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SYSTEMATIC EVALUATION PROGRAM REVIEW OF NRC SAFETY TOPIC III-1 ASSOCIATED WITH THE ELECTRICAL, INSTRUMENTATION, AND CONTROL PORTION OF THE CLASSIFICATION OF STRUCTURES, COMPONENTS, AND SYSTEMS FOR THE GINNA NUCLEAR POWER PLANT

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by

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ABSTRACT

This report documents the technical evaluation and review of NRC Safety Topic III-1, associated with the electrical, instrumentation, and control portions of the classification of structures, components, and systems for the Ginna Nuclear Power Plant, using current licensing criteria.

FOREWORD

This report is supplied as part of the Systematic Evaluation Program being conducted for the U.S. Nuclear Regulatory Commission by Lawrence Livermore National Laboratory. The work was performed by EG&G, Inc., Energy Measurements Group, San Ramon Opertions for Lawrence Livermore National Laboratory under U.S. Department of Energy contract number DE-AC08-76NV01183.

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1. INTRODUCTION

Some of the SEP plant structures, systems, and components may not be designed to withstand the effects of a safe shutdown earthquake and remain functional. In some cases, systems and components important to safety may not be designed, fabricated, erected, and tested to quality standards commensurate with their safety function.

The compilation of the major systems required for design basis events (DBE) and for safe shutdown of the plant is submitted in support of NRC Safety Topic III-12. This safety topic addresses whether the major systems identified meet current quality standards.

2. REVIEW GUIDELINES

The objective of this review is to identify only the major electrical, instrumentation and control systems (EICS) required for DBE and for safe shutdown of the plant. This identification is to be performed when reviewing each NRC safety topic. A detailed search is not to be made to identify all required systems for DBE and for safe shutdown.

3. COMPILATION OF IDENTIFIED SYSTEMS

3.1 ENGINEERED SAFETY FEATURE SYSTEMS

The following engineered safety feature systems are required for DBE and safe shutdown:

1. Safety injection system (Emergency Core Cooling System)
   a. High-pressure safety injection pumps
   b. Low-pressure safety injection (RHR) pumps
   c. Passive accumulators
   d. Refueling water storage tank
   e. Boric acid tanks
2. Containment air recirculation and filtration system
   a. Fan-cooler units
   b. Charcoal filter units
   c. Iodine removal units
   d. Hydrogen recombiner
3. Containment spray system
   a. Containment spray pumps
   b. Refueling water storage tank
   c. Spray additive tank
4. Containment isolation system
5. Containment ventilating system
   a. Recirculation ventilation
   b. Purge system

3.2 REACTOR PROTECTION SYSTEMS

The following reactor protection systems (reactor trip channels) are required for DBE and safe shutdown:

1. High nuclear flux (power range)
2. High nuclear flux (intermediate range)
3. High nuclear flux (source range)
4. Overtemperature ΔT
5. Overpower ΔT
6. Low RCS pressure
7. High pressurizer pressure
8. High pressurizer water level
9. Low reactor coolant flow
10. Turbine trip
11. High containment pressure
12. Low steam generator pressure
13. Low steam generator level
14. Manual trip

3.3 ADDITIONAL SYSTEMS

In addition to the ESF and RPS, the following systems are required for DBE and safe shutdown:

1. Auxiliary feedwater system
2. Service water system
3. Component cooling water system
4. Residual heat removal system
5. Chemical and volume control system
6. Offsite power system
7. Control room systems
8. Emergency power (a-c and d-c) and control power for the above systems and components

REFERENCES

1. Rochester Gas and Electric Corporation, Ginna Final Safety Analysis Report, dated April 23, 1975.

2. EG&G, San Ramon Division, technical evaluation reports on NRC safety topics:

   a) Safety Topic VI-7.A.3, "ECCS Actuation." November 1979.
   b) Safety Topic VI-10.A, "Testing of RTS and ESF, Including Response Time," November 1979.
   c) Safety Topic VII-1.A, "Isolation of RPS from Non-safety Systems, Including Qualification of Isolation Devices," July 1980.
   d) Safety Topic VI-7.B, "ESF Switchover from Injection to Recirculation Mode," November 1979.
   e) Safety Topic VII-2, "ESF System Control Logic and Design," July 1980.
   f) Safety Topic V-11.B, "RHR Interlock Requirements," June 1980.
   g) Safety Topic V-10.B, "RHR System Reliability," May 1980.
   h) Safety Topic VII-3, "Systems Required for Safe Shutdown," August 1980.

APPENDIX A
NRC SAFETY TOPICS RELATED TO THIS REPORT

1. Safety Topic VI-7.A.3 — "ECCS Actuation."

2. Safety Topic VI-10.A — "Testing of RTS and ESF, Including Response Time."

3. Safety Topic VII-1.A — "Isolation of RPS from Non-safety Systems, Including Qualification of Isolation Devices."

4. Safety Topic VI-7.B — "ESF Switchover from Injection to Recirculation Mode.

5. Safety Topic VII-2 — "ESF System Control Logic and Design."

6. Safety Topic III-2 — "Wind and Tornado Loadings."

7. Safety Topic III-3 — "Hydrodynamic Loads."
   a) Effects of high water level on structures
   b) Structural and other consequences (e.g., flooding of safety-related equipment in basements) of failure of underdrain systems
   c) Inservice inspection of water control structures.

8. Safety Topic III-4 — "Missile Generation and Protection."
   a) Tornado missiles
   b) Turbine missiles
   c) Internally-generated missiles
   d) Site proximity missiles (including aircraft).

9. Safety Topic III-5 — "Evaluation of Pipe Breaks."
   a) Effects of pipe break on structures, systems and components inside containment
   b) Pipe break outside containment.

10. Safety Topic III-6 — "Seismic Design Considerations."