PROJECT INSTRUCTION	Sargent & Lundy	INSTRUCTION PI-MP3-02 REV. 4

Client: Northeast Utilities

Station: Millstone Unit 3

Title: REVIEW OF SYSTEM DESIGN FOR COMPLIANCE WITH THE DESIGN AND LICENSING BASIS

☒ **Safety-Related** ☐ **Non-Safety-Related**

Reviewed By:						Approved By:
System Lead	Programmatic Lead	O&M Lead	Accident Mitigation Lead	QA Engineer	Internal Review Committee Chairman	Verification Team Manager Date: 9-16-97

Description

Rev. 4 Revised PI to:

- Clarify the scope of review for non-safety related instrumentation
- Clarify the scope of the EQ/SQ & review
- Allow deviation from standard component review checklists

1.0 PURPOSE

This instruction establishes the requirements for the design review of systems included in the scope of the Independent Corrective Action Verification Program (ICAVP). The purpose of the design review is to verify the system design as reflected on design output documents and design process documents is consistent with the plant's Design and Licensing Basis. Additionally, the design review will verify technical adequacy of design process documents. This review process in conjunction with the modification review process (PI-MP3-03) operating, maintenance and testing review process (PI-MP3-06) and plant configuration walkdowns (PI-MP3-05) will verify that the current as modified system is capable of the functional requirements contained in the design and licensing basis documentation.

2.0 REFERENCE

2.1 NRC Inspection Manual Procedure 93801, Safety System Functional Inspection

2.2 NRC Inspection Manual, Chapter 2535, Design Verification Programs

2.3 10CFR50.2, Definitions

2.4 NRC Confirmatory Order Establishing Independent Correction Action Verification Program - Millstone Nuclear Power Station, Units 1, 2, and 3

2.5 NUMARC 90-12, Design Basis Program Guidelines

2.6 PI-MP3-06, Operations and Maintenance and Testing Procedures and Training Documentation Reviews

2.7 PI-MP3-07, Review of System Design for Compliance with the Design and Licensing Basis

2.8 PI-MP3-09, Preparation and Approval of Checklists

2.9 PI-MP3-11, Discrepancy Report Submittal and Closure

2.10 PI-MP3-12, Project File Index

2.11 CK-MP3-02 Series Checklists as follows:

CK-MP3-02-01	System Reference List
CK-MP3-02-02	System Requirements List
CK-MP3-02-03	Design Process Document Review Checklist
CK-MP3-02-04.1	P&ID Review Checklist
CK-MP3-02-04.2	Logic Diagram Review Checklist
CK-MP3-02-04.3	Electrical Schematic Review Checklist
CK-MP3-02-05.1	Mechanical Component Review
CK-MP3-02-05.2	Electrical Component Review
CK-MP3-02-05.3	I&C Component Review
CK-MP3-02-06	Topical Area Review

Note: Checklists used in the performance of this PI are not included as attachments to the PI. Checklists are prepared and controlled as separate documents per PI-MP3-09.

3.0 DEFINITIONS

3.1 **Accident Mitigation Systems Review Group (ARG)** - The subgroup of the ICAVP Verification Team responsible for review of critical characteristics of accident mitigation systems to ensure those systems can perform their required safety functions.

3.2 **Operations & Maintenance and Testing Review Group (ORG)** - The subgroup of the ICAVP Verification Team responsible for the review of the operating, maintenance and testing procedures, and training materials for the systems within the scope of the ICAVP.

3.3 **System Review Group (SRG)** - The subgroup of the ICAVP Verification Team responsible for performing an in-depth review of the design of the systems in the scope of the ICAVP.

3.4 **Configuration Review Group (CRG)** - The subgroup of the SRG Verification Team responsible for walkdowns to verify the current as-built conditions are in conformance with the design output documents.

3.5 **Design Bases** - The information which identifies the specific functions to be performed by a structure, system or component of a facility, and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be (1) restraints derived from generally accepted "state of the art" practices for achieving functional goals or (2) requirements derived from analysis of the effects of a postulated accident for which a structure, system or component must meet its functional goals (Reference 2.3).

3.6 **Design Output Documents** - Controlled plant documents such as specifications, drawings, vendor drawings, datasheets, lists and databases (Reference 2.5).

3.7 **Design Process Documents** - Documents such as calculations, analysis, evaluations or other documented engineering activities that substantiate the final design (Reference 2.5).

3.8 **Current Licensing Basis (CLB)** - The set of NRC requirements applicable to a specific plant, and a licensee's written commitments for assuring compliance with and operation within applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and are in effect. The CLB includes the NRC regulations contained in 10 CFR Parts 2, 19, 20, 21, 30, 40, 50, 51, 55, 72, 73, 100 and appendices thereto; orders; license conditions; exemptions, and Technical Specifications (TS). It also includes the plant-specific design basis information defined in 10 CFR 50.2 as documented in the most recent Final Safety Analysis Report (FSAR) as required by 10 CFR 50.71 and the licensee's commitments remaining in effect that were made in docketed licensing correspondence such as licensee responses to NRC bulletins, generic letters, and enforcement actions, as well as licensee commitments documented in NRC safety evaluations or licensee event reports. (Reference 2.7)

3.9 **Verifier** - The individual assigned to review engineering attributes within his area of responsibility.

4.0 RESPONSIBILITIES

4.1 The Verification Team Manager shall be responsible for overall management of the Verification Team.

4.2 The SRG Lead shall be responsible for assigning the Lead Verifier for each system in the ICAVP scope and for overall coordination of the SRG effort.

4.3 The Lead Verifier shall be responsible for performing system reviews for the attributes within his area of expertise and for assigning verifiers with appropriate background for review of remaining attributes.

4.4 The Verifiers shall be responsible for performing reviews of engineering attributes within their area of expertise in accordance with this instruction.

5.0 PROCEDURE

5.1 General

The Nuclear Regulatory Commission (NRC) Confirmatory Order referenced in Section 2.0 of this PI requires Northeast Utilities (NU) to implement the ICAVP. The Confirmatory order also defines the scope of the ICAVP. Item 2 of the scope of the ICAVP described on page 13 of the Confirmatory order requires the Licensee to verify the current as-modified plant conditions against design basis and licensing basis documentation. This procedure describes one aspect of the process needed to perform the verification described above. Specifically, this procedure will determine if the current system design as reflected on design output documents and design process documents is consistent with the system design basis and licensing basis documentation. This review is not intended to verify the design basis as stated in the Licensing Basis Documentation is consistent with the Licensing Basis. For example, a design basis consideration that may be described in the FSAR is that the system is designated a Quality Class 1 system in accordance with RG1.26. This review will verify the design of the system was performed to Quality Class 1 standards. This review will not verify that the Quality Class 1 designation was applied correctly per the guidelines of RG1.26. In other words, this procedure verifies the design basis requirement is properly incorporated in the design

and does not verify the design basis is in conformance with the licensing basis. Verification of conformance between licensing basis and design basis was performed by NRC prior to issuance of the operating license. Changes subsequently issued will be reviewed in detail as part of the modification review process (PI-MP3-03).

The systems to be included in the scope of the ICAVP program will be defined by the Nuclear Regulatory Commission. A meeting will be held with the NRC, NEAC and NU to finalize the boundaries of the selected systems and interfacing systems after the systems have been identified. In general, the systems boundary will be limited to the safety related portion of the selected systems and certain non-safety related instrumentation which meet the screening criteria described in Attachment 6.4. S&L's review of the vertical slice systems will address interfaces as follows:

- Mechanical Interfaces - S&L will review the interfacing system calculations to the extent needed to verify that the functions required to support the vertical slice review system were addressed in the design of the interfacing system. We will review the interfacing systems drawings and procedures to the extent needed to verify the support functions are addressed.

  technical verification of the adequacy of the interfacing systems calculations, procedures or drawings. For example, if a vertical slice system requires support of a cooling water system, we will verify the cooling water system's hydraulic analysis, operating procedure, P&ID and piping drawings support the vertical slice system functional requirements.

- I&C Interfaces - I&C interfaces will be treated in a slightly different manner compared to mechanical interfaces section above. We will review input signals from interfacing systems through to its signal source to verify that the functions required to support the system under review were addressed in the design of the interfacing system. We will review the output I&C signals for the system under review through to the input point of the interfacing system. The extent of these reviews is described in Attachment 6.3.

- Electrical Interfaces - Electrical interfaces will be treated in a slightly different manner. A detailed review of the electrical distribution system from the motor control center or switchgear,

as applicable, to the load is included as part of the vertical slice system review. A load path review will be performed for the remainder of the electrical distribution system (diesel generator to switchgear or MCC). The extent of this review is described in Attachment 6.2.

Once the systems and boundaries have been identified, the following tasks shall be performed in order to determine if the system's design is consistent with the plant's design and licensing basis:

a. Document Retrieval & Review
b. Identification of System Requirements
c. Technical Review of Design Process Documents
d. Upper Tier Drawing Review
e. Component Review
f. Topical Review
g. Reconciliation of Design vs. Design & Licensing Basis
h. Discrepancy Report Preparation and Closure
i. Final Report Preparation

The detailed instructions for performing these tasks are provided in the subsections 5.2 through 5.11 below. References 2.1, 2.2 and 2.4 were used to develop these instructions. Attachment 6.1 is a flow chart illustrating the system review process.

5.2 Document Retrieval & Review

5.2.1 Since there may be duplication between documents required by the various review groups, the following division of responsibility has been established:

5.2.1.1 The SRG shall gather, as a minimum, the following licensing and design bases documents and system specific documents:

a. Design & Licensing Basis Documents (Applicable Sections Only)
a.1 NRC Regulations
a.2 Technical Specifications
a.3 Updated Safety Analysis Report
a.4 NRC Safety Evaluation Report
a.5 MP3 Commitments to NRC included in Docketed Correspondence

a.6 Design Basis Documentation Package (DBDP)

b. System Specific Documents
b.1 Engineering Calculations (Mech, Elect, Struct, I&C and Piping Analysis)
b.2 Equipment Procurement Specifications
b.3 Modification Packages
b.4 System Descriptions
b.5 Equipment List
b.6 Environmental and Seismic Qualification Reports
b.7 Findings and corrective actions identified by NU during the implementation of their Configuration Management Plan (CMP)

5.2.1.2 The ORG Shall gather, as a minimum, the documents listed below:

a. Operating Procedures including Emergency Operating Procedures
b. Maintenance Procedures
c. Surveillance Test Procedures
d. Vendor Manuals
e. System Training Procedures
f. Necessary Support and/or Related Procedures
g. Operational Data Needed To Support Review of Design Process Documents

5.2.1.3 The CRG shall gather, as a minimum, the following system specific drawings:

a. P&IDs
b. Logic Drawings
c. Electrical Schematics
d. Piping Drawings
e. Electrical Single Line Drawings
f. Panel Wiring Drawings
g. Cable Routing Drawings and Databases
h. Pipe Support Drawings
I. Structural Equipment Mounting Details
j. General Arrangement/Equipment Location Drawings
k. Instrument Location Drawings
l. Zone Maps (Environment/Fire Protection, etc).

5.2.2 Design and Licensing Basis documents are available in the S&L ICAVP Library. System specific documents shall be obtained from NU. Requests for documentation from NU shall be submitted in accordance with subsection 3.1 of PI-MP3-01.

5.2.3 Once the documents have been gathered, each group shall complete the applicable section of the System Reference List (SRL). Checklist CK-MP3-02-01 and an Access Database shall be used to develop the SRL.

5.2.4 The Lead Verifier from the SRG, CRG and ORG shall be responsible for ensuring, the SRL is prepared per checklist CK-MP3-02-01.

5.2.5 Each member of the ORG, SRG and CRG assigned to review the system shall study the documentation to become as familiar as possible and achieve an in-depth understanding of the system as it relates to their area of expertise. Each member shall also review the findings and corrective actions that resulted from NU's CMP. S&L shall not duplicate findings identified by the NU CMP.

5.2.6 If the need for additional documents is identified during the review process, these documents shall be requested in accordance with subsection 5.2.2 of this PI.

5.2.7 Updates to the SRL shall be made in the same manner as initial input.

5.2.8 The SRG Lead shall file a hardcopy of the completed SRL in accordance with PI-MP3-12.

5.3 Identification of System Requirements

5.3.1 The SRG shall review the licensing and design basis documents to identify the functional, performance, and other design requirements for the system being reviewed.

5.3.2 The SRG Lead shall assign a Lead Verifier for each of the systems being reviewed. The Lead Verifier shall be from the related discipline (Mechanical for Mechanical System, Electrical for Electrical System, etc). The SRG Lead shall also assign verifiers from other disciplines as needed to support the system review process.

5.3.3 The Verifier(s) shall review the Licensing and Design Basis Documents for the system being reviewed to identify design, performance and functional requirements. Each requirement shall be entered into the System Requirements List. Checklist (Checklist CK-MP3-02-02) shall be used to develop the System Requirements Checklist.

Note: The System Requirements Checklist shall be developed electronically using an Access Database. Checklist CK-MP3-02-02 provides the instructions for using the database.

5.3.4 The Verifier(s) shall as a minimum, perform a review of the following documents in order to develop the system requirements checklist:

a. FSAR
b. SER
c. Technical Specifications
d. Licensing Commitments contained in docketed correspondence (from NU's Licensing Commitment List)
e. Design Criteria Documents (including NSSS Vendor documents)
f. Design Basis Document Package (only those documents contained in the DBDP which are plant controlled documents or correspondence shall be considered valid for the purpose of defining system requirements).

The review of the FSAR for functional, performance and design requirements shall focus on the following system specific and area topics as a minimum.

a. Applicable Regulatory Guides
b. Conformance to the Standard Review Plan
c. TMI Action Items
d. Design of Structures, Components, Equipment and Systems (Chapter 3).
e. Engineered Safety Features (Chapter 6).
f. I&C (Chapter 7)
g. Electrical Power (Chapter 8)
h. System Design (Chapter 4,5,9 or 10 as applicable).
i. Accident Analysis (Chapter 15)
j. Human Factors Engineering (Chapter 18)

k. Fire Protection

This review shall define functional, performance and design requirements related to the following system specific topics:

a. Mechanical Design
b. Electrical Design
c. I&C Design
d. Structural Design
e. Piping Design (including identification of postulated break locations.)
f. Equipment Qualification (limited to seismic and environmental qualification of system components, does not include verification of seismic response spectra or environmental parameters.)

The review shall also define requirements for the vertical slice systems related to the following topical areas:

a. Hazards including pipe whip, jet impingement, missiles and flooding.
b. Station Blackout
c. Appendix R Safe Shutdown Analysis.

5.3.5 The ORG shall identify and enter operating, maintenance and testing requirements into the System Requirements Checklist per PI-MP3-06. The ARG shall enter critical characteristics required for accident mitigation identified per PI-MP3-07 into the system requirement checklist. Entries shall be per this procedure.

5.3.6 Each entry into the system requirements list shall be independently reviewed by a verifier form the same group and discipline. The Verifier(s) performing the independent review shall review each entry for accuracy with the source document. Review shall be performed in accordance with CK-MP3-02-02.

5.3.7 The independent Verifier(s) and/or the Verifier(s) who initially prepared the systems requirements checklist shall initiate a DR for any conflicting requirement identified during the review of the Design and Licensing Basis documentation. The DR shall be processed in accordance with Section 5.10 of this procedure.

5.3.8 The SRG or ORG Lead, as Applicable, will review each entry into the Systems Requirements Checklist for completeness. This review shall be performed per Checklist CK-MP3-02-02. The SRG Lead shall distribute the checklist to the project file in accordance with PI-MP3-12.

5.4 Technical Review of Design Process Documents

5.4.1 The SRG shall perform a detailed review of applicable design process documents to verify technical adequacy and that the conclusions of the calculations support the system requirements.

5.4.2 Applicable design process documents shall include:

a. Mechanical calculations (hydraulic calculations, component sizing calculations, design pressure and temperature calculations, NPSH calculations, etc.
b. Electrical calculations (load calculations, voltage drop, etc.)
c. I&C calculations (setpoint calculations)
d. Structural calculations (equipment mounting, pipe supports, cable tray supports, conduit supports, etc.)
e. Piping Analysis
f. EQ/SQ Reports (includes verification of the correctness of inputs used in the vendors qualification report. Line by line review of vendors calculations are not included. If qualification was by someone other than vendor, a detailed review will be performed)

The review of interfacing system calculations to the extent described in Section 5.1 of this Project Instruction shall be included in the scope of this section.

5.4.3 Checklist CK-MP3-02-03 shall be used to document the design process document review. The applicable subject specific checklists from PI-MP3-03 shall also be used in conjunction with CK-MP3-02-03.

5.4.4 The Verifier(s) shall review the adequacy of the following attributes:

a. Numerical Accuracy - The numerical aspects and mathematical operations shall be error free. The number of significant figures

shall be consistent with the input data, assumptions and design methodology. Transposed or transferred numbers are correct.

b. Modeling Accuracy - Analytical models shall be consistent with the degree of accuracy of the input data, assumptions and design methodology.

c. Assumptions and Engineering Judgment - Assumptions and engineering judgment shall be consistent with the design approach and methodology.

d. Design Inputs - Design inputs shall be based on the latest controlled design documents.

e. Methodology - The method shall be appropriate for the purpose and scope of the calculation.

Note: During the review of design process documents, operational data, where available, shall be used to confirm calculation assumptions and/or conclusions.

5.4.5 The Verifier(s) shall note any comments identified during the review on the Design Process Document Review Checklist (CK-MP3-02-03).

5.4.6 The Verifier(s) shall evaluate the comments to determine if they affect the conclusion of the Design Process Document. The evaluation shall be documented on the Design Process Document Review Checklist (CK-MP3-02-03).

5.4.7 The Verifier(s) shall indicate on the checklist coversheet (CK-MP3-02-03) whether the conclusions are acceptable with comments or unacceptable, and shall sign and date the coversheet.

5.4.8 For acceptable with comments or unacceptable dispositions, the Verifier shall generate a Discrepancy Report per subsection 5.10 of this PI. The Verifier(s) shall also evaluate the unacceptable disposition for impact on other documents that may use the conclusion as input. The Verifier(s) shall consult other SRG members while evaluating the impact.

Note: Calculation results are typically used as input in other documents. If a Discrepancy is identified which affects the result of

the calculation, it is important to define where those results were used and evaluate those documents for impact. The review should be done prior to generating a Discrepancy Report so that the Discrepancy Report describes the full extent of the condition.

5.4.9 The Lead Verifier shall verify the checklists have been properly completed, indicate his concurrence with signature and date, and shall compile and file the design process document review checklists prepared by the Verifier(s) to the project file in accordance with PI-MP3-12.

5.5 Upper Tier Document Review

5.5.1 The SRG shall perform a functional review of the upper tier drawings as one of the steps necessary to verify the system is capable of performing required functions as described in the design and licensing basis. This review includes the vertical slice system drawings as well as interfacing system drawings to the extent described in Section 5.1. The SRG shall also perform a technical review of the drawings to verify conformance to design calculations and classification criteria.

5.5.2 The Verifier(s) shall utilize drawing review checklists CK-MP3-02-4.1, -4.2, -4.3 for the review of the P&IDs, logic diagrams and electrical drawings (i.e. schematics, single lines and instrument loop diagrams), respectively. These checklists define the attributes to be reviewed. In general, review attributes will include flow paths, interlocks, automatic actuations, permissives, redundancy and separation, safety classification, component sizes, pressure class, overpressure protection, adequacy of interfacing system tie-ins, etc. The review is not intended to identify drafting or style errors.

5.5.3 The Verifier(s) shall note any comments on the applicable checklists (CK-MP3-02-4.1, -4.2, -4.3).

5.5.4 Upon completion of the review, the Verifier(s) shall sign and date the coversheet of the applicable checklists.

5.5.5 The Verifier(s) shall generate a Discrepancy Report per Subsection 5.10 of this PI for any discrepancies not previously identified by the NU CMP.

5.5.6 The Lead Verifier shall verify the checklists have been properly completed, indicate his concurrence with signature and date, and shall compile and file all drawing review checklists prepared by the Verifier(s) in the project file per PI-MP3-12.

5.6 Component Review

5.6.1 The SRG shall perform a detailed review of system components. This review shall verify the design data included in the design and licensing basis, the vendor drawings, the procurement specifications, equipment list and calculations are consistent.

5.6.2 The scope of this review shall include all major mechanical, electrical and I&C components.

5.6.3 Detailed component checklists are included in the CK-MP3-02-05 series checklists. These checklists verify attributes such as classification, design conditions, operating conditions, functional requirements, applicable codes and standards, performance requirements, and qualification requirements, etc.

5.6.4 The Verifier(s) shall complete individual Component Review Checklists (CK-MP3-02-05 series) for each component within the scope of review. The Verifier may use the forms included in the checklist or may create his own form provided all technical attributes included in the checklist are addressed. Discrepancies noted shall be indicated in the appropriate blocks on the checklists.

5.6.5 Upon completion of the review, the Verifier(s) shall sign and date the checklists.

5.6.6 The Verifier(s) shall generate a Discrepancy Report in accordance with Subsection 5.8 of this PI for any discrepancies not previously identified by the NU CMP.

5.6.7 The Lead Verifier shall verify the checklists have been properly completed, indicate his concurrence with signature and date, and shall file all completed checklists in the project file per PI-MP3-12.

5.7 Topical Area Reviews

5.7.1 The SRG shall perform a review of the following topical areas:

a. Hazards including pipe whip, jet impingement, missiles and flooding

b. Station Blackout

c. Appendix R Safe Shutdown Analysis

5.7.2 The Verifier shall document the review of topical areas using checklist CK-MP3-02-06. This review shall verify the following:

a. That the pipe whip and jet impingement effects of postulated breaks in the vertical slice system have been analyzed.

b. That potential missiles from the vertical slice system have been evaluated.

c. That the flooding analysis considers the vertical slice system's contribution to area flood levels.

d. The vertical slice system components, if credit for operation was taken in the station blackout coping assessment, are capable of performing the required functions.

e. The vertical slice system has been adequately addressed in the Appendix R Analysis if credit for system operation was taken in the safe shutdown analysis. This includes a routing check of the vertical slice system's cabling required for the safe shutdown analysis.

f. In addition, one fire zone will be selected which includes one vertical slice system's cabling required for the safe shutdown analysis. All associated circuits in common enclosures with the vertical slice system's cabling will be reviewed to confirm that these associated circuits meet the Fire Protection Evaluation Report Section 6.3.1.3. Step 1 statement "Safety-related and nonsafety-related circuits are routed in their own separate raceways and properly applied protective devices are included in all Millstone 3 power and control circuits; thus, this failure mode would not surface."

5.7.3 Upon completion of the review, the Verifier(s) shall sign and date the applicable portion of the checklists.

5.7.4 The Verifier(s) shall generate a Discrepancy Report in accordance with subsection 5.10 of this PI for any discrepancies not previously identified by the NU CMP.

5.7.5 The Lead Verifier shall verify the checklist has been properly completed, indicate their concurrence with signature and date, and shall file all completed checklists in the project file per PI-MP3-12.

5.8 Reconciliation of Design vs. Design and Licensing Basis

5.8.1 The SRG will complete the verification of the system design versus the design and licensing basis documentation. The verification shall be completed by dispositioning each requirement on the System Requirements Checklist (Checklist CK-MP3-02-02).

5.8.2 Where applicable, the Verifier(s) shall identify on the System Requirements Checklist, the design process documents which verify the restraints imposed by the system requirement are not exceeded. The Verifier(s) shall either indicate the design process document either supports the requirement or describe any deficiencies.

5.8.3 The Verifier(s) shall identify on the System Requirements Checklist, the design output documents related to the system requirement. The Verifier shall indicate whether the technical requirements contained in the design output documents are consistent with the system requirements or shall identify the discrepancy.

5.8.4 The Verifier(s) shall complete the dispositions in the System Requirements Checklist, using the Access Database in accordance with CK-MP3-02-02.

5.8.5 Dispositions to the system requirements shall be independently reviewed by a Verifier from the same group and discipline. The independent review shall be in accordance with CK-MP3-02-02.

5.8.6 The Verifier(s) shall generate a Discrepancy Report in accordance with Subsection 5.10 of this PI for any discrepancies not previously identified in Subsection 5.4, 5.5, and 5.6 of this procedure.

5.8.7 The SRG Lead shall review the dispositions in the system requirements checklist (CK-MP3-02-02) for completeness and technical accuracy. The SRG Lead shall notify the ARG Lead that either all critical characteristics for accident mitigation systems have been satisfied or he shall identify which are not.

5.8.8 The Lead Verifier shall file a hardcopy of the completed checklist in the project file per PI-MP3-12.

5.9 SRG Support for ORG Procedure Review Process

5.9.1 During the implementation of the Procedure Review Process described in PI-MP3-06, the ORG will highlight all performance parameters including operating ranges and/or limitations described in the procedures. These parameters will be submitted to the SRG for verification via checklist CK-MP3-06-10. The ORG may also identify operating modes which are not explicitly identified in the system requirements checklist. The ORG will submit these modes to the SRG for review via checklist CK-MP3-06-10 to verify the design and analysis support operation in this mode.

5.9.2 The SRG Lead Verifier or assigned Verifier shall review these parameters to ensure they are correct. The Verifier shall complete the CK-MP3-06-10 checklist by identifying the basis for the parameter, if correct, and/or preparation of a DR per Section 5.10 of this procedure for incorrect parameters. Once all parameters have been reviewed the Verifier shall sign and date checklist CK-MP3-06-10 and shall return the completed checklist to the ORG.

5.9.3 The SRG will review any operating modes submitted by the ORG per checklist CK-MP3-06-10. The SRG Verifier shall review the mode to ensure it is within the system's design basis. The SRG Verifier shall enter his conclusions on checklist CK-MP3-06-10, sign and date the checklist and return it to the ORG. If the evaluated mode is outside the system's design basis, the SRG Verifier shall prepare a DR per Section 5.10 of this procedure.

5.10 Discrepancy Report Preparation and Closure

5.10.1 Discrepancy Reports for discrepant conditions identified during the system review process shall be prepared and processed in accordance with PI-MP3-11. Discrepancy reports shall not be initiated

for findings already identified by NU during implementation of the CMP.

5.10.2 Review of NU dispositions for the Discrepancy Reports generated during the review cycle shall be in accordance with PI-MP3-11.

5.11 Final Report

5.11.1 The Lead Verifier shall draft a final report summarizing the results of the system review.

5.11.2 The report format shall be determined by the Verification Team Manager.

5.11.3 The report shall be reviewed and approved by the VT Lead, VT Manager and IRC prior to external distribution.

6.0 ATTACHMENTS

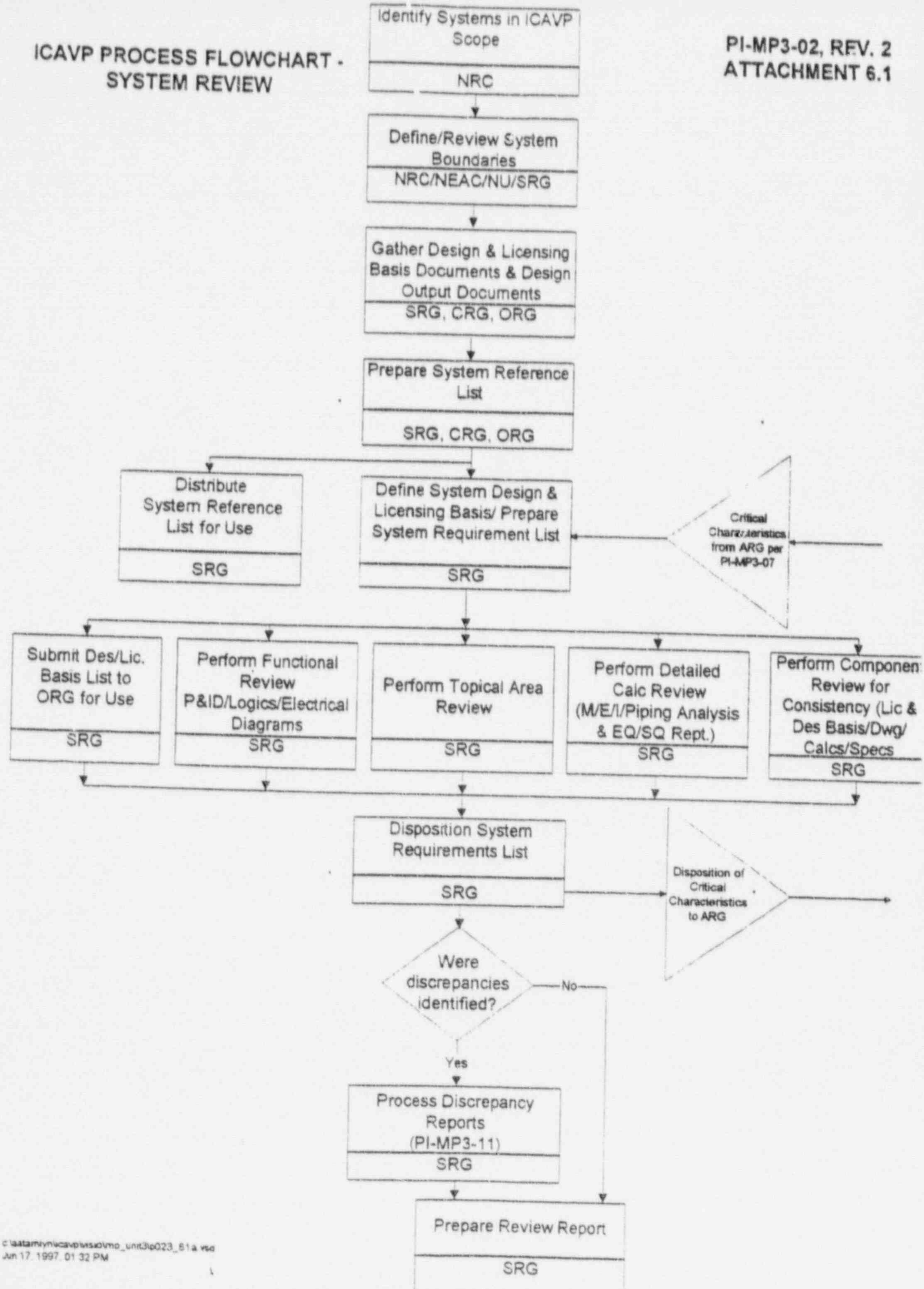
6.1 ICAVP Process Flowchart, "System Review" (1 page)

6.2 Scope of Electrical Support System Review (3 pages)

6.3 Scope of I&C Interfacing Signal Review (3 pages)

6.4 Scope of I&C non-safety related component review (2 pages)

ICAVP PROCESS FLOWCHART - SYSTEM REVIEW



Scope of Electrical Support System Review

This verification will consist of identifying the buses that feed all the components (including in direct I&C signal input components [See Attachment 6.3]) used in the systems under review and determine the "load-time' profile for these components. The "path" from these buses are to be identified up to the electrical onsite source (i.e. diesel-generator, battery & charger, inverter, etc.) This is explained in Pages 2 and 3 of this Attachment. The loading time profile on each bus for the components of the system under review shall be verified for the calculations that use this information as input. The bus voltage will also be identified from the voltage drop calculations to verify that the correct bus voltage was used to determine voltage drop to the components of the system under review.

Once the loads are verified, the load carrying components in the "path" will be checked for design sizing based on the total operating load of the bus as shown in the bus loading calculations. Loading for components of systems not under review will be accepted (without verification) as shown in the bus loading calculations as input. Coordination of protective devices (relays, breakers, fuses, etc.) for the "paths" required to supply the components of the systems under review will be verified to confirm acceptable coordination and that the required bus operating loading is addressed.

The onsite source load-time profile will be checked to determine that the source input is properly included for the components of the systems under review (including transient loading) . The overall source sizing will also be checked against total loading of the source, however, verification of other systems loading will not be done but simply accepted as input. In addition, the battery charger (or inverter) and its continuous loading profile will be similarly checked to confirm the size, that the "path" is complete to the diesel-generator, and load profile matches or envelopes the diesel-generator loading input from the charger (inverter).

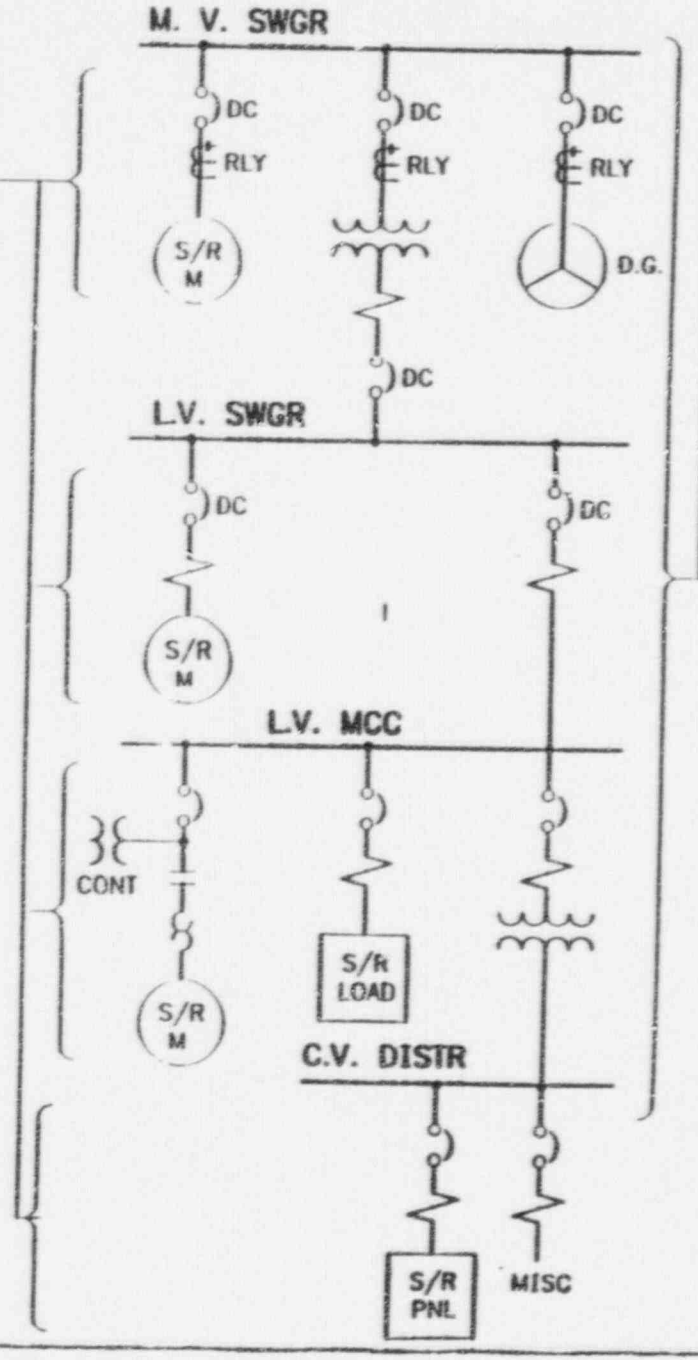
If the system under review has components credited for Appendix R/Safe shutdown use, verify that the electrical support system components (equipment and cabling) in the "path" to the onsite source are not affected by fires in the fire zones which are identified as needing the components of the system under review for safe shutdown during the postulated fire.

When all of the systems under review have been identified, along with most of the components that are fed from MCCs, two MCCs with non-duplicate load components will be selected for review of all design sizing and coordination for all loads on these two MCCs. The load input from other systems not under review will not be verified, but the design of the MCC will be verified based on the component input.

AC SYSTEM SUPPORT

PART OF MECH. SYSTEM REVIEW

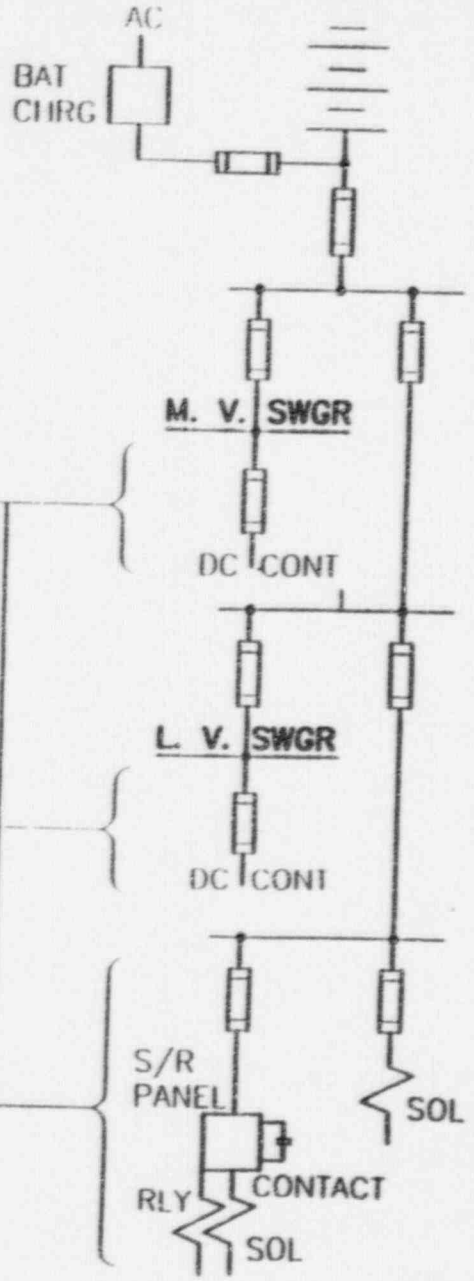
- APPLICABLE LICENSING REQ'MTS
- GROUNDING (TOUCH & SYSTEM)
- LOOP SIZING
- APP. R INCLUDED
- SAFE SHUTDOWN INCLUDED
- CABLE SIZING (TRAY,FIRESTOP,AMB.)
- VOLT DROP (POWER & CONTROL)
- PROTECTIVE SETTINGS
- OPERATING VOLTAGE RANGE
- COMPONENT I.D.



ELEC SYSTEM SUPPORT REVIEW FOR MECH. SYSTEM.

- -MECH. SYSTEM LOADING ACCOUNTED FOR
- -OPERATING VOLTAGE RANGE
- -PROTECTIVE SETTING COORDINATION FOR PATH (OVERLOAD, FAULT, ELEC. EQUIP PROTECTION)
- -SAFE SHUTDOWN SUPPORT INCLUDED FOR MECH SYSTEM
- -APP. R ANALYSIS INCLUDED FOR MECH SYSTEM
- -ALL RELATED SYSTEM COMPONENTS FED FROM SAME SOURCE (DIVISION)

CONTROL DC SYSTEM SUPPORT



PART OF MECH SYSTEM REVIEW

APPLICABLE LICENSING REQ'MENTS
EQUIPMENT RATINGS
APP. R INCLUDED
SAFE SHUTDOWN INCLUDED
CABLE SIZING (INCLUDING TRAY, FIRE STOP, DUCT, AMBIENT)
VOLTAGE DROP (CKT)
PROTECTIVE SETTINGS
VOLTAGE RANGE
COMPONENT E.Q.

ELEC SYSTEM SUPPORT REVIEW FOR MECH SYSTEM

- MECH SYSTEM CONTROL LOADING ACCOUNTED FOR (INCLUDING TIMING/REPETITION)
- DISTR. VOLT DROP TO BUS/SWGR
- PROTECTIVE SETTINGS COORDINATION FOR PATH (OVERLOAD, FAULT, ELEC. EQUIP. PROTECTION)
- SAFE SHUTDOWN SUPPORT INCLUDED FOR MECH SYSTEM
- APP. R ANALYSIS INCLUDED FOR MECH SYSTEM
- ALL RELATED SYSTEM COMPONENTS FED FROM SAME SOURCE (DIVISION)

Scope of Instrumentation and Control Interface System Review

There are three categories of interfacing I&C signals which will be included in the review. These include:

1. Indirect input signals
2. Direct input signals
3. Output signals

Indirect Inputs

Indirect I&C input signals are those signals which originate in another system and input into the system under review by first passing through another system (i.e. RPS). Indirect input signals will be treated as though they are a part of the system boundary, as follows:

- Review includes 100% review as described in this PI for the vertical slice system, except that only dissimilar channels of each process variable will be reviewed.
- Review also includes walkdown of all channels for one (1) selected process variable per PI-MP3-05.
- The other system the indirect signal passes through will be treated as a black box. Review will only include a document review of the signal path as it appears on logic diagrams, and schematics. This review will verify signal parameters, divisional source, setpoint, range and accuracy. Setpoint and loop accuracy calculations will be reviewed for technical adequacy for the affected instrumentation. Wiring diagrams will not be reviewed for the Reactor Protection (Solid State Protection) panels/cabinets.

Direct Inputs

Direct I&C input signals are those signals which originate in another system and input directly into the system under review without passing through another system. For direct I&C input signals, the review includes the interfacing system instrument signal paths to their signal source to verify that the functions required to support the vertical slice review were addressed in the design of the interfacing system. The review includes the signal path as it appears on interfacing system P&IDs, logic diagrams, and schematics. This review will verify signal parameters, divisional source, setpoint, range and accuracy. Setpoint and loop accuracy calculations will be reviewed for technical adequacy for the affected instrumentation.

Output Signals

Output signals are those signals which originate in the vertical slice system and output to the interfacing system. This review includes the I&C output signals from the vertical slice system through to the input point (usually up to the control relay; or in the case of an analog signal, up to and including the signal isolator) of the interfacing system. The review includes the signal path as it appears on interfacing system P&IDs, logic diagrams, and schematics. This review will verify

signal parameters, divisional source, setpoint, range and accuracy. Setpoint and loop accuracy calculations will be reviewed for technical adequacy for the affected instrumentation.

If the interfacing system I&C signal inputs or outputs are covered by the vertical slice review of another system included in the review then the review of the affected instrumentation will not be duplicated.

NONSAFETY-RELATED COMPONENT SCREENING

Nonsafety-related components will be screened for special requirements. The special requirements criteria are identified as follows:

1. Specified by Emergency Operating Procedures
2. Required by the Technical Specifications
3. Used for In-service Testing
4. Required for Safe Shutdown
5. Identified as Appendix R Related
6. Used for Post Accident Monitoring.

The screening method will use Northeast Utilities' PMMS database for the nonsafety-related components of the Millstone Unit 3 systems under review. Unless a nonsafety-related component is required to meet one of the above selection criteria, the component will be treated as a boundary component requiring only limited review. Checklists will not be performed for process connected components for local indication such as temperature sensors and indicators and pressure gages, not installed but identified components, components in the signal path from the signal isolator to the computer or annunciator. The computer input list will be checked to ensure the signal has a related computer input. The annunciator at the local panels and in the main control room will receive a nameplate engraving drawing check compared to the physical plant.

I&C BOUNDARIES