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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JUN 18 1979

NOTE TO: Sue Lynd, FMEA Study Coordinator
FROM: T. Dunning, Section Leader, ICSB, DSS
THRU: R. M. Satterfield, Chief, ICSB, DSS
SUBJECT: FMEA INFORMATION REQUESTED BY THE PRESIDENTS TMI COMMISSION

ICSB requirements for and use of FMEA's are as follows. The responses are keyed to the unsigned June 15, 1979 note to the DSS Branches requesting this FMEA information:

1. R.G. 1.70 requires an FMEA to be submitted in SAR's to demonstrate the single failure criterion has been met with the design of the reactor trip system and the portion of the protection system used to initiate and control operation of the engineered safety features systems and essential auxiliary supporting systems.
2. The FMEA is used to demonstrate how the requirements of the General Design Criteria and Part 50.55a(h) (i.e. IEEE-279) are met. The FMEA is submitted in the SAR.
3. The staff reviews the applicants FMEA to assure that the design satisfies the design bases requirements. The conclusions drawn from the review contribute to bases for acceptability of the design.
4. The philosophy of failure modes and effects analysis is applied throughout our case review process.

A handwritten signature in black ink, appearing to read "T. Dunning".

T. Dunning, Section Leader
Instrumentation and Control
Systems Branch
Division of Systems Safety

cc: V. Moore
V. Benaroya
F. Rosa



U.S. NUCLEAR REGULATORY COMMISSION

Revision 3
November 1978

REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

REGULATORY GUIDE 1.70

STANDARD FORMAT AND CONTENT OF SAFETY ANALYSIS REPORTS FOR NUCLEAR POWER PLANTS

LWR EDITION

USNRC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the NRC staff of implementing specific parts of the Commission's regulations, to describe techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience. This guide was revised as a result of substantive comments received from the public and additional staff review.

Comments should be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

The guides are issued in the following ten broad divisions:

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| 1. Power Reactors | 6. Products |
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Requests for single copies of issued guides (which may be reproduced) or for placement on an automatic distribution list for single copies of future guides in specific divisions should be made in writing to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Technical Information and Document Control.

Regulatory Guide 1.118, "Periodic Testing of Electric Power and Protection Systems."

7.2 Reactor Trip System

For standardized systems, it is preferred that the information listed be supplied in a topical report and that the topical report be referenced in the appropriate place in the SAR.

7.2.1 Description

7.2.1.1 System Description. Provide a description of the reactor trip system to include initiating circuits, logic, bypasses, interlocks, redundancy, diversity, and actuated devices. Any supporting systems should be identified and described. Those parts of any system not required for safety should be identified.

7.2.1.2 Design Basis Information. Provide the design basis information required by Section 3 of IEEE Std 279-1971. Provide preliminary logic diagrams, piping and instrumentation diagrams, and location layout drawings of all reactor trip systems and supporting systems in the PSAR.

7.2.1.3 Final System Drawings. In the FSAR, provide electrical schematic diagrams for all reactor trip systems and supporting systems, final logic diagrams, piping and instrumentation diagrams, and location layout drawings. Describe the differences, if any, between the logic diagrams and schematics submitted in the PSAR and those in the FSAR and the effects on safety-related systems.

7.2.2 Analysis

✓ Provide analyses, including a failure mode and effects analysis, to demonstrate how the requirements of the General Design Criteria, IEEE Std 279-1971, applicable regulatory guides, and other appropriate criteria and standards are satisfied. In addition to postulated accidents and failures, these analyses should include, but not be limited to, considerations of instrumentation installed to prevent or mitigate the consequences of:

1. Spurious control rod withdrawals,
2. Loss of plant instrument air systems,
3. Loss of cooling water to vital equipment,
4. Plant load rejection, and
5. Turbine trip.

The analyses should also discuss the need for and method of changing to more restrictive trip setpoints during abnormal operating conditions such as operation with fewer than all reactor coolant loops operating. Reference may be made to other sections of the SAR for supporting systems.

7.3 Engineered-Safety-Feature Systems

For standardized systems, it is preferred that the information listed be supplied in a topical report and that the topical report be referenced in the appropriate place in the SAR.

7.3.1 Description

7.3.1.1 System Description. Provide a description of the instrumentation and controls associated with the engineered safety features (ESF), including initiating circuits, logic, bypasses, interlocks, sequencing, redundancy, diversity, and actuated devices. Any supporting systems should be identified and described. Those parts of any system not required for safety should be identified.

7.3.1.2 Design Basis Information. Provide the design basis information required by Section 3 of IEEE Std 279-1971. For the PSAR review, provide preliminary electrical schematic diagrams, logic diagrams, piping and instrumentation diagrams, and location layout drawings of all engineered-safety-feature instrumentation, control systems, and supporting systems.

7.3.1.3 Final System Drawings. In the FSAR, provide electrical schematic diagrams for all ESF circuits and supporting systems, and final logic diagrams, piping and instrumentation diagrams, and location layout drawings. Describe the differences, if any, between the logic diagrams and schematics submitted in the PSAR and those in the FSAR and the effects on safety-related systems.

✓ 7.3.2 Analysis

Provide analyses, including a failure mode and effects analysis, to demonstrate how the requirements of the General Design Criteria and IEEE Std 279-1971 are satisfied and the extent to which applicable regulatory guides and other appropriate criteria and standards are satisfied. In addition to postulated accidents and failures, these analyses should include considerations of (1) loss of plant instrument air systems and (2) loss of cooling water to vital equipment. The method for periodic testing of engineered-safety-feature instrumentation and control equipment and the effects on system integrity during testing should be described.

7.4 Systems Required for Safe Shutdown

For standardized systems, it is preferred that the information listed be supplied in a topical report and that the topical report be referenced in the appropriate place in the SAR.