

JUL 02 1984

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Docket Nos.: 50-352/353

Mr. Edward G. Bauer, Jr.  
Vice President & General Counsel  
Philadelphia Electric Company  
2301 Market Street  
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Dear Mr. Bauer:

Subject: Design Verification Audit For the General Electric Safety  
Parameter Display System

As you know, the General Electric Company has developed an Emergency Response Information System (ERIS) which contains, in part, the Safety Parameter Display System (SPDS). The Philadelphia Electric Company has referenced a GE topical report, NEDE-30284, in partial response to the NUREG-0737 Supplement 1 requirement for a description of the SPDS for the Limerick application. The staff plans to conduct a design verification audit of the ERIS/SPDS design in NEDE-30284 and will meet with GE to do so.

Enclosed is a draft audit plan for our review of the design with GE. The plan defines topics which the staff desires to evaluate, along with the data, information, documentation and personal needed by GE to support the audit. The Specific dates for the audit are July 24-27, 1984.

The attached plan for the staff audit is being provided for your information regarding the staff's review of the GE topical report. No response is requested to this letter.

Sincerely,

A. Schwencer, Chief  
Licensing Branch No. 2  
Division of Licensing

Enclosure:  
As stated

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DESIGN VERIFICATION AUDIT  
FOR THE  
GENERAL ELECTRIC EMERGENCY RESPONSE INFORMATION SYSTEM

Background

All holders of operating licenses issued by the Nuclear Regulatory Commission (licensees) and applicants for an operating license (OL) must provide a Safety Parameter Display System (SPDS) in the control room of their plant. The Commission approved requirements for the SPDS are defined in Supplement 1 to NUREG-0737.

The purpose of the SPDS is to provide a concise display of critical plant variables to control room operators to aid them in rapidly and reliably determining the safety status of the plant. NUREG-0737, Supplement 1, requires licensees and applicants to prepare a written safety analysis describing the basis on which the selected parameters are sufficient to assess the safety status of each identified function for a wide range of events, which include symptoms of severe accidents. Licensees and applicants shall also prepare an implementation plan for the SPDS which contains schedules for design, development, installation, and full operation of the SPDS as well as a design verification and validation plan. The safety analysis and the implementation plan are to be submitted to the NRC for staff review. The results of the staff's review are to be published in a Safety Evaluation Report (SER).

The Emergency Response Information System (ERIS) has been developed by General Electric to provide vital plant data informational network for timely control and effective plant management in the event of an emergency. The ERIS design responds to the requirements for an SPDS. ERIS is described in NEDE-30284P\*. The ERIS provides the data acquisition, storage, and processing required to generate real-time visual displays and provides printed records of transient data events. The graphic displays offered by ERIS are an integral part of the overall emergency response capability requirements specified in Supplement 1 to NUREG-0737.

On May 24, 1984, the staff met with General Electric to discuss the review and a design verification audit of ERIS. At the meeting, personnel from General Electric provided information on the development status of the system and provided details (proprietary) on various display formats used in the system. The development status of the system was provided in terms of the elements of a software-life cycle. An equivalent hardware-life cycle was

\* NEDE-30284-P "Licensing Topical Report for the General Electric Emergency Response Information System," November 1983, General Electric Company Proprietary Information.

also presented and discussed. The staff used the information obtained at this meeting and the information contained in NEDE-30248-P as the basis for the draft audit plan enclosed.

#### Discussion

The draft audit plan has been developed for the design verification review of the General Electric ERIS. The scope of this plan is limited to an evaluation of the SPDS functions and will not apply to other emergency response capabilities designed into the system. The results from the audit will apply to all utilities which install ERIS. Utilities may take credit for meeting part of the NUREG-0737, Supplement 1 SPDS requirements by referencing the GE topical and the staff's Safety Evaluation Report (SER) to be written after the audit. Any plant specific modifications of ERIS which relate to the Commission approved requirements for an SPDS must be described in the utility's SPDS submittal to the NRC.

#### Audit Schedule

General Electric has requested that the audit be conducted during the period of July 24 to July 27, 1984. Staff reviewers should notify the Human Factors Engineering Branch prior to June 20, 1984 if they are unable to support the audit.

#### Inputs to Safety Evaluation Report

All members of the staff participating in the audit are to document and forward their findings within one calendar week after the last day of the audit. The goal is to prepare a Safety Evaluation Report and submit it to the Program Manager before the end of August 1984. Your SER inputs should be forwarded to the Branch Chief of Human Factors Engineering, Division of Human Factors Safety. These inputs will then be integrated into an SER for management review and approval.

#### NRC Audit Team

The NRC Audit Team will consist of representatives from the Human Factors Engineering Branch, Procedures and Systems Review Branch, Instrumentation and Control Systems Branch, and from the Vendor Inspection Program. The specific audit topics for each of these disciplines are defined in the plan which follows.

DRAFT AUDIT PLAN  
DESIGN VERIFICATION AUDIT  
FOR THE  
GENERAL ELECTRIC EMERGENCY RESPONSE INFORMATION SYSTEM (ERIS)

Review Basis: NUREG-0737, Supplement 1, "Clarification of TMI Action Plan Requirements; Requirements for Emergency Response Capability."

I.	<u>General Topics</u>	<u>Audit Needs</u>	<u>Estimated Time (Hours)</u>
1.	An entry briefing by the NRC audit team to discuss schedule and audit plan.	A conference room or equivalent to hold briefing.	0.25
2.	Staff caucus to discuss results of audit.	A conference room or equivalent.	2
3.	An exit briefing by the NRC audit team to report on the findings of the audit.	A conference room or equivalent to hold briefing.	0.5
4.	General Electric to define the scope of the SPDS within the Emergency Response Information System in terms of the requirements for an SPDS as stated in NUREG-0737, Supplement 1.	Have available all elements of the ERIS design as it currently exists consisting of hardware, software and display formats.	0.5
5.	Staff audit of the Design Verification and Validation Program used in the development of ERIS.	Have available the Design Verification and Validation Program. Also, on a part-time basis, have available a qualified person capable of answering staff questions on the program.	1.5

II. Human Factors Engineering Audit

<u>Topics</u>	<u>Audit Needs</u>	<u>Estimated Time (Hours)</u>
1. Staff audit of the Generic System Specifications and standards used in the design, such as human factors engineering standards. Also, audit generic application data.	Generic System Specifications, generic application data and standards used in the design. Also, on a part-time basis, have available personnel capable of answering questions on the specifications and standards.	2
2. Staff audit of the validation of the display formats utilizing man-in-the-loop tests of a prototype display.	The validation program and the results from the program. Also have available personnel capable of answering staff questions on the validation program and the results from the program.	2
3. Staff audit of the generic software requirements for incorporation of human factors requirements.	The generic software requirements, the generic spec., and human factors standards used in the design. Also have available personnel capable of answering questions on the above documents.	1.5
4. Staff audit of the design, code, test software and data base instructions (if applicable).	Design documentation, listing of code, and description of data base. Also have available personnel capable of answering questions on the above documents.	1.5

<u>Topics</u>	<u>Audit Needs</u>	<u>Estimated Time (Hours)</u>
5. Staff audit of integration tests and test results for data base, displays and scenarios.	Documents and test plans for integration tests along with test results. Also have available design verification personnel and other personnel as needed to answer questions on the above documents.	2
6. Staff audit of selected display formats for conformance to human engineering standards and guidelines.	Selected display formats on proto-type display system, if available. As a minimum, a hard copy, in color, of selected display formats will suffice.	2.5
7. Staff audit of display devices, display controls, and keyboards, etc. for conformance to human engineering standards and guidelines.	Have available display devices, display controls and keyboards, etc. Also have available personnel to answer staff questions on the above devices.	2
8. Staff audit of design validation test methods, and test plans. The staff understands that design validation tests have not begun at this time.	Documents on test methods and test plans, if available. If documents are not available, provide a discussion on validation testing.	1

III. Procedures and Systems Review Audit

<u>Topics</u>	<u>Audit Needs</u>	<u>Estimated Time (Hours)</u>
1. Staff audit of displayed information on the critical safety functions, including radioactivity control and reactivity control as defined by NUREG-0737, Supplement 1. The use of data from source range monitors and from containment radiation monitors are also to be audited in terms of the critical safety functions.	A demonstration or discussion as how ERIS meets the requirements of NUREG-0737, Supplement 1 should be provided. The concept of an enhanced display, with display formats, should be included, if appropriate. Also, General Electric should have available a listing of the critical safety functions with an identification of ERIS parameters used to satisfy each critical safety function.	2
2. Staff audit of provisions for expansion to accommodate future revisions to the Emergency Procedure Guidelines.	Have available memory storage specifications for the software, data bases, and data along with hardware computer memory sizes.	1

IV. Instrumentation and Control Systems Audit

<u>Topics</u>	<u>Audit Needs</u>	Estimated Time (Hours)
1. Audit and evaluate the program plan of the reliability assessment and/or testing of the SPDS hardware. Review the rationale for the selection of hardware components.	Have available the reliability program, test results (if any) and the basis on the selection of hardware.	2
2. Audit the accuracy requirements of instrumentation used for the selected parameters.	Have available the design requirements for the instrumentation.	1
3. Audit the Computer Operating System	Have available whatever information is necessary to support this effort.	2
A. Operating software - that software other than application software (to control disk, to control tape, to control multiplexer)		
B. System architecture and the fault tolerance of the architecture		
C. Storage capacity and expandability of system		
D. CPU efficiency, information rates		
E. Initial and periodic testing		
F. Software security (from system crashes, system overloads, conflicting tasks on systems employing general purpose, multi-task computers).		

<u>Topics</u>	<u>Audit Needs</u>	<u>Estimated Time</u> <u>(Hours)</u>
4. Audit of qualification of isolation devices	Have available the design criteria and the qualification test results which respond to the defined data needs.	4
A. Audit each type of device used to accomplish electrical isolation, describe the specific testing performed to demonstrate that the device is acceptable for its application(s). This description should include elementary diagrams when necessary to indicate the test configuration and how the maximum credible faults were applied to the devices.		
B. Audit data to verify that the maximum credible faults applied during the test were the maximum voltage/current to which the device could be exposed, and audit how the maximum voltage/current was determined.		
C. Audit data to verify that the maximum credible fault was applied to the output of the device in the transverse mode (between signal and return) and other faults were considered (i.e., open and short circuits).		
D. Audit the pass/fail acceptance criteria for each type of device.		

<u>Topics</u>	<u>Audit Needs</u>	<u>Estimated Time</u> <u>(Hours)</u>
E. Audit the measures taken to protect the safety systems from electrical interference (i.e., Electrostatic Couplings, EMI, Common Mode and Crosstalk) that may be generated by the SPDS.		
As information, licensees and applicants who use ERIS should provide a commitment that the isolation devices comply with the environmental qualifications (10 CFR 50.49) and with the seismic qualifications which were the basis for plant licensing.		

V. Vendor Inspection Program

<u>Topics</u>	<u>Audit Needs</u>	<u>Estimated Time</u> (Hours)
1. Verify procedures consistent with NRC requirements.		20
2. Verify implementation of procedures.		
3. Evaluate findings for possible enforcement action.		
4. Identify and tabulate items requiring follow-up during subsequent inspections.		