SARGENT & LUNDY

VSRP
Rev. 2
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WATTS BAR NUCLEAR PLANT
VERTICAL SLICE REVIEW PLAN

TENNESSEE VALLEY AUTHORITY

Approved by R.C. Heider Date 6/7/88
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This Review Plan defines the program for the Vertical Slice Review (VSR) by Sargent & Lundy (S&L) of specified activities related to the design and construction of the Watts Bar Nuclear Plant (WBN) of Tennessee Valley Authority (TVA). This VSR will cover work done by TVA and any contractors responsible for portions of activities included in this review. This Plan is intended to be fully responsive to the requirements set forth in Request for Task Proposal No. R0019.

The purpose of this VSR is to provide reasonable additional assurance that the design and construction of the WBN meets licensing requirements through 1) a review of the technical adequacy of selected systems and the design process, 2) a verification of the as-constructed plant for selected systems, and 3) a review of the QA/QC records for selected systems to demonstrate the records adequately reflect the design and installed plant hardware. The VSR will be performed on two systems selected by the VSR team and accepted by the Watts Bar Program Team (WBPT). It will be necessary to include in the VSR, portions of other systems or to perform a limited horizontal review of selected portions of the plant. The selection of these systems shall be made to ensure coverage of essential plant elements. The VSR will either verify the adequacy of plant systems, components, and structures or identify the nonconforming conditions.

This work has been divided into six major subtasks:

- Overall Task Administration and General Activities
- Engineering Verification Review
- Construction Verification Review
- QA/QC Records Verification Review
- Internal Review Committee Activities
- Trend Analysis and Final Report

The following chapters provide greater detail of the activities for each of these subtasks. 1

Chapter II, Scope and Approach to Work, discusses how S&L will carry out the VSR. It also includes a flow chart illustrating the key process events leading to issuance of the final report.

Chapter III, Qualifications and Experience, presents S&L's experience on similar recent projects.

Chapter IV, Project Organization, describes S&L's project team approach, key personnel, and the strengths the project team will bring to this review.

Chapter V, Quality Assurance Program, includes the Quality Assurance Program to be used on the project.

Chapter VI, Protocol, includes the communication protocol to be used on the project.

A. General

1. Develop VSR Plan, Instructions, and Training Plans

S&L will develop the project manual which will be used to control the project activities. The manual will describe the scope of work. This manual identifies the requirements for quality-related work and implements the requirements of S&L's Quality Assurance Program as outlined in the Quality Assurance Program. The project manual will include the following:

- VSR Plan
  - Vertical Slice Review Flow Chart
  - Project Organization Chart
  - QA Program for the VSR
- Project Controls
- Man-Hour Estimate
- Project Administrative Instructions
- Project Instructions
- Resumes of Project Team

Exhibit II-1 is a flow chart illustrating the key process events of the VSR. The flowchart provides an illustration of the major subtasks; engineering, construction, and QA/QC records verification; Internal Review Committee activities; and trend analysis and final report preparation.

Project administrative instructions are procedures prepared to cover financial and administrative activities between S&L, S&L subcontractors and TVA that are not quality assurance related. Project instructions are project-specific procedures that involve quality activities. The planned project procedures are identified in Exhibit II-2.

The project manual will be issued to WBPT for comments and acceptance.

The S&L Project Manager is responsible for approving the project manual and ensuring that the project personnel are properly instructed in its use.

The project procedures will establish the methodology for the VSR from which the training plans will be developed.

2. Assemble Design Requirements and Design Documents

The timely completion of this project requires that S&L obtain relevant design requirement documents and design documents on the designated systems, structures, and topics from TVA. These documents will include, but not be limited to, those listed on Exhibits II-3, II-4, and II-5.

B. System/Element Selection Criteria

1. Develop System and Element Selection Criteria

A system selection criteria was developed utilizing the NRC I&E Manual, chapter 2530, "Independent Design Inspection Program," as guidance. This criteria provides guidance to assure that the coverage of essential elements will meet the program objective.

The system selection criteria is shown as Exhibit II-6.

2. System Selection

Using the system selection criteria, two representative systems (one mechanical and one electrical) will be selected for the VSR. In addition portions of certain other systems and structures will be identified for a horizontal review to assure coverage of essential plant elements and attributes.

A letter documenting the S&L recommendation for the two selected systems, the rationale for the selection, and the identification of portions of other systems and structures required to consider essential plant elements will be sent to the WBPT for acceptance.

There are a number of completed or ongoing special programs at WBN which will verify the adequacy of certain elements/attributes with respect to the design and licensing requirements. Therefore, TVA has excluded from the VSR scope the elements/attributes associated with the:

- Large bore and Class 1 small bore pipe stress analysis and support design, their construction, and associated QA/QC records
- Installation of plant welds and associated QA/QC records
- Concrete Quality
- Environmental Qualifications per 10 CFR 50.49

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- Control Room Human Factors design, construction, and associated QA/QC records

The VSRT will consider these excluded areas and make a determination if portions should be included in the VSR program for completion of the review. In no case will excluded programs impact on the completeness of the VSR effort.

3. Element Selection

The objective of this task is to establish a set of elements which, when reviewed in accordance with methodology established in Chapter II, sections F, G, and H, will support conclusions regarding the quality of the design, construction, and QA/QC records.

The word "element" as used in this plan is defined as plant structures, systems, components, and spatial features.

The "Elements and Attributes List to Verify Design Adequacy, Construction Adequacy and QA/QC Records Adequacy - Watts Bar Nuclear Plant" (E/A List) will be used as input to select elements and attributes that will be examined during the VSR. Additional elements/attributes not specifically included in the E/A List and identified as required by the VSR team will be included in the review.

Since the design and construction activities in the plant may not be homogenous, the selected elements will be determined by the application of industry experience and engineering judgment.

The selection process will be biased toward those areas of the systems which have greater potential for discrepancies and those areas which are more critical to the proper performance of plant safety functions. For those elements that are inaccessible during the construction verification, the information obtained from the engineering verification and the records verification will be considered for a selected sample of inaccessible elements in evaluating construction adequacy.

Considerations influencing the element selection, both with respect to the total number of and the selection of specific elements, will be documented.

C. Definitions and Resolution of Findings

1. Definitions

The description of the design, construction, and QA/QC records verification process is discussed in sections F, G, and H, respectively. Findings resulting from the verification will be identified as follows:

- Observations
  A design, construction, or records related condition which is perceived by a reviewer or inspector to be in nonconformance with the licensing or other documents imposing safety-related requirements.

- Non-Discrepant Observations
  An Observation which is confirmed, after a review, to be in conformance with the licensing or other documents imposing safety-related requirements.

- Discrepancy
  An Observation which is confirmed, after review, to be in nonconformance with the licensing or other documents imposing safety-related requirements. |1

- Design-Significant Discrepancy
  A design, construction, or records related Discrepancy which, after engineering evaluation, is found to be in nonconformance with the appropriate code, standard, or licensing requirements.

- Safety-Significant Discrepancy
  A design, significant Discrepancy which, if remained undetected, could result in the loss of capability of the affected system or structure to perform its intended safety function. For this evaluation, credit is not allowed for redundancy at system or train level. |1

2. Resolution of Findings

The processing of an Observation from its identification to the resolution of its significance will be as described below.

The Observation reports resulting from the Engineering Verification, Construction Verification, and QA/QC Records Verification will be forwarded to the IRC for review.

If an Observation is identified by the VSR team but not yet acted upon by the IRC and additional information becomes available, the VSR team may reclassify the Observation to a Non-Discrepant Observation. Justification will be provided for all such reclassifications. The Observation reports will be forwarded to the IRC.

The IRC, comprised of the Head, Quality Assurance Division, and the Mechanical, Structural, and Electrical Design Directors, and a Control and Instrumentation representative, will review the Observation report in accordance with the project manual procedure PI-WBVSR-04 as described in Exhibit II-2. Using the available documentation and the results of the VSR team assessment, the IRC will determine if the Observation is a Discrepancy. If the condition exists, the IRC will prepare a Discrepancy report. If the condition does not exist, the Observation will be identified as Non-Discrepant and sent back to the project team for further processing. Additional elements may need to be reviewed as a result of a Discrepancy. Such expansion will be directed by the IRC. 1

The Discrepancy reports (DRs) will be transmitted from the IRC formally by letter to the identified responsible WBN line organization lead for resolution and for a design/safety significance determination.

The WBN line organization will propose the resolution and determine the design/safety significance of the Discrepancy. The DR and its associated resolution will be returned to the VSR team and the IRC for review and acceptance of the proposed resolution and the design/safety significance determination. 1

The VSR team and IRC will review the WBN line organization proposed Discrepancy resolution and design/safety significance determination for acceptance.

In the course of this review S&L may request that additional evaluation be performed by the responsible WBN line organization before final comments are made to the WBPT. Acceptable resolutions to the discrepancies, including the design/safety significance determinations, and unresolved discrepancies will be reported to the WBPT.

The VSR team will provide appropriate comments to the WBPT on the WBN line organization resolution.

In the course of the WBPT review, the WBPT may request that additional evaluation be performed by the responsible TVA line organization and returned to the VSR team for evaluation.

D. Trend Analysis

The trend analysis involves the review of all discrepancies to ascertain the nature, significance, and frequency of occurrence. The discrepancies are then evaluated collectively to determine if there are any generic implications which result in the identification of programmatic deficiencies.

If the trend analysis results in the identification of adverse trends, the WBPT will be informed.

E. Final Report

A final report will be prepared and issued. A preliminary outline of the final report is included in Exhibit II-7. All discrepancies and corresponding TVA responses, where applicable, shall be incorporated into the final report. The report shall document the review findings, the collective significance, and the conclusion reached.

In addition, the report will document the conclusions which can be drawn regarding systems, structures, and components which were not reviewed.

The report and any data provided to the WBPT shall be in a form suitable for direct input by the WBPT into the WBPT systematic evaluation data base.

F. Engineering Verification Review

1. General

The design will be evaluated by assessing the Watts Bar specific work. This will be accomplished through the techniques of vertical reviews and limited horizontal review to examine specific elements/attributes not included in the vertical reviews.

The review of each system will be divided into three activities: design requirements, design process and design adequacy. In practice these activities will be integrated and performed as a relatively continuous activity for each area of the design. That is, each design area being reviewed

will (1) have its requirements established, (2) have the design process assessed, and (3) reviewed for technical adequacy.

The review of the selected systems will be to assure that the system functional and licensing requirements are met. In addition, selected elements will be reviewed for design adequacy by considering the interface between the elements and WBN and WBN to the elements.

System boundaries will be as generally described in the FSAR, design criteria, and system descriptions. The review will cover mechanical, structural, electrical, instrumentation and control, plant arrangements, and fluid system aspects of the design. 1

2. Preparation of Engineering Design Checklists and Associated Training Plans

The engineering design control process review will be controlled by the project manual, the project instructions, and checklists. For the selected elements, detailed checklists will be developed based on an examination of the attributes and past S&L practices.

Training plans will be prepared on use of the checklists.

3. Review

The review methodology for assessing the selected systems and horizontal areas is as follows:

- Design Requirements Review

  The design requirements review will determine the extent to which design criteria or other design objectives meet licensing requirements. These will be used to implement a review of the design process and the design adequacy and to assess how design inputs are specified.

  The sources of the requirements will be the FSAR, including responses to NRC questions on the FSAR, the SER and supplements thereto, approved design criteria and system descriptions, as well as other documents or requirements which TVA WBPT identifies.

- Design Process Review
The design process review will provide an assessment of the effectiveness of the design process based upon reviews of the selected system and of other technical areas as necessary. In performing this task, reviews will be made to evaluate the extent to which the design process is sufficiently controlled so that safety-related design requirements are met, and that specified licensing requirements are met. This includes both establishment of suitable controls and proper and consistent implementation of them.

In making this assessment, due consideration will be given to the extent to which engineering judgment is appropriate, in lieu of written procedures. Recognition will be made of the complexity of the work, its uniqueness, qualifications of personnel performing it, and other relevant factors.

Selected documents in the specified systems will be reviewed for adequacy of procedural requirements and for general effectiveness in controlling the design process. Where procedural requirements are not applicable, the actual process will be evaluated to determine the extent to which the design is adequately controlled.

Documents reviewed will include those related to design criteria, calculations (both by hand and computer), drawings, specifications, and design change authorizations.

The documents will be reviewed for:

- Adequacy of documentation of the design calculations

- Interface design control between TVA and Westinghouse and other important design contractors

- Design change and configuration control

- Design reviews performed by TVA, covering the specified systems, for technical adequacy

- Such other aspects related to design control which are embodied in the FSAR and its referenced documents

- **Design Adequacy Review**
  Design adequacy review will assess each of the selected systems for functional adequacy in meeting the specified licensing requirements and safety-related design requirements. These requirements will be those determined from the design requirements review.

  To assess design adequacy, primary reliance will be placed on the results as described in design output documents. It is recognized there are many ways to arrive at an adequate design which meets design requirements. No attempt will be made to re-verify each step in assessing the design of the specified systems. Instead, the designs will be reviewed for accurate input and reasonableness of outputs, and adequacy of the design techniques based on a review of selected work. 1

  In judging accuracy and completeness of design documents, due recognition will be given to established professional engineering practices and other precedents established in the nuclear industry. This judgment will consider the level of detail needed to link design requirements with the output documents, and the process employed. It will also consider the need to justify design decisions and assumptions.

  Selected design documents will be reviewed for the following:

  - Safety classifications, to determine if the structures, systems, and components have been properly classified as to safety significance as defined in 10 CFR 50

- Accuracy and completeness of the design criteria and other inputs, including assumptions and codes or standards

- Applicability of standard design methods

- Method of analysis, to determine if an appropriate method was used, including mathematical models, and use of standards

- Engineering judgments and assumptions and the basis on which they were documented and exercised

- Accuracy of implementing the analysis, including use of properly validated computer codes

- Adequacy of means by which designs were verified

- Translation of design into output documents for completeness, clarity, and proper control

- Reasonableness of the output, in relation to similar designs

In performing the above reviews, each system will be reviewed from the standpoint of an integrated design, properly coordinated between disciplines. It will include mechanical, electrical, nuclear, instrumentation and control, and civil/ structural aspects of the design.

The cut-off date for the vertical slice review documentation will be April 22, 1988. The design revisions applicable at the VSR cut-off date will be considered as the basis of the review.

Examples of what is anticipated to be included in the review are the following:

- Mechanical Systems including process design, separation requirements, and system descriptions

- Mechanical Components including stress analysis, piping design, pipe supports for Class II and III piping systems less than 2-1/2", seismic qualification, and design specifications

- Civil/Structural aspects including equipment anchorage, load determination, load combination, analytical techniques, design and construction specifications, and design procedures

- Instrumentation and Control aspects including control system design, separation, and annunciation | 1

- Electrical Systems including power supply and system design, equipment selection, layout and arrangement, cabling and raceway design, separation/isolation, and system descriptions

- Electrical and Instrumentation and Control Components including seismic qualification, design specifications, and cable installations

- Design Systems including procedures and other controls, design tools, and quality program

- Design Standards including standard drawings and requirements, interpretations of codes and standards, and standard specifications

- Common Requirements including design requirements for HELB/MELB, and fire protection. | 2

During the VSR the reviewers will verify that:

- Licensing requirements have been incorporated into the design output documents

- Design input requirements have been adequately incorporated into design output documents

- Design input and associated design output documents are adequately supported by design calculations or other appropriate documentation

Any potential conditions that appear not to meet licensing or safety-related design documents will be identified as Observations.

If an Observation is identified by the VSR team but not yet acted upon by the IRC and additional information becomes available, the VSR team may reclassify the Observation to a Non-Discrepant Observation. Justification will be provided for all such reclassifications. The Observations will be forwarded to the IRC.

G. Construction Verification (CV) Review

1. General

The construction will be evaluated by assessing the completed work. This will be accomplished through the evaluation of the as-constructed condition of a selected set of elements by use of specific attributes. The construction verification will be managed by the S&L Construction and QA/QC Records Verification Manager.

The review of the construction scope will be divided into two major activities: identification of inspection requirements and construction adequacy. The inspection will cover mechanical, structural, electrical, instrumentation and control elements.

The objective of the CV review is to verify that as-constructed elements are in conformance with the design output documents in effect on the cut-off date.

To accomplish the objective, a reinspection of a selected set of completed safety-related construction work will be conducted. The results of this reinspection will show the extent to which completed construction meets the design requirements. Actual inspection will be performed by a subcontractor (Fluor/Daniel) managed by S&L.

The construction verification organization (Exhibit IV-1) is such that the discipline inspectors will report to more senior certified personnel who will provide guidance on the items being recorded. All inspectors will be Level II or higher and will report to Level III Lead Inspectors. The Level III Lead Inspectors will be managed by the inspection contractor's manager but will receive technical direction and assistance from their discipline counterparts in S&L's engineering support group.

This organization maintains the contractor's responsibility for the quality of the inspection and permits S&L to maintain a firm control on the direction and intent of the program.

2. **Preparation of Construction Verification Checklists and Associated Training Plans**

The CV activities will be controlled by the project manual, the project instructions and the checklists. For the selected elements detailed checklists will be developed based on a visual examination of the accessible recreatable attributes of the elements and past industry practices. Checklists are approved by the VSR Construction and QA/QC Records Verification Manager.

Training plans will also be prepared on use of the checklists.

3. **Review**

Experienced S&L senior engineers select the elements and attributes and provide specific, accept/reject criteria for the inspectors.

An inspection contractor (Fluor/Daniel) will visually inspect S&L-selected elements and provide inspection reports for S&L to evaluate. To verify construction attributes, qualified and certified inspectors will use approved contractors' procedures and checklists to inspect accessible, recreatable, and construction complete attributes for each item selected. The Engineering Support Supervisor will coordinate with the TVA line organizations to ensure complete inspection packages are prepared, assist inspection personnel to ensure the engineering output documents have been properly applied, and provide support information to the Construction and QA/QC Manager for his evaluation.

Accessible attributes are those attributes that can be verified without removing or invalidating previously installed work. However, such verification may require the removal of fireproofing, insulation, or removable covers. Inaccessible attributes are those which would require major rework to gain access such as disassembly of valves, piping

internals, or other similar activities. Attributes associated with items embedded in concrete or masonry walls are also considered inaccessible.

Recreatable inspections are those which can be meaningfully done after construction has been completed. Attributes are nonrecreatable if they cannot be verified after construction is completed.

Verification activities will be performed using the latest approved and implemented design drawings available at the cut-off date and specifications applicable to WBN. Any apparent deviation from the inspection requirements outside the tolerances specified by TVA design output documents will be documented by the inspectors in accordance with approved procedures.

Examples of what is anticipated to be in the construction verification inspections are the following:

- Element location in relationship to benchmarks is in agreement with installation drawings
- Element configuration conforms to installation drawings
- Element orientation conforms to installation drawings
- Element size, rating, and capacity conforms to engineering output documents
- Element critical dimensional relationships conform to design documents within construction tolerances imposed
- Element separation conforms to installation drawings
- Element physical protection conforms to engineering output documents

4. Training, Qualifications, and Certification of CV Personnel

Persons performing the CV inspection activities will be trained, qualified, and certified in accordance with the subcontractor's inspection program based on ANSI N45.2.6. Individuals performing other CV activities will be trained, qualified, and certified (if applicable) in a manner appropriate for the activities being performed. It is assumed that no TVA certifications will be required.

H. QA/QC Records Verification Review

1. General

The QA/QC Records Verification will be accomplished by assessing the records reflecting the construction and installation process of a selected set of elements. To determine the adequacy of the QA/QC records, a twofold approach is taken to: 1) examine the construction support records at intervals over the construction life of the plant and 2) examine construction installation records to determine the extent to which they document the quality of the construction.

2. Preparation of QA/QC Records Checklists and Associated Training Plans

The QA/QC Records Verification process will be controlled by the project manual and the project procedures. For the selected elements detailed checklists for the records will be developed based on an examination of the attributes and past industry experience. Checklists are approved by the VSR Construction and QA/QC Records Verification Manager.

Training plans will be prepared on use of the checklists.

3. Sample Selection

The majority of elements selected for records verification will be a subset of the elements being verified in the CV review. This selection method provides a tie between the as-constructed plant and the construction records. In addition, many elements reviewed during the engineering verification review will be selected for records verification.

There will however be a few elements selected for records verification that will fall outside of the set of CV. This may be necessary to obtain records samples that fit the

time periods required for the records programmatic verification. The elements selected for this verification may not easily be field verified.

However, should these records show any potential hardware problems that can be visually verified, a special effort will be made to include the elements in the CV program.

4. Record Review

The QA/QC Records Verification Supervisor will be responsible for providing technical direction in the review of selected QA/QC records. The records will be reviewed for items which have the potential of affecting the quality of the constructed hardware.

- Construction Support Records Review

  The first approach of QA/QC records review will examine the records for a vertical slice of the system inspected including receipt inspection, storage, construction testing, personnel qualification, NCRs, and installation.

  Records will be verified, as applicable, for the following:

  - Accuracy requirements were met
  - Completeness
  - Most current approved documents used
  - Materials and methods used met applicable specifications
  - Required inspections were performed, recorded, and reviewed by qualified personnel
  - Component locations properly documented
  - Physical separation and independence requirements were met
  - Personnel qualifications met stated requirements and were current

- Receipt inspection records uniquely identify components
- Applicable engineering and functional specifications of received items and components were met
- Required component characteristic, material, performance tests, qualification tests, non-destructive tests are met
- Specified storage condition and requirements were maintained
- Storage inspections were made at specified intervals
- Deviation records complete and reviewed by qualified personnel
- Reporting requirements of 10 CFR 21 and 10 CFR 50 were recognized during evaluation and appropriate action was taken
- NCR reports include the status of corrective action or resolution
- NCRs prepared where records indicated nonconformances existed

The records reviewed during review of construction support records will be distributed over time since time is an important factor in determining the long-term record quality affecting plant hardware.

In this records sample it may not be possible to select a sample that has been looked at during the CV program. If, however, the records show a potential hardware problem that can be visually verified, a special effort will be made to include it in the CV program.

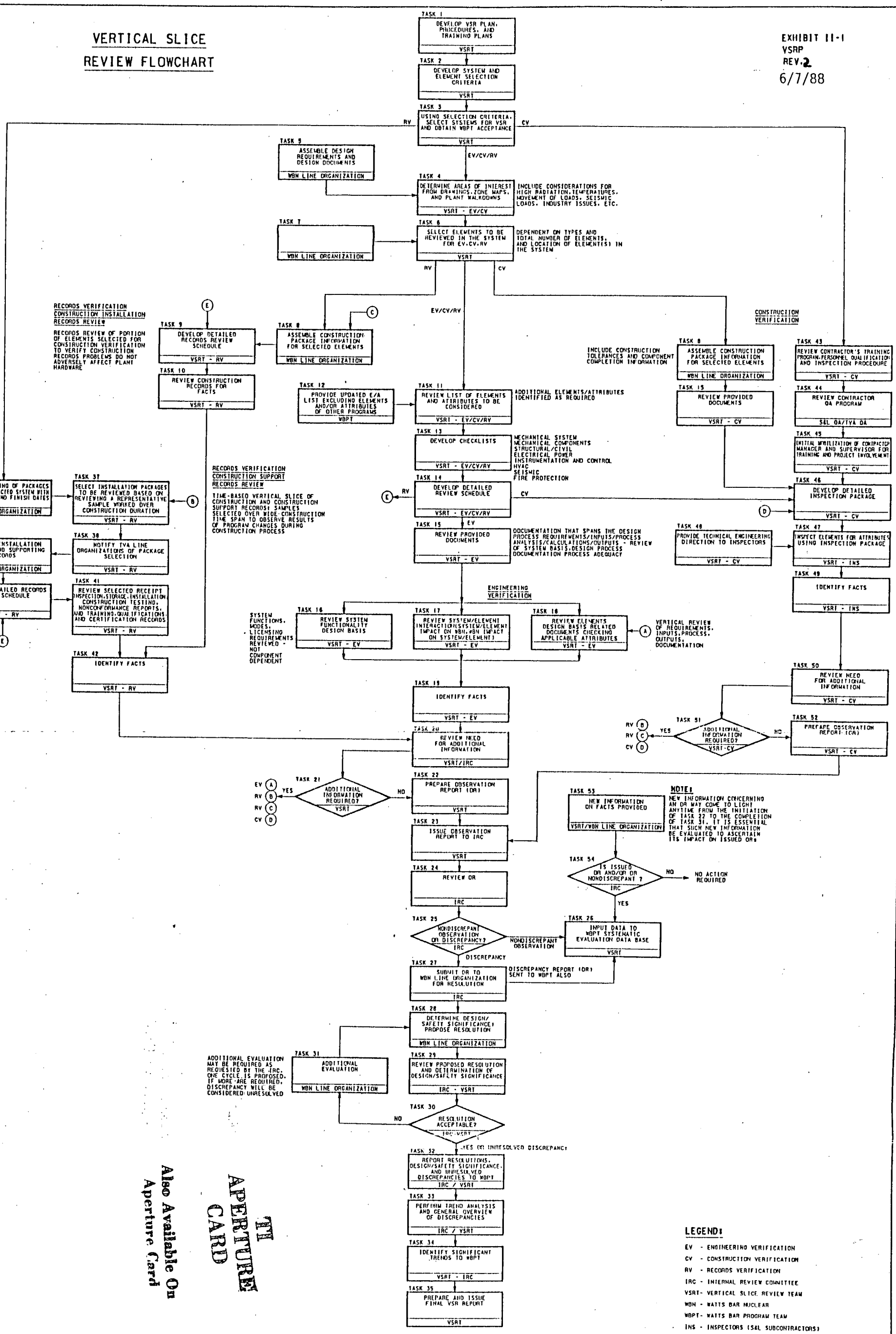
- **Construction Installation Records Review**
  Installation records of a portion of the elements examined during the CV and some inaccessible elements will be reviewed in the second approach. The construction installation records review will verify that the installation was done in a controlled and documented process that can confirm the quality of the installed hardware.

The QA/QC Records Verification Supervisor will issue all record Observations. The QA/QC Records Verification Supervisor and his reviewers will prepare the information necessary to support the IRC in their review of the Observations submitted.

If an Observation is identified by the VSR team but not yet acted upon by the IRC and additional information becomes available, the VSR team may reclassify the Observation to a Non-Discrepant Observation. Justification will be provided for all such reclassifications.

VERTICAL SLICE
REVIEW FLOWCHART

EXHIBIT II-1
VSRP
REV. 2
6/7/88



Also Available On
Aperture Card

TI
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CARD

8807050115-01

Project Administrative Instructions

PAI-WBVSR-01	Correspondence and Communication with Client
PAI-WBVSR-02	Travel to Client Engineering Offices or Station
PAI-WBVSR-03	Processing Changes in Scope
PAI-WBVSR-04	Project Monitoring and Progress Reporting

Project Instructions

PI-WBVSR-01	Engineering Verification Review
PI-WBVSR-02	Construction Verification Review
PI-WBVSR-03	QA/QC Records Verification Review
PI-WBVSR-04	Processing of Observations and Discrepancies
PI-WBVSR-05	Project File Index and Review Document Control

- FSAR
- SER
- Other licensing requirements from:
  - Construction discrepancy reports (50.55e)
  - NRC Bulletins
  - Notice of Violations
  - Generic Letter

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- TVA Quality Assurance Manuals
- Watts Bar Project Manual
- TVA Design Guides and Standards
- TVA Engineering Procedures
- TVA current organization charts that represent design flow
- Interface design specifications (TVA and Westinghouse)

Documents or information anticipated to be pertinent to the systems, structures or components being reviewed include:

- System piping and instrumentation diagrams
- General arrangement drawings
- Applicable engineering standards
- System and component design criteria
- Technical specifications
- Design installation and test specifications
- Installation/Construction Drawings
- Non-Conformance Reports (NCR)
- Condition Adverse to Quality Reports (CAQR)
- Field Change Request (FCR)
- Engineering Change Notices (ECN)
- Design drawing hierarchy
- Logic diagrams (with legend sheets)
- Loop diagrams
- Instrument index
- Instrument data sheets
- Instrument location drawings
- Computer I/O list
- Annunciator drawings
- Instrument procurement specifications
- Control board arrangement drawings
- Control board physical drawings
- Control board wiring drawings
- Intermediate instrumentation cabinet physical drawings
- Intermediate instrumentation cabinet wiring drawings
- Instrument impulse line routing drawings
- Electrical calculations
- Electrical single-line drawings
- Electrical schematic diagrams
- Electrical raceway and routing drawings
- Electrical wiring drawings
- Cable tabs
- Termination cards
- Master control diagrams or equivalent
- Design basis criteria calculations and/or analysis for:
  - a-c on-site power systems
  - d-c power systems
  - a-c instrumentation power systems
  - power cable ampacity and derating
  - power and control circuit voltage drop

- Equipment specifications and equipment data packages
- Equipment list
- Valve list
- Specification index
- ASME design specifications
- System piping drawings
- Piping isometric drawings
- Seismic II over I assessment
- Flooding report
- Pipe whip restraint drawings
- Westinghouse system design specifications and data sheets
- Westinghouse instrument data sheets
- Approved design change documents
- Hanger sketches
- Hanger installation drawings
- The following design basis documentation:
  - Pipe support restraint calculations
  - Pipe support auxiliary steel calculations
  - Data prepared for input to the pipe program used in analysis
  - Special calculations used for flange qualification
  - Stress indices calculations used for non-standard fitting including integral attachments
  - Structural anchor calculations, if any
  - Calculations for fluid transient Loads, if any
  - Pipe sizing for pressure and flow including corrosion allowances used in calculating pipe wall thickness
- Stress reports including the following aspects:
  - Functional capability assurance
  - Pipe break location identifications, based on stress criteria or lack thereof
  - Any ISI requirements
  - Thermal transient stress evaluation
  - Fatigue evaluation of gamma plugs
  - Class I fitting details and contours from field measurements
  - Stress indices for small taps

- Existing input data including:
  - Site seismic g-level and related geological data
  - Building seismic response spectra
  - Instrumentation and controls standard specifications
  - Standard equipment product literature and test reports supplied by vendors to TVA
  - Generic engineering or test data supplied by Westinghouse
  - Structural Calculations
  - *Installation - Construction Records - General
  - *Installation - Construction Records - Each discipline
  - *Installation - Construction Records - Receiving and Storage
  - *Manufacturing records
  - *Procurement records
  - *Construction progress status for selected systems
  - *Discipline construction specifications for all disciplines

*To be provided at site only

The systems selected to be reviewed in the Watts Bar Verticle Slice Review Program will be chosen considering the following criteria:

1. The system must be safety-related, essential to plant safety

2. The system should involve a cross-section of engineering and design disciplines within the TVA design organization

3. The concept and implementation of the system design should be by TVA

4. The system should be generally representative of safety-related features of other systems

5. The system should be reasonably complex, requiring several modes of operation involving redundancy and single failure considerations

6. The system design should involve internal interfaces between functional areas such as:

   - Mechanical
   - Civil/structural
   - Electric power
   - Instrumentation and control

   and the external interfaces with Westinghouse, component vendors, and TVA engineering

7. Major portions of the system should already be installed

8. The system should have a clearly defined design basis

9. The system should have required design changes over the plant design period

It is recognized that each of the systems selected may not encompass all of the above criteria. However, by choosing additional sections of other systems for review, it is intended that the above criteria be covered. Other considerations in selecting systems for review are:

1. The system should include new or unique design features.

2. If a PRA has been performed on the WBN, consideration of the results of the PRA will be included in the system selection.

3. Results of other inspections such as; IDVPs, IDRs, IDIs and CAPs will be considered in system selection.

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  3. Checklist Preparation
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A. Direct and Related

S&L has been providing nuclear services for new and operating PWRs and BWRs for over 30 years. Our nuclear services assignments cover a full range of backfits, including plant betterment modifications, TMI-related modifications and NRC bulletin-designated modifications. Exhibit III-1 shows the operating PWRs we are currently servicing.

Exhibit III-2 shows our experience with audits and design reviews similar to the proposed work. We have been involved in 12 such programs on 11 nuclear units. 1

S&L also has provided personnel to the Institute of Nuclear Power Operations (INPO) to assist in the development of procedures and practices used for the Construction Evaluation Project (CEP) in the mechanical and instrumentation and controls areas.

B. Nuclear Design Experience

S&L provides comprehensive engineering, design, and construction management services for electric power generating and transmission facilities. Founded in 1891, we are today one of the nation's leading engineering partnerships. Over the years our clients have authorized us to design more than 700 units representing 90,000 MW of generating capacity. Since 1955, we have provided a wide range of these services to clients on more than 110 projects, including 17 large nuclear units.

S&L's overall nuclear design experience is summarized in Exhibit III-3.

Operating PWRs Sargent & Lundy Is Currently Servicing

Utility/Station	MW	Operation Date
Arizona Public Service Company		
• Palo Verde 1,2,3	1270 each	1985, 1986, 1987
Baltimore Gas & Electric Company (BG&E)		
• Calvert Cliffs 1,2	850 each	1975, 1977
Carolina Power & Light Company (CP&L)		
• Robinson 2	665	1971
Commonwealth Edison Company (CECo)		
• Braidwood 1,2	1120 each	1987, 1989
• Byron 1,2	1120 each	1987, 1988
• Zion 1,2	1040 each	1973, 1974
Consumers Power Company		
• Palisades	777	1971
Florida Power & Light Company (FP&L)		
• St. Lucie 1,2	827, 837	1976, 1983
• Turkey Point 3,4	666 each	1972, 1973
Kansas Gas & Electric Company (Kansas G&E)		
• Wolf Creek 1	1250	1981
Northeast Utilities		
• Connecticut Yankee	582	1968
• Millstone 2	870	1975
Northern States Power Company (NSP)		
• Prairie Island 1,2	520 each	1973, 1974
Omaha Public Power District (OPPD)		
• Fort Calhoun 1	486	1973

Utility/Station	MW	Operation Date
Pacific Gas & Electric Company (PG&E)		
• Diablo Canyon 1,2	1084, 1106	1985, 1986
Southern California Edison (So Cal Ed)		
• San Onofre 1	436	1968
Tennessee Valley Authority (TVA)		
• Sequoyah 1,2	1148 each	1981, 1982
• Watts Bar	1177 each	holding
• Browns Ferry 2	1065	holding
Virginia Power		
• North Anna 1,2	893 each	1978, 1980
• Surry 1,2	781 each	1972, 1973

Client	Station/Unit	Description of Audit or Design Review
Public Service Electric and Gas Company	Hope Creek 1	S&L performed an independent design verification program to provide additional independent assurance that the design of Hope Creek Generating Station met licensing requirements and Nuclear Regulatory Commission (NRC) regulations through a review of the technical adequacy of the design of representative station systems and structures, and the design process used on Hope Creek. This verification included both vertical- and horizontal-type reviews.
Commonwealth Edison Company	Braidwood 1,2	Braidwood Construction Assessment Program (BCAP) Commonwealth Edison Company conducted a sample inspection of construction work and QC records to verify the quality of construction. S&L participated in checklist preparation and performed all construction discrepancy evaluations. S&L also trended the discrepancies and drew conclusions regarding the construction quality and participated in the preparation of the final BCAP report. The Institute of Nuclear Power Operations (INPO) conducted an evaluation of our control of the design, including examinations of our organization and administration, design control, project support, training, quality control, and test control. The evaluation involved a detailed vertical path examination through the design combined with a horizontal examination at several points.
	Byron 1,2	Bechtel Power Corporation reviewed our design of the essential service water system, component cooling water system, and 125 volt dc distribution system for adherence to design requirements, technical adequacy, and adequacy of the design process.

Client	Station/Unit	Description of Audit or Design Review
		Commonwealth Edison Company conducted a QC Inspector Reinspection Program to verify the qualifications of inspectors. Assessments regarding the quality of construction by the various contractors were also made. S&L evaluated the discrepancies found and recommended appropriate sample expansions and additional reinspections in order to establish confidence in the quality of construction. S&L described their engineering assessments in the final report which was instrumental in favorably reversing the ASLB license decision for Byron 1.
		An NRC integrated design inspection team performed a detailed review of our design of the auxiliary feedwater and containment spray systems. The team evaluated the project organization; technical aspects of mechanical, electrical, instrumentation, and structural design; and adequacy of compliance with design requirements. The design process, including the adequacy of our design interface with the NSSS vendor, was also reviewed in detail.
		INPO conducted an evaluation of our control of the design, including examinations of our organization and administration, design control, project support, training, quality control, and test control. The evaluation involved a detailed vertical path examination through the design combined with a horizontal examination at several points.
		Teledyne Engineering Services conducted an independent design review of our design for the residual heat removal system in the low-pressure coolant injection mode for loop C.

Client	Station/Unit	Description of Audit or Design Review
The Detroit Edison Company	Enrico Fermi 2	Cygna performed an Independent Design Verification Program of S&L's design. Included a horizontal review to confirm that an adequate design control process was established and implemented; and an in-depth, multi-disciplined technical review to confirm that the as-built configuration agreed with design specifications, criteria, and licensing commitments. This vertical review confirmed the accuracy and completeness of the design changes. Systems investigated included the RHR primary shutdown path components, RHRSW fluid path components, and the RHR cooling tower.
Illinois Power Company	Clinton 1	Bechtel Power Corporation reviewed our design of the shutdown service water system, high-pressure core spray system, Class 1E AC electrical system and common requirements (HELB/MELB, fire protection, seismic II/I interaction) for adherence to design requirements, technical adequacy, and adequacy of the design process. Baldwin Associates performed a 100% field verification of completed construction and Illinois Power Company conducted a sample overinspection of this work. S&L prepared checklists and acceptance criteria for the inspection work and dispositioned all NCRs that resulted from the inspections. We also determined the safety significance of discrepancies and did a trend analysis of the discrepancies found in the overinspection effort. S&L participated in the preparation of final reports which established the quality of the construction work. INPO reviewed our control of design and construction processes associated with the residual heat removal system, the shutdown service water system, and the auxiliary power and dc systems.

Client	Station/Unit	Description of Audit or Design Review
Public Service Indiana	Marble Hill 1	Nova, an outside engineering consulting firm, performed an engineering review to examine the engineering techniques S&L used in developing the Marble Hill design. The scope of Nova's review was directed to the instrumentation and controls area, it included documentation reviews, field examination and interviews with S&L engineering personnel.
TU Electric	Comanche Peak 1,2	S&L conducted an INPO-type, self-initiated evaluation of the construction project including an evaluation of the design control, construction control, scheduling, planning, quality assurance, and administration. The evaluation included examination of TU Electric organization and administration, the design process, training, quality control, quality assurance, testing, planning, and scheduling and involved a detailed vertical path examination through the organization's design and construction functions, as well as horizontal examination at several points of the design process.
The Cincinnati Gas & Electric Company	Zimmer 1	Bechtel Power Corporation, as the construction manager and constructor, performed a detailed review of our design and the status of engineering.

Nuclear Units Authorized for
Design by Sargent & Lundy

Station/Unit	Client	Type of Reactor	Rated Gross MW	Year of Operation
Yonggwang 4*	Korea Electric Power Corporation	PWR	1000	1996
Yonggwang 3*	Korea Electric Power Corporation	PWR	1000	1995
Braidwood 2	Commonwealth Edison Company	PWR	1120	1989
Braidwood 1	Commonwealth Edison Company	PWR	1120	1987
Byron 2	Commonwealth Edison Company	PWR	1120	1988
Clinton 1	Illinois Power Company	BWR	985	1987
Byron 1	Commonwealth Edison Company	PWR	1120	1987
La Salle 2	Commonwealth Edison Company	BWR	1122	1984
La Salle 1	Commonwealth Edison Company	BWR	1122	1982
Fort St. Vrain 1	Public Service Company of Colorado	HTGR	335	1979
Zion 2	Commonwealth Edison Company	PWR	1040	1974
Zion 1	Commonwealth Edison Company	PWR	1040	1973
Quad Cities 2	Commonwealth Edison Company	BWR	850	1972
Quad Cities 1	Commonwealth Edison Company	BWR	850	1971
Dresden 3	Commonwealth Edison Company	BWR	850	1971
Dresden 2	Commonwealth Edison Company	BWR	850	1971
La Crosse	Dairyland Power Cooperative	BWR	48	1969
SEFOR	Southwest Atomic Energy Associates	LMFBR	No turbine	1967

*Korea Power Engineering Company (KOPEC) is the lead A-E. Sargent & Lundy is a subcontractor to KOPEC for the design and transfer of technology work.

Station/Unit	Client	Type of Reactor	Rated Gross MW	Year of Operation
Elk River	Units Power Association	BWR	No turbine	1961
EBWR	U.S. Atomic Energy Commission	BWR	5	1956
Borax III	U.S. Atomic Energy Commission	BWR	3	1955
Bailly N1	Northern Indiana Public Service Company	BWR	684	Cancelled
Marble Hill 1	Public Service Indiana	PWR	1175	Cancelled
Marble Hill 2	Public Service Indiana	PWR	1175	Cancelled
Zimmer	The Cincinnati Gas & Electric Company	BWR	839	Cancelled

Notes:

- Our experience includes 10 pressurized water reactors, 13 boiling water reactors, one high-temperature gas reactor, and one liquid metal fast breeder reactor.
- We are experienced working with the major U.S. NSSS and turbine suppliers, including Westinghouse, General Electric, and Allis-Chalmers.

The review team chosen for this project is shown in Exhibit IV-1. Resumes of these individuals are included in chapter VIII. The review team members are chosen in accordance with the selection criteria provides in Exhibit IV-2.

The project team is supported by engineers, designers, and other specialized personnel as required to perform the work associated with this project.

A review of the project team's results will be provided by the Internal Review Committee. The Committee will be headed by Mr. H. S. Taylor, currently the Head, Quality Assurance Division, and will include representatives from the mechanical, structural, electrical, and control and instrumentation engineering disciplines. The representatives from the mechanical, structural, and electrical engineering disciplines will be the Design Directors from each of these departments.

The strengths that S&L's project team and Internal Review Committee will bring to the project are described below.

A. Project Team

- **Project Director - B. A. Erler**

  Mr. Erler has more than 18 years of experience in the design of nuclear power plants involving work on 15 nuclear stations. He has been very closely involved with a number of engineering and construction reinspection programs on recent nuclear power plant which have received their operating license. Some of the programs include the Byron Inspector Reinspection Program, the Clinton Overinspection Program, the Braidwood Construction Assessment Program, and the Hope Creek Independent Verification Program.

  He currently is on the ACI/ASME Joint Technical Committee for Concrete Pressure Vessels for Nuclear Applications, and has chaired or been a member of numerous other technical committees developing national structural standards for design of nuclear power plants. Mr. Erler is a registered Structural Engineer in Illinois and a registered Professional Engineer in 10 additional states.

- **Project Manager - R. C. Heider**

  As Project Manager for the Clinton Power Station, he has extensive experience in establishing management systems, reviewing and solving complex procedural problems, and integrating various elements of data systems into a comprehensive program. As Project Manager, he coordinated an extensive regulatory commitment identification program, as well as establishing the overall project control procedural program. He was also involved with the Clinton IDR and Construction Audit Team (CAT) audit of Clinton. Mr. Heider is a registered professional engineer in the State of Illinois.

- **Engineering Verification Manager - O. A. Hrynewych**

  Mr. Hrynewych has more than 20 years experience in the design of nuclear power plants involving work on eight nuclear units.

  Since 1983, Mr. Hrynewych has been project manager for CP&L's H. B. Robinson - Unit 2 and Brunswick - Units 1 and 2. He has managed day-to-day planning of all of S&L's activities, including corrective action, construction assessment, piping design and analysis, licensing support, hazard evaluation, equipment qualification, and many other programs. He has managed the Dresden Station Diesel Generator Safety System Functional Inspection (SSFI) evaluation, the INPO-type self initiated construction project evaluation for Comanche Peak and the INPO-type self initiated design process evaluation of the Wolf Creek and Callaway projects. Before his involvement on the CP&L project, Mr. Hrynewych was a mechanical project engineer on CG&E's Wm. H. Zimmer Project, and the CECo's Carroll County Station and Byron and Braidwood stations. He also served as an assistant head of the Nuclear Safeguards and Licensing Division. Mr. Hrynewych is a registered professional engineer in the State of Illinois, North Carolina, South Carolina, and Georgia.

- Construction and QA/QC Records Verification Manager - R. L. Humphreys

  Mr. Humphreys has over 16 years of experience in nuclear power. He supervises a staff of field and office engineers performing plant services in the area of construction, modification support services, outage assistance, maintenance services, and operating services. He has also been called upon by our clients for modification program evaluations, construction prudency, modifications and maintenance testing evaluations, and root cause evaluation programs requiring an understanding of plant programs, procedures, and systems. Mr. Humphreys was chosen for this assignment because of his field experience in the areas of construction and modification of nuclear power plants.

- Mechanical Project Engineer - D. DeMoss

  Mr. DeMoss has served as a mechanical project engineer on two major nuclear design projects: Commonwealth Edison Company's Byron and Braidwood stations. He has coordinated onsite mechanical engineering and design activities associated with mechanical process piping systems including review and approval of design and engineering changes in the field, resolution of installation problems, resolution fo startup and testing problems, and liaison between the client's construction personnel and the home office. In conjunction with these assignments, he has coordinated the evaluation of mechanical discrepancies identified by quality assessment programs. Mr. DeMoss has been with S&L for over 10 years. Mr. DeMoss is a registered professional engineer in the States of Illinois and Ohio.

- Electrical Project Engineer - T. M. McCauley

  Mr. McCauley has served as electrical project engineer on two major nuclear design projects: The Detroit Edison Company's Fermi and Illinois Power Company's Clinton. He has directed a full range of electrical engineering tasks on these projects and has participated in work to satisfy an independent design review for Clinton and a pump and valve operability review by the NRC. He has also

participated in and directed work during the Clinton FSAR certification program. Mr. McCauley has developed a number of digital computer programs for engineering applications, including a firestop cable ampacity program and an auxiliary system load monitoring program for nuclear plant work. He is a registered professional engineer in the State of Illinois.

- Special Horizontal Review Topics Project Engineer - T. J. Ryan

  Mr. Ryan has over 15 years of experience in structural design of power plant facilities with a heavy emphasis on nuclear plants. As a senior structural project engineer, he has directed the work of structural engineers, geologists, hydrologists, and engineering specialists on the Byron/Braidwood, Dresden, and Quad Cities projects. Mr. Ryan worked directly with CECo as a technical advisor on the Braidwood Construction Assessment Program, and he had a major role in the evaluations and resolutions for the Byron reinspection program. His experience also includes major assignments on the Zimmer and Clinton projects.

B. Internal Review Committee

- Quality Assurance Division Head - H. S. Taylor

  As the Quality Assurance Division Head, Mr. Taylor has developed and maintained QA procedures that are necessary for the implementation of S&L's QA program and has coordinated the preparation of detailed procedures by other engineering disciplines. Mr. Taylor has been deeply involved in design control and design verification issues. He has contributed to the identification of those issues, recommended approaches for their resolution, and participated in overseeing the implementation of corrective action. Mr. Taylor was particularly instrumental in the Hope Creek Independent Design Verification Program. He chaired the Internal Review Committee which reviewed every observation proposed by the verification team and issued the final observations.

Mr. Taylor participated in developing several specialized programs to provide assurance of design and construction adequacy. Examples include an overinspection program, several as-built walkdown procedures, and a final safety analysis report certification program to track licensing commitments. He has been responsible for ensuring that an entire project team adheres to S&L's QA standards and procedures that have been established to meet U.S. government and industry requirements for nuclear power plants. He has been responsible for conducting training sessions in the use and implementation of S&L's QA program and procedures for all personnel involved in safety-related activities and has been responsible for internal and external audits of consulting organizations retained by S&L.

- **Mechanical Design Director - E. B. Branch**

  Mr. Branch has over 18 years of experience in the stress analysis of piping systems and mechanical equipment for power plants at S&L. His overall experience in power plants exceeds 30 years. He has extensive experience not only in the design process, but also with the design philosophy changes that have occurred in the nuclear industry through participation in the ASME, PVRC, and NRC licensing activities. Mr. Branch has been active in the ASME Working Group on Piping Design (past chairman of plant group), the Subgroup on Design, and the Section III Committee. He is also an active contributor in the PVRC Technical Committee on Piping Systems and is chairman of the Task Group on Industry Practices. He is currently involved in studies leading to more realistic design practices and methodologies. Mr. Branch is a registered professional engineer in the State of Illinois.

- **Structural Design Director - A. K. Singh**

  Dr. Singh has over 15 years of experience in all phases of analysis and design of power plant structures and components. His assignments include seismic response of structures and piping, soil-structure interaction, design and analysis of cable tray and HVAC ducts, and design of turbine and fan foundations. He has worked extensively in

investigating and recommending remedies for structural vibration problems. Dr. Singh has developed several computer programs for power plant applications. Dr. Singh is a registered professional and structural engineer in the State of Illinois.

- **Electrical Design Director - L. R. Stensland**

  Mr. Stensland has 35 years experience in electrical engineering of steam-electric generating stations. He has worked on numerous station design projects, as well as various backfit projects at both fossil- and nuclear-fueled plants. His current job responsibilities include monitoring the flow of design information and the effectiveness of the Electrical Drafting Standards and the Drafting and Field standards. When required, he reviews and comments on independent design review reports. He is S&L's specialist on transformers and a member of the IEEE Committee on Transformers. Mr. Stensland is a registered professional engineer in Arkansas, Illinois, Indiana, Kentucky, Louisiana, Michigan, New York, Ohio, Texas, and Wisconsin.

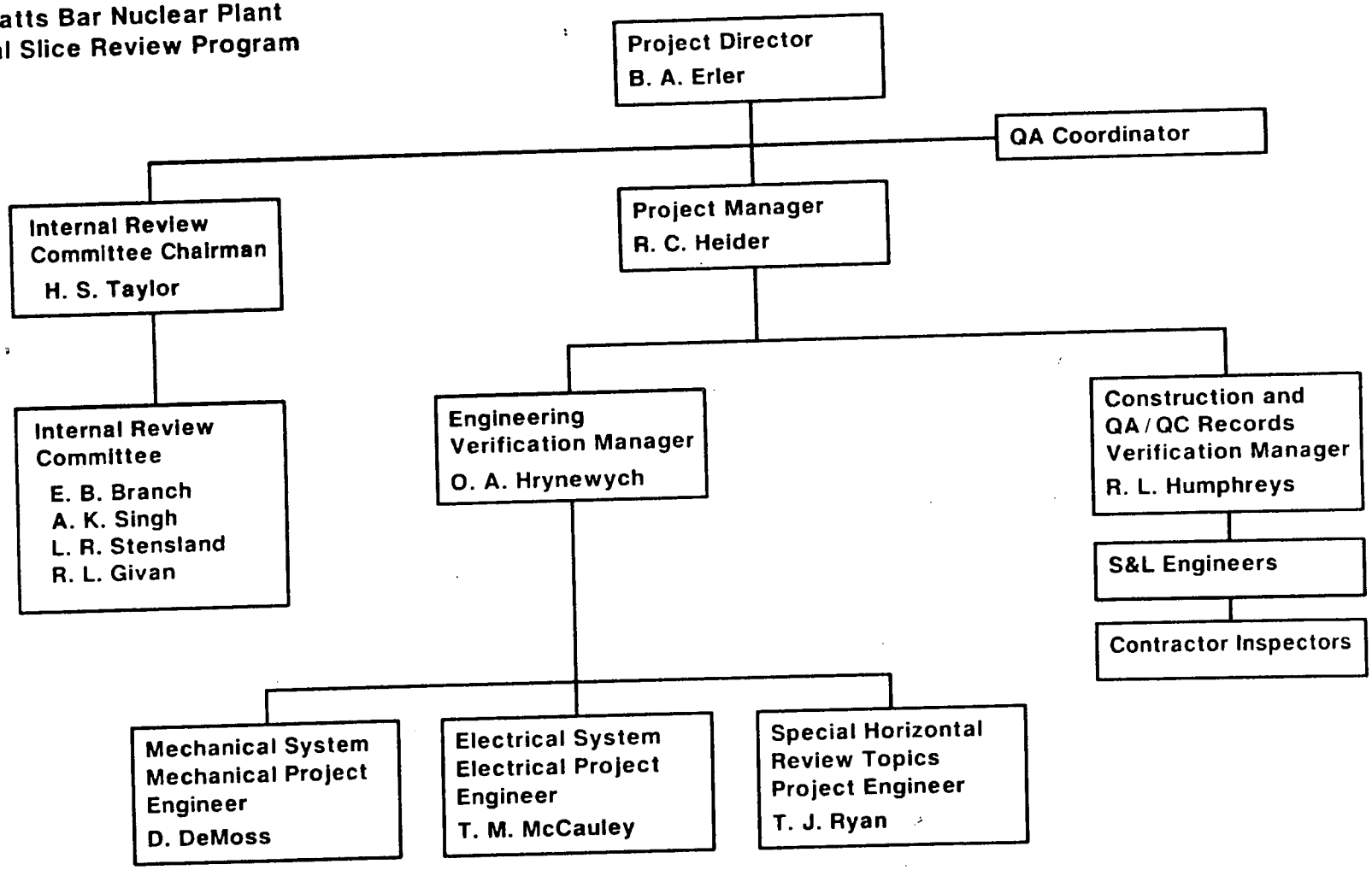
- **Control & Instrumentation Representative - R. L. Givan**

  Mr. Givan has extensive experience in the design and engineering of nuclear-fueled steam electric generating stations. As the Assistant Division Head, Mr. Givan participates in virtually all projects within the division's scope of work. He has also been involved with many projects as program manager, consultant, and supervisor of project engineering in the Control & Instrumentation Division. Mr. Givan was a member of the Internal Review committee for the Hope Creek Independent Design Verification Program.

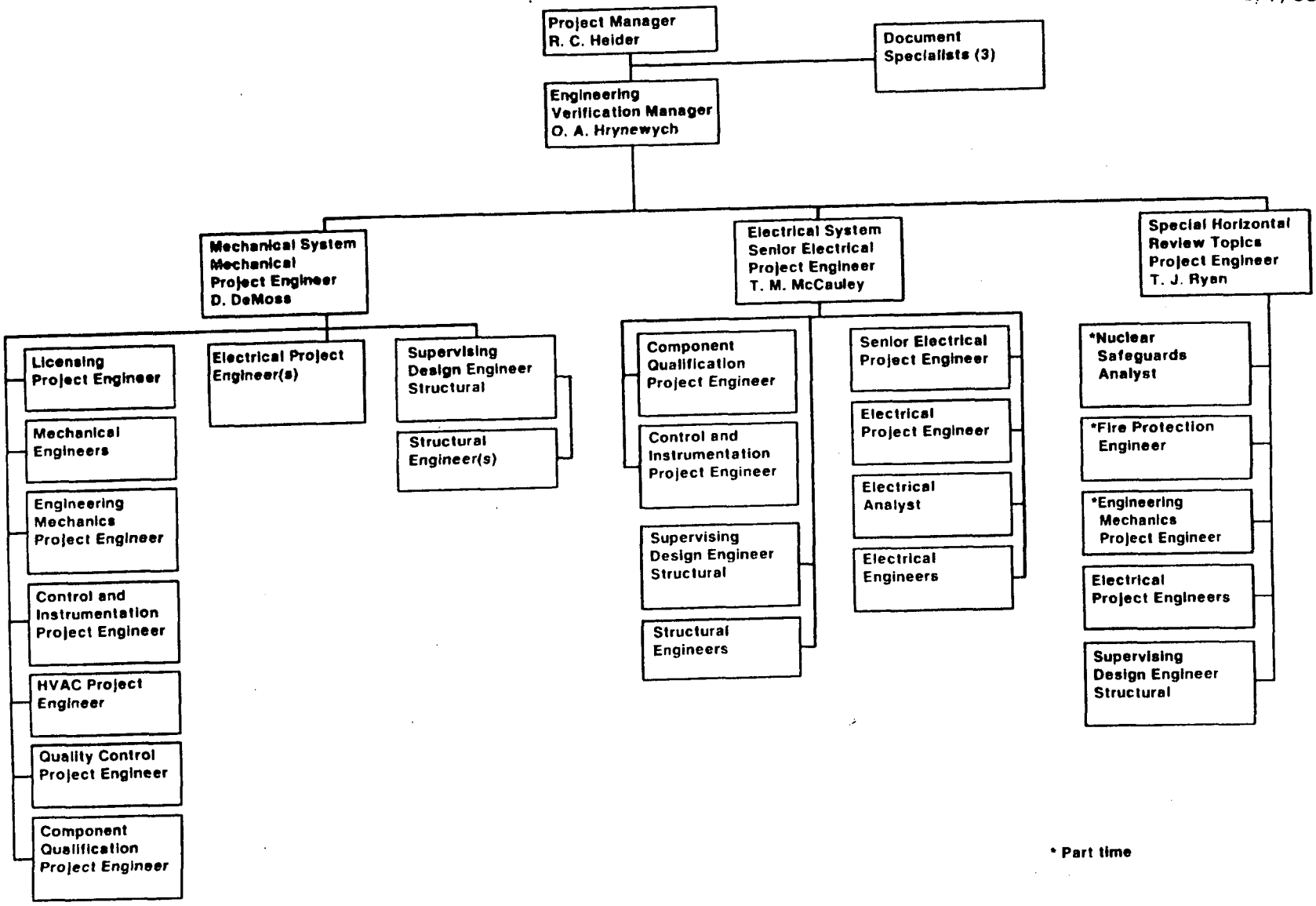
  Prior to joining S&L in 1975, Mr. Givan was an instrumentation project engineer involved in the installation and checkout of instrumentation systems in a BWR plant; a project engineer with operational control and responsibility for checkout and launch operations of Saturn V booster and ground support systems; a systems engineer engaged in electrical and mechanical systems analysis and

development of checkout requirements and operations for spacecraft; and a missile systems engineer involved in electrical and mechanical missile systems operational evaluation and technical assistance to Department of the Navy Operational Forces.

TVA Watts Bar Nuclear Plant
Vertical Slice Review Program



Design – Vertical Slice Review Project Team Organization



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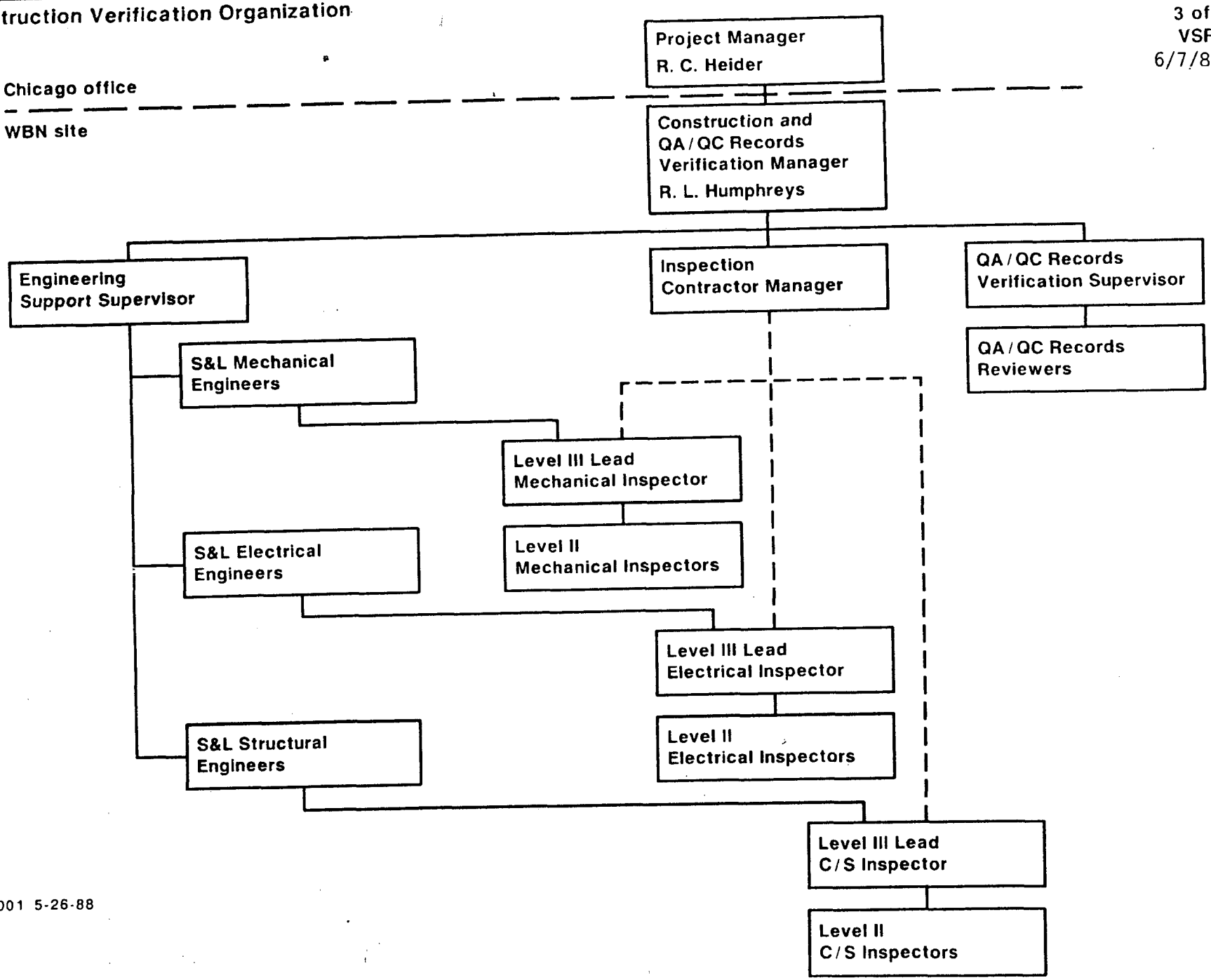
Construction Verification Organization



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The VSR team members will be chosen in conformance with the following selection criteria:

1. The VSR project team member's experience must conform to the requirements of S&L's General Quality Assurance Procedure GQ-1.03, "S&L Position Description"

2. The VSR project team member must have experience in the design and construction of nuclear power plants as determined by the project manager.

3. The VSR project team member must have specialized expertise in the area of his responsibility.

4. The lead engineers of the VSR project team will be selected based on their nuclear design and construction experience including experience associated with inspections and evaluations similar to the VSR.

QUALITY ASSURANCE PROGRAM

FOR THE

VERTICAL SLICE REVIEW

OF

WATTS BAR NUCLEAR PLANT

Approved By B. A. Erler

B. A. Erler
Project Director

H. S. Taylor

H. S. Taylor
Head, Quality Assurance Division

Revision 0 Date 5-26-88

QUALITY ASSURANCE PROGRAM

FOR THE

VERTICAL SLICE REVIEW

OF

WATTS BAR NUCLEAR PLANT

TABLE OF CONTENTS

Section	TITLE
1.0	Introduction
2.0	Organization and Responsibilities
3.0	Design Review Control
4.0	Document Control and Records
5.0	Audits

1.0 Introduction

This program establishes the quality assurance requirements for work performed by S&L on the Vertical Slice Review (VSR) of the Watts Bar Nuclear Plant. This program provides controls for the activities specified in the VSR Plan.

This quality assurance program complies with the requirements of 10 CFR Part 50, Appendix B, as described in the NRC approved S&L Quality Assurance Program Topical Report, SL-TR-1A, Revision 7, to the extent applicable to a VSR process and as described herein. Criteria addressed by this program are organization, design control, document control, and QA audits. Compliance with the requirements of this quality assurance program and the implementing project plan and procedures is mandatory for personnel performing the review.

2.0 Organization and Responsibilities

2.1 Organization Chart

The organization chart for the review team is shown in the VSR Plan. The organization chart indicates lines of authority and lines of communication for the project team.

2.2 Responsibilities

2.2.1 Project Director

The Project Director is a Partner of the firm and represents S&L Management on the review team. He is responsible to the Client for the overall conduct and results of the VSR. The Project Director shall be responsible for approval of this quality assurance program.

2.2.2 The Head, Quality Assurance Division

The Head, Quality Assurance Division is responsible for preparation, approval, and control of this project quality assurance program.

2.2.3 Project Manager

The Project Manager reports to the Project Director. He shall be responsible for:

- The execution of the review activities in accordance with this quality assurance program
- The preparation, approval, and control of a project manual including project procedures

- Acting as the main contact at S&L for TVA and its contractors
- Ensuring that the project personnel are properly trained in the use of the project manual and procedures

2.2.4 Quality Assurance Coordinator (QAC)

The Quality Assurance Coordinator reports to the Senior Quality Assurance Coordinator. He shall be responsible for:

- Review of project instructions
- Monitoring of the review work to determine conformance to this quality assurance program
- Participation in the review of the design process

2.2.5 Project Review Team

The responsibilities of the members of the Project Review Team are addressed in the project manual and procedures.

3.0 Review Control

3.1 General

The VSR shall comply with the requirements of this quality assurance program. The necessary controls to be used by the review team are governed by the project manual and procedures. These documents shall clearly state the requirements and practices for the project team. Preparation and issuance of the Project Manual shall precede initiation of the actual review work.

3.2 VSR Plan

The VSR Plan shall describe the review scope, the overall approach to the review, and the responsibilities for the review team. The plan shall define the project procedures required for the review.

4.0 Document Control and Records

4.1 General

The quality assurance program is prepared under the direction of the Head, Quality Assurance Division and approved by the Project Director and Head, Quality Assurance Division.

A Project Manual will be established by the Project Manager. It shall contain the VSR Plan and project procedures.

The plan is prepared and approved by the Project Manager, and concurred with by the Head, Quality Assurance Division.

Project procedures are prepared by the Project Manager or a designee reviewed by the QAC, and approved by the Project Manager.

4.1 Document Control

The VSR Plan and any revisions thereto shall be prepared and approved in accordance with this quality assurance program.

The Project Manager shall establish a plan for the turnover of program documents. The turnover plan shall be concurred with by TVA WBPT and may be completed progressively upon issuance of the document or at the termination of the review effort.

S&L retention of these doucments shall be determined by the Project Manager and TVA WBPT.

5. Audits

Audits shall be performed on the VSR program including any subcontractors in accordance with the S&L QA Program.

Subcontractors QA programs shall also be reviewed and accepted in accordance with the S&L QA Program.

In the conduct of the VSR by S&L, the following protocol shall be adhered to:

A. Purpose

The purpose of employing an independent reviewer, including the vertical slice reviewer, is to obtain an unbiased assessment of the subjects covered. Therefore, every reasonable effort should be directed toward assuring that the observations and conclusions of the independent reviewer are the results of the reviewer's own independent assessment and not influenced or biased by representations of other parties such as TVA organizations or contractors responsible for subjects under review.

Three principal organizations are involved in an independent assessment. The first group, the independent reviewer, is a group of technically qualified individuals with no current or prior significant involvement in WBN design, construction, or QA/QC records activities. The independent reviewer will provide an unbiased evaluation of areas subject to review. The second group is the TVA organization whose work is subject to the assessment. The line organizations will provide access to facilities, records, and personnel as needed for review and will respond to identified issues. The WBPT will act as the third party in monitoring the conduct of the review.

The WBPT overview includes monitoring the implementation of the review protocol as well as determining actions necessary for licensing. Since the third-party function will be performed by the WBPT, the appropriate NRC communication will be maintained through the WBPT. Should other parties desire to communicate with the independent reviewer, they will be referred to the WBPT. The WBPT will handle such communications in accordance with this protocol.

The following guidelines are intended to accommodate the need to assure independence of the independent reviewer, to accommodate the legitimate need to assure an efficient method for the independent reviewer to obtain information, and to provide for communication between the independent reviewer and the line organizations. However, it is the responsibility of the independent reviewer to assure that these guidelines are implemented in a manner which assures the independence of its review.

B. Formal Communications

Formal communications may be conducted by letter, memorandum, meeting, or telephone and will be used in the following circumstances:

- When the independent reviewer provides or desires substantive discussion of its evaluations, observations, findings, or recommendations, or
- If the line organizations or WBPT desires to discuss possible or proposed resolutions with the independent reviewer.

Formal letters and memoranda will be submitted by the independent reviewer to the WBPT at the same time they are submitted to the line organizations. Formal letters or memoranda from the WBPT or line organizations to the independent reviewer will be copied to the other party.

Formal meetings will be announced to all parties by the initiator. It is desirable to provide at least two working days' advance notice. The inability of any other party to attend such a meeting is not a basis for delay. Nonetheless, a good faith effort should be made to provide notice and accommodate all parties. Meetings shall be documented by the initiator and copies provided to the other parties within five working days.

Formal telephone conversations will be announced to all parties by the initiator. It is desirable to provide at least one working day's advance notice. The inability of any other party to participate in the telephone conversation is not a basis for delay. Nonetheless, a good faith effort should be made to provide notice and accommodate all parties. Telephone conversations shall be documented by the initiator and copies provided to the other parties within five working days.

C. Information Communications

Informal communications may be conducted by letter or informal memorandum, meeting, or telephone and will be used in the following circumstances:

- When the independent reviewer requests information to commence or complete its review,

- When the independent reviewer seeks clarification of information or additional information for review, or

- When the line organizations or WBPT seeks clarification or additional information to allow a full understanding of the independent reviewer's evaluations, findings, or recommendations.

Informal meetings and telephone conversations do not require announcement or documentation.

D. Limitation of Independent Review

It is necessary that the record clearly reflect the extent to which the independent reviewer's conclusions are the result of his or her own independent assessment. Therefore, any information which is treated as factual, but not independently verified by the independent reviewer, shall be carefully documented and specifically identified as such.

E. Filing

The independent reviewer will establish a file which includes both the information reviewed as well as the record of formal communications conducted under this protocol. This file will be retained until the issuance of a full power operating license for Unit 2.

F. Financial or Administrative Matters

Communications between line organizations or WBPT and the independent reviewer solely with respect to the financial and administrative aspects of the independent review contract are outside the scope of this protocol.