

October 15, 1982

LS05-82-10-047

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Mr. E. P. Rahe, Manager
 Nuclear Safety Department
 Water Reactor Division
 Westinghouse Electric Corporation
 Post Office Box 355
 Pittsburgh, Pennsylvania 15230

Dear Mr. Rahe:

SUBJECT: SAFETY PARAMETER DISPLAY SYSTEM (SPDS)

The NRC staff has completed an audit plan for the design verification audit of the Westinghouse generic SPDS. A copy of the plan is enclosed. This audit plan defines technical topics that the NRC staff will evaluate and it also contains an agenda of activities.

We currently plan to conduct the audit on October 25 - 27, 1982. Should you have any questions regarding this letter, please contact Walter A. Paulson (301-492-7214) of my staff.

Sincerely,

Original signed by
 Dennis M. Crutchfield

Dennis M. Crutchfield, Chief
 Operating Reactors Branch #5
 Division of Licensing

Enclosure:
 As stated

8211050145 821015
 PDR TOPRP EMVWEST
 C PDR

OFFICE	DL: ORB #5	DL: ORB #5					
SURNAME	WPaulson:cc.	DCrutchfield					
DATE	10/14/82	10/15/82					

ENCLOSURE

SPDS DESIGN VERIFICATION AUDIT PLAN

SPDS DESIGN REQUIREMENTS ARE STATED IN:

SECY 82-111

REQUIREMENTS FOR EMERGENCY RESPONSE CAPABILITY

REVIEW OF SPDS - WESTINGHOUSE DESIGN VERIFICATION AUDIT

HUMAN FACTORS ENGINEERING BRANCH

REVIEW GUIDELINES:

- NURFG-0696 "Functional Criteria for Emergency Response Facilities"
NUREG-0700 "Guidelines for Control Room Design Reviews"
NUREG-0835 "Human Factors Acceptance Criteria for the Safety Parameter Display System"

TECHNICAL TOPIC

AUDIT TIME

AUDIT NEEDS

1. HFE Design Verification

1A Audit results of HFE Design Verification Audits, Problems defined and how resolved.

Have available verifier, designer and documents that supported/resolved HFE problems identified in design verification process.

1B Also documentation for design and standards used in design.

4 hrs.

2. Operator Display

Audit the design of display frames(s) and the design of the operator interface with the display.

Have available display designer, verifier and design documents.

4 hrs.

3. Audit design of application Software--

- Display generation software
- data base schema, if any
- processor duty cycles and display refresh rates
- separation from other computer implemented functions

Software designer, software design documents and listing of code, if available.

4 hrs.

TECHNICAL TOPIC

AUDIT TIME

AUDIT NEEDS

4. Audit Test Plan

4A - Functions tested

4B - Acceptance criteria

4C - Man-in-loop test

4D - Operator comprehension criteria ..

2-3 hours.

Designer of test plan, test plan, and acceptance criteria for test cases.

WESTINGHOUSE RESPONSE:

In response to the staffs' design verification audit plan defined above, Westinghouse is prepared to support the audit for the following numbered topics:

1. (portions)

2. (portions)

4.

The remaining topics (and partial topics) will be addressed in later audits.

REVIEW OF SPDS - WESTINGHOUSE DESIGN VERIFICATION AUDIT
INSTRUMENTATION & CONTROL SYSTEMS BRANCH AUDIT

REVIEW GUIDELINES: NUREG-0696 "Functional Criteria for Emergency Response Facilities"
Standard Review Plan

TECHNICAL TOPICS

AUDIT TIME

AUDIT NEEDS

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.

2.5 hrs.

Have available the reliability program, test results (if any) and the basis on the selection of hardware.

2. Audit the qualification test program of the isolation devices that are utilized for electrical separation between the safety parameters and the SPDS. These devices must be qualified in accordance with IEEE-279-1971 Section 4.7.2.

2 hrs.

Have available the qualification test results.

3. Audit the functional layout of the SPDS hardware, cables, and interfaces to ascertain the potential for the propagation of electrical faults and/or EMI.

3 hrs.

Have available layout drawings depicting installation and cable runs.

4. Audit the as-built system against the design criteria for the instrumentation systems, and the correct installation of the equipment.

2.5 hrs.

Have available the design requirements for the SPDS.

TECHNICAL TOPICS

AUDIT TIME

AUDIT NEEDS

5. Audit the accuracy requirements of instrumentation used for the selected parameters.

2 hrs.

Have available the design requirements for the instrumentation.

6. Audit the Computer Operating System

4 hrs.

Have available whatever information is necessary to support this effort.

6A Operating software - that software other than application software (to control disk, to control tape, to control multiplexer)

6B System architecture and the fault tolerance of the architecture

6C Storage capacity

6D CPU efficiency, information rates

6E Initial and periodic testing

6F Software security (from system crashes, system overloads, conflicting tasks on systems employing general purpose, multi-task computers).

WESTINGHOUSE RESPONSE:

In response to the staff's design verification audit plan defined above, Westinghouse is prepared to support the audit for the following numbered topics:

5, 1 C (portions).

The remaining topics will be addressed in later audits.

REVIEW OF SPDS - WESTINGHOUSE DESIGN VERIFICATION AUDIT

REACTOR SYSTEMS BRANCH

REVIEW GUIDELINES: NUREG-0696, "FUNCTIONAL CRITERIA FOR EMERGENCY RESPONSE FACILITIES"

NUREG-0660, "NRC ACTION PLAN DEVELOPED AS A RESULT OF THE TMI-2 ACCIDENT"

NUREG-0737, "CLARIFICATION OF TMI ACTION PLAN REQUIREMENT"

REG. GUIDE 1.97 (Rev. 2), "INSTRUMENTS FOR LIGHT-WATER COOLED NUCLEAR POWER PLANTS TO ASSESS PLANT AND ENVIRONS DURING AND FOLLOWING AN ACCIDENT"

TECHNICAL TOPICS

AUDIT TIME

AUDIT NEEDS

I.A List minimum set of parameters to provide sufficient information to plant operators about:

- a. Reactivity control,
- b. Reactor Core cooling and heat removal from primary system,
- c. Reactor coolant system integrity (including coolant inventory and thermal transients),
- d. Radioactivity control,
- e. Containment conditions.

20 minutes

Be prepared to present, discuss in detail, the information requested.

I.B Provide the information requested in I.A above for the following operating situations:

- Normal operation to hot standby at 540⁰F
- Hot shutdown - refueling

20 minutes

Be prepared to present, and discuss in detail, the information requested.

TECHNICAL TOPICS

AUDIT TIME

AUDIT NEEDS

I.C. Provide the information in I.A. and I.B., for the following situations:

- Incidents of moderate frequency, infrequent incidents and limiting faults leading to initiation of protection
- Subsequent to initiation of protective Action during recovery to a stable plant status
- Subsequent adjustment of plant status to best medium and long term status

Be prepared to present, and discuss in detail, the information requested.

20 minutes

2. Provide information on which licensing basis faults including incidents of moderate frequency, infrequent incidents and limiting faults have been selected as the principal determinants of the parameters considered important enough to be represented as individual parameters on the SPDS and any integrated representation deriving therefrom. Why have these particular faults been selected as the design basis for the SPDS?

Be prepared to present, and discuss in detail, the information requested.

1 hour

3. Provide detailed traces of the important parameters for the transients selected as the design bases.

Be prepared to present, and discuss in detail, the information requested.

1 hour

TECHNICAL TOPICS

AUDIT TIME

AUDIT NEEDS

4. What is the basis for diagnosing the various parameters in developing the integrated display system?

1 hour

Be prepared to present, and discuss in detail, the information requested.

5. Provide a detailed description of the instrument sensors and their location on the primary coolant loop. Justify the suitability of each instrument to represent in a meaningful manner, the local or bulk conditions proposed to be represented on the SPDS, and over the full range of types of flow conditions expected to be encountered including during:

- Forced flow conditions by 4,3,2 and one RCP operating (for single & two phase flow conditions)
- Natural circulation
- Periods of inadequate core cooling

Discuss the detailed capability of each sensor and related signal conditioning system to respond to the dynamic circumstances of the transients deriving from the faults selected for the SPDS design bases.

2 hours

Be prepared to present, and discuss in detail, the information requested.

TECHNICAL TOPICSAUDIT TIMEAUDIT NEEDS

- | <u>TECHNICAL TOPICS</u> | <u>AUDIT TIME</u> | <u>AUDIT NEEDS</u> |
|---|-------------------|---|
| 6. Discuss the capability of the sensors and related channels to adequately respond under the particular external environment consequent upon faulted conditions. | 20 minutes | Be prepared to present, and discuss in detail, the information requested. |
| 7. Discuss the Technical Specifications proposed for the system. | 20 minutes | Be prepared to present, and discuss in detail, the information requested. |
| 8. Describe how the SPDS is being used to support effectiveness of Emergency Response Guidelines for Westinghouse, and other reactor facilities as appropriate. | 1 hour | Be prepared to present, and discuss in detail, the information requested. |

WESTINGHOUSE RESPONSE:

In response to the staff's design verification audit plan defined above, Westinghouse is prepared to support the audit for the following numbered topics:

- 1.
- 2.
- 3.
- 4.
5. (portions)

The remaining topics will be addressed in later audits.

REVIEW OF SPDS - WESTINGHOUSE DESIGN VERIFICATION AUDIT
CORE PERFORMANCE BRANCH AUDIT

REVIEW GUIDELINES:

NUREG-0696 "Functional Criteria for Emergency Response Facilities"

Standard Review Plan

TECHNICAL TOPICS

AUDIT TIME

AUDIT NEEDS

- | | | |
|---|--------|---|
| 1. Review implementation of physics and thermal hydraulic algorithms. | 2 hrs. | |
| 2. Review QA procedures for physics and thermal hydraulic algorithms. | 2 hrs. | |
| 3. Inspect displays for a variety of transients to determine if T. H. and physics parameters are being displayed correctly. | 2 hrs. | Be prepared to run a variety of transients |
| 4. Review results of sample problem. | 2 hrs. | Be prepared to run a sample problem if requested. |

WESTINGHOUSE RESPONSE:

Westinghouse states the above topics are to be evaluated in Audit II, Validation of Integrated Systems.

REVIEW OF SPDS - WESTINGHOUSE DESIGN VERIFICATION AUDIT
VENDOR PROGRAM BRANCH-- REGION IV

REVIEW GUIDELINES: DESIGN INSPECTION MODULE

VALIDATION OF COMPUTER CODES MODULE

TECHNICAL TOPICS

AUDIT TIME

AUDIT NEEDS

- | | |
|---|---|
| 1. Verify procedures consistent with NRC requirements. | As part of Region IV's Vendor Inspection Program. |
| 2. Verify implementation of procedures. | |
| 3. Evaluate findings (daily and final) for possible enforcement action. | |
| 4. Identify and tabulate items requiring follow-up during subsequent inspections. | |

WESTINGHOUSE RESPONSE:

Westinghouse suggested that the Vendor Program Branch only participate in Audit II, Validation of Integrated Systems. The staff finds this unacceptable as it does not conform to the Commission approved requirements in SECY 82-111. The Vendor Program Branch will participate in all staff audits.

SPDS DESIGN VERIFICATION AUDIT

ADMINISTRATIVE ISSUES

- Audit Start-up Meeting Agenda

Meeting Time (3-4 Hours)

Resolve:

- Independence of design verifier
From original designer of SPDS
- Westinghouse to define
scope of display to support prime SPDS function
- Westinghouse states concerns on NUREG-0835
Defines additional design requirements
- Discuss design verification audit plan
Each technical reviewer discusses plan element
- Audit Summary Meeting
(Time, 0.5 hours per day)
- Staff presents summary of audit findings
- Discuss design validation audit/technical review goals
 - o RSB Technical Topic 8

SPDS DESIGN VERIFICATION AUDIT SCHEDULE

DAY 1, OCTOBER 25, 1982

AUDIT START-UP MEETING
(RESOLVE OLD ACTION ITEMS) 1/2 DAY

DAY 2, OCTOBER 26, 1982

I. REVIEW DESIGN PROCESS

HFEB-2	4 HOURS
HFEB-1B	2 HOURS
RSB-3	1 HOUR
VPB- REG IV	

II. STAFF CAUCUS 0.25 HOUR

III. DAY 2 AUDIT SUMMARY 1 HOUR

DAY 3

I. KEY SAFETY PARAMETERS

RSB IA, IB, IC, 2, 4	2 HOURS
RSB 5, I&CSB-5,1	2 HOURS
VPB - REG. IV	

II. TESTING OF MAN IN LOOP

HFEB 1A	2 HOURS
HFEB 4C, 4D*	2 HOURS
VPB - REG IV	

III. TEST PLAN FOR VALIDATION OF INTEGRATED SYSTEM

HFEB 4A, 4B*

2 HOURS

IV. STAFF CAUCUS

.25 HOUR

DAY 3 AUDIT SUMMARY

-1 HOUR

NOTE: * IMPLIES PARALLEL EFFORTS

NOTE: HFEB-2 DEFINES HUMAN FACTORS ENGINEERING BRANCH, TECHNICAL TOPIC NUMBER TWO.