is applied in order to satisfy the single failure criterion.

3. Electrically operated valves that are classified as “active” valves (i.e., are required to open or close in various safety system operational sequences, but are manually controlled) should be operated from the main control room. Such valves may not be included among those valves from which power is removed in order to meet the single failure criterion unless (1) electrical power can be restored to the valves from the main control room, (2) valve operation is not necessary for at least 10 minutes following occurrence of the event requiring such operation, and (3) it is demonstrated that there is reasonable assurance that all necessary operator actions will be performed within the time shown to be adequate by the analysis. The plant technical specifications should include a list of the required positions of manually controlled, electrically operated valves and should identify those valves to which the requirement for removal of electric power is applied in order to satisfy the single failure criterion.

4. When the single failure criterion is satisfied by removal of electrical power from valves described in items 2 and 3, above, these valves should have redundant position indication in the main control room, and the position indication system should, itself, meet the single failure criterion.

5. The phrase “electrically operated valves” includes both valves operated directly by an electrical device (e.g., a motor-operated valve or a solenoid-operated valve) and those valves operated indirectly by an electrical device (e.g., an air-operated valve with an air supply controlled by an electrical solenoid valve).

C. REFERENCES

None.