



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

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Safety Evaluation Report for the Washington Nuclear Plant 2
Safety Parameter Display System

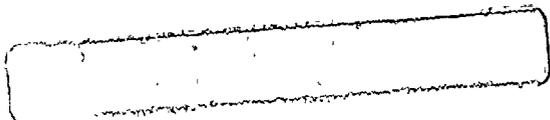
1.0 INTRODUCTION

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 (V&V) Plan. The Safety Analysis and the Implementation Plan are to be submitted to the NRC for staff review. The results from the staff's review are to be published in a Safety Evaluation Report (SER).

There are a number of requirements which the SPDS should satisfy. They are, with Supplement 1 to NUREG-0737 references in parentheses, as follows:

1. Concise display of critical plant variables to aid control room operators in determining the safety status of the plant (4.1a)

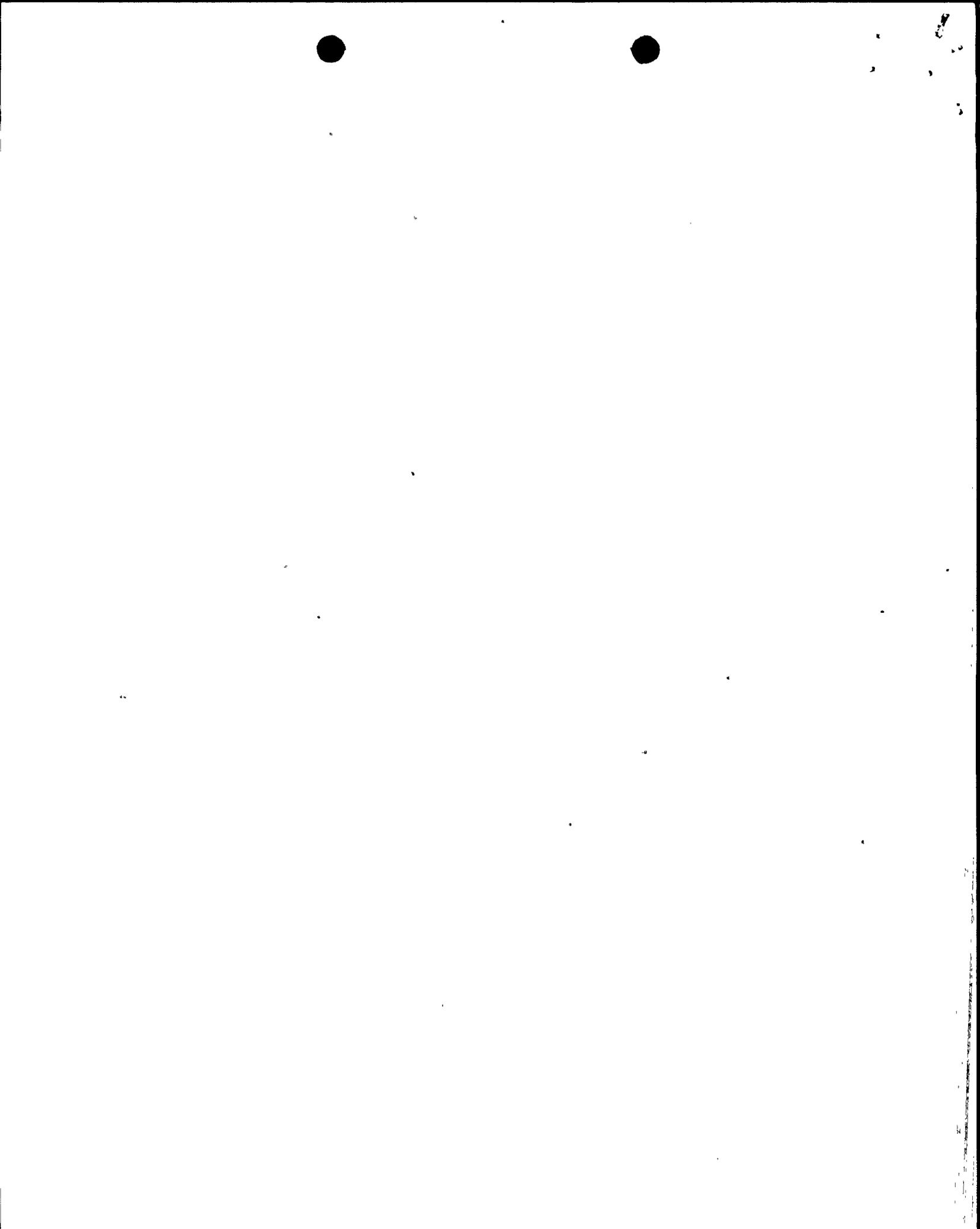




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2. Aid operators in rapid, reliable determination of plant safety status (4.1a and 4.1b)
3. Location convenient to control room operators (4.1b)
4. Continuous display of information from which plant safety status can be assessed (4.1b)
5. Suitable isolation from electrical or electronic interference with equipment and sensors that are in use for safety systems (4.1c)
6. Implementation of procedures and operator training leading to timely and correct safety status assessment both with and without the SPDS (4.1c)
7. Prompt implementation (4.1d)
8. Incorporation of accepted human factors principles (4.1e)
9. Parameters selected to provide, as a minimum, information about reactivity control, reactor core cooling and heat removal from the primary system, reactor coolant system integrity, radioactivity control, and containment conditions (4.1f)

The NRC staff review will be directed at: (a) confirming the adequacy of the parameters selected to be displayed to assess critical safety functions, (b) confirming that means are provided to assure that the data displayed are valid, and (c) confirming that the licensee has committed to a human factors program to ensure that the displayed information can be readily perceived and comprehended so as not to mislead the operator. If based on this review, the staff identifies a serious safety question or seriously inadequate analysis, the Director of NRR may request or direct the licensee to cease implementation.



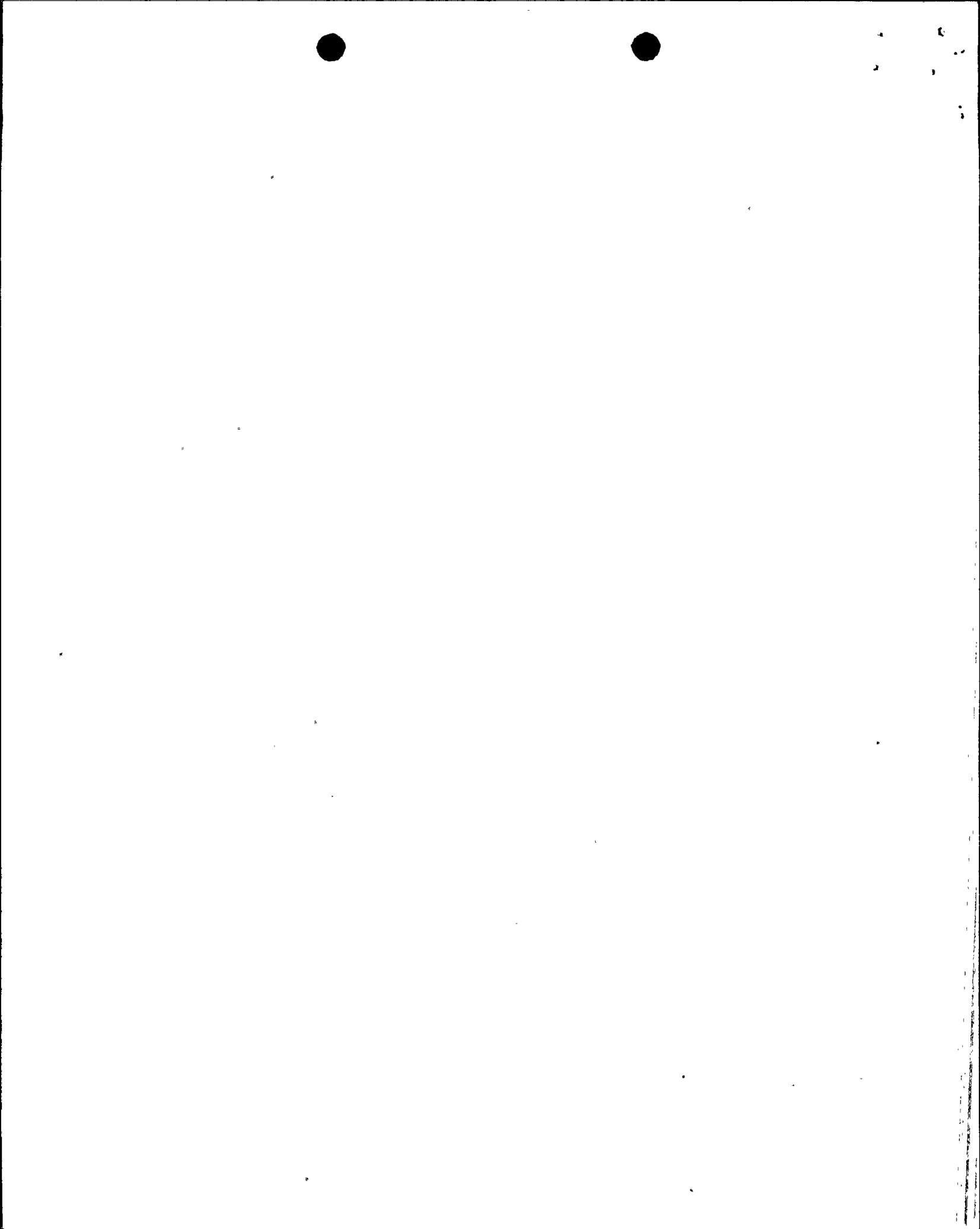
The Washington Public Power Supply System (the Supply System) based the SPDS for Washington Nuclear Plant 2 (WNP-2) on the Boiling Water Reactor Owners Group's Graphic Display System. It is a computerized system designed to provide information to operators during all modes of plant operation. However, its primary purpose is post-accident monitoring of plant safety status. Three levels of display are provided. The Level 1 display gives an overview of plant status in terms of five critical safety functions. Level 2 displays provide more detailed information about specific functions. Level 3 displays provide data intended to aid implementation of plant emergency operating procedures. The WNP-2 SPDS was declared operational January 11, 1984.

2.0 EVALUATION

The staff has evaluated plans for the WNP-2 SPDS based on all information available to date. Evaluation was consistent with Section 18.2, Rev. 0, of the Standard Review Plan (SRP -- NUREG-0800). A synopsis of that evaluation is provided below. The staff was assisted in its evaluation by Science Applications International Corporation (SAIC) personnel. A copy of the SAIC Technical Evaluation Report (TER), which contains a detailed evaluation of the available information, is provided as Attachment 1. The staff concurs with evaluations and conclusions in the TER.

2.1 Concise display of critical plant variables to aid control room operators in determining the safety status of the plant

Evaluation criteria related to this requirement address the selection of plant variables for display and the actual display of those variables. Particular attention is devoted to display factors which can impact rapid, reliable comprehension of plant safety status by operators.



In it's TER (Attachment 1, Paragraph IV.1) the review team concludes that the WNP-2 SPDS meets this requirement. No further information is required.

2.2 Aid operators in rapid, reliable determination of plant safety status

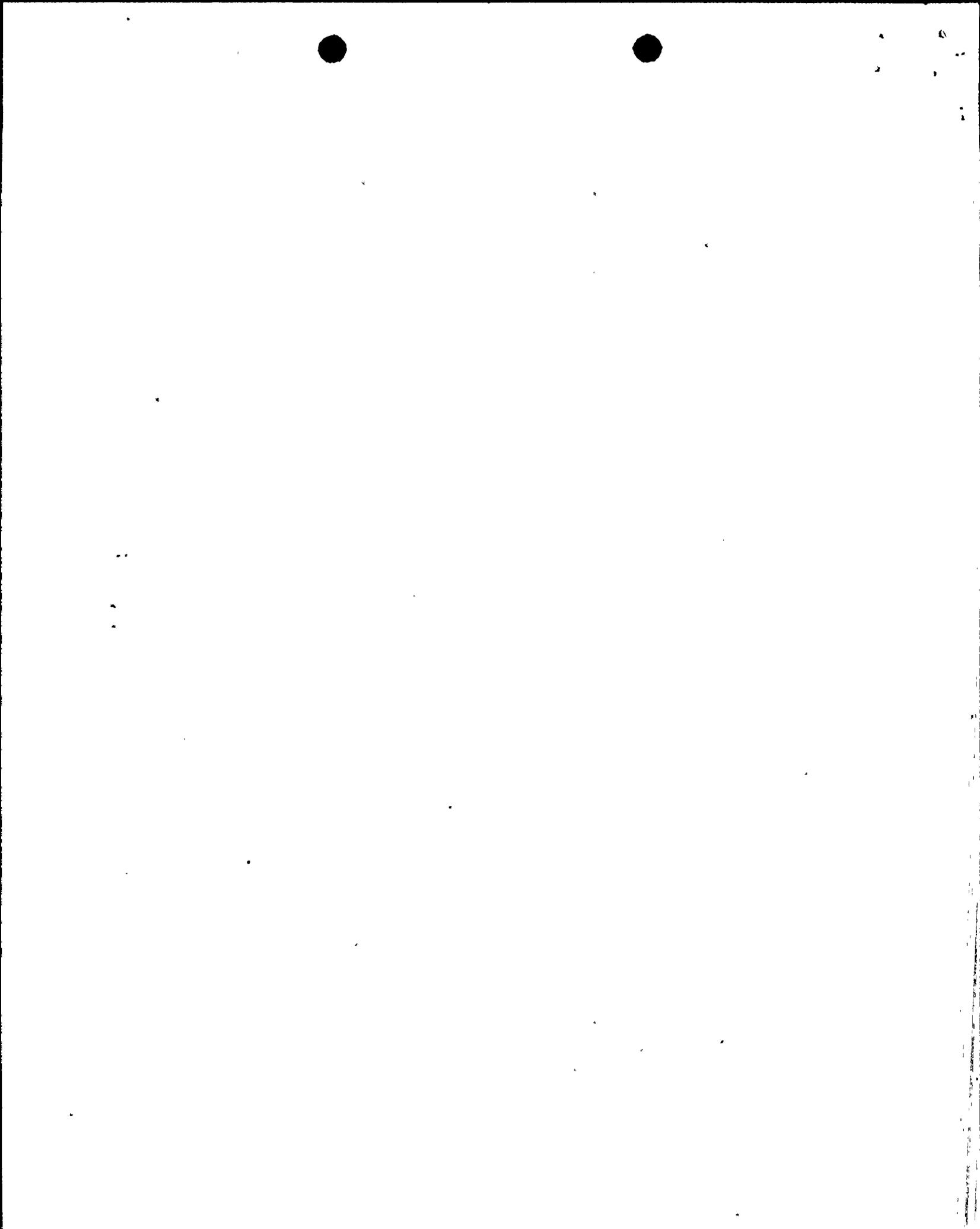
Evaluation criteria related to this requirement address factors which affect how rapidly the operator is informed of changes in plant variables. The criteria also address factors which affect the accuracy of displayed information across a wide range of events and factors which affect operator confidence in that information. Finally, the criteria address means by which the operator may recognize SPDS failure.

The staff concludes that the WNP-2 SPDS provides means to assure that displayed data are valid and an indication of when signals cannot be validated. However, the Supply System did not provide information on SPDS availability or software verification and validation. Availability information is needed for the staff to draw a conclusion regarding satisfaction of this requirement.

2.3 Location convenient to control room operators

Evaluation criteria related to this requirement address physical and visual factors which can impact operator access to SPDS displays and controls. The criteria also address SPDS interference with normal crew movement and visual access to other control room systems.

The staff concludes that the WNP-2 SPDS meets this requirement. No further information is required.



2.4 Continuous display of information from which plant safety status can be assessed

Evaluation criteria related to this requirement address SPDS users' timely and reliable awareness of plant safety status and of important changes in critical safety related variables.

The staff concludes that the information needed to evaluate the WNP-2 SPDS against the above criteria was not available. The Supply System should provide information sufficient to allow evaluation of the WNP-2 SPDS against this requirement.

2.5 Suitable isolation from electrical or electronic interference with equipment and sensors that are in use for safety systems

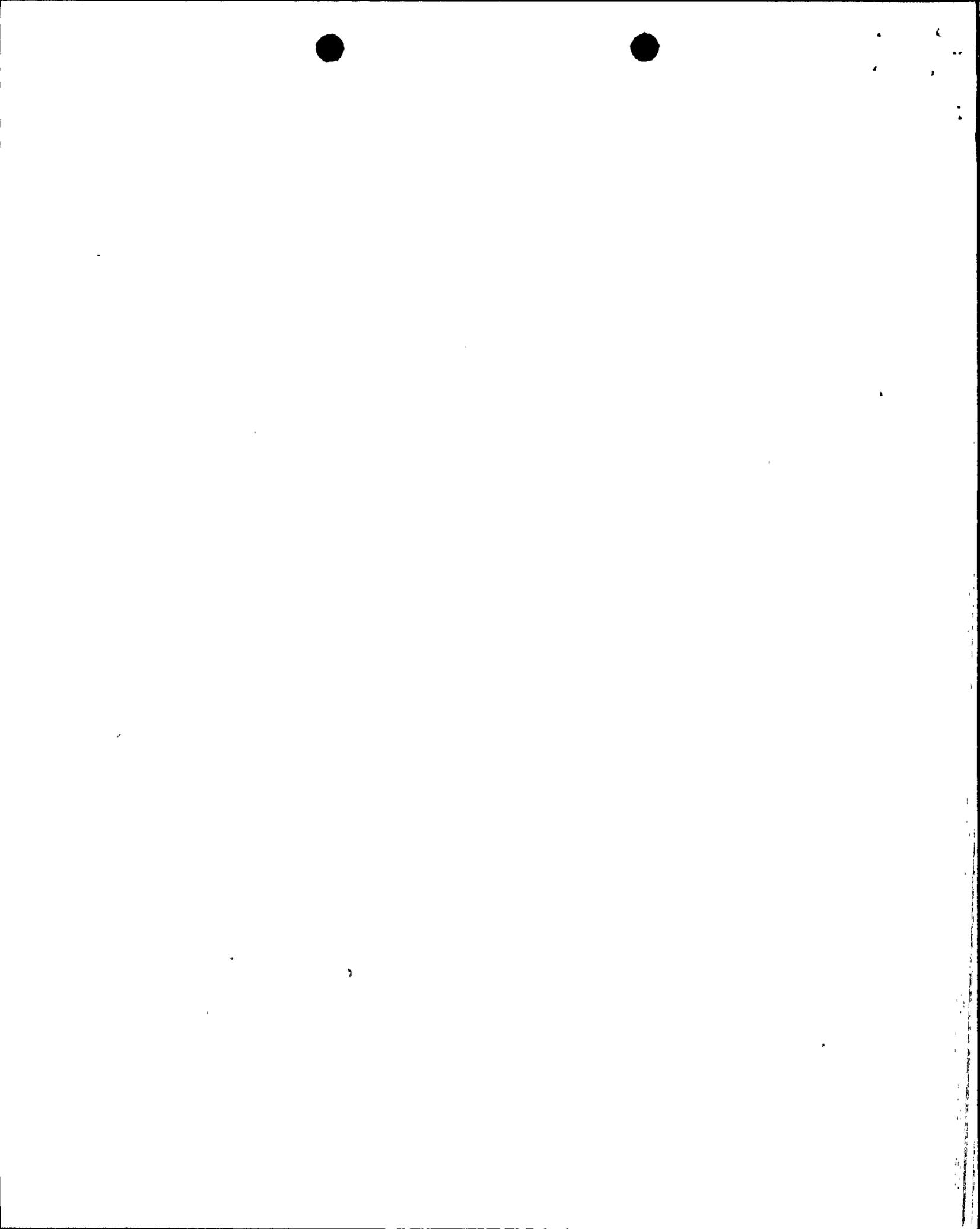
Evaluation criteria related to this requirement address the impact on safety systems of applying the maximum credible fault voltage/current to the SPDS.

The staff reviewed information provided by the Supply System concerning the devices used to isolate the WNP-2 SPDS from safety systems. That review indicated that the selected devices (Analog Devices Model 289 isolation amplifiers) are qualified isolators and are acceptable for use as an interface between the SPDS and safety systems. Attachment 2 provides details of the staff review.

2.6 Implementation of procedures and operator training addressing actions with and without the SPDS

Evaluation criteria related to this requirement address procedures and training to assure that the normal control room operating crew can determine plant safety status both with and without the SPDS.

A conclusion could not be made regarding this requirement. The Supply System should provide information sufficient to allow evaluation of the WNP-2 SPDS against this requirement.



2.7 Prompt implementation

Supplement 1 to NUREG-0737 does not provide specific evaluation criteria for this requirement. Paragraph 4.3 of that document does, however, describe the staff's position on prompt SPDS implementation. Additional guidance is provided in Paragraph 5 of Appendix A to SRP Section 18.2.

The SPDS was to be operational before WNP-2 exceeded 5 percent power in order to satisfy a license condition. The Supply System met the operational date specified in that license condition.

2.8 Incorporation of accepted human factors principles

Evaluation criteria related to this requirement address display formats and the application of human factors engineering principles to those displays so that information is readily perceived and comprehended by users.

The staff concludes that the Supply System has implemented a human factors program addressing both development and future modification of the WNP-2 SPDS. That program has resulted in incorporation of accepted human factors principles.

2.9 Parameters selected to provide, as a minimum, information about reactivity control, reactor core cooling and heat removal from the primary system, reactor coolant system integrity, radioactivity control, and containment conditions

Evaluation criteria related to this requirement address the selection of plant parameters and combinations of parameters which can be evaluated to determine the status of the five critical safety functions identified above.



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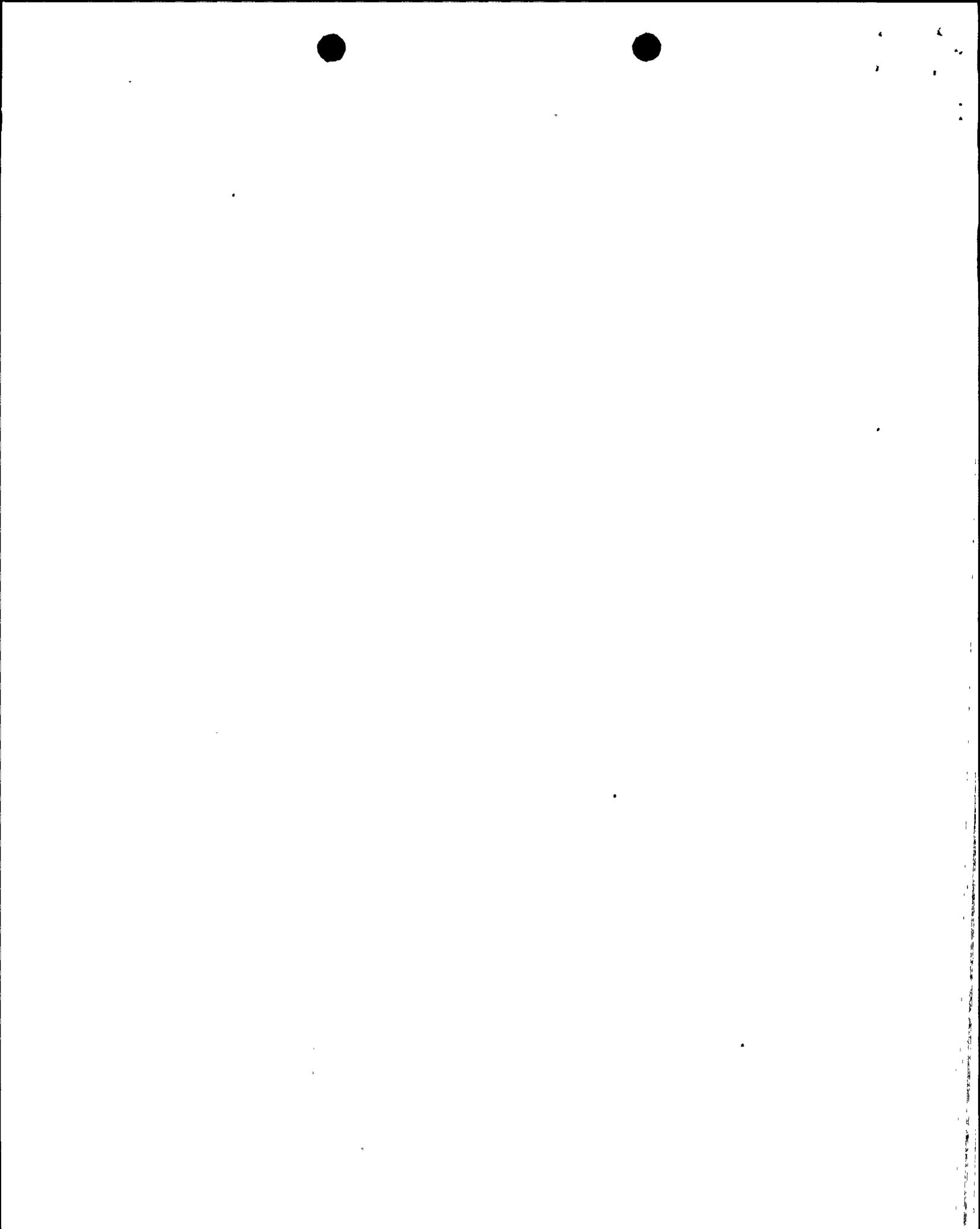
The staff concludes that the WNP-2 SPDS displays an acceptable set of parameters to monitor four of the five critical safety functions. Sufficient information may not be available to monitor containment conditions. The staff recommends that the Supply System either add containment hydrogen information to the SPDS or justify its omission.

2.10 Written safety analysis

The Supply System submitted a Safety Analysis Report (SAR) related to the SPDS for Washington Nuclear Plant 2 (WNP-2) by letter dated July 31, 1983. Staff review of the Supply System's SAR indicated the need for more information. That information was requested by the staff's letter of August 10, 1984. An October 9, 1984 letter from the Supply System responded to the staff's request. The staff made additional requests for information during telephone conversations on December 19, 1984 and February 28, 1985. The Supply System responded to those requests by letters dated January 31, 1985 and December 20, 1985 respectively. Although the Supply System has made a number of submittals related to the WNP-2 SPDS, the staff does not yet have sufficient information to complete evaluation of that system. Specific information needs are identified in 3.0 below.

2.11 Determine whether SPDS implementation involves an unreviewed safety question or change of Technical Specifications

The July 1, 1983 SAR indicated that the Supply System did not intend to have the WNP-2 SPDS reviewed by the offsite safety review committee. Staff concern resulted in a request for additional information regarding unreviewed safety questions. The Supply System referred to FSAR Section 7.7.2 which stated that there were no unreviewed safety questions related to the WNP-2 SPDS. Based on that statement, the staff concludes that the Supply System has satisfied this requirement.



2.12 Verification and validation

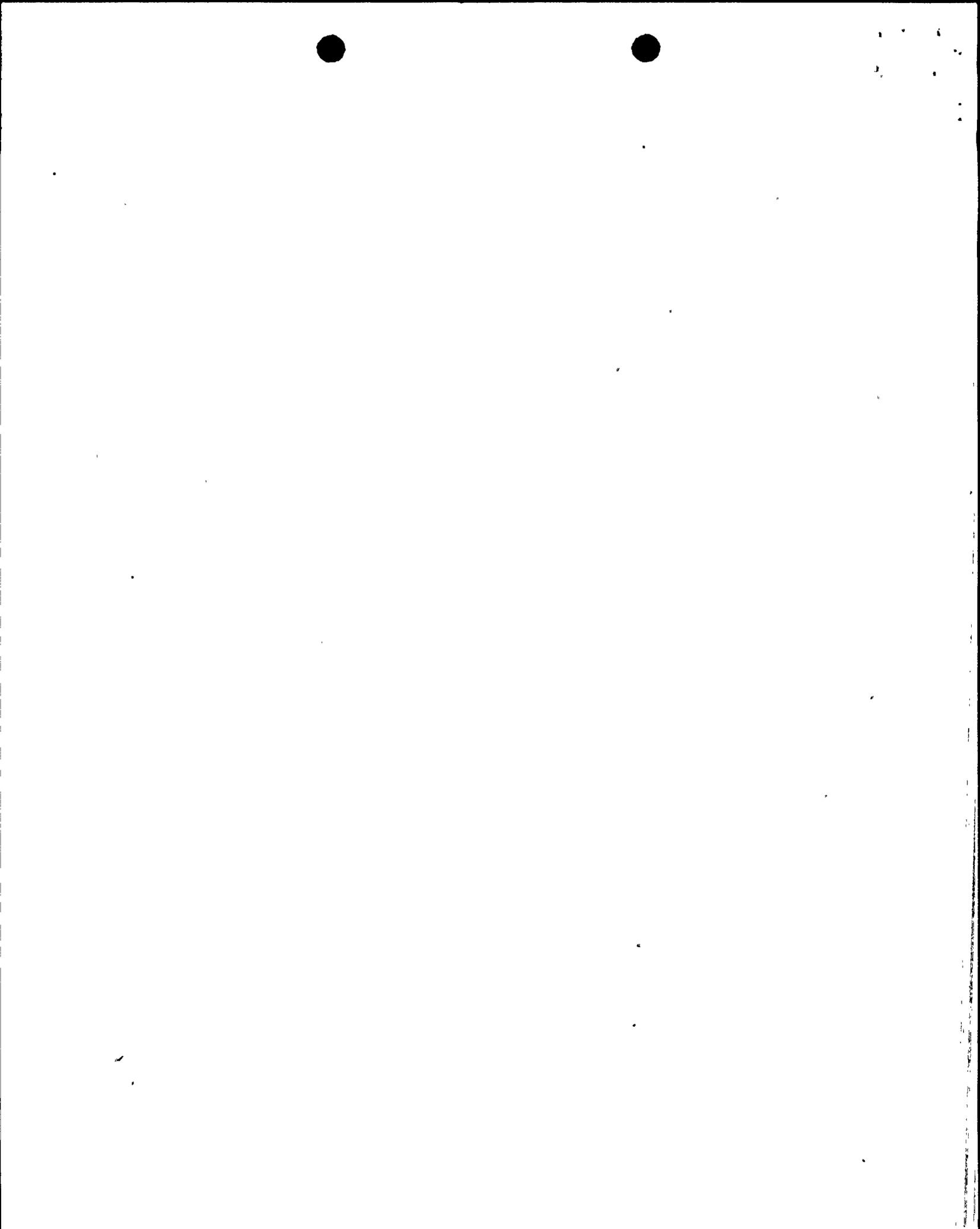
Guidelines for conducting an SPDS verification and validation program address checks to assure that the design will satisfy functional needs and checks to assure that the system was properly installed. The guidelines also address documentation of identified problems, documentation of design modifications, and qualifications and independence of persons performing the verification and validation.

The Supply System did not provide information on a verification and validation program for the WNP-2 SPDS. Information about such a program, and when completed, is needed by the staff to complete the evaluation of the WNP-2 SPDS.

3.0 CONCLUSION

Staff evaluation of information provided by the Supply System has identified no serious safety question related to the WNP-2 SPDS. While the staff concludes that SPDS implementation may continue at WNP-2, that conclusion does not imply full satisfaction of Supplement 1 to NUREG-0737 SPDS requirements. A post-implementation audit will be necessary sometime in the future. Further information identified below and explained in more detail in Attachment 1, is requested by the staff to continue its evaluation of the WNP-2 SPDS:

1. Provide information on SPDS availability.
2. Provide information on the continuous display of information.

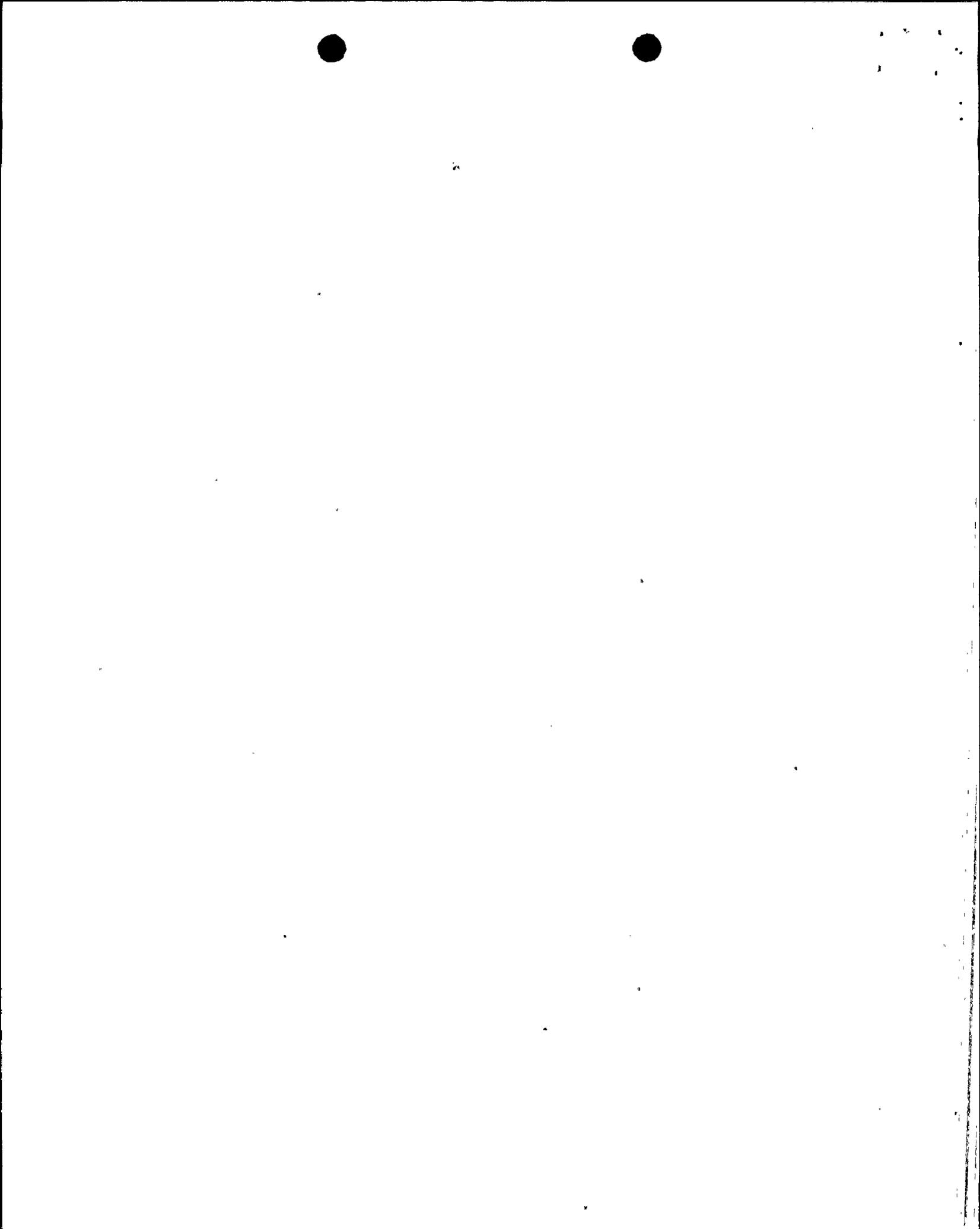


3. Provide information on implementation of procedures and operator training addressing action with and without the SPDS.
4. Provide a commitment to add information on monitoring of containment hydrogen or justify the omission of such information.
5. Provide a description of and the results of the SPDS verification and validation program.

The Supply System is referred to Section 18.2, Appendix A of the SRP for guidance in providing the information listed above. That information should be submitted in a supplement to the SAR for the WNP-2 SPDS.

Principal Contributor: Dennis I. Serig

Dated: July 22, 1987



REFERENCES

NUREG-0660, "NRC Action Plan Developed as a Result of the TMI-2 Accident," May 1980; Revision 1, August 1980.

NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1980; Supplement 1, December 1982.

NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 18.2, Rev. 0, November 1984.

Letter from G.D. Bouchey (Supply System) to A. Schwencer (NRC). Subject: "Nuclear Plant No. 2 Safety Parameter Display System (SPDS) Safety Analysis Report, Submittal of," dated July 1, 1983.

Letter from A. Schwencer to G.D. Bouchey. Subject: "Request for Additional Information - Safety Parameter Display System for WNP-2," dated August 10, 1984.

Letter from G.C. Sorenson (Supply System) to A. Schwencer. Subject: "Nuclear Plant No. 2 - NRC Request for Additional Information - Safety Parameter Display System (SPDS)," dated October 9, 1984.

Letter from G.C. Sorenson to A. Schwencer. Subject: "Nuclear Plant No. 2 - Graphic Display System Human Factors," dated January 31, 1985.

Letter from G.C. Sorenson to E. Adensam (NRC). Subject: "Nuclear Plant No. 2 - NRC Request for Additional Information - Safety Parameter Display System (SPDS)," dated December 20, 1985.

Memorandum from F. Rosa (NRC) to M. Srinivasan (NRC). Subject: "Washington Nuclear Power Plant No. 2 - Review of Isolation Devices that Interface with the SPDS," dated March 25, 1986.

Letter from R.T. Liner (SAIC) to S. Bajwa (NRC). Subject: "Safety Parameter Display System Review," dated March 23, 1987.

