



July 19, 2010
NRC:10:065

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Response to U.S. EPR Design Certification Application RAI No. 421

Ref. 1: E-mail, Getachew Tesfaye (NRC) to Martin Bryan, et al (AREVA NP Inc.), "U.S. EPR Design Certification Application RAI No. 421 (4779,4784), FSAR Ch 18," June 21, 2010.

In Reference 1, the NRC provided a request for additional information (RAI) regarding the U.S. EPR design certification application (i.e., RAI No. 421). Technically correct and complete responses to 1 (Question 18-174) of the 8 questions to RAI No.421 are enclosed with this letter.

The enclosed response consists of the following:

Question #	Start Page	End Page
RAI 421 — 18-174	2	2
RAI 421 — 18-175	3	4
RAI 421 — 18-176	5	23
RAI 421 — 18-177	24	28
RAI 421 — 18-178	29	29
RAI 421 — 18-179	30	30
RAI 421 — 18-180	31	31
RAI 421 — 18-181	32	32

A complete answer is not provided for 7 of the questions. The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 421 — 18-175	September 15, 2010
RAI 421 — 18-176	September 15, 2010
RAI 421 — 18-177	September 15, 2010
RAI 421 — 18-178	September 15, 2010
RAI 421 — 18-179	September 15, 2010
RAI 421 — 18-180	September 15, 2010
RAI 421 — 18-181	September 15, 2010

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AREVA NP considers some of the material contained in the enclosure to be proprietary. As required by 10 CFR 2.390(b), an affidavit is enclosed to support the withholding of the information from public disclosure. Proprietary and non-proprietary versions of the enclosure to this letter are provided.

If you have any questions related to this submittal, please contact me by telephone at 434-832-2369 or by e-mail at sandra.sloan@areva.com.

Sincerely,



Sandra M. Sloan, Manager
New Plants Regulatory Affairs
AREVA NP Inc.

Enclosures

cc: G. Tesfaye
Docket No. 52-020

requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information".

6. The following criteria are customarily applied by AREVA NP to determine whether information should be classified as proprietary:

- (a) The information reveals details of AREVA NP's research and development plans and programs or their results.
- (b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.
- (c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for AREVA NP.
- (d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for AREVA NP in product optimization or marketability.
- (e) The information is vital to a competitive advantage held by AREVA NP, would be helpful to competitors to AREVA NP, and would likely cause substantial harm to the competitive position of AREVA NP.

The information in the Document is considered proprietary for the reasons set forth in paragraph 6(c) above.

7. In accordance with AREVA NP's policies governing the protection and control of information, proprietary information contained in this Document has been made available, on a limited basis, to others outside AREVA NP only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. AREVA NP policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

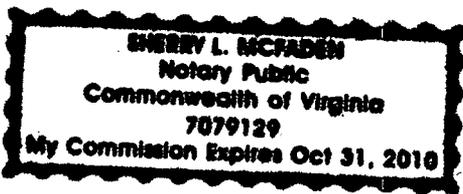
9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

Scott Parnell

SUBSCRIBED before me on this 19th
day of July, 2010.

Sherry L. McFaden

Sherry L. McFaden
NOTARY PUBLIC, COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: 10/31/10
Reg. # 7079129



Response to

Request for Additional Information No. 421(4779, 4784), Revision 1

6/21/2010

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 18 - Human Factors Engineering

Application Section: FSAR Chapter 18

**QUESTIONS for Operating Licensing and Human Performance Branch
(AP1000/EPR Projects) (COLP)**

Question 18-174:

HSI IP, Revision 3 has removed reference to both Flammanville -3 and Olkiluoto-3 as being predecessor plants. Revision 3 contains a new statement, "The Human System Interface (HSI) design for the US EPR plant is based on operating experience, and outputs from the human factors engineering (HFE) program analysis." This statement is unclear with respect to what specific "operating experience" is being referred to by AREVA. The staff requests for the applicant to clarify this statement accordingly. In addition, the Inheritance Plan indicates that Olkiluoto -3 is a predecessor plant and the staff requests for the applicant to reconcile this discrepancy.

Response to Question 18-174:

The Inheritance Plan is no longer considered as an input into the HSI Design Implementation Plan. AREVA does not plan to update or maintain the Inheritance Plan going forward.

The term "operating experience" refers to the outputs of the operating experience review (OER) program element described in the U.S. EPR OER Implementation Plan. The sentence in question may be misleading by using the phrases "outputs from the human factors engineering (HFE) program analysis" and "operating experience" separately when OER is a type of HFE program analysis. This wording was not intended to differentiate operating experience from the overall HFE program.

The OL3 plant will not be used specifically for operating experience because it is not yet in operation. However, lessons learned from elements such as construction and design implementation can be used from the predecessor plants (OL3 and FA3). The use of OER as an input into HSI design is described in section 2.1.1 of the HSI Design Implementation Plan.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 18-175:

NUREG-0711 11.4.1.2.1(3) states:

- 1) The sample should reflect a range of situational factors that are known to challenge human performance, such as:
 - ◆ Operationally difficult tasks—the sample should address tasks that have been found to be problematic in the operation of NPPs, e.g., procedure versus situation assessment conflicts. The specific tasks selected should reflect the operating history of the type of plant being validated (or the plant's predecessor).
 - ◆ Error-forcing contexts—Situations specifically designed to create human errors should be included to assess the error tolerance of the system and the capability of operators to recover from errors should they occur.
 - ◆ High-workload conditions—the sample should include situations where human performance variation due to high workload and multitasking situations can be assessed.
 - ◆ Varying-workload situations—the sample should include situations where human performance variation due to workload transitions can be assessed. These include conditions that exhibit (1) a sudden increase in the number of signals that must be detected and processed following a period in which signals were infrequent and (2) a rapid reduction in signal detection and processing demands following a period of sustained high task demand.
 - ◆ Fatigue and circadian factors—the sample should include situations where human performance variation due to personnel fatigue and circadian factors can be assessed.
 - ◆ Environmental factors—the sample should include situations where human performance variation due to environmental conditions such as poor lighting, extreme temperatures, high noise, and simulated radiological contamination can be assessed.

Section 3.2.3 of the Validation & Verification Implementation Plan, Rev. 2 states that the performance shaping factors identified in this criterion will be included in the scenarios. However, Section 3.2.9 of the Validation & Verification Implementation Plan, Rev. 2 states that until start-up and operations, it is not valid to attempt to assess environmental conditions in a simulated environment because the results are not reliable, and are too artificial; and that therefore, the only environmental variable that will be simulated will be loss of AC power. The staff requests for the applicant to clarify this inconsistency. In addition, please specify if all factors identified in the criterion, including environmental factors, will be included in the scenarios.

Response to Question 18-175:

The U.S. EPR Human Factors Engineering Design Implementation Plan Section 3.3 addresses the verification of features that cannot be evaluated with a full scope simulator during validation and verification (V&V). Examples of these types of features include environmental factors such as control room lighting, acoustics, and habitability.

These environmental factors can not be assessed until the actual control room is constructed. Therefore, verification of some environmental factors will take place during the design implementation phase of the HFE program and use realistic conditions that are typical of actual operating conditions. All factors identified in the criterion, including environmental factors, are addressed during V&V or design implementation. The confusion lies between the scenarios completed on the simulator during V&V and those completed at the plant during design implementation. Internal and external validity, reliability, and repeatability are essential to the quality of data. Thus, only data will be collected that upholds best scientific practices, and some of that data can not be reasonably gathered in the simulator. This particularly applies to environmental data.

Section 3.2.9 of the V&V Implementation Plan will be revised to reference the HFE Design Implementation Plan for features that cannot be evaluated on the V&V simulator.

Document Number	Commitment Date
U.S. EPR Human Factors Verification and Validation Implementation Plan #118-9046087-003	9/15/2010

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 18-176:

NUREG-0711 11.4.1.2.2 states the results of sampling should be combined to identify a set of scenarios to guide the subsequence analyses. A given scenario may combine many of the characteristics identified by operational event sampling.

NUREG-0711 11.4.3.2.4 (1) also states:

- 1) The operational conditions selected for inclusion in the validation tests should be developed in detail so they can be performed on a simulator. The following information should be defined to provide reasonable assurance that important performance dimensions are addressed and to allow scenarios to be accurately and consistently presented for repeated trials:
 - ◆ description of the scenario and any pertinent "prior history" necessary for personnel to understand the state of the plant upon scenario start-up
 - ◆ specific initial conditions (precise definition provided for plant functions, processes, systems, component conditions and performance parameters, e.g., similar to plant shift turnover)
 - ◆ events (e.g., failures) to occur and their initiating conditions, e.g., time, parameter values, or events
 - ◆ precise definition of workplace factors, such as environmental conditions
 - ◆ task support needs (e.g., procedures and technical specifications)
 - ◆ staffing objectives
 - ◆ communication requirements with remote personnel (e.g., load dispatcher via telephone)
 - ◆ the precise specification of what, when and how data are to be collected and stored (including videotaping requirements, questionnaire and rating scale administrations)
 - ◆ specific criteria for terminating the scenario.

The staff requests for the applicant to provide a sample of the set of scenarios that will be used in the applicant's Validation & Verification Implementation Plan. The applicant's response regarding these scenarios should include the following information:

- a. The sample set to include at least 4 different scenarios.
- b. The sample set should be representative of the variety scenarios that will be generated.
- c. This sample set of scenarios should include the level of detail that is needed to implement the scenario stated in NUREG 11.4.3.2.4(1).
- d. The scenarios should include all information outlined in the numbered list contained in sections 3.6.3.5 of the V&V IP R. 2, page 72, and section 4.3.1, (4.3.1.2 thru 4.3.1.13) of same.
- e. The method used to combine the elements listed in the V&V IP to create the set, written at a level of detail that it may be replicated and repeated.

Response to Question 18-176:

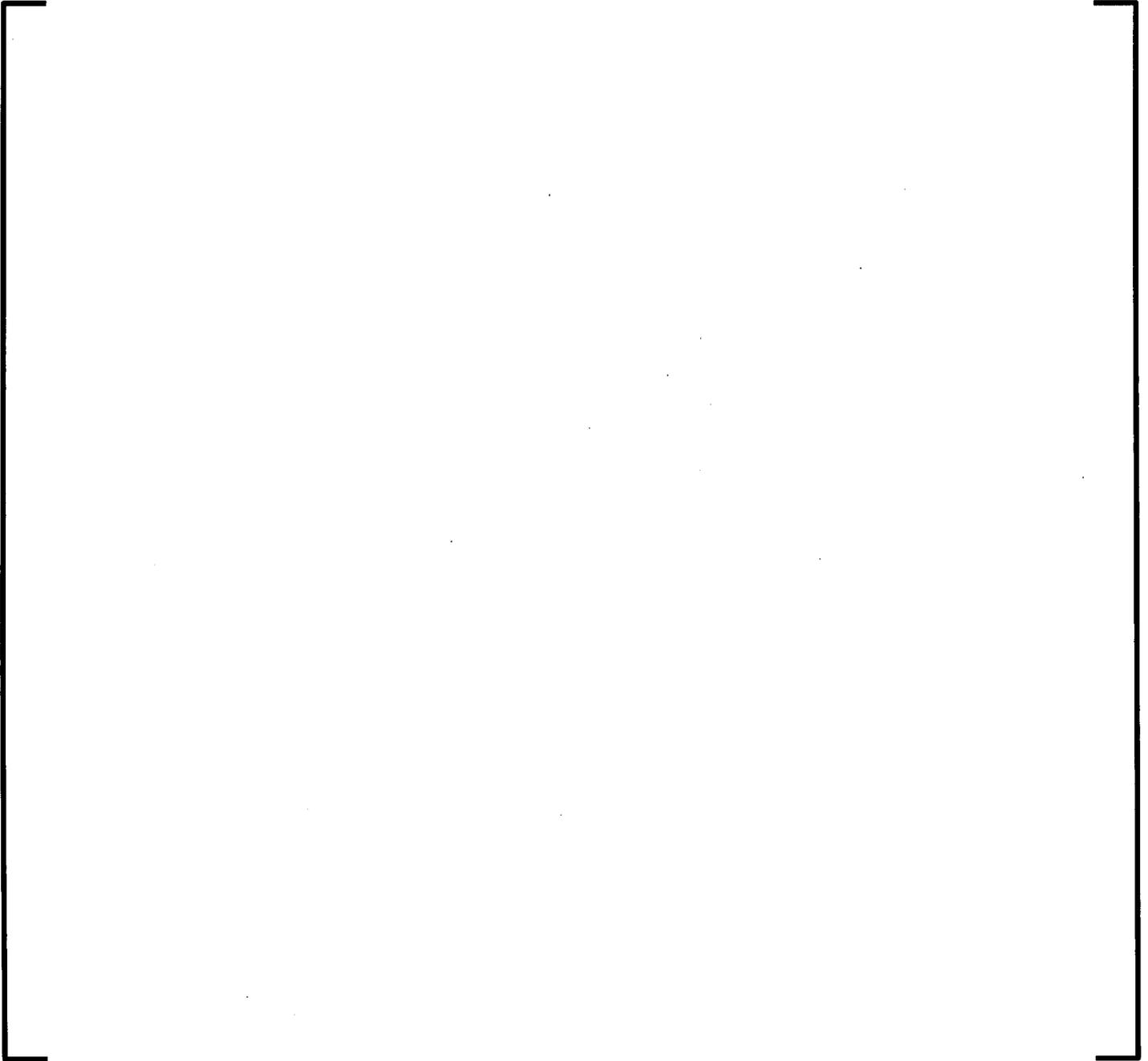
As discussed with the NRC in a teleconference on Thursday June 17th, 2010, AREVA will provide example scenarios to meet the criteria in question in the next revision of the U.S. EPR Human Factors Engineering (HFE) Verification and Validation (V&V) Implementation Plan. The first example scenario, presented to the NRC in the teleconference, is provided below.

Document Number	Commitment Date
U.S. EPR Human Factors Verification and Validation Implementation Plan #118-9046087-003	9/15/2010

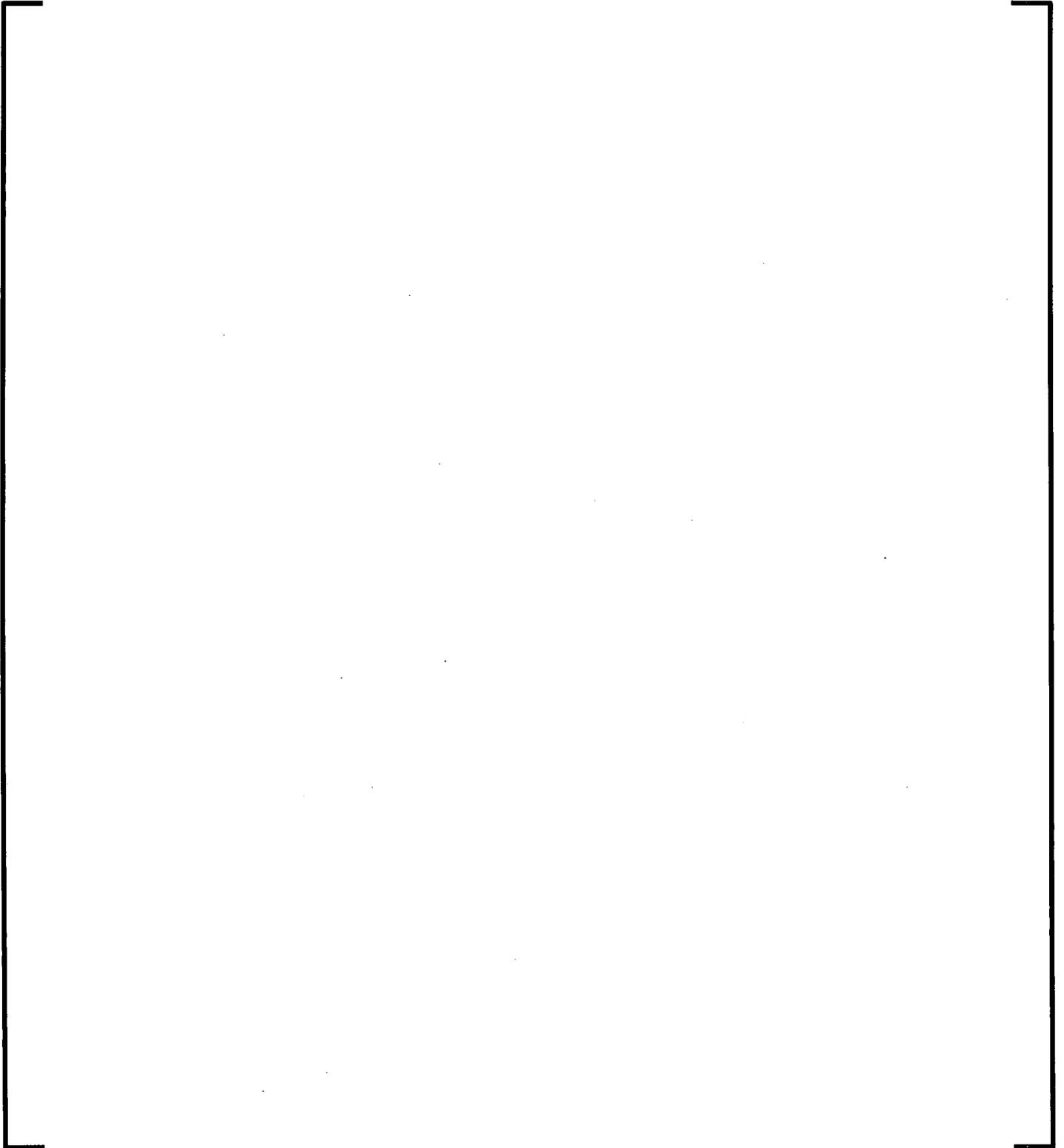
V&V SCENARIO SIMULATOR GUIDE

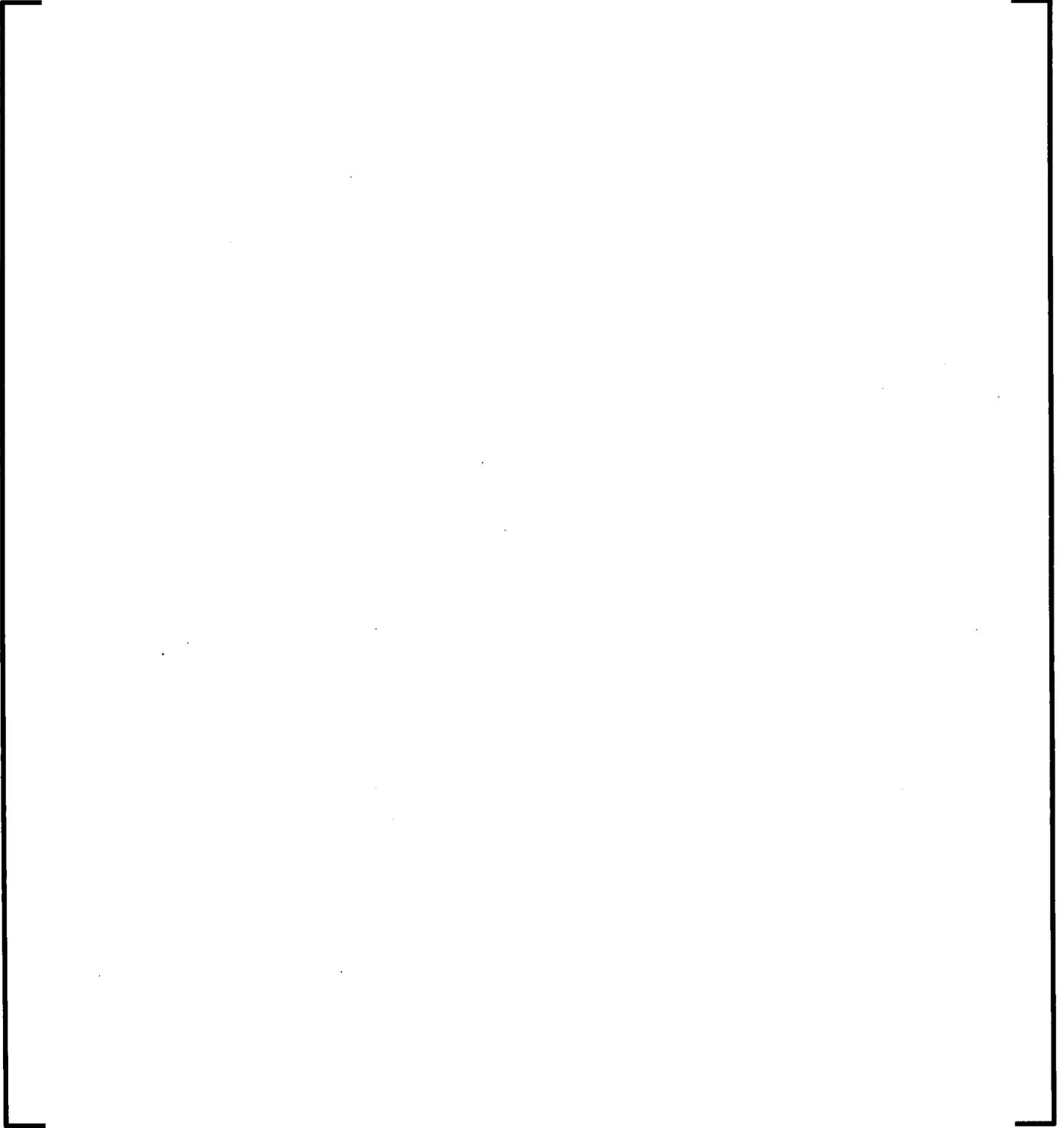


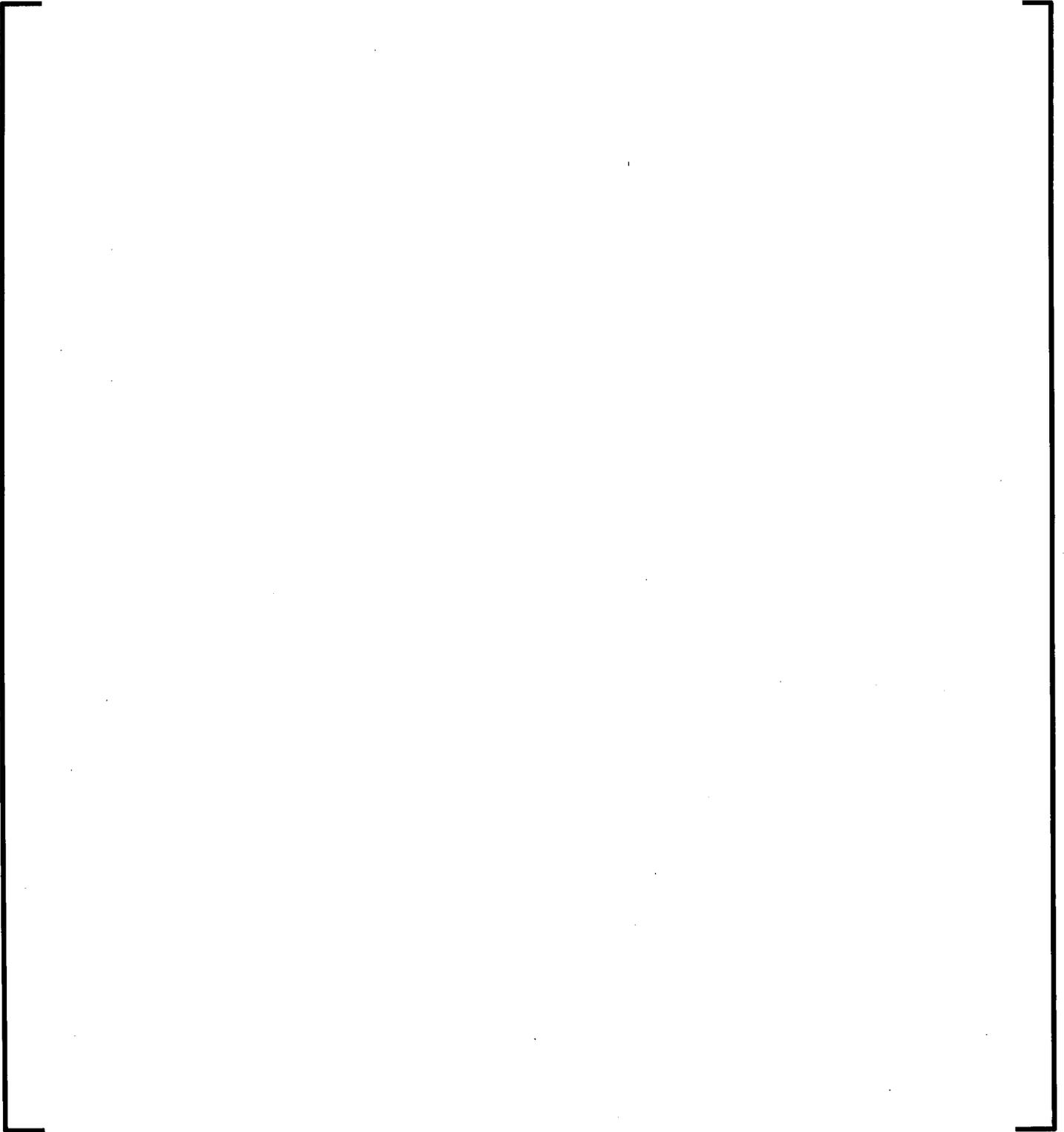
EPR V&V Scenario				
REVISION/USAGE LOG				
REVISION NUMBER	DESCRIPTION OF REVISION	DATE	PAGES AFFECTED	REVIEWED BY
0	INITIAL ISSUE	6/13/10	All	

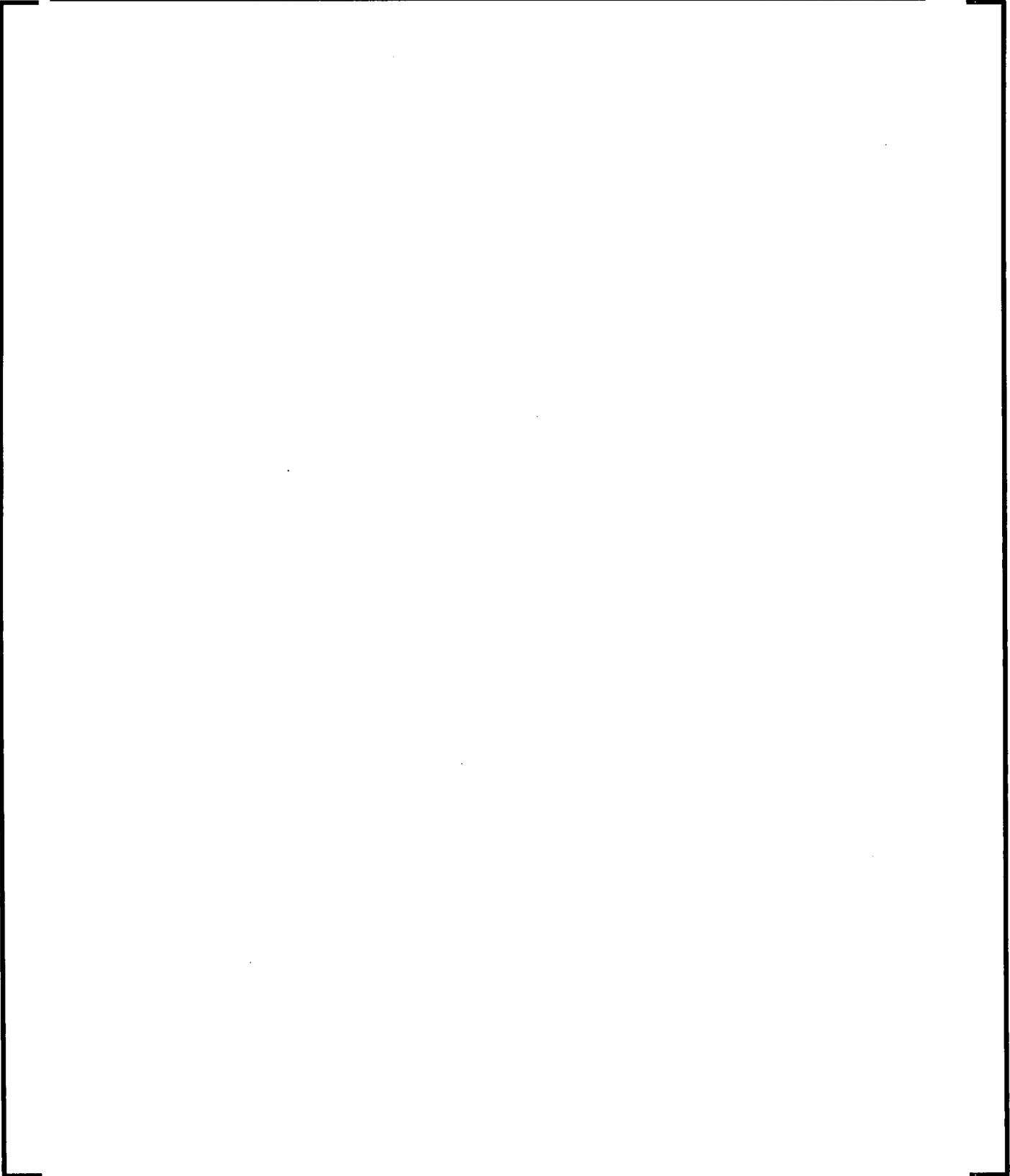


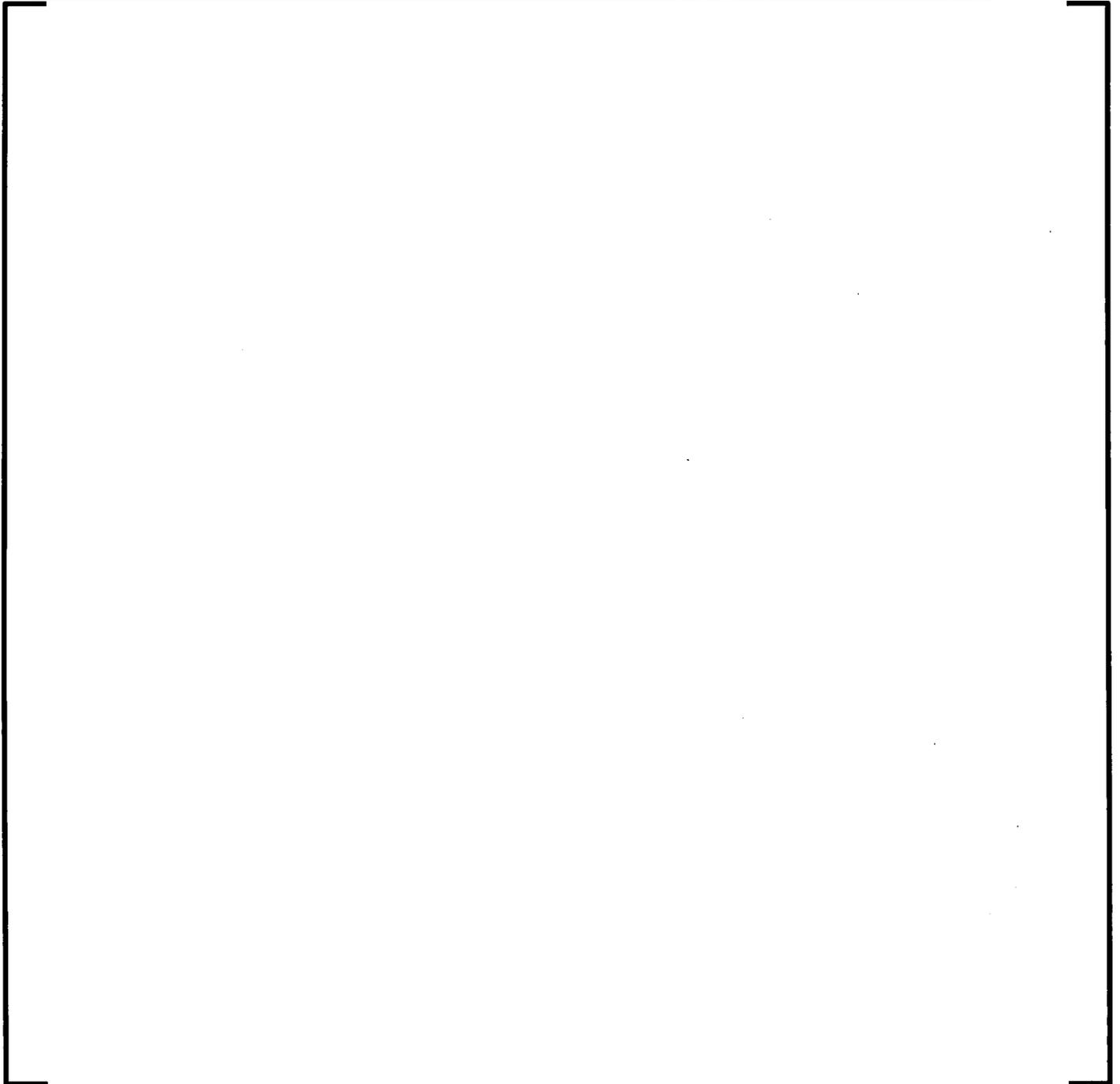


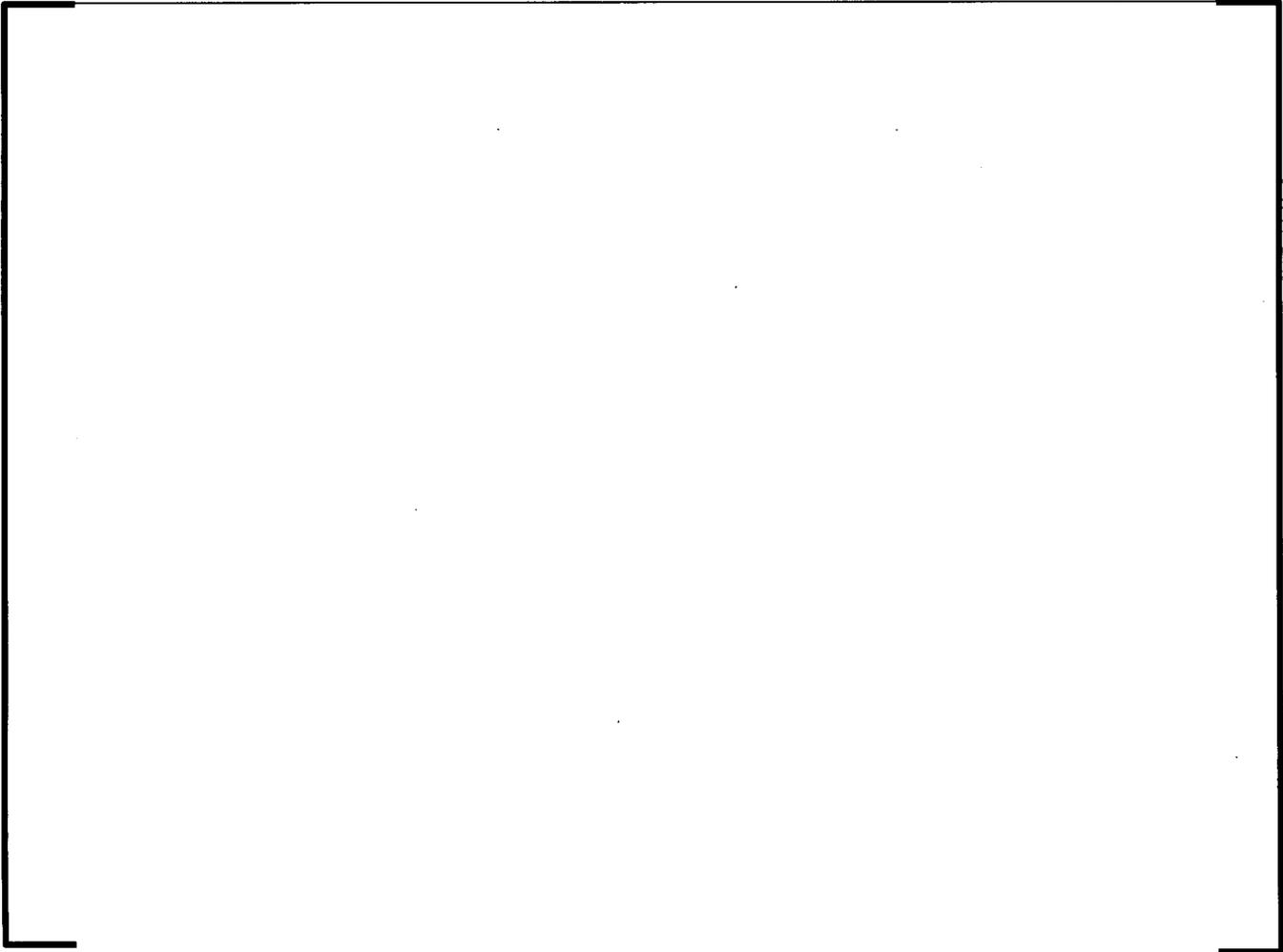


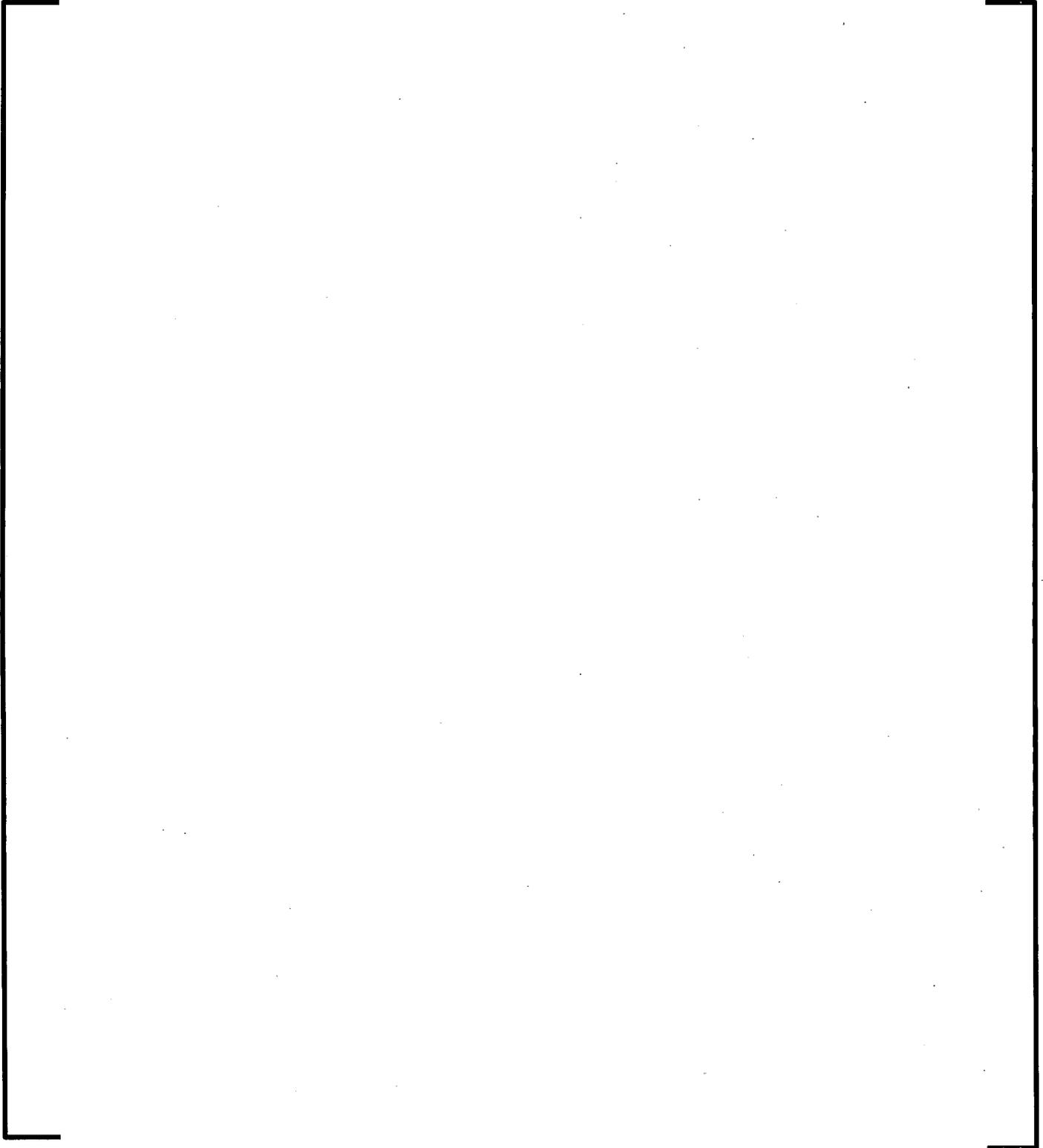


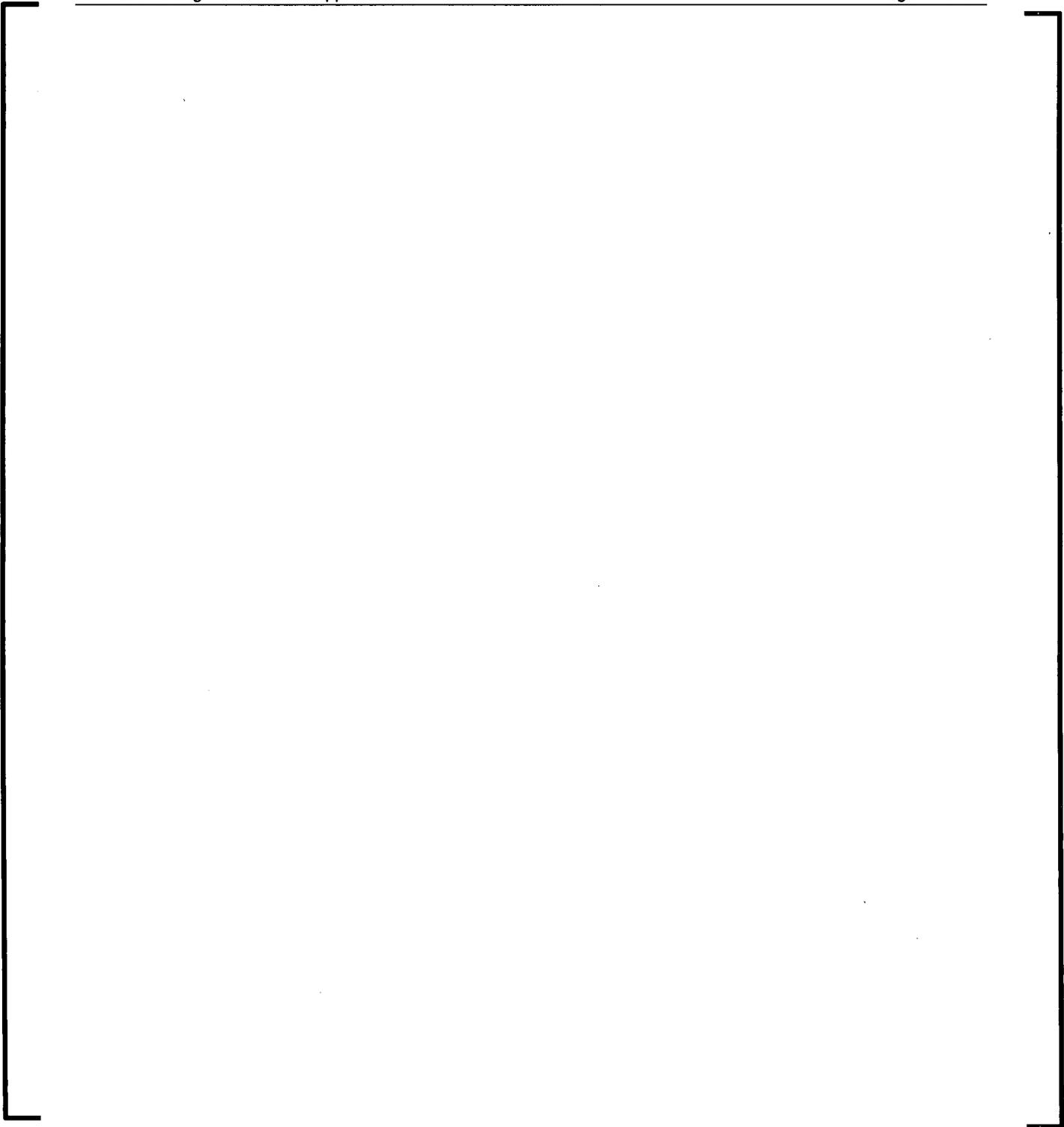


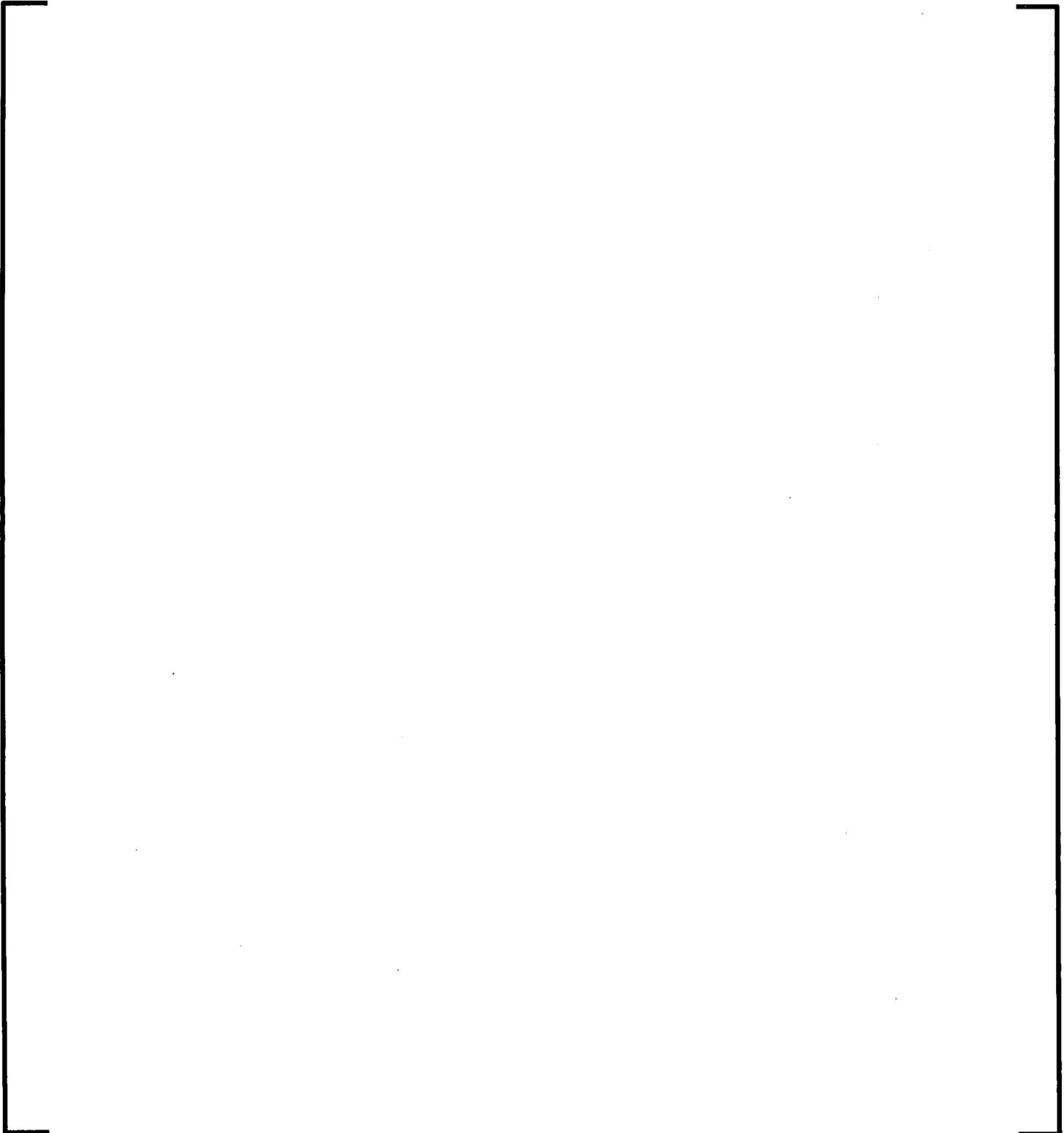


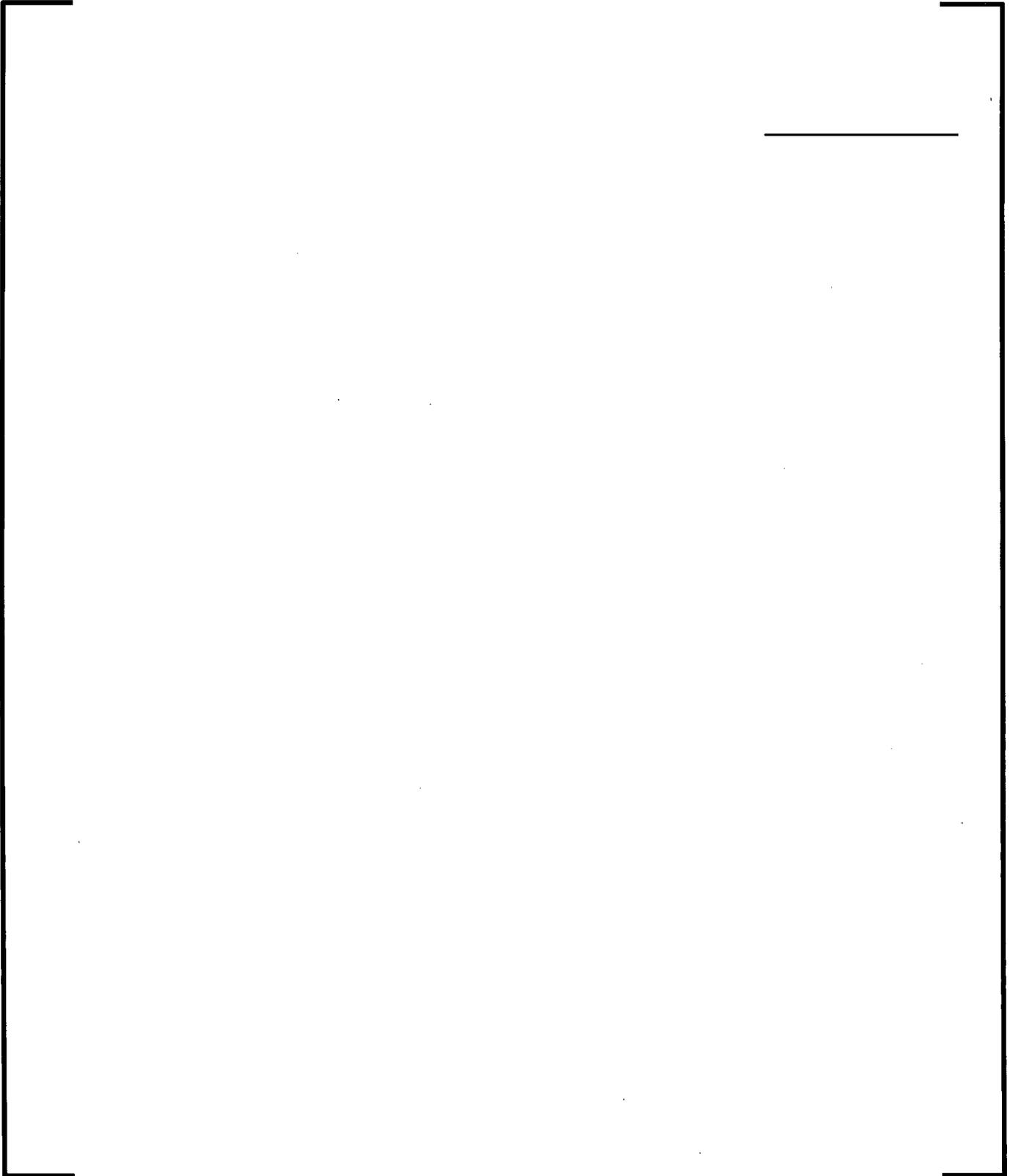


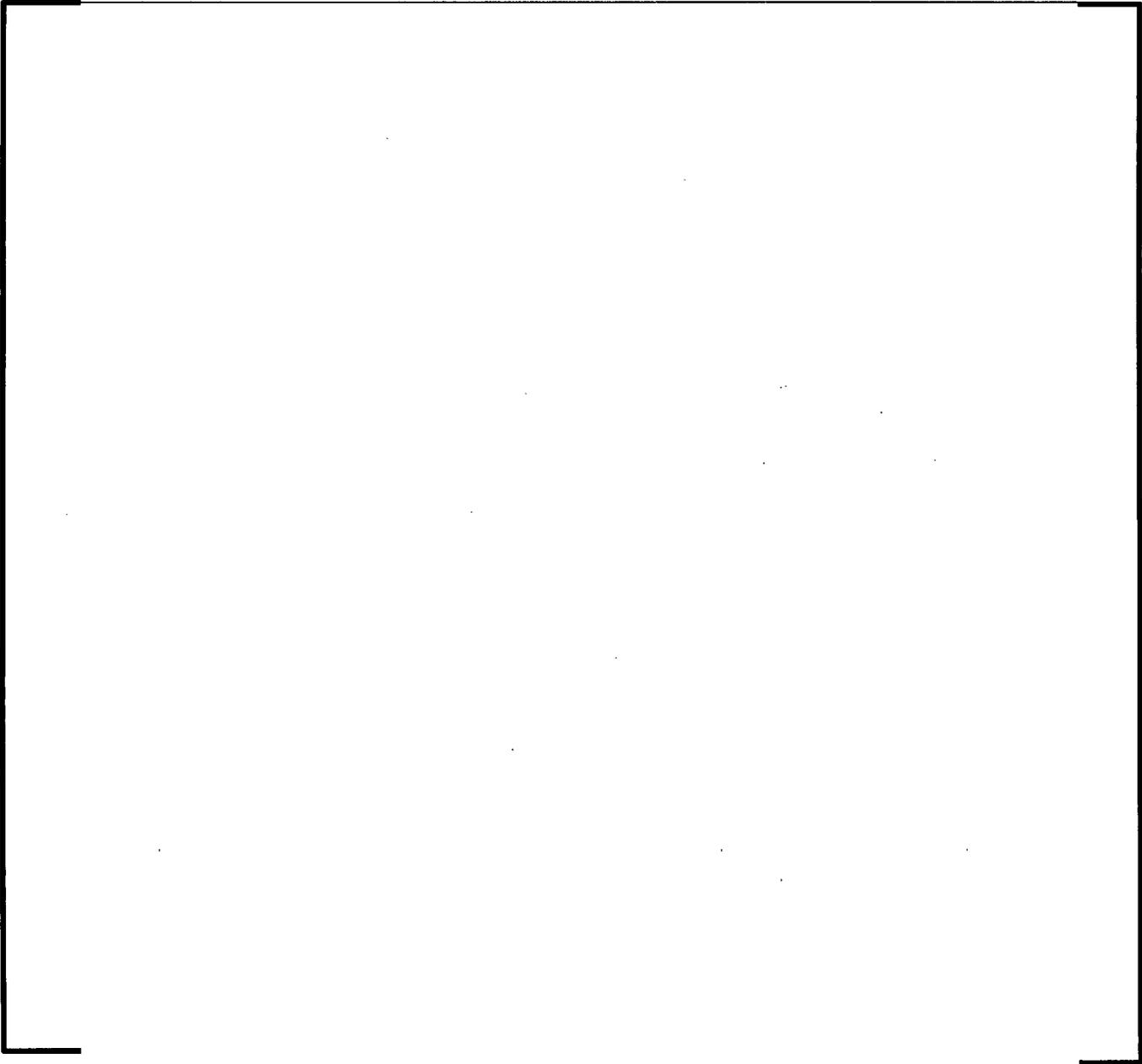


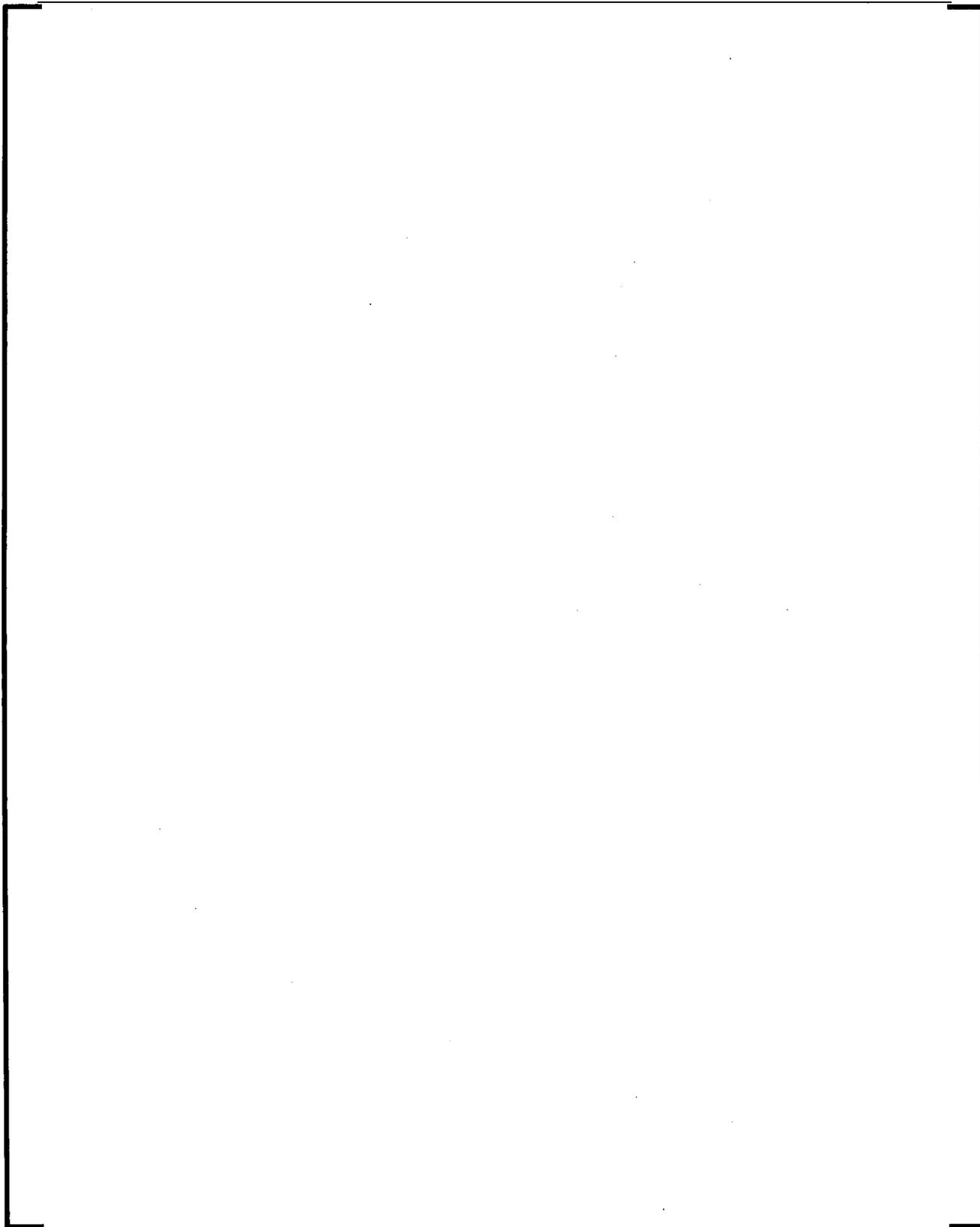


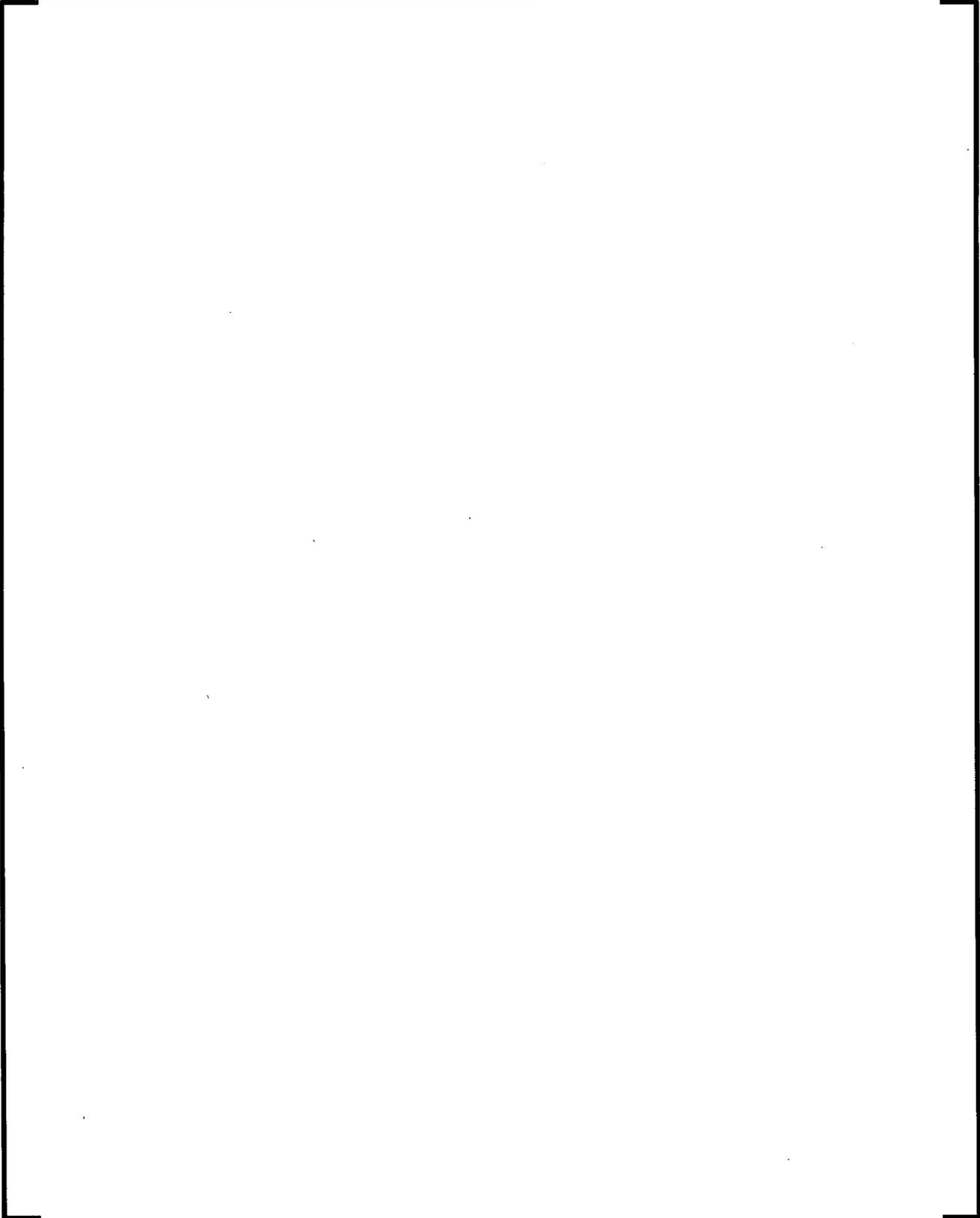


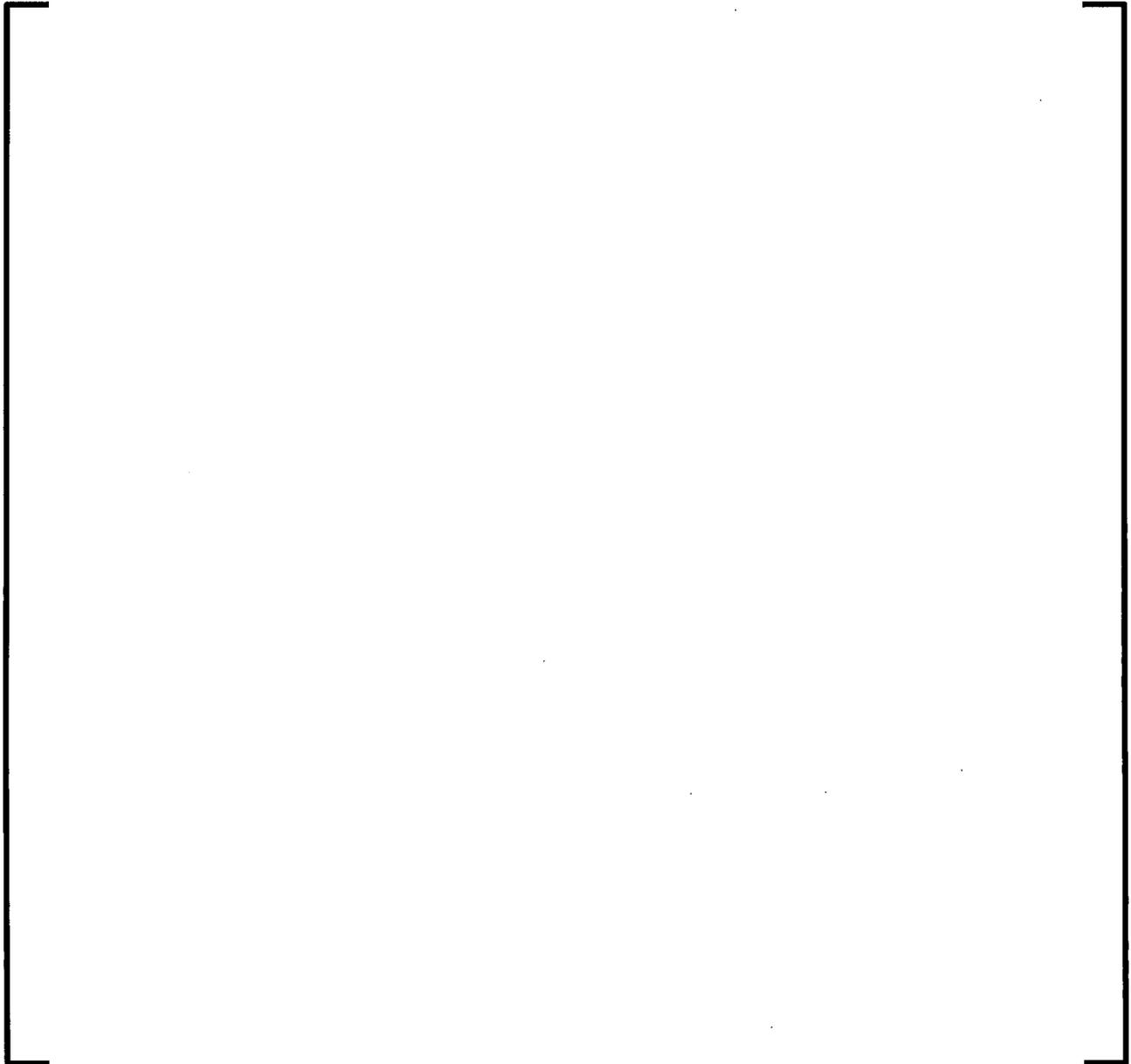












FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 18-177:

NUREG-0711 11.4.1.2.2 (2) states:

The scenarios should not be biased in the direction of over representation of the following:

- Scenarios for which only positive outcomes can be expected
- Scenarios that for integrated system validation are relatively easy to conduct administratively (scenarios that place high demands, data collection or analysis are avoided).
- Scenarios that for integrated system validation are familiar and well structured (e.g., which address familiar systems and failure modes that are highly compatible with plant procedures such as "textbook" design-basis accidents)

The staff request for the applicant to provide the sampling method that will be used to develop the set of sample scenarios to be used for Verification and Validation in order to demonstrate how sampling bias will be avoided.

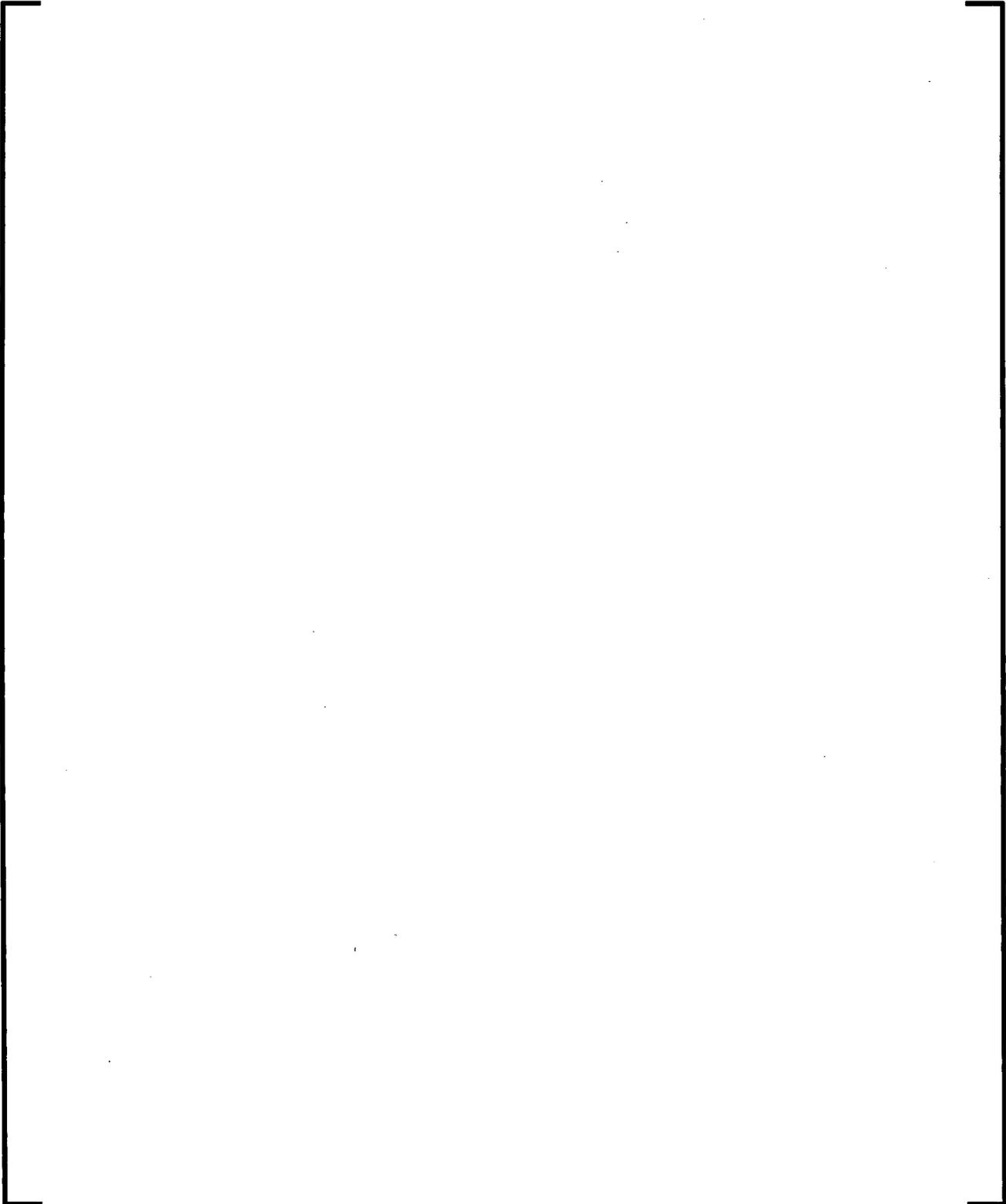
Response to Question 18-177:

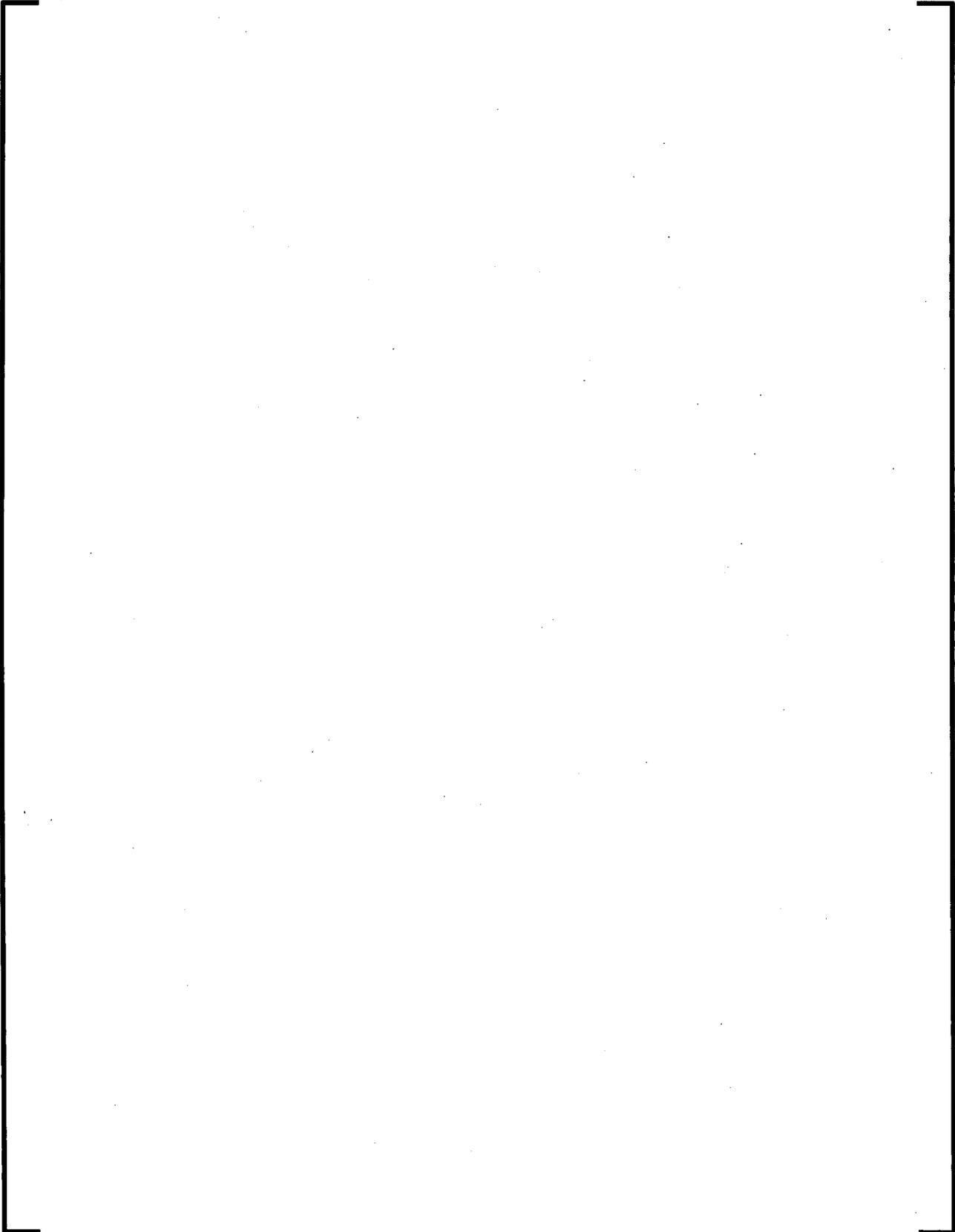
As discussed with the NRC in a teleconference on Thursday, June 17th, AREVA NP will provide additional information on the sampling methodology for scenarios to meet the criteria in question in the next revision of the U.S. EPR Human Factors Engineering (HFE) Verification and Validation (V&V) Implementation Plan. This sampling methodology will follow the methodology described in the teleconference. Provided below are example figures relating to the methodology discussed in the teleconference.

Figure 18-177-1—Example P artial U.S. EPR V&V Scenario Matrix



Figure 18-177-2—Example: Outcome-Based Weighting Factors







Document Number	Commitment Date
U.S. EPR Human Factors Verification and Validation Implementation Plan #118-9046087-003	9/15/2010

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 18-178:

NUREG-0711 section 11.4.2.3.2 states that the criteria for the HFE Design Verification Review Criteria should be identified.

Human Factors Engineering Design Verification is discussed in Section 3.5.2 of the V&V IP R. 2. In it, the applicant states that designs are compared to HFE guidelines and those deviations from accepted HFE guidelines, standards, and principles are documented as HEDs. The staff requests for the applicant to identify the document or documents that contain all these accepted guidelines, standards, and principles. (This may be NUREG-0700 or the EPR HFE Style Guide. If another document is used, then please provide a brief justification or rationale.)

Response to Question 18-178:

Section 3.5.2 of the U.S. EPR HFE V&V Implementation states:

“HFE Design Verification verifies that each HSI component design meets personnel task requirements and operational considerations, and reflects HFE guidelines, standards, and principles reflected in the U.S. EPR™ style guide.”

The U.S. EPR HSI Design Style Guide and the U.S. EPR Local Control Station Style Guide are the documents that contain the accepted HFE guidelines, standards, and principles for evaluation during Verification and Validation (V&V).

These documents will be explicitly cited for use during design verification in the next revision of the U.S. EPR HFE V&V Implementation Plan to comply with the NUREG-0711 criteria in the question.

Document Number	Commitment Date
U.S. EPR Human Factors Verification and Validation Implementation Plan #118-9046087-003	9/15/2010

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 18-179:

NUREG-0711 section 11.4.2.3.2(4) states that HEDs, should be documented by the applicant in terms of the HSI component involved and how its characteristics depart from a particular guideline. However, the staff cannot find this information in the V&V IP. The staff requests the applicant to identify where this commitment can be found.

Response to Question 18-179:

The HFE V&V Implementation plan section 3.7.8.2 includes the "associated HSI" in the HED evaluation documentation. An additional bullet will be added to this section in the V&V IP to include "the specific characteristics that deviate from an HFE guideline and the associated guideline that was violated" to meet the criteria in the question.

Document Number	Commitment Date
U.S. EPR Human Factors Verification and Validation Implementation Plan #118-9046087-003	9/15/2010

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 18-180:

NUREG-0711 section 11.4.2.3.2(2) states that the characteristics of the HSI components should be compared with the HFE guidelines. In addition, for each guideline a determination should be made whether the HSI is acceptable or discrepant from the guideline. However, the staff does not find commitment and process to compare each guideline to the HSI in the V&V IP. The staff request for the applicant to identify where this information can be found.

Response to Question 18-180:

The Response to Question 18-178 identifies the section in the Verification and Validation (V&V) Implementation plan where it states that human system interface (HSI) components are compared to Human Factors Engineering (HFE) guidelines. Specifically, Section 3.5.2.4.4, describes the design verification of HSI components. For example, this includes "visually checking for compliance with the style guide for graphical user interfaces".

The Human Engineering Discrepancy (HED) process, described in Section 3.7 of the V&V Implementation plan, captures HSI components that do not meet HFE guidelines or are "discrepant". This meets the requirements of NUREG-0711 section 11.4.2.3.2(2) which states that "it should be determined whether the HSI is "acceptable" or "discrepant" from the guideline, an HED."

Examples of HEDs are given in Section 3.7.2 of the V&V Implementation Plan and include "displays require interpretation, are difficult to read, or are not well labeled". This is an example of an HED that could come from design verification of HSI components or displays.

The following sentence will be added to the end of Section 3.5.2.4.4 of the revised V&V Implementation Plan to strengthen the commitment to the criteria in the question. "Discrepant HSI components identified during design verification are recorded as HEDs and follow the HED process described in Section 3.7."

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FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 18-181:

Section 3.6.2.3 of the V&V IP R. 2 states that the simulators used in HFE V&V activities are described in section 3.8. However, the staff finds that section 3.8 refers to the final plant HFE/HSI design check; but, it does not provide a description of the simulators. The staff requests for the applicant to correct this reference to indicate that the descriptions of the simulators are found in section 3.9.

Response to Question 18-181:

This reference will be corrected to reference section 3.9 in the next revision of the U.S. EPR Human Factors Engineering (HFE) Verification and Validation (V&V) Implementation Plan.

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FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.