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B&W NPGD QUALITY ASSURANCE PROGRAM FOR NUCLEAR EQUIPMENT

— Revision 4 —

BABCOCK & WILCOX
Nuclear Power Group
Nuclear Power Generation Division
P. O. Box 1260
Lynchburg, Virginia 24505

Babcock & Wilcox

Babcock & Wilcox
Nuclear Power Generation Division
Lynchburg, Virginia

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B&W NPGD Quality Assurance Program for Safety Related Nuclear Equipment and Services

ABSTRACT

B&W's Quality Assurance Program (QAP) for Nuclear Steam Systems (NSS) and Nuclear Steam Cores (NSC) is described in this report. This report is divided into 18 sections conforming in format to the 18 requirements listed in Appendix B of 10 CFR 50.

The program is implemented through the Nuclear Power Generation Division (NPGD) and includes design, procurement, and manufacturing activities of NPGD and all its suppliers who furnish safety-related items or services to NPGD.

These activities are controlled by including applicable quality assurance requirements, as described in this topical report, in NPGD procurement documents imposed on its suppliers. Each supplier must then establish and/or maintain a documented QA Program to meet the requirements imposed by the procurement documents. Implementation of the suppliers' NPGD-approved QA Program is verified by NPGD through audit and surveillance activities. The position and relationships of the NPGD within B&W's structure are described in Section 1. Section 2 presents an overview of the QAP describing its implementation, its operation, the controls imposed on all suppliers.

Format guidance and criteria requirements for the preparation of information included in each section of this report were obtained from the NRC document, "Standard Review Plan" dated November 24, 1975, as amended through discussions and meetings with Regulatory Staff. Each of the criteria applicable to the NPGD is addressed in this document.

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1. INTRODUCTION AND ORGANIZATION

The Nuclear Power Generation Division implements a QA Program for each of the product lines comprising its commercial offerings. For the Nuclear Steam System (NSS) and Nuclear Steam Core (NSC) Product Lines, NPGD employs QA Programs (QAP's) each of which complies with Appendix B of 10CFR50. The B&W products shall incorporate the quality requirements, either expressed or implied by its customers and as contained in contractual commitments. The quality of each product and service will be consistent with the public interest and applicable laws, regulations, codes, and standards. 4

Throughout this topical report, the term Quality Assurance Program (QAP) shall mean the NSS and NSC Product Line QA Programs. The term "supplier" shall mean all organizations providing items or services in the B&W scope-of-supply. This would include such B&W organizations as Bailey Controls, Diamond Power Specialty, Nuclear Materials and Manufacturing Division and Nuclear Equipment Diision. 4

Thus, all manufacturing activities are controlled by the imposition of quality assurance requirements via procurement documents and are monitored by audit and surveillance functions of the NPGD. Equipment manufactured by the Research and Development Division and the Nuclear Division of B&W is termed "B&W-manufactured equipment".

All divisions and subsidiaries of B&W supplying nuclear equipment for contracts administered by NPGD are directed by the Company President to accept and implement the NPGD QA requirements imposed by the NPGD procurement documents (see Appendix C).

Babcock & Wilcox comprises various divisions and subsidiaries engaged in the design, manufacture, erection, and service of nuclear power plants. The corporate relationship and structure of the major divisions, subsidiaries, and works involved in nuclear power plant contracts are as follows:

1. The B&W Organization (Figure 1) - The major suppliers of commercial nuclear material, services and equipment are the doubleboxed organizations.

The following organizations have major responsibilities in supplying design services and manufacturing and erection capabilities:

a. Nuclear Power (Figure 2) comprises the Nuclear Power Generation Division (Figure 3), the Nuclear Equipment Division (Figure 4), and Nuclear Materials and Manufacturing Division (Figure 5). The major suppliers are the Nuclear Equipment Division and The Nuclear Materials & Manufacturing Division. 4
b. B&W Construction Company (Figure 6).
c. Bailey Controls Company (Figure 7).
d. Diamond Power Specialty Company (Figure 8).
e. Control Components, Int'l. (CCI) (Figure 9).

The NPGD deals directly with each of these divisions, subsidiaries, and shops in performing its responsibility of executing contracts for commercial nuclear steam systems, fuel, and related activities. NPGD imposes the requirements of Appendix B, 10 CFR 50, on its suppliers through procurement documents and measures their effectiveness through its audits and survillance functions. B&W suppliers to NPGD must meet the same QAP requirements as outside suppliers.

B&W's Tubular Products Divisions supplies products to the Barberton Works. The Nuclear Manufacturing and Materials Division supplies nuclear fuel assemblies and associated core control components to the NPGD. The Fossil Power Generation Division may manufacture supports and restraints and other items for NED, and the Research and Development Division may supply various monitoring devices to NPGD. NPGD exercises QA authority over these suppliers in the same manner as with external supliers of B&W, i.e., by control of supplier QA programs. The specifics of this control are described in subsequent sections of this report.

Each of the organizations within the B&W structure concerned with manufacturing and fabrication has a quality organization responsible for quality assurance functions and for providing technical, administrative, and functional directions for its quality assurance program. Those quality functions must

conform to the requirements of the NPGD QA program as imposed by NPGD QA Specification NPG 09-1212. NPGD approval of the supplier's QA program indicates acceptance of the supplier's methods for compliance with NPGD requirements as defined in NPG 09-1212.

QA independence from manufacturing schedule and cost control is provided as shown in the organization charts. This independence extends to work level inspection responsibilities, thus ensuring that the individual performing inspection on the floor is independent of any cost or schedule requirements. The responsibility, freedom of action, and authority for NPGD-QA is provided by policy direction. The same degree of QA freedom and authority is required of all suppliers. This is verified by pre-award and periodic audits by NPGD as described in subsequent sections of this document. 4

NPGD's audit and surveillance activities ensure that each supplier's QA organization has the authority and freedom from cost or schedule requirements to accomplish the following:

1. Identify quality problems through checking, auditing, inspecting, and verifying performance by quality personnel who are independent of manufacturing schedule and cost.
2. Initiate action, make recommendations, or resolve quality problems.
3. Follow up and verify implementation of corrective action for quality problems.
4. Take such action as is necessary to control further processing, delivery, or installation until proper disposition of identified quality problems has been accomplished.

The application of these items is extended to subtier vendors by control of supplier vendor control programs as a function of the NPGD QA program.

1.1 Business Integration Group - Quality & Technology Division (Figure 10)

The Quality & Technology Division (QTD) of the Business Integration Group (BIG) has the responsibility to develop and implement quality assurance (QA) policies for the B&W Company. The Quality & Evaluation (Q&E) Department of the QTD establishes these policies. Each B&W Division is responsible for preparing a written quality policy, approved by the Vice President or General Manager of the Division, to fulfill the requirements of the B&W quality policies.

Each B&W Division establishes and implements a QA Program tailored for its own operations that satisfies the requirements of the Company and Division QA policies. The Q&E Department is responsible for administering the B&W quality assurance policies and maintains an overview of the quality assurance activities of the various B&W organizations. The Q&E Department reviews the quality programs of all B&W Divisions and makes recommendations for compliance with B&W policies as necessary. Q&E evaluates the effectiveness of the various quality systems, identifies quality systems problems, assures the adequacy of corrective action to resolve deficiencies, and provides management visibility to the total B&W quality assurance activities as necessary to assure compliance. 4

The adequacy of the scope, implementation and effectiveness of the NPGD QA Program is assessed by Q&E at least every two years. Written procedures are established to define the audit requirements. The results of each audit are formally prepared and presented, along with appropriate recommendations to Division management for review.

Q&E maintains lines of communication with the various organizations of the B&W Company, but the primary interface between B&W organizations for NSS activities is through NPGD. Any differences that arise between NPGD and another B&W organization are referred to the Vice President of the Nuclear Power Group for resolution or escalation as necessary. The NPGD QA Program is imposed on all NPGD suppliers of safety-related items in the B&W scopes of supply, whether they are B&W suppliers or outside vendors.

1.1.1. Nuclear Power Generation Division (Figure 3)

Within B&W, the NPGD has been delegated the overall responsibility for executing contracts for commercial nuclear steam systems and fuel. In executing these contracts, NPGD is responsible for a scope of effort extending from the design concept through refueling of a nuclear steam system, including reload fuel for nuclear systems designed by other NSSS suppliers. The organizations within the NPGD that are primarily involved in quality assurance are Reactor & Fuel Management, Engineering, Customer Service, Business Administration & Integration, and Quality Assurance. The extent to which these organizations are involved in the development of the scope of effort is covered in subsequent paragraphs. 4

1.1.1.1. Reactor & Fuel Management

The Manager Reactor & Fuel Management reports to the Vice President of the NPGD. He is responsible for the management of nuclear steam system and fuel contracts through Product Line Managers. The NSSS Product Line consists of a Manager, NSSS product lines, NSSS project team comprised of a Senior Project Manager, Project Managers, Associate Project Managers, and Project Aides. The Project Team assigned to a specific contract is responsible for official communication with the plant owner, and, in addition, performs the management function required to deliver NSSS related hardware and software to the utility customer. The Fuel Product Line is composed of the Manager, Fuel Product Line, Project Managers, and a Contract Administration Unit. The Project Manager assigned to a specific contract is responsible for official communications with the plant owner on all reload fuel contracts. In addition, he performs management function to deliver the fuel hardware and software to the utility customer. 4 4

1.1.1.2 Engineering Department (Figure 3)

The Manager of the Engineering Department reports to the Vice President of NPGD. The Engineering Department includes, NPGD Engineering Operations, Project Engineering, Plant Engineering, Equipment Engineering, RCS Components Engineering, Fuel Engineering, Advanced Energy Systems Engineering and Licensing; and is responsible for: 4

A. The functional design and associated systems analysis of the reactor coolant and secondary systems.

B. Specification of system requirements and interfaces.

C. Design of certain mechanical systems.

D. Plant integration.

E. Specification of balance-of-plant (BOP) criteria.

F. Engineering and specification of auxiliary systems and control and instrumentation systems.

G. Engineering and specification of purchased plant equipment, including equipment manufactured by the NED.

H. Detailed engineering for core support structures, service structures, and supports and restraints manufactured by the NED.

I. Specification of requirements for B&W-manufactured items.

J. Engineering and detail design of the initial and assembly design for all reload cores, including plutonium recycle cores.

K. Advanced technology in the areas of thermodynamics, physics and radiation transport, system reliability and controls, safety and system analysis, applied mechanics, materials, chemistry, and Codes.

1.1.1.3 Customer Service Department

The manager of Customer Service reports to the Vice President of NPGD. The Customer Service Department includes Training Services, Field Engineering and Services, Engineering Services, Nuclear Parts enter, Special Products, and Inservice Inspection. 4

The Customer Service Department is a consolidation of all customer service functions within NPGD. It has the responsibility for providing integrated service to customers and to effectively support the Division customer service business through a single organization. The department is responsible for:

A. Training programs for NPGD & customer personnel in theory, operation, and maintenance of nuclear steam systems.

B. Preparing test and operating specifications for use by the plant owner.

C. Providing NPGD personnel on site for NPGD site activities, processing site problem reports and implementing solutions, and providing general advice and consultation to the plant owner. 4

D. Providing services for operating plants, including refueling and maintenance services.

E. Providing reactor diagnostic services.

F. Supplying replacement parts and operating the parts distribution center.

G. Accomplishing inservice inspection for operating plants and plants under construction.

H. Designing, developing and producing special products as required to support the need of the nuclear industry in the operation, inspection, and performance evaluation of the NSSS.

1.1.1.4. Business Administration and Integration (BA&I)

The manager of BA&I reports to the Vice President of NPGD. The BA&I Department has three activities that are of interest to QA; General Services, Purchasing, and Employee & Community Relations. 4

1.1.1.4.(a) Business Administration and Integration - General Services

General Services includes Data Management, Management Information and Administrative Systems, Graphics and Office Facilities Management, Computer Services, and Document Preparation; and is responsible for:

A. Initial distribution and recording of NPGD-generated technical documents.

B. The identification of technical documentation (generated by both NPGD and suppliers)

C. The operation of a system for storage, retention, and retrieval of records vital to the Company. 4

D. A system for tracking and expediting changes to product configuration.

E. Operation of the documentation data base.

F. Development and control of administrative policies, systems, and procedures, and their coordination with the requirements established by other departments of B&W-NPGD.

G. Graphic and illustration services.

. Computer programming of technical applications, numerical analysis, operation of digital and hybrid computing facilities, data preparation and input/output functions.

I. Editing, typing, and reproduction of technical documents prepared at NPGD.

1.1.1.4.(b) Business Administration & Integration - Purchasing

The Manager of Purchasing is responsible for procuring reactor accessories, fuel, and installation services purchased from accessory suppliers. Purchasing also arranges supplier interfaces with QA Audits (QAA) and QC Surveillance (QCS) as required to obtain satisfactory resolution of adverse findings of audits and surveillance. 4

4

1.1.1.4. (c) Business Administration & Integration - Employee & Community Relations

Two activities within Employee & Community Relations are of interest to QA. The Manager of Wage and Salary Administration maintains a file of position descriptions that describe the responsibilities, authority, and reporting relationships of individuals in the NPGD. The Manager of Manpower Training and Development assists all NPGD organizations in planning, evaluating, coordinating, and record keeping for all the training of NPGD personnel.

1.1.1.5. Quality Assurance

The Manager of NPGD QA reports to the Vice President, NPGD. He is responsible for the development and implementation of a program to ensure quality in the products and services in the NPGD scope of supply, which includes auditing the quality-related functions of the B&W-supplied site consultant. Organizational freedom from the activities being regulated is ensured by the existence of QA as a separate organization within NPGD at the same level as the organizations being regulated. The Manager of QA provides technical and administrative control for all NPGD QA personnel.

Division policy assigns the Manager of QA the responsiblity and authority to ensure the establishment, definition, implementation, and enforcement of NPGD programs, policies, procedures, and techniques that will meet the quality objectives of Federal Regulations (specifically 10 CFR 50, Appendix B) and applicable Codes, standards, and customer contracts commitments.

The NPGD QA Manager must be a graduate of an accredited college or university in an engineering or scientific field or be able to substitute experience at a rate and level determined acceptable by the next

higher level of management. He must have a minimum of five (5) years' experience in an engineering or technical field and two (2) years' in a managerial capacity. 4

The QA Manager implements the requirements of this QA program through the actions of four operating sections -- Quality Assurance Audits (QAA), Quality Control Surveillance (QCS), Quality Assurance Engineering (QAE) and QA-Field Service (QA-FS). 4

QAA conducts a program of pre-award, NPGD internal, and supplier audits to ensure conformance to the NPGD QA program. Preaward audits evaluate the capabilities of prospective suppliers. Periodic internal and supplier audits ensure implementation and evaluate compliance to NPGD QA requirements. Each of these audits includes checks to confirm the existence of suitable programs to verify the quality of the product.

QCS conducts surveillance of the sources of supply for the continuing application of QA programs and actions to products manufactured for NPGD. These surveillance actions are described in the subsections of this report dealing with procured items.

QAE provides a review and analysis of the adequacy of quality-related actions performed by all the sections of NPGD and its suppliers.

QA-Field Service ensures that quality requirements applicable to Customer Service Field Activities are defined, implemented and carried through to produce products and services with a quality level expected by customers and B&W Management; assures that the Customer Service scope of business complies with applicable laws and B&W Quality Assurance commitments; and that field related activities satisfy applicable Codes, Standards, and requirements expressed in Master Service Contracts and Customer specificiations. 4

Section 2 and subsequent sections define how QA personnel exercise their authority and organizational freedom to (1) identify quality problems; (2) initiate, recommend, or provide solutions, (3) verify implementation of solutions; and (4) suspend or control further processing or delivery of a nonconforming item until the proper disposition of the deficiency or unsatisfactory condition has been approved and documented.

1.1.2. Nuclear Equipment Division (Figure 4)

Most of the major components in the NSSS are fabricated by the B&W Nuclear Equipment Division (NED) located in Barberton, Ohio, with its own QA organization headed by a Quality Assurance Manager. Like those in the other divisions, the QA Manager is responsible for the implementation of B&W policies. The QA Manager of the NED Barberton Shop reports to the General Manager, NED. The NED QA organization functions include the preparation and maintenance of QA policies, technical procedures, proposal reviews, vendor auditing, and surveillance and periodic internal audits of all activities affecting quality and internal quality control. 4

1.1.3. B&W Construction Company (Figure 6)

The B&W Construction Company (B&WCC) provides consultation services to the customer for NPGD during the field installation phase of the NSSS. This service provides a mechanism for feedback to NPGD on receipt inspection results, reporting site problems, and consultation on field construction activities. The B&W Site Representative heads the consultation services organization.

The NSSS may be installed by B&WCC. B&WCC has a QA organization with a QA Supervisor, whose independence from schedule and cost control is ensured by reporting to the Nuclear Services Manager, who is independent of construction activities. The B&WCC QA organization functions include preparation and maintenance of QA policies, Quality Control administrative and technical procedures, proposal review, and auditing the field quality control organization and construction activities.

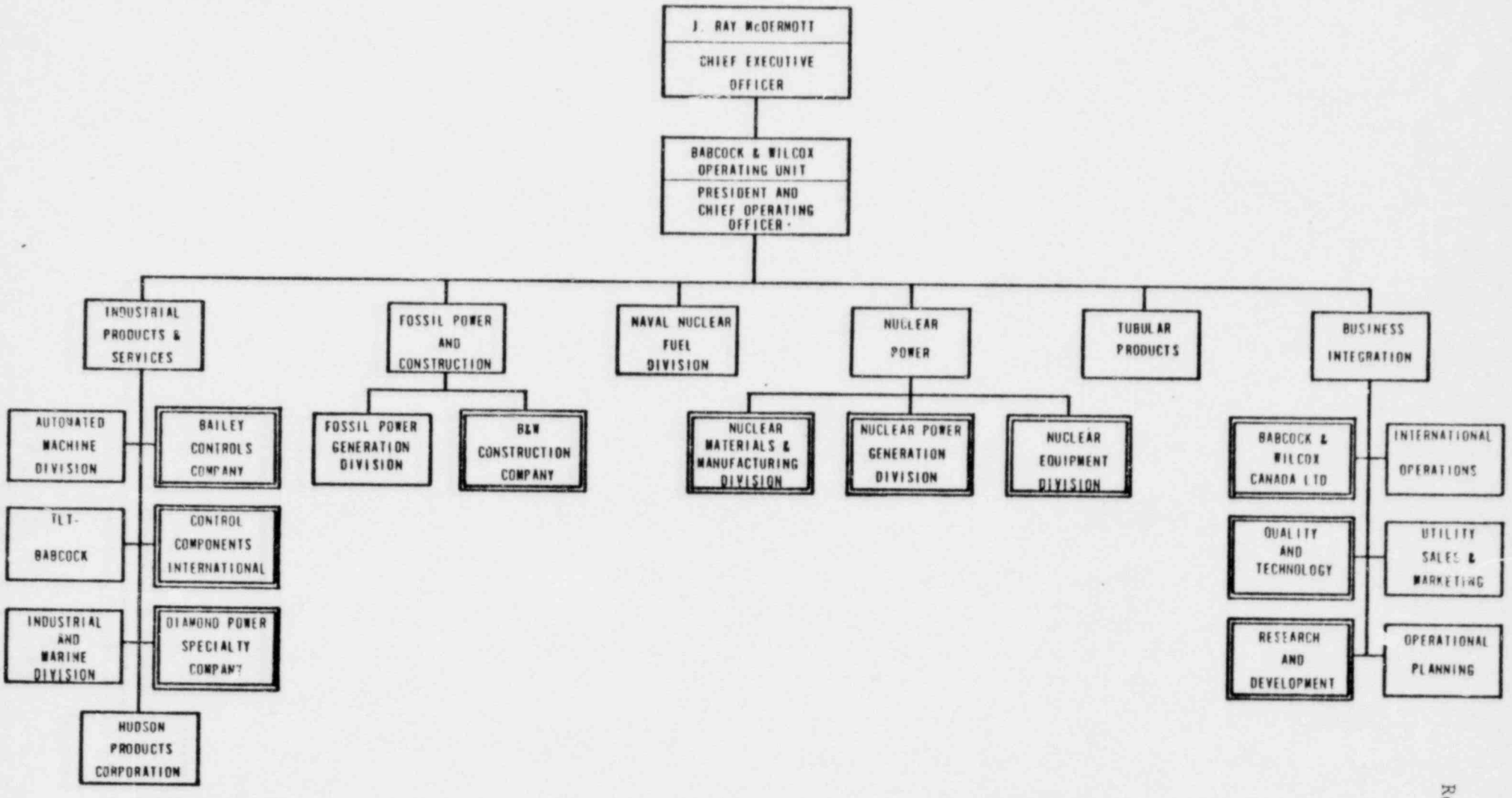
1.1.4. Nuclear Materials and Manufacturing Division (Figure 5)

The Nuclear Materials & Manufacturing Division (NMMD) is responsible for supplying fuel assemblies and associated core control components to the Nuclear Power Generation Division. NMMD has two fabrication 4

facilities. The facility located in Apollo, Pennsylvania is responsible for converting UF_6 to UO_2, which, after conversion, is supplied to the Commercial Nuclear Fuel Plant (CNFP) located in Lynchburg, Virginia where the principal manufacturing activities are pelletizing of UO_2, fuel rod loading and fabrication, fuel assembly operations, spacer grid fabrication, and the machining of miscellaneous small components.

Each facility has a quality control manager who is responsible for the administration of the entire quality program for that facility. Both quality control managers report directly to their respective plant manager. The quality program includes the preparation and maintenance of quality control plans and procedures, vendor auditing and surveillance, and inspecting and auditing of quality-related plant internal activities.

FIGURE 1


J. RAY McDERMOTT
CHIEF EXECUTIVE OFFICER
BABCOCK & WILCOX OPERATING UNIT
PRESIDENT AND CHIEF OPERATING OFFICER
INDUSTRIAL PRODUCTS & SERVICES
FOSSIL POWER AND CONSTRUCTION
NAVAL NUCLEAR FUEL DIVISION
NUCLEAR POWER
TUBULAR PRODUCTS
BUSINESS INTEGRATION
AUTOMATED MACHINE DIVISION
BAILEY CONTROLS COMPANY
FLT-BABCOCK
CONTROL COMPONENTS INTERNATIONAL
INDUSTRIAL AND MARINE DIVISION
DIAMOND POWER SPECIALTY COMPANY
HUDSON PRODUCTS CORPORATION
FOSSIL POWER GENERATION DIVISION
B&W CONSTRUCTION COMPANY
NUCLEAR MATERIALS & MANUFACTURING DIVISION
NUCLEAR POWER GENERATION DIVISION
NUCLEAR EQUIPMENT DIVISION
BABCOCK & WILCOX CANADA LTD
INTERNATIONAL OPERATIONS
QUALITY AND TECHNOLOGY
UTILITY SALES & MARKETING
RESEARCH AND DEVELOPMENT
OPERATIONAL PLANNING

NUCLEAR POWER

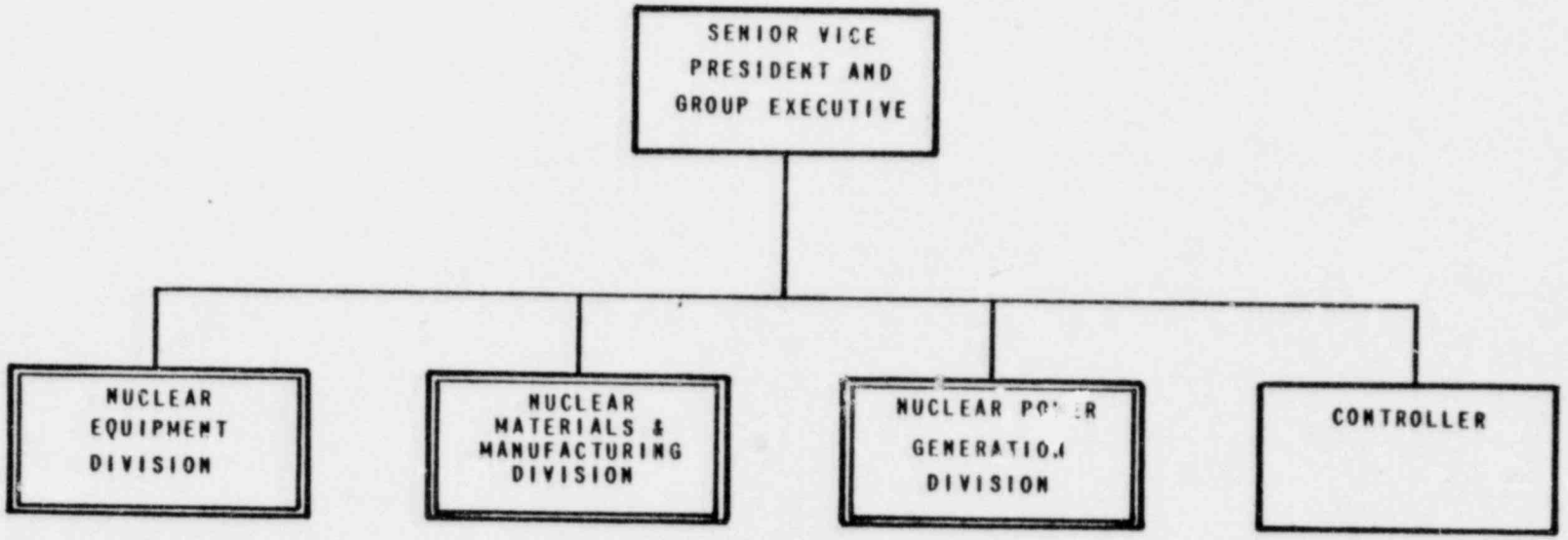


Figure 2

NUCLEAR POWER GENERATION DIVISION

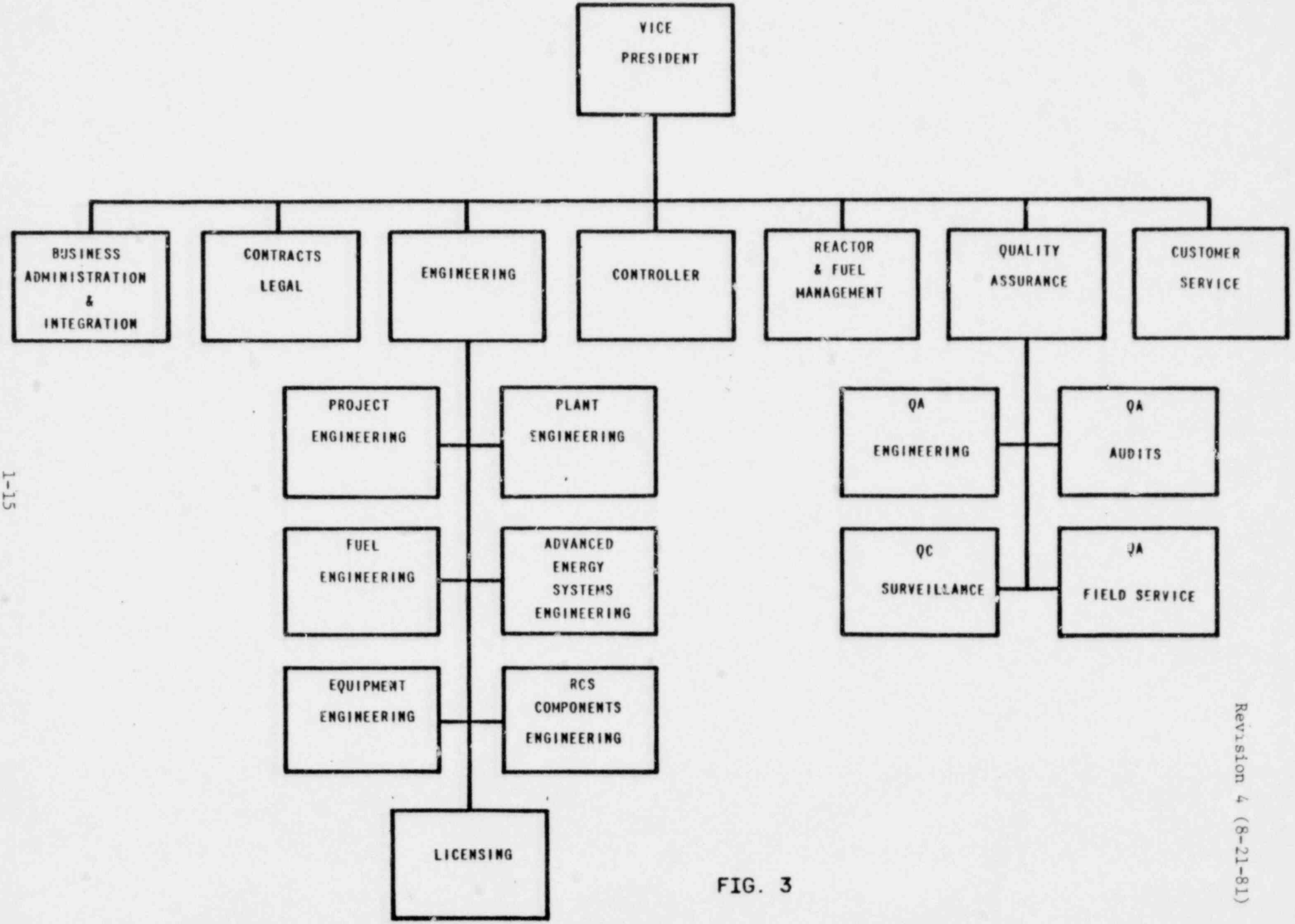


FIG. 3

NUCLEAR POWER

NUCLEAR EQUIPMENT DIVISION

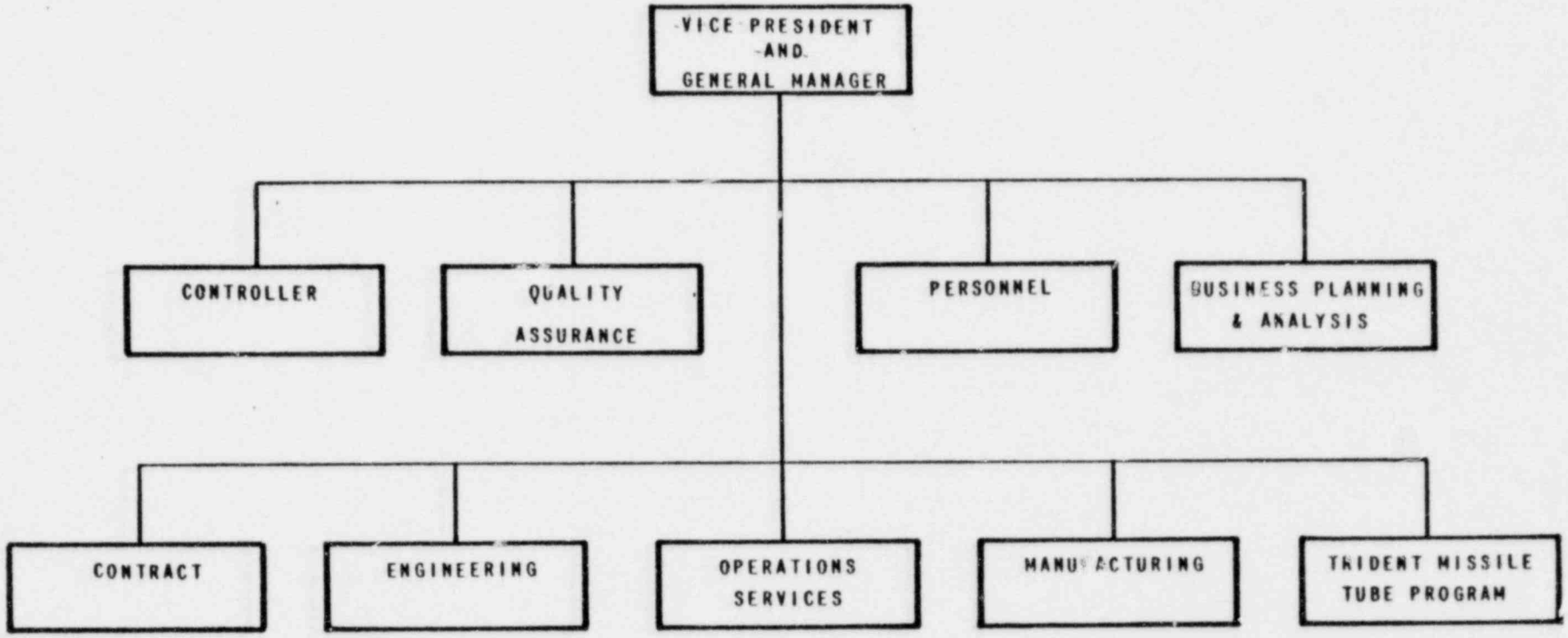


Figure 4

NUCLEAR POWER

NUCLEAR MATERIALS & MANUFACTURING DIVISION

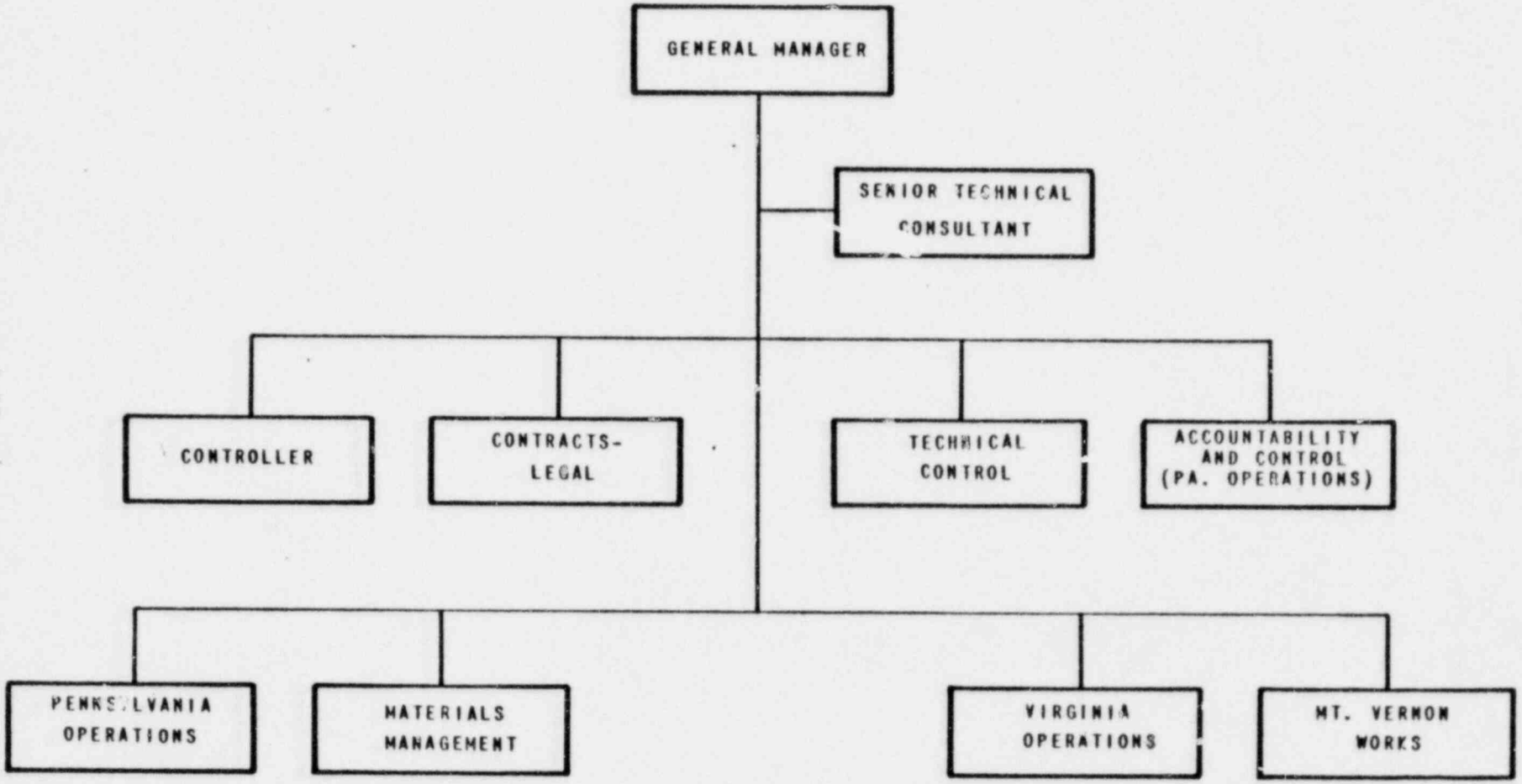


Figure 5

FOSSIL POWER & CONSTRUCTION

B&W CONSTRUCTION COMPANY

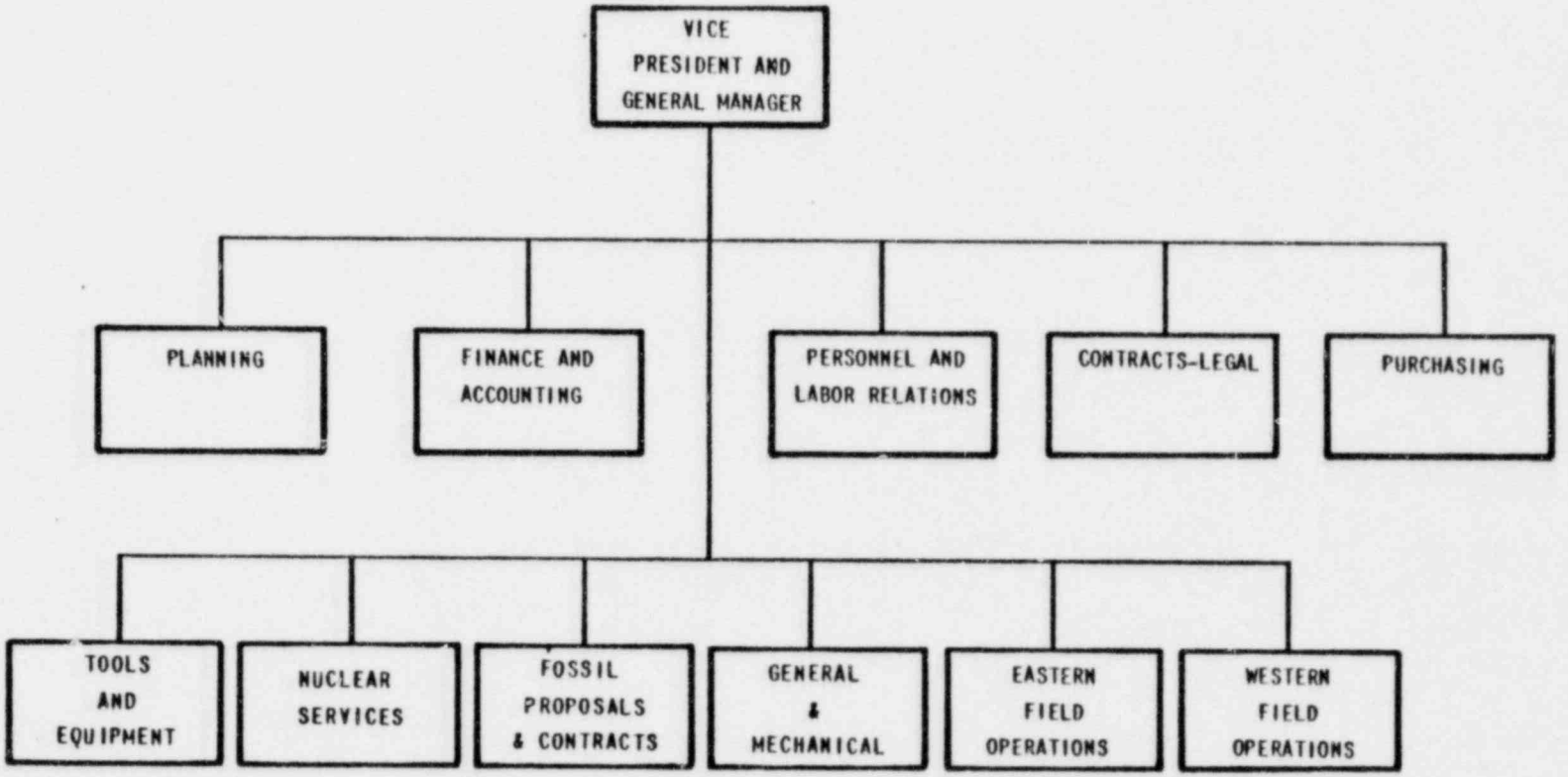


Figure 6

INDUSTRIAL PRODUCTS & SERVICES

BAILEY CONTROLS COMPANY

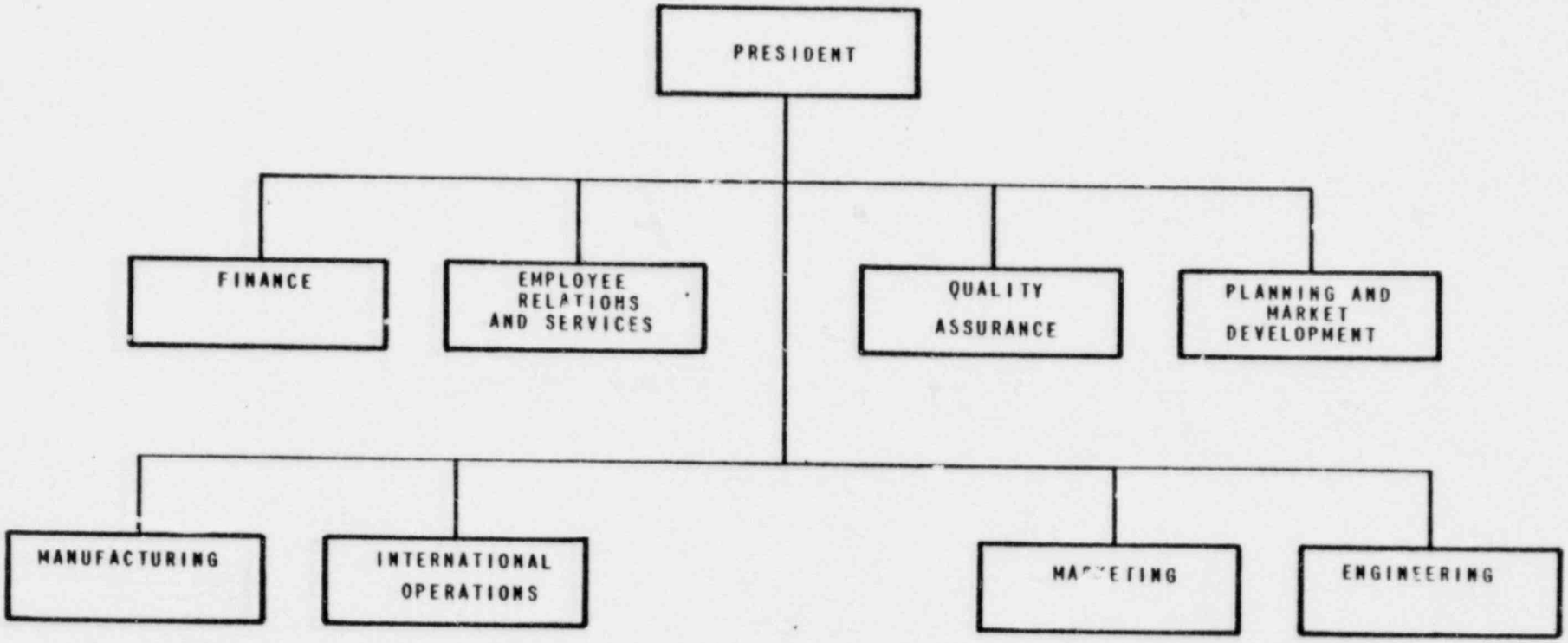


Figure 7

INDUSTRIAL PRODUCTS & SERVICES

DIAMOND POWER SPECIALTY COMPANY

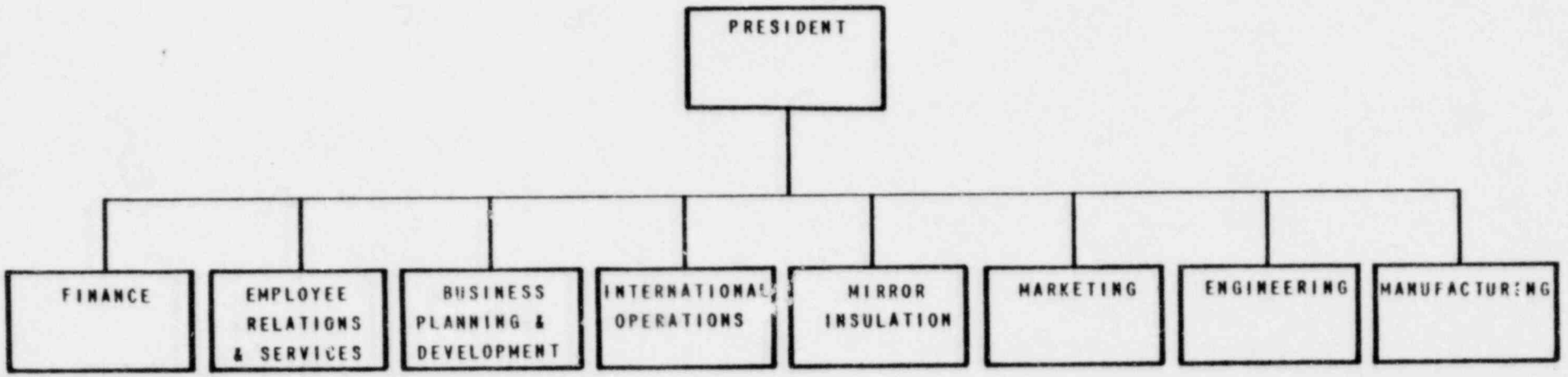


Figure 8

Business Integration

Quality & Technology

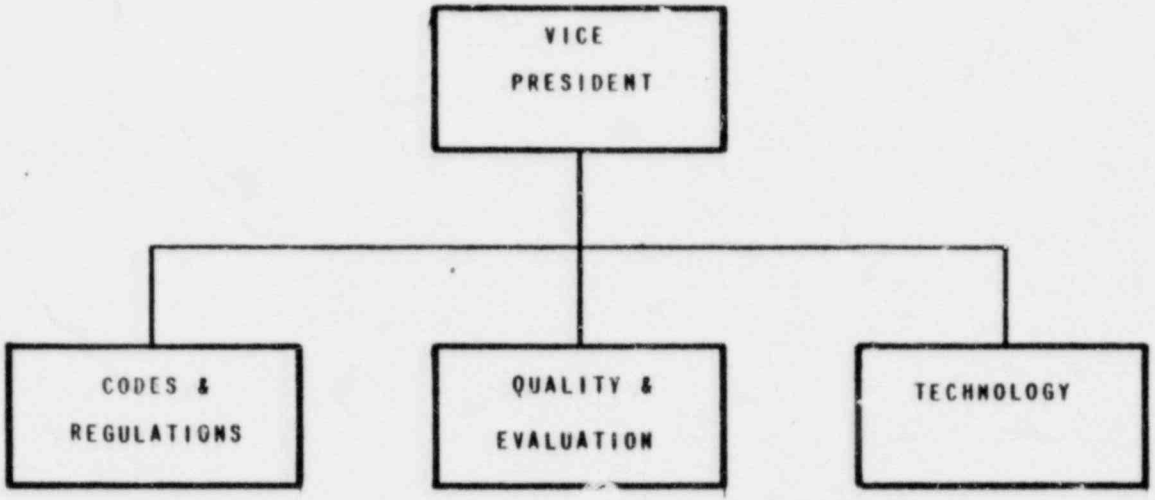


FIGURE 9

2. QUALITY ASSURANCE PROGRAM

2.1 Policy

The NPGD has escasblished and shall maintain a Quality Assurance Program (QAP) as defined in this report for the regulation of the activities associated with the design, procurement, manufacture, production, testing, inspection, examination, erection, preservation, and handling of safety-related nuclear components, fuel, and services supplied by the NPGD. This report is evaluated annually and updated to incorporate any administrative or operational changes necessary to ensure that it describes the NPGD QAP.

The QAP establishes and maintains standards of quality through the development and use of written policies, procedures, and instructions and the implementation of effective plans of required disciplines. The program is organized and administered to comply with the "Quality Assurance Criteria for Nuclear Plants," as outlined in Appendix B to 10 CFR 50; the "Rules of Safety" set forth in Section III of the ASME Boiler and Pressure Vessel Code; and ANSI N45.2, "Quality Assurance Program Requirements for Nucler Power Plants." The policies and procedures have been coordinated with and are mandatory for each of the organizations within the NPGD whose activities affect quality.

The overall QAP definition is provided by the Manager, QA, and must be approved by the Vice President of NPGD. The Vice President of NPGD ensures the implementation of the QAP through the issuance of a published Division Policy on Quality Assurance, which directs that the approved policies, programs, and procedures be followed. The policy declares that the QAP is mandatory for all NPGD organizations and personnel and that applicable QA requirements are imposed on each NPGD supplier, including other divisions and subsidiaries of B&W by the inclusion of quality assurance specifications in procurement documents. This policy statement appears in the Administrative Manua. along with the procedures that implement QAP. A typical list of the implementing procedures, cross-referenced to the criteria of 10 CFR 50, Appendix B, is given in Table 1. 4

Authority to deviate from NPGD quality procedures is reserved for the Vice President, NPGD. When Quality-related actions, discussions, or conditions may have significant B&W impact, the Vice President, NPGD, is responsible for escalation to higher levels of management. Where interests of other divisions are involved or are not clear, consultation will be held with responsible personnel in other divisions to identify and resolve possible conflicts. To assist the Vice President in accomplishing his QA responsibilities, copies of internal audit reports are provided for his review and direction. 4

The NPGD Vice President conducts Division Staff meetings during which each department manager presents the current status of programs within his department and the problems that require resolution by Division management. The QA Manager presents a summary of QA activities and problems at this time, and a discussion is held to identify any items that must be resolved at Division management level.

A training program is established to benefit the employees of each organization contributing to the quality of the NSSS and NSC components and to satisfy the training requirements specified in Appendix B to 10 CFR 50 and with the requirements of the Regulatory Guides and ANSI Standards as defined in Appendix A to this report. The NPGD satisfies training and indoctrination requirements by regulating internal actions through the Administrative Manual and by imposing QAP requirements on suppliers via procurement documents. Advanced training programs in QA-related technologies are provided by Q&E and are available to all B&W QA organizations. 4

A part of the indoctrination presentation, to train NPGD employees, is a description of the NPGD Administrative Manual procedure and standard system and the manual's application to the activities performed in NPGD. The application of this system provides an auditable method to determine that personnel performing quality-related activities are in compliance with QAP procedures. QA personnel make a presentation that stresses the emphasis to be placed on quality performance and the use of procedures.

The Administrative Manual provides the framework of working methods and records the placement of responsibilities for personnel in NPGD.

The NPGD policy on training emphasizes the need for training NPGD personnel to maintain necessary skills and defines Division responsibilities

for training, planning, and execution. Each individual receives informal on-the-job training in the working group to which he is assigned.

QA managers maintain a training program to ensure the proficiency of QA personnel in QA and QC philosophy and methods. The QAA Manager is responsible for training auditors and prospective auditors in NPGD to maintain a pool of qualified talent for auditing purposes. Proficiency is ensured by retraining, re-examining, and/or recertifying personnel as necessary.

B&W Specification 09-1212, "QA Program Requirements for Nuclear Equipment," imposes quality indoctrination and training requirements on NPGD suppliers of safety-related items as described in this report. Acceptance of the terms of procurement documents obligate suppliers to comply with the requirements of the QA Specification. Supplier compliance with the training requirements is verified by audit, or surveillance.

Table 2 is a listing of typical nuclear safety related components with applicable codes and classifications. B&W Quality Classifications Specification 07-1000584, establishes criteria for classifying safety related items. 4

B&W-NPGD's position with respect to the Regulatory Guides and ANSI Standards pertaining to QA (as they apply to the B&W scope of supply) is stated in Appendix A to this report.

Organizational freedom from the activities being regulated is ensured by QA being a separate organization within NPGD, reporting directly to Division management. This provides sufficient authority for QA personnel (1) to identify quality problems; (2) to initiate or recommend solutions; (3) to verify implementation of solutions; and (4) to suspend or control further processing or delivery of a nonconforming item until proper disposition of the deficiency or unsatisfactory condition has been approved and documented. Action is taken by QA to order correction or suspension of any work that does not conform to the specification requirements. 4

The NPGD QA organization approves all QA programs relating to the NPGD contract requirements and conducts audits of activities and records as appropriate to ensure compliance with the QA program requirements for safety-related equipment.

Quality-related activities initiated before submission of the PSAR are initial design, controlled as described in section 3, and procurement of long-lead items, controlled as described in sections 4 and 7.

Assurance of appropriate equipment and environmental conditions for tests is required by procurement documents for all supplier testing and prototype tests. Field tests of installed plants are the responsibility of the plant owner. In many other cases, the existence of an environment conducive to quality will be the subject of audit activity, as described in sections 7 and 18.

2.2. Implementation

The QA Manager implements the QAP through the action of four operating sections: Quality Assurance Audits (QAA), Quality Control Surveillance (QCS), Quality Assurance Engineering (QAE), and QA Field Service (QA-FS). 4

QAA conducts pre-award and periodic supplier audits and internal audits to evaluate the implementation of QA programs by NPGD and its suppliers (see section 1). Audit assignments are made to each QA Auditor, charging him with the responsibility for auditing specified QA program elements of NPGD or suppliers. Each auditor is responsible for accomplishing all audit activity assignments to meet the requirements of NPGD administrative procedures. QA auditors initiate and document action to correct noted deficiencies to ensure compliance with the QAP.

QCS inspects the sources of supply for continuing application of QAPs and actions to products produced for NPGD. They prepare and implement source visitation plans review QA documentation, initiate and document action to correct item deficiencies and approve shipping releases.

QAE reviews quality-related actions performed by NPGD and its suppliers. This includes review of design documents and manufacturing processes and procedures for proper application of QA requirements; the necessary checks and balances during design; product accept-reject criteria and appropriate test for 4

design verification. A QA engineer is assigned to each contract, with responsibility for performing QAE activities to ensure uniform application of the QAP to all contracts. QA engineers are responsible for reporting to management on the QA status of programs and controls.

QA-Field Service ensures that quality requirements applicable to Customer Service Field Activities are defined, implemented and carried through to produce products and services with a quality level expected by customers and B&W Management; assures that the Customer Service scope of business complies with applicable laws and B&W Quality Assurance commitments; and that field related activities satisfy applicable Codes, Standards, and requirements expresssed in Master Service Contracts and Customer specificiations. 4

Each of the QA operating section managers provides the QA Manager with a detailed monthly report of QA activities, progress, and problems. From these reports, the QA Manager provides the Vice President of NPGD with a monthly report on the status of QA activities for the month, advising him of QA problems and recommended actions to resolve the problems. The Vice President, through consultation with managers who report to him, and evaluation of audit reports, assures himself of the adequacy of the NPGD QA program.

2.2.1 Quality Classification

The degree of QA involvement with a specific equipment/component is determined by the quality classification system defined in the B&W Quality Classification Specification derived from Regulatory Guide 1.26 and IEEE Standard 308-1974. The quality classification specification defines the criteria for determining seismic and quality classifications that apply to fuel and fluid, electrical, and mechanical equipment of the B&W scope of supply. This document defines a philosophy for establishing a graduated classification system that recognizes that components and systems of a nuclear plant serve roles of greater or lesser importance relative to their safety function and to the safety of the public in general.

2.2.2 Internal QAP Operation

The QAP ensures that all applicable regulatory requirements, codes, design criteria, quality standards, and B&W requirements are correctly translated into specifications, drawings, procedures, instructions, and reports.

The requirements for each system are defined in System Descriptions Specifications, which identify the applicable regulatory requirements, codes, design criteria, and special NPGD requirements. System descriptions define the system design and establish functional requirements for components. Design and quality requirements are specified in Equipment Specifications, which are used as the design basis. 4

Design requirements are imposed on suppliers through procurement documents. Procurement activity is initiated by the prepartion of a Procurement Authorization. Compliance with contractual and quality assurance requirements is ensured by the review of procurement documents by the Project Manager function and QAE, respectively.

NPGD QA procedures are prepared to ensure the independent review of key design documents and design changes. Design activity details are covered in section 3.

The combined activities of QA, the Project Management function, and Engineering provide a system of total involvement that ensures the necessary checks and balances through all stages of the contract.

QA conducts audits of the NPGD organizations whose activities affect quality. Audits are conducted routinely and are scheduled to cover all quality-related areas annually. The reports on findings from the internal audits are provided to the managers of the areas audited, to the QA Manager, and to the Vice President, NPGD, for review, analysis, and action, as required. 4

2.2.3 Supplier Control

Supplier activities are controlled by the QAP Requirements Specification 09-1212. The QA specification addresses the 18 criteria of Appendix B of 10 CFR 50. It requires the supplier to organize, plan, establish, implement, and maintain a system using written procedures to control product quality

as required in the procurement documents. Special manufacturing processes and those administrative functions necessary to ensure the quality of the component, assembly, or system are included. The QA specification requires supplier QA personnel to have sufficient organizational freedom and independence from the pressures of production to ensure their ability to perform assigned responsibilities. The supplier is responsible for imposing on his vendors the QA requirements necessary to meet the applicable sections of the QA specification.

The extent to which the QA specification applies will be supplied as part of the procurement package documentation. The procurement package identifies requirements for reporting of safety concerns; the required documentation to be submitted; the QA specification requirements that apply; and the disposition of documentation generated during the procurement process. The procurement documents identify the types of documentation that will be shipped with the components for site receipt and installation as objective evidence of quality. QA review of the procurement package is accomplished to assure inclusion of all quality requirements (see Section 4).

The term "supplier" shall mean all organizations that provide items in the B&W scope of supply, including manufacturing and fabricating organizations of B&W. Thus, the manufacturing activities are controlled by the imposition of QA requirements in procurement documents and evaulated by the audit and surveillance functions of NPGD QA.

Acceptance of the specification 09-1212 is indicated by acceptance of the procurement documents by the supplier. Compliance with the requirements of the specification is ensured by audit and surveillance of all suppliers. Specification 09-1212 is further addressed in section 4.

QA control of supplier activities starts with a pre-award supplier evaluation by QA to determine the acceptability of the supplier to B&W. Procurement documents are evaulated by QA to ensure that the documents contain the requirements specified by the QAP and the contract. Ongoing supplier activities are monitored by QA in the form of in-process supplier quality program audits, inspections, and supplier performance evaluations.

QA evaluates the QA data package prepared by the supplier to ensure that it contains the documentation specified in the procurement documents.

When the QA Manager has been assured that the supplier has satisfied the requirements of the QAP, the QA Manager will certify that NPGD can provide documentary evidence that supplied materials and equipment conform to the procurement requirements. The certification provides authorization for the preparation of a shipping release and is a part of the QA documentation furnished to the owner. 4

Further details on procurement activities are included in sections 4 and 7.

2.2.4 Site Activities

NPGD provides an on-site consultation service through a representative of the B&W Construction Company to advise the utility on the installation of the equipment, components, and materials furnished under the NPGD scope of supply. The status of receipt inspections and reports of any problems on site within the NPGD scope of supply are reported to NPGD. NPGD evaulates these problem reports and recommends remedial or corrective action wherever necessary. QA monitors the activities of the NPGD site consultation activities through site audits.

Plant preoperational tests and plant operation are the responsibility of the plant owner and are outside B&W's scope of supply. However; NPGD does prepare test specifications and operating specifications. These documents are prepared in accordance with Appendix B to 10 CFR 50 and Regulatory Guide 1.68. Resulting procedures prepared by the owner are reviewed by Customer Service for content and implementation if such review is required by contract. The B&W-prepared specifications are provided to the plant owner and do not become a part of the QA data package (see section 14 for additional information).

The NPGD Site Operations Manager submits reports to NPGD Field Engineering & Services concerning problems and nonconforming startup test results within or affecting the NPGD scope of supply. NPGD evaluates these problem reports and recommends remedial or corrective action wherever necessary. 4

Table 1. B&W Quality Assurance Program Procedures (Typical Listing)

Document No.	Document Title	Applicable Sections of QA Manual, 19A-N.1
NPG-0150-01G	Objectives and Responsibilities - Quality Assurance	1
-0151-10G	Objectives and Responsibilities - Purchasing	1
-0151040G	Objectives and Responsibilities - Project Management	1
-0151-50G	Objectives and Responsibilities - General Services	1
-0151-51G	Objectives and Responsibilities - Computer Services	1
-0151-52G	Objectives and Responsibilities - Graphics & Office Facilities Management	1
-0151-53G	Objectives and Responsibilities - Data Management	1
-0151-54G	Objectives and Responsibilities - Document Preparation Section	1
-0151-70G	Objectives and Responsibilities - Engineering	1
-0151-72G	Objectives and Responsibilities - Licensing Section	1
-0151-76G	Objectives and Responsibilities - Fuel Engineering Section	1
-0151-85G	Objectives and Responsibilities - Customer Services	1
0199-01G	NPGD-Organization Charts	1
NPG-0305-01	Preparation of Nuclear Steam Core (NSC) Contract Information (CI) Sheets	3,4,6,17
-0305-03	Preparation, Distribution and Use of the Commercial Contract Information (CCI) Sheets - NSS Contracts	3,4,6,17
-0310-05	Equipment and document Numbering System	6,8
-0310-27	Preparation and Revision of Core contract Requirements List (CCRL)	3,6
-0310-28	Technical Deviation List	3
-0310-29	Records Requirements List (RRL)	17
NPG-0402-01	Processing of NPGD Prepared Calculations	3,6,17
-0403-01	Policy - Codes and Standards - Applicability to Proposals and Contracts	3
-0403-11	Signatures on Engineering Documents	3,6
-0403-12	Policy - Application of NRC Regulatory Guides	3,6
-0405-05	Contract Variation Approval Request (CVAR)	15,16
-0405-13	Plant Parameter Lists (PPL)	3
-0405-21	change Inquiry/Authorization (CI/A)	3,6,15,16

Table 1. (Cont'd)

Document No.	Document Title	Applicable Sections of QA Manual, 19A-N.1
NPG-0405-22	Design Review	3,16
-0405-30	Design,Tests Documentation and Verification	3
-0407-12	Assignment of Part Numbers	8
-0408-08	Materials Review and Consultation	3
-0408-16	Material Selection for the KV Material Surveillance Program	3
-0411-01	Performance Criteria Specifications Format and Numbering System	3
-0411-02	Preparation and Revision of Performance Criteria Specifications	3
-0412-11	Preparation and Revision of Technical Standard Manual	3,6
-0412-27G	Policy - Technical Standards	6
-0412-53	Document Dictionary and Document Identifiers	6
-0412-54	Policy - Product Documentation	3
-0412-55	Preparation of Design Specifications/Requirements Documents	3,4,5,6,7,13
-0412-56	Processing of Design Specifications/Requirements Documents	3,4,5,6,7
-0412-57	Preparation of NPGD Detail Design Documents and Plant Arrangement Drawings	3,5,6
-0412-58	Processing NPGD Prepared Detail Design Documents and Plant Arrangement Drwings	3,5,6,13,14
-0412-63	Format - NPGD Technical Documents	5
-0412-66	Release of Product Documentation	6
0412-67	Processing of non-NPGD Prepared Technical Documents	3,5,6,10,13,14
-0413-03	Independent Design Reviews of ASME Stress Reports and Other Design Analysis	3
-0413-04	Policy - Independent Review of Stress Reports and Analysis	3
-0413-05	Owners Agent (NPGD) Review of Stress Reports for ASME Code Components	3
-0414-06	Preparation and Processing B&W Positions on NRC Regulatory Guides	3
-0414-12	Preparation of Contract and Generic Licensing Documents	3,6,14
-0414-13	Processing Contract and Generic Licensing Documents	3,6,14

Table 1 (Cont'd)

Document No.	Document Title	Applicable Sections of QA Manual, 19A-N.1
NPG-0503-04	Site Problem Report	13,15,16
-0503-07	Field Change Authorization	3,6
-0504-12	Preparation and Processing of Site Instructions	11,14
-0504-13	Preparation of Site Support Documents	11,14
-0504-14	Processing of NPGD Prepared Site Support Documents	11,14
NPG-0902-06	Computer Program Development and Certification	3
-0903-03	Internally Developed Computer Program Manuals	3
-0903-13	Hybrid Computer Programming and Usage	3
NPG-1212-12	Preparation and Processing of Procurement Documents	3,4,7,13,17
NPG-1303-07	Preparation, Review, Approval and Issuance of Administrative Policies and Procedures	6
-1303-15	Control of NPGD Manuals	6
-1303-17	Preparation, Issue and Control of NPGD Operating Instructions	6
-1303-21G	Records Retention Program	17
-1311-01G	NPGD Filing System	6,17
-1311-08G	Policy - Record Retention	17
-1311-10G	Retention of Computer and Data Processing Input/Output Media	17
NPG-1405-04G	Policy - Training and Education	2
NPG-1701-70	Policy - Assurance of Quality	1
-1702-09	Preparation/Review/Approval of QA Manual	0
-1702-22	Training of NPGD Employees	2,18
-1702-70G	Policy for Quality Assurance Program	2

Table 1. (Cont'd)

Document No.	Document Title	Applicable Sections of QA Manual, 19A-N.1
NPG-1703-01	Preparation and Processing of Internal Deficiency Report/Restraint Order/Corrective Action Request	2,7,15,16
-1705-03	Preparation and Processing of Quality Assurance Data Package and NPGD Certificate of Conformance	7,10,17
-1707-01	Processing of Safety Concerns	15
-1708-08	QC Surveillance - NPGD Suplied Equipment	2,5,7,10,13,14,15,16

Note: These procedures are in a continuing state of review and revision as required to improve implementation of the QA program. B&W may add, modify, and/or delete procedures, or portions thereof, without changing the intent of the overall QA program. Therefore, this list should only be considered as representative.

Table 2. Typical B&W System Codes and Classifications

Principal components	R.G. 1.26 quality group classification[a]	B&W Quality class[b]	Principal construction codes and standards[c]	Seismic category[d]
Reactor Equipment				
Reactor vessel and head	A	I-1	III-1	I
Reactor vessel supports	NA	III-1	III-1, NF	I
Reactor vessel appurtenances, pressure retaining portions, including control rod drive mechanism housing	A	I-1	III-1	I
Core support structures	NA	III-1	III-G	
Internal structures	NA	III-1	NA	I
Fuel assemblies	NA	IV-2	NA	I
Control rod assemblies	NA	IV-2	NA	I
Control rod drive portions providing trip capability	NA	III-1	NA	I
Control rod drive cooling coils	NA	Non-Safety	NA	Non-Seismic
Control rod drive mechanism stator	NA	Non-Safety	NA	Non-Seismic
Reactor Coolant System				
RC pumps, motors, and auxiliaries	(f)	(f)	(f)	(f)
Piping, RCPB	A	I-1	III-1	I
RC piping supports	NA	III-1	II-1, NF	I
Pressurizer	A	I-1	III-1	I
Pressurizer supports	NA	III-1	III-1, NF	I
Steam generators, tube side	A	I-1	III-1	I
Steam generators, shell side	B	I-2	III-1	I
Steam generator supports	NA	II-1	III-1,NF	I

Table 2. (Cont'd)

Principal components	R.G. 1.26 quality group classification[a]	B&W Quality class[b]	Principal construction codes and standards[c]	Seismic category[d]	
Valves					
Pressurizer relief and safety	A	I-1	III-1	I	
In safety class I-1 lines	A	I-1	III-1	I	
ngineered Safety Features					
Decay heat removal/low press. injection system					
DHR low-pressure injection pumps	B	I-2	III-2	I	DHR low-pressu
injection pump motors	NA	II-1	IEEE-323/344	I	DHR coolers, t
side	B	I-2	III-2	I	
DHR coolers, shell side	C	I-3	III-3	I	
VAlves					
In safety class I-1 lines	A	I-1	III-1	I	
In safety class I-2 lines and containment isolation	B	I-2	III-2	I	
High-pressure injection system					
Makeup high pressure injection pumps	B	I-2	III-2	I	
Makeup high pressure injection pump motors	NA	II-1	IEEE-323/344	I	
Valves, including containment isolation	B	I-2	III-2	I	
Core flooding system					
Core flood tanks	B	I-2	III-2	I	

Table 2. (Cont'd)

Principal components	R.G. 1.26 quality group classification[a]	B&W Quality class[b]	Principal construction codes and standards[c]	Seismic category[d]
Valves				
Core flood tank relief and nitrogen isolation	B	I-2	III-2	I
In safety class I-1 lines	A	I-1	III-1	I
In safety class I-2 lines and containment	B	I-2	III-2	I
Instrumentation and control System				
Reactor protection system				
All portions	NA	II-1	Refer to 7.1	I
Nuclear instrumentation				
All portions that provide input to the reactor protection system	NA	II-1	Refer to 7.1	I
Nonnuclear instrumentation				
All portions that input to the reactor protection system	NA	II-1	Refer to 7.1	I
All portions that input to the ESF actuation system	NA	II-1	Refer to 7.1	I
ESF actuation system				
All portions	NA	II-1	Refer to 7.1	I

Table 2. (Cont§d)

Principal components	R.G. 1.26 quality group classification[a]	B&W Quality class[b]	Principal construction codes and standards[c]	Seismic category[d]
ESF systems (controls and instrumentation required for safety associated with each actuated system)				
Emergency core cooling system	NA	II-1	Refer to 7.1	I
Controls and instrumentation associated with safe shutdown systems				
CRD control system, trip portion	NA	II-1	Refer to 7.1	I
Fluid system controls necessary for safe shutdown	NA	II-1	Refer to 7.1	I
Instrumentaiton associated with other systems required for safety				
Decay heat suction valve interlock	NA	II-1	Refer to 7.1	I
Core flooding isolation valve interlock	NA	II-1	Refer to 7.1	I
Other instrumentation systems				
Local instrument racks associated with safety related equipment	NA	II-1	--	I
Integrated control system	NA	Non-Safety	--	Non-Seismic
Control rod drive control system, less trip portion Incore monitoring system	NA	Non-Safety	--	Non-Seismic
Nuclear instrumentation (except power range)	NA	Non-Safety	--	Non-Seismic

Table 2. (Cont'd)

Principal components	R.G. 1.26 quality group classification[a]	B&W Quality class[b]	Principal construction codes and standards[c]	Seismic category[d]
Auxiliary equipment				
Fuel handling and storage				
Fuel handling and storage equipment				
Auxiliary fuel handling bridge	NA	(g)	NA	I
Fuel transfer tube gate valve	D	Non-Safety	NA	Non-Seismic
Fuel transfer tube, inside containment	B	III-1	III-MC	I
Main fuel handling bridge	NA	(g)	NA	I
Fuel storage handling bridge	NA	(g)	NA	I
New fuel elevator	NA	Non-Safety	NA	Non-Seismic
New fuel handling tool	NA	Non-Safety	NA	Non-Seismic
Rod assembly handling tool	NA	Non-Safety	NA	Non-Seismic
Source handling tool	NA	Non-Safety	NA	Non-Seismic
Failed fuel transfer container	NA	Non-Safety	NA	Non-Seismic
Rod assembly handling container	NA	Non-Safety	NA	Non-Seismic
New fuel storage racks	NA	(g)	NA	I
Spent fuel storage racks	NA	(g)	NA	I
Reactor building storage racks	NA	(g)	NA	I
Rod assembly handling tool sling	NA	III-2	NA	Non-Seismic
Makeup and purification system				
Makeup tank	B	I-2	II-2	I
Makeup/high pressure injection pumps	See high-pressure injection system			
Makeup/high pressure injection pump motors	See high-pressure injection system			
Purification demineralizers	B	I-2	III-2	I
Purification demineralizer prefilter	B	I-2	III-2	I
Purification filter	B	I-2	III-2	I
Seal injection filter	B	I-2	III-2	I
Leatdown flow control valve	B	I-2	III-2	I

Table 2. (Cont'd)

Principal components	R.G. 1.26 quality group classification[a]	B&W Quality class[b]	Principal construction codes and standards[c]	Seismic category[d]
Heat exchangers				
Letdown coolers, tube side	A	I-1	III-1	I
Letdown coolers, shell side	C	I-3	III-3	I
Seal return coolers, tube side	C	I-3	III-3	I
Seal return coolers, shell side	C	I-3	III-3	I
Valves				
In safety class I-1 lines	A	I-1	III-1	I
In safety class I-2 lines and containment isolation	B	I-2	III-2	I
In safety class I-3 lines	C	I-3	III-3	I
Chemical addition and boron recovery system				
Distillate storage tank	D	I-4	NA	Non-Seismic
Deborating demineralizer [h]	D	I-4	VIII	Non-Seismic
RC bleed evap demineralizer	D	I-4	VIII	Non-Seismic
Distillate demineralizer	D	I-4	VIII	Non-Seismic
Boric acid filter	D	I-4	VIII	Non-Seismic
RC bleed evap system	D	I-4	NA	Non-Seismic
RC distillate transfer pump	D	I-4	NA	Non-Seismic
RC bleed evap feed pump	D	I-4	NA	Non-Seismic
Distillate test tank pump	D	I-4	NA	Non-Seismic
Boric acid pump	D	I-4	VIII	Non-Seismic
Caustic pump	D	I-4	NA	Non-Seismic
Regenerative caustic mix tank	D	I-4	NA	Non-Seismic
RC bleed evap distillate test tank	D	I-4	NA	Non-Seismic
Boric acid mix tank	D	I-4	NA	Non-Seismic
Boric acid addition tank	D	I-4	VIII	Non-Seismic

Table 2. (Cont'd)

Principal components	R.G. 1.26 quality group classification[a]	B&W Quality class[b]	Principal construction codes and standards[c]	Seismic category[d]
Conc boric acid storage tank	D	I-4	NA	Non-Seismic
Reactor coolant degasifier[h]	D	I-4	NA	Non-Seismic
Degasifier vent valve	D	I-4	NA	Non-Seismic
RC bleed holdup tank[h]	D	I-4	NA	Non-Seismic
Valves				
In safety class I-3 lines	D	I-4	NA	Non-Seismic
Others	D	I-4	NA	Non-Seismic

(a) A, B, C, D - Quality group classification as defined in Regulatory Guide 1.26 Na - Not applicable to quality group classification.
(b) Quality classifications as defined in NPGD quality classification system.
(c) Principal construction codes and standards are identified as:
I: ASME Boiler and Pressure Vessel Code, Section I.
III-1, 2, 3, MC: ASME Boiler and Pressure Vessel Code, Section III, Class 1, 2, 3, NF, NG or MC.
VIII: ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.
(d) Seismic Category I as defined in Regulatory Guide 1.29 and Appendix A to 10 CFR 100. Non-Seismic is defined as other than Seismic Category I.
(e) See NRC Regulatory Guide 1.14.
(f) The RC pump and motor will be designed to maintain its coastdown capability following the safe shutdown earthquake. See Table 5.5-3 and section 5.5.1 of B-SAR-205 for a discussion of classifications of individual components.
(g) This equipment is seismically qualified to the extent required to ensure that fuel damage will not occur during normal and SSE conditions that would release radioactivity in excess of allowable limits. Appropriate QA requirements are applied to ensure that seismic qualification requirements are met.
(h) Classifications are conditional pending dose calculations for the applicant's individual site (see section 9.3.4.2.6.16, items 4 and 5, of B-SAR-205).

3. DESIGN CONTROL

3.1. Introduction

The NSS and fuel design and design change are performed within the Engineering Department. Plant level design requirements are developed and documented by the Project Engineering Group. The system level design requirements, which flow from the plant level requirements, are developed and documented by the Systems Engineering Group within Plant Engineering. Using the system level design requirements, design organizations (i.e., RCS Component Engineering, Equipment Engineering, Fuel Engineering and some groups within Plant Engineering) develop and document the system and component designs and then review the resultant designs for compliance with design requirements. The engineering organization responsible for the initial requirements or design also approves all the changes to these requirements or designs. In addition to the review of design changes by the organization responsible for the initial design, the Project Engineering Group assures that interfaces are properly accounted for through an additional independent technical review of the change. 4

The NSS and fuel contracts are divided into specific tasks, each covering a portion of the B&W scope of supply. Each task has a cognizant engineer who is assigned lead responsibility for the task. The cognizant engineers for the design function are referred to as Task Engineers, while those assigned to establishing system design requirements are called System Engineers. The Task Engineers are responsible for developing designs in conformance with the system requirements. QA performs audits to ensure that the design review procedures have been followed for all safety-related systems and components.

A design review board is convened to evaluate new product designs, new processes, and major design changes. Design reviews are held at the mutual direction of the Engineering and Contract Project Managers. The design review board has no design responsibilities other than to evaluate designs (and processes) proposed to it. The design organization has responsibility to address the comments of the design review board. 4

3.2. Controls

The design parameters for each of the systems in the overall NSSS are set forth in the Plant Parameter List. The System Description identifies the applicable regulatory requirements, codes, system design requirements, special NPGD and contract requirements, and applicable QC requirements. The Plant Parameter List (PPL) identifies major factors of plant design that, if changed, would have significant impact on plant design or analysis efforts of one or more engineering department sections. Procedures are established to ensure that the system requirements are developed by System Engineers to include the applicable regulatory requirements and design bases. System descriptions describe the system design and establish functional requirements for the components. Design requirements are specified in design specifications which are used by internal design functions and by suppliers as their design bases. A design specification consists of an Equipment Specification and specification drawings (used in conjunction with Hardware Data Sheets and Contract Technical Requirements if applicable) to completely define a particular system, component, or item. These documents are identified to the supplier on an Applicable Document List. Procedures establish the responsibilities for independent reviews of safety-related NSSS and fuel design documents to ensure that the requirements are consistent and that the designs will meet the requirements, as described later in this section. Any changes in specified requirements are considered equivalent to design changes. 4 4

QA provides an overview of the design requirements when QA Engineering reviews the procurement documents for inclusion of appropriate QA requirements 4

Measures to ensure that the applicable regulatory requirements and design bases are correctly translated into drawings, written procedures, and instructions are described in section 5.

..PGD's document control procedures ensure that drawings and design documents are distributed to the responsible individuals in a timely manner, thereby ensuring their prompt inclusion during the design activity. Controls used to prevent the use of obsolete or superceded documents are stated in section 6, Document Control.

The methods of defining and reviewing the nuclear steam core (NSC) design criteria/bases are similar to those described for the NSSS except that the design requirement documents are the System Requirements Specification and the Core Contract Requirements List for initial cores and Fuel Cycle Design Requirements (FCDR) for reloads. The design functions, in turn, initiate detail drawings, specifications, fuel loadings, control rod patterns, and other documents that define the design. 4

Project Engineering prepares the Core Contract Requirements List and Fuel Engineering prepares the Fuel Cycle Design Requirements. Specifications are prepared by Task Engineers, reviewed by independent reviewers, and approved by the responsible unit manager. The specifications address the specific requirements for materials, parts, and equipment.

The Reactor Coolant System Component Engineering section is responsible for the coordination of requests for material data, processes, and applications. Requests for materials selection, major material deviations, variations from established standards or the explanation of materials-related problems are submitted to this organization for resolution.

The materials selected by the engineering sections are based on documented standards. Reactor operating experience, the results of R&D programs, and experience reported in the open literature are used to validate/update these standards.

The implementation of new directives and the interpretation of guides from regulatory agencies is coordinated by the Licensing section of the Engineering Department.

Procurement documents and internal instructions provide for the review and approval of suppliers special processes. Nondestructive examination process procedures are evaluated by Quality Assurance. Other special process procedures such as heat treatment and welding are evaluated by Engineering. This division of responsibilities provides the best utilization of expertise.

The verification of physical and functional interfaces is assigned to the organization responsible for the hardware design. Design documents are controlled by appropriate document release media. 4

Information related to interfaces between the B&W scope of supply and the rest of the plant is provided by the Balance of Plant (BOP) criteria. Design changes affecting the Balance of Plant criteria are documented by appropriate design change procedures and are reviewed and approved in accordance with these procedures. Coordination of external and internal interfaces among participating design organizations is ensured by procedures for review, approval, release, and distribution of the documents used to develop and control the design. The Project Management function coordinates design interfaces with the plant owner by submitting the appropriate documents in accordance with contract terms.

Procedures are provided for design verification of NSSS components, fuel, and core components. The procedures cover design document review, review of design changes, design review boards, design calculation review, and first-of-a-kind tests for verification. 4

Reviews of design documents are conducted routinely for (1) appropriate design requirements and (2) design changes, which are not major redesigns, i.e., not of sufficient magnitude to convene a design review board, as discussed below. Procedures are established to provide routine independent reviews of the design documents and design changes for proper application of the applicable regulatory requirements, codes, system design requirements, QA requirements, and special NPGD contract requirements. 4

Independent design review boards are convened to evaluate new product designs or services or major changes to existing products or services. The design review board verifies the adequacy of nuclear safety-related products and services by assuring that the deliverable products are based on sound technical principles. The review board also assures that applicable requirements have been considered in the design of the product.

Design review boards consist of a chairman and individuals, technically competent, but independent of the design effort. One of the board members is appointed secretary. Quality Assurance is represented on design review boards involving the development of new products or upgrades using new technology. Design review checklists are used to challenge the design. Recommended actions are defined for follow-up in normal work channels.

Meeting minutes are written to document the findings and recommendations of the design review board. Design review boards may be conducted at the conceptual, preliminary, or final design stages. 4

Calculations are used to establish design requirements or verify the detail design. The cognizant analyst is required to document the calculations as to purpose, assumptions, method, input data, results, and conclusions. Wherever possible, standard calculational methods, material property data, and certified computer programs are used. Calculations are checked by an independent reviewer who is competent in the particular type of analysis.

Design verification by testing is used whenever engineering judgment leads to the conclusion that design analysis or previous experience cannot substantiate the safe and reliable operation of the design. Design verification includes testing under the design conditions as described by ANSI N45.2.11.

Development or prototype tests may be characterized as B&W research and development or vendor-supplied tests. In either case, the tests are conducted by organizations other than NPGD as vendor supplied tests. The Equipment Specification gives the design limits of the item to be tested, and the QA requirements include testing to the most adverse design conditions. In these circumstances, cognizant NPGD engineers review and approve the test results.

Procedures are established to provide documented control of design changes to NSSS and fuel designs. Changes are reviewed and approved by the cognizant organization(s) involved in establishing the adquacy of the design. Independent reviews are conducted to ensure that the NSSS design will meet the requirements and to determine that the full impact of the design change is properly assessed. If the change constitutes a major redesign, procedures require that a design review board be convened to evaluate the proposed change.

B&W does not differentiate between safety-related equipment that must be specially designed to meet functional requirements and "off-the-shelf" safety-related equipment that meets established functional requirements. In either case, the program described throughout this report is applied depending on the safety classification of the equipment.

Procedures are established to ensure that field changes also receive review and approval by the organizations responsible for establishing the adequacy of the design or by other organizations with comparable expertise designated to review and approve changes.

The control and maintenance of design documents are described in section 6, and the documentation of errors, deficiencies, and their correction is described in section 16.

4. PROCUREMENT DOCUMENT CONTROL

Procurement authorizations (PA's) are prepared by the cognizant engineer and attached to the procurement package which consists of technical, quality, and other requirement documents needed to define the equipment and services to be procured. The procurement package is reviewed by QA and the cognizant unit manager and approved by the Project Management function. The Purchasing Manager delegates the authority to the Project Management function to procure items from the Nuclear Equipment Research & Development and Nuclear Materials & Manufacturing Divisions. Orders to be placed with all other suppliers are processed through the Purchasing office. The Purchasing office applies standard and special terms and conditions prior to issuing the order. Additional coverage of procurement activities is included in section 7. 4

The QA requirements imposed on NPGD suppliers are set forth in QA Specification NPG 09-1212. This document, is part of the procurement documentation and specifically delineates the quality requirements that must be incorporated in all safety-related equipment and services supplied or performed by NPGD suppliers. The QA specification NPG 09-1212 addresses all 18 criteria of 10 CFR 50 Appendix B, and the procurement documents define the appropriate application of these criteria to the supplier.

The QA Specification NPG 09-1212 details the necessary QA program requirements that the supplier must meet. The QA Manual, 19A-N.1, defines the measures utilized by NPGD to ensure that the supplier follows his stated program and notifies the NPGD of changes. The QA specification outlines the requirements for written procedures and supplier documentation. It specifies the controls the supplier must exercise over the design, fabrication, inspection, testing, to assure that the requirements of the equipment specification are met. Suppliers are required to have procedures for maintaining QA records

and a comprehensive system of audits. The supplier is responsible for imposing on his vendors the QA requirements necessary to meet the applicable sections of the QA specification.

Document submittal and QA requirements are identified to a supplier in the procurement package. The procurement package will identify QA requirements of safety class nuclear system components during supplier design and fabrication activities. The procurement documents will identify; (1) the major component quality classification and principal design code; (2) the documentation requirements for the major component and its subcomponents as identified by equipment specification and QA program specification paragraph; and (3) each of the QA program specification paragraph requirements that must be included in the supplier QA program. 4

QA Specification NPG 09-1212 is applied to all suppliers of safety-related equipment. Requiring suppliers to meet the same standardized criteria is added assurance that NPGD will receive the same quality product from all. Standardizing the criteria enables NPGD to administer the same QA program uniformly throughout the design, procurement, and delivery cycle and enhances the effectiveness of the members of the QA Organization.

NSC contract specifications are imposed by PAs prepared by Fuel Engineering, and approved for procurement by the Fuels Product Line Manager. 4

Procedures are established for the QA review of procurement documents to determine that all quality requirements are correctly stated, that they can be inspected and controlled, that there are adequate acceptance and rejection criteria, and that the documents have been prepared in accordance with QA program requirements. These procedures provide for evidence of QA approval of procurement documents.

Procedures for review of procurement documents by appropriate organization's management, and QA ensure that the procurement documents contain the following items as applicable:

1. Design basis technical requirements, including regulatory requirements, component and material identification, drawings, specifications, codes and industrial standards, tests and inspection requirements, and special process instructions for such activities as fabrication, cleaning, erection, packaging, handling, shipping, storage, and inspection.

2. Requirements to identify the documentation to be prepared, maintained, submitted, and made available for review and/or approval, such as drawings, specifications, procedures, inspection and fabrication plans, inspection and test records, personnel and procedure qualifications, materials, and chemical and physical test results.

3. Requirements for the delivery or retention, control, and maintenance of records.

4. The right of access to the supplier's facilities and records for source inspection and audit.

Procedures are established to permit the purchasing activity to function only on receipt of properly authorized PA from the Project Management function. The Purchasing activity is not permitted to make any change to the technical or quality requirements portion of a requisition in placing these requirements on a purchase order or an inquiry without a PA approved in the same manner as the original PA. 4

Similarly, procedures are established whereby the requirements for design of B&W-manufactured components are invoked by PA. Any modifications to those requirements must also be transmitted by PA.

Quality Assurance may order termination of procurement action when procurement documents conflict with the requirements of the QA program. Such orders will indicate what action is required to be taken which will be acceptable to Quality Assurance. 4

Drawings defining NED manufactured component interfaces are approved by the system designer who originated the interface design requirements. The fabrication drawings, prepared by Engineering, are then checked independently, in accordance with established procedures, before use by NED. 4

Any deviations to design requirements must be approved by the organization that originated the design requirements.

For nuclear fuel, any design changes requested by the NMMD must be implemented by a PA process through Fuel Engineering and approved by the Fuel Product Line Team (see section 3 for details on design changes).

5. INSTRUCTIONS, PROCEDURES, AND DRAWINGS

The QA Program is implemented through written procedures or instructions within all parts of the NPGD. These procedures and instructions are reviewed and approved by NPGD QA for the application of appropriate requirements before the documents are approved and distributed for use. 4 4

The QAP requires that activities affecting quality be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances and accomplished accordingly. These documents shall include appropriate quantitative or qualitative criteria for determining whether an activity has been satisfactorily accomplished.

The preparation, and release of all policies, procedures, and instructions within the NPGD organization is the responsibility of the NPGD Policies, Systems and Procedures Unit (PS&P). This organization is responsible for developing procedures that meet the requirements of the QA Manual and securing approvals from the affected line organizations and QA. These procedures are implemented by publication in the NPGD Administrative Manuals which are controlled by Management & Information Systems (M&IS)

The manual system consists of a series of policies, procedures, and instructions which are distributed to B&W organizations, depending on the responsibilities of the organization. Thus, the manuals assigned to an organization in Engineering would contain the procedures affecting the Engineering Department while Customer Service would have manuals containing procedures affecting Customer Services, etc. 4

The manuals are kept at Manual Stations located throughout NPGD and are maintained current by M&IS.

A supplier responsible for an activity affecting quality shall be required to provide the necessary instructions, procedures, or drawings to appropriately prescribe the activity. These documents shall have been reviewed

and approved by responsible personnel before accomplishing the activity. The NPGD may require the submittal of such documents for review and acceptance before an activity is undertaken. Such a requirement shall be clearly identified in procurement documents and established on the basis of the importance of the activity to safety.

In their audits and inspections, QA shall verify that activities affecting quality have been performed in accordance with approved and appropriate instructions, procedures, or drawings, and that adequate documentation exists to verify this when required.

6. DOCUMENT CONTROL

Policies, instructions, and procedures (inital issue and changes) are controlled by PS&P to ensure the prompt inclusion of changes to these and to related documents and the proper control of obsolete or superseded documents to prevent their inadvertent use. 4

Engineering design data, materials, and generic NSSS design criteria, are prepared by Engineering and distributed to Engineering Technical Manuals by Data Management. 4

The responsibility for the preparation, review, and approval of product design documents is assigned to the Engineering organization responsible for the hardware designs. Reviews are conducted by QA of standard design documents and equipment specifications (included in procurement packages) to assure that quality requirements are clearly and accurately stated. The user organization prepares the applicable document to ensure its compliance with regulatory, code, and B&W requirements. The resultant document is issued to the cognizant line managers by the responsible organization for review and approval. Overall distribution control and the storage of approved records is the responsibility of M&IS. 4

NPGD operates a Document Control System that identifies and reports the status of contract documentation originated by NPGD or received from vendors and/or customers. Documents are received, approved, released and distributed by authorized personnel to individuals requiring the documents in the execution of their assigned responsibilities. In addition, these documents are stored in the NPGD Records Center where they are eventually microfilmed and copies are sent to the underground storage location in Pennsylvania for permanent storage. 4

Changes to the documents are accomplished by the same organizations that prepared the original document. Each change is reviewed approved, and released in the same manner as the original document.

Drawings are prepared, reviewed, approved, and distributed in accordance with approved administrative procedures that have been prepared and implemented as described above.

As a function of the QA Audit Program, QA is responsible for periodically auditing the aforementioned organizations for compliance with their governing documents. The audits are conducted to ensure that proper documents are available and are being properly controlled and used. Document change control methods are further described in section 3.

Procedures within NPGD provide for the preparation of master lists identifying the current revision numbers of design and procurement documents. These lists are updated and distributed to predetermined responsible personnel on a schedule determined by the controlling organizations and apply to all documents affecting quality within the NPGD, including specifications, interface documents, drawings, procurement documents, standard manuals (including the QA manual), procedures manuals, test procedures, and design requirement documents.

Similar requirements for the control of manufacturing drawings/specifications and manufacturing-related procedures shall be required of all suppliers to NPGD by the procurement documents.

7. CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES

As a function of the overall QA Audit Program, QA evaluates the capability of suppliers and maintains a list of approved suppliers showing the acceptability of various suppliers, both prospective and current. The listing is supported by pre-award evaluations and in-process supplier quality program audits and is reflected in the B&W Quality & Technology "list of approved suppliers." 4

NPGD exercises control over each supplier by (1) imposing the NPGD-QA program through the NPGD QA Specification NPG 09-1212; (2) imposing the QA audit program, including the status of the supplier's program acceptance to NPGD, and inclusion of audit documentation and corrective action in the Audit Record System; (3) monitoring the procurement system for compliance with procedures; and (4) surveillance of manufacturing and fabrication functions by QA. 4

Procedures are established that permit the Purchasing operation to function only on receipt of properly approved PAs. These documents are reviewed by QA for completeness and QA requirements and by cognizant organizations for administrative and technical requirements. Purchasing is not permitted to make any change to the technical portion of a PA in placing these requirements on a purchase order, change order, or inquiry.

Purchasing reviews the B&W list of approved suppliers for possible suppliers to whom an inquiry will be forwarded. They take into consideration the supplier's past performance and quality history. Supplier responses to requests for quotations will be reviewed to determine acceptability of the supplier. In the event an inquiry is sent to a supplier that has not been audited and approved by B&W, QA will be advised of this and a pre-award quality audit may be required. Purchasing will not place an order with a supplier until such supplier is approved by QA. 4

The evaluation of suppliers is performed by qualified QA personnel utilizing information gathered from purchasing, engineering functions, and the QA audit program as to the responsiveness of the supplier in correcting deficient areas and the current acceptability of the supplier to the applicable QA program specification. The evaluation of suppliers before the award of a contract and during fabrication is accomplished in accordance with section 18. The acceptability of suppliers of safety-related equipment, material, and services is based on one or more of the following items:

1. The ability of the supplier to comply with the elements of the QA specification that are applicable to the type of material, equipment, and services being procured.

2. A review of previous records and performance of suppliers who have supplied similar articles of the type being procured.

3. A survey and evaluation of the supplier's facilities and QA program, when no previous quality records are available, to determine the capability to supply a product meeting all required design, manufacturing, and quality requirements.

After selection of a supplier, purchase orders will not be placed with the selected suppliers until an approved PA has been received. The buyer prepares the purchase order and identifies attachments received with the PA. The buyer will ensure that the selected supplier is approved for the quality classifications and the contract which pertain to the procurement. See section 4 for additional coverage of procurement activities.

The terms and conditions applied to all purchases shall provide for B&W and B&W customer access to the supplier's plant for inspection and QA purposes during any portion of the manufacture or work on the subject purchase order. 4

A QA Audit Record System is maintained to provide ready reference to audit schedules, open audit findings, and audit status of all suppliers.

QCS uses the procurement documents to develop, implement, and document a surveillance plan in accordance with written procedures as described in section 10. As the procurement and fabrication cycles progress, shop inspection is monitored and system auditing is performed. The required documentation is 4

acquired and approved by QA. NPGD-QA provides the plant owner with a certificate of conformance in accordance with the owner's contract requirements. The certification is prepared after QA determines that procurement requirements have been met and that documentation, as identified in the procurement documents, has been reviewed and found acceptable. When requirements are complete and the product is ready for shipment to the utility plant site, the required documentation is reviewed for completeness and acceptability by QA. The certification is prepared by QA, signed by the Manager of QA, and sent to the plant owner. Should any QA record be temporarily not available, the deficiency is identified on the certificate and the QA data package is placed under a QA hold. Items represented by the QA data package are not released for installation until the deficiency is resolved and the QA hold is removed. A revised certificate is prepared when the QA hold is removed.

Supplier activities are monitored periodically by QA personnel during fabrication to ensure supplier conformance with the NPGD procurement specification. Reports are prepared for each visit and form the basis for vendor quality history.

Procurement documents (see section 4) require the supplier's receiving inspection to meet the following requirements:

1. The material, equipment, or component is properly identified and corresponds with the receiving documentation.

2. The material, component, or equipment and acceptance records are inspected and judged acceptable in accordance with predetermined inspection instructions before installation or use. Records verifying the aforementioned will be available at the supplier's facility for audit by NPGD QA.

3. Items accepted and released are identified as to their inspection status before release for installation or further work.

4. Nonconforming items are clearly identified and controlled until proper disposition is made.

The NPGD assigns responsibility to its suppliers for imposing on their suppliers the necessary QA requirements to meet the applicable portions of QA Specification 09-1212.

Site receiving inspection is the responsibility of the plant owner. NPGD monitors the receiving inspection of B&W-supplied equipment through B&W site personnel, who report to NPGD.

The surveillance planning and performance for an individual procurement are described more fully in section 10.

8. IDENTIFICATION AND CONTROL OF MATERIALS, PARTS AND COMPONENTS

Suppliers are required to have procedures to describe the criteria for establishing identification requirements. Necessary controls must be defined by the supplier for maintaining identification and traceability of materials and items from receipt by the supplier through storage, prefabrication processing, and fabrication to final acceptance of the complete items by the NPGD. Where physical identification is neither practical nor sufficient, physical separation, procedural control, or other means are allowed. Materials and items are identified by heat or serial numbers, or other means, either on the item or on records traceable to it.

Task, group and sequence number as well as mark numbers are assigned by NPGD to all items appearing in the NPGD Process & Instrumentation Drawing (P&ID). All other items comprising the NPGD scope of supply (not appearing on a P&ID) are be assigned a task, group, and sequence number or a part identification number (PIN). 4

The task, group, and sequence or PIN numbers are used for the association of documents to the hardware to which it is applicable. The mark numbers, where applicable, are used for part traceability during design, procurement, fabrication, erection and installation. A mark number uniquely identifies the type and location of an item within a system.

The task, group, and sequence numbers are assigned by the Project Manager. The mark or PIN numbers are assigned by the cognizant engineer.

Suppliers may use the NPGD assigned identification numbers in conjunction with their own identification system during design, procurement, fabrication and shipping. If the supplier uses his identification and control system, he must be able to demonstrate traceability of his number to the NPGD assigned identification number. Following the requirements specified in the procurement

documents, QAA evaluates the identification and control system used by the supplier for adequacy by auditing the supplier as described in this manual. QCS monitors the application of approved procvess control systems on products for the NPGD. These audits and surveillance actions are performed to ensure the following:

A. Suppliers implement an identification and control system that provides traceability to original materials, reports, and documents that satisfy the requirements of applicable Codes, standards, and specifications.

B. The identification system used by each supplier is consistently and uniformly applied.

C. Suppliers maintain the required identity and control of materials (including welding and brazing materials), parts, and components during manufacture and shipping of their products.

D. Identification methods used are not detrimental to the product.

E. Nonconforming items are identified and segregated for acceptable items.

F. Proper identification of materials and items is verified before their release for assembly or shipping.

9. CONTROL OF SPECIAL PROCESSES

NPGD procurement documents establish the requirements for control of special processes by suppliers of safety-related equipment, including their suppliers. This includes the submittal of special process procedures to NPGD for approval when required by the procurement documents. Changes to previously approved special process procedures are required to be submitted to NPGD for approval. Control of the procurement documents is described in section 4.

QAA evaluates the special process control systems used by suppliers during the performance of the QA audit program as described in sections 7 and 18. QCS conducts surveillance of the suppliers for the application of approved process control procedures as described in section 10. 4

The audits and surveillance actions are performed to ensure the following:

1. Supplier special process procedures, such as heat treating, welding, nondestructive examination and cleaning, to be used for NPGD items are submitted to and approved by NPGD when required by the procurement documents.

2. Supplier special process procedures incorporate all applicable codes, standards, and other regulatory requirements.

3. Supplier special processes are performed in accordance with qualified approved procedures using approved methods and materials, utilizing personnel and equipment qualified in accordance with applicable codes or standards.

4. Supplier records of procedure, process, operator, and equipment qualification and approval are available and maintained.

5. Special processes are accomplished with written process sheets, shop procedures, check lists, travelers, or equivalent that provide adequate space for recording evidence of verification.

10. INSPECTION

Two basic QA functions - audits and surveillance - are utilized to ensure that the supplier's inspection is performed in accordance with the appropriate requirements of the NPGD procurement documents. Proposed suppliers of equipment and materials, including suppliers within Babcock & Wilcox, are reviewed by NPGD-QA as a function of the QA audit program in accordance with written auditing procedures to verify that the suppliers can demonstrate an acceptable QA inspection program. The supplier's program must contain the requirements for an inspection function that operates in accordance with approved written procedures and utilizes personnel trained and qualified in accordance with applicable standards. The inspection function must be organized to eliminate any conflict of interest with schedule and cost. After a supplier has been accepted and procurement has begun, routine in-process audits are conducted by NPGD-QA throughout the manufacturing process to ensure that the supplier and his inspection department are performing in compliance with the approved QA inspection program. | 4 | 4

In addition to audits of the supplier's inspection program, a second level of surveillance is provided on the shop floor of a supplier's plant. Before manufacturing begins, a surveillance assignment is made to a specific NPGD-QCS representative charging him with the responsibility for monitoring the performance of the supplier's in-process and final inspection of each safety-related item. The supplier's final inspection is a NPGD-QA mandatory hold point, and provisions are made in procurement documents to notify NPGD-QA of the hold point and to prevent shipment without NPGD-QA approval. A written procedure and an appropirate check list, which defines the QC surveillance criteria, is used by NPGD-QCS personnel to carry out this responsibility. Upon receipt of

the assignment, the QCS personnel prepares a surveillance plan and has the plan (and any change or waiver of points in the plan) approved by his manager. The surveillance plan indicates NPGD witness and/or hold points as well as customer (or authorized agent) designated witness and/or hold points. 4

Visits to the supplier are made to carry out the surveillance plans. A report, prepared in accordance with written procedures, is made for each visit. 4 During the duration of the assignment, the QCS personnel determine that nonconformances, if any, are adequately resolved and documented and that the supplier's corrective actions are acceptable. A nonconformance report is prepared for each nonconformance found, a copy is left with the supplier, and the report used to follow up on correction of the nonconformance. Re-inspection or retest by the supplier may be required when inspection or test results appear questionable or additional data are required. Re-inspection may be observed by QCS to clear a nonconformance. Re-inspection are conducted in accordance with the original inspection requirements. 4

When Vendor inspection is accomplished by NDE or sampling plans, NDE procedures and sampling plans are submitted to NPGD for review and approval in accordance with the requirements of section 9, "Control of Special Process." 4

The evaluation of the supplier's inspection program and procedures by QA personnel shall determine the following:

1. Inspection personnel are independent from the individual or group performing the activity being inspected and have no conflict of interest with cost and schedule.

2. Inspection procedures, instructions, and check lists are provided and contain the following items:

   a. Identification of quality characteristics to be inspected.

   b. Identification of the organization/individuals responsible for performing the inspection.

   c. Acceptance or rejection criteria.

   d. Description of the method (s) of inspection.

   e. Evidence of completion and certification of each inspection operation.

   f. Record of the results for each inspection operation.

3. Inspection procedures or instructions are available for use, along with necessary drawings and specifications prior to each inspection operation.

4. The supplier's inspectors are qualified and that each inspector's qualification is kept current.

5. Inspection equipment is within calibration prior to an inspection operation.

6. Modifications, repairs, and replacement items made after initial inspection are inspected in accordance with documented procedures and inspection requirements or acceptable alternatives to verify acceptability.

7. Indirect control (by monitoring processing methods, equipment, and personnel) is provided when inspection of processed materials or products is impossible or disadvantageous.

8. Both inspection and process monitoring are provided when control is inadequate without both.

11. TEST CONTROL

When engineering judgement, codes, standards, or regulations indicate that testing is required, a written test program is established by the responsible design organization to ensure conformance with code, regulatory, and design requirements. The test programs shall describe all required tests, such as prototype qualification tests, proof tests before installation, preoperational tests, and operational tests to demonstrate that structures, systems, and components will perform satisfactorily in service. The design shall be verified by testing whenever engineering judgment leads to the conclusion that design analyses or previous experience cannot substantiate the operability and safety of the component or system. The test program shall require testing to be performed in accordance with written test procedures that incorporate or reference the design requirements and acceptance limits contained in the applicable design documents.

Written test procedures shall be prepared by the organization performing the test and shall be reviewed by the organization responsible for the design requirements. These procedures shall include provisions for ensuring that prerequisites for the given test are complied with, that testing methods are provided, that adequate instrumentation is available and used, that testing is performed under suitable environmental conditions, and that necessary monitoring is performed.

Prerequisites include such items as provisions for hold and notification points for witness by B&W, the plant owner, or an authorized agent; calibrated instrumentation; adequate and appropriate equipment; acceptance and rejection criteria; use of trained and qualified personnel; the condition of test equipment and preparation, condition and completeness of the item to be

tested; suitable environmental conditions; and provisions for data acquisition, collection, and storage. The methods of documenting or recording the test data shall be indicated. Conduct of the test shall be witnessed by QCS when required by the Surveillance plan. QC surveillance will ensure that the test procedures and equipment utilized are those approved by NPGD and that the testing is conducted in accordance therewith.

Test results shall be evaluated by the responsible NPGD design organization to ensure the design requirements have been met.

12. CONTROL OF MEASURING AND TEST EQUIPMENT

Procurement documents require all suppliers to provide an effective and operational system for measurement and testing equipment maintenance, calibration, and selection. This system is evaluated in accordance with the QA audit program by QA Audits to ensure inclusion of the following, as appropriate:

1. Techniques of selection, calibration and control of measuring and test equipment.

2. Calibration schedule and intervals.

3. Availability of procedures and instructions describing the calibration techniques, calibration frequency, maintenance, and control of all measuring and test instruments, tools, gages, fixtures, reference standards, transfer standards, and nondestructive test equipment which are to be used.

4. All measuring instruments in the system are processed through a mechanical, electrical, or optical calibration facility.

5. Reference standards used are calibrated by equipment traceable to the National Bureau of Standards where such standards exist or, where nonexistent, provisions are established to document the basis for calibration.

6. Standards have an accuracy adequate to verify that the measuring and test equipment (M&TE) being calibrated are within the procurement document tolerance requirements for which they are being used. M&TE are calibrated against reference standards having tolerances not greater than one-quarter (1/4) of the tolerance of the requirements of the M&TE. Greater uncertainty is acceptable when limited by the accuracy of commercially available standards.

7. All working standards are (1) marked with calibration labels to indicate the next due date for calibration or (2) the calibration information is contained in records traceable to the working standard.

8. Instruments are uniquely identified and traceable to calibration records. Records shall be maintained indicating the last calibration date and the due date. The calibration due date shall be displayed on or attached to each item or on records traceable to each item.

9. Provisions for ensuring and documenting the validity of previously performed inspections or tests when measuring or test equipment is found to be out of calibration, including identification of inspection equipment used.

10. Provisions for including examination equipment in the control system.

11. The loss in accuracy of successive levels of calibrating standards is identified.

During the course of fabrication, the NPGD-QA representatives witness critical test and inspection measurements in accordance with the requirements of approved supplier procedures and drawings. During the course of witnessing these tests and inspections, the QA representative will verify that the calibration due date has not been exceeded for the equipment being used. Where discrepancies are found in the supplier's system indicating that measuring and test equipment is in use beyond its calibration due date, the QA representative will require the supplier to resolve, to his satisfaction, any case where such equipment has been found to be used. | 4 | 4 | 4

13. HANDLING, STORAGE, AND SHIPPING

Procurement documents identify items that have specific cleaning, handling, preservation, storage, and shipping requirements and specify handling or marking requirements and require work and inspection instructions to be accomplished by qualified individuals. These requirements are written into the procurement documents by the design group responsible for the item being procured. 4

Supplier's handling, cleaning, preservation, storage, and shipping systems are audited during the evaluation of the suppliers through the pre-award and quality systems audits conducted as a part of the NPGD QA audit program. These measures are monitored by QA personnel at the supplier's plant during the procurement phase to ensure that special specification or purchase order requirements are implemented before their need by procedural controls prepared in accordance with the specification requirements to preclude damage, loss, or deterioration. 4

The B&W Construction Company, in support of the NPGD's function of providing site consultant services, prepares a Field Specification Manual for review and approval by NPGD, which defines recommended special handling, storage, cleaning, and preservation requirements to be carried out by the site erection organization. These instructions supplement requirements specified by the supplier's instruction manual for the equipment. 4

NPGD QA monitors the implementation of these requirements at the site. 4

14. INSPECTION, TEST, AND OPERATING STATUS

Each supplier's QA program is evaluated by NPGD QA as a function of the QA audit program before procurement to ensure the existence and implementation of a system meeting the requirements of QA Specification NPG 09-1212 for documenting and identifying items that have satisfactorily passed all required manufacturing processes, inspections, or tests, and to preclude the inadvertent bypassing of such requirements. The systems must include procedures for marking instructions or another method of status indication such as stamps, tags, labels, shop travelers, with inspection or test records. The procedures shall control the application and removal of the status indicators, identify the source of authority required for such actions, and provide documented control of the bypassing of required inspections, tests, or other critical operations. The procedures shall ensure that personnel concerned with production or cost control will not exercise control over the application or removal of status indicators. | 4 | 4

After the supplier has been approved, in-process audits are conducted by QA as a continuing check of system acceptability.

The audit preparations made by each audit team member before starting an audit provides an historical insight into the effectiveness of the test and inspection methods. Audit procedures provide for a pre-audit review of purchase orders, specifications, procedures, trip reports, audit reports, and identified problem areas. This pre-audit planning function and development of check lists in preparation for the audit ensures a review of both requirements and performance, thereby determining system adequacy.

The application of this identification system will be monitored by the QA personnel during in-process and final inspections of products. Before a release for shipment will be granted, any deviations found by QA will require resolution to NPGD's satisfaction. | 4

QA responsibilities, duties, and records (attesting to evidence of quality) and transferred from NPGD to the customer at the time of shipment of equipment from the supplier's plant.

Receiving, storage, installation, testing, and operation of the equipment is the responsibility of the plant owner; and thus, he is responsible for maintaining control over inadvertent operation of the installed system and components. To assist the owner in this control, the NPGD procedures ensures that:

1. The suppliers of equipment to NPGD provide instruction manuals as required by procurement documents. These manuals are reviewed and approved by NPGD Engineering and the approved manuals are forwarded to the plant owner to delineate maintenance and operating instructions for individual systems and components.

2. NPGD customer service provides test specifications that detail requirements and prerequisites for testing site-installed equipment in the NPGD scope of supply. These specifications are forwarded to the plant owner for his use in preparing plant test procedures. The NPGD Customer Service site representatives advise the plant owner with regard to site tests in accordance with these specifications.

3. NPGD Customer Service provides operating specifications that give generalized instructions for the operation of site-installed systems or the overall plant. In addition, NPGD Customer Service provides a "Plant Limits and Precautions" document and a "Setpoints" document. These documents are sent to the plant owner for his use in preparing the plant operating procedures. Customer Service reviews the final procedures for operation of equipment in the NPGD scope of supply before equipment is used. (if such review is required by contract)

NPGD is responsible for correcting equipment faults, failures, malfunctions, etc., under warranty as specified in its contracts. The same or later codes, standards, and QA requirements are invoked as were required by the original equipment. 4

QA audits are conducted to assure the above activities are conducted in accordance with the applicable quality program procedures. 4

15. NONCONFORMING MATERIALS, PARTS, OR COMPONENTS

Procurement documents for items purchased by the NPGD impose on the supplier control and reporting requirements for nonconforming materials, parts, or components. These requirements include the existence of procedures for following items:

1. Controlling the identification, documentation, and segregation of nonconforming items to preclude further processing, delivery or installation pending notification of affected individuals and/or organizations, review of the nonconformances, and approval of disposition.

2. Documentation identifying the item; the inspection requirements which the item does not meet; the disposition of the nonconformance; and signature approval of the disposition.

3. Identifying the individuals and/or organizations, including NPGD as customer, who have the responsibility and authority to approve dispositions, depending on the nature of the nonconformance and the proposed disposition. Personnel performing disposition activities shall be free from the conflicts of production and cost control.

4. Segregating nonconforming items to preclude the use of the nonconforming item. Segregation may be by controlled physical separation of such items from acceptable items or by tagging, when physical separation is impractical.

5. Reinspecting or re-examining repaired and reworked items in accordance with initial criteria.

6. Controlling the repair and/or rework of nonconforming items.

7. Promptly identifying and reporting nonconformances to NPGD.

8. Making the documentation of nonconformances disposition ("use as is" or "repair") part of the quality record of the items.

The NPGD requires suppliers to submit a written request for approval of nonconformances that violate requirements of NPGD procurement documents, NPGD specifications, or NPGD approved supplier drawings, specifications, and procedures that cannot be corrected by a continuation of the original manufacturing process or by rework (remachining, reassembling, etc.), provided that:

1. The nonconformance can be restored by repair to such a condition that the capability of an item to function is unimpaired even though the item still may not conform to the original requirement. Or,

2. The supplier wishes to "use as is".

These nonconformances are reported by suppliers to NPGD for disposition by Engineering. The remedial or corrective action proposed by the supplier is reviewed by Engineering and if approved is verified by QA during QC surveillance or QA audits of the suppliers facilities. 4

Non-conformances that affect interfaces with equipment outside the NPGD scope of supply or the functions or interchangeability of items in the NPGD scope of supply are reported to the customer as they occur.

QA receives copies of non-conformance documents for analysis and disposition as described in section 16 and prepares a monthly summary report to the Manager of QA as described in Section 2. Non-conformances, including those dispositioned "repair" or "use as is," are brought to the attention of appropriate management levels when corrective action is required. 4

Deviations from specifications or drawings, approved by NPGD, are either listed or included in the QA Data Package (mentioned in section 17) at the time of component shipment.

QA personnel monitor suppliers for the existence and application of adequate systems for the control of nonconforming materials, parts, or components to meet the requirements imposed by procurement documents. QA periodicaly reviews the quality performance of suppliers, including nonconformance report records, and reports on these reviews to the Manager of QA as described in section 18. 4

QA monitors suppliers as described in section 10. Nonconformance reports are prepared for each nonconformance found during the inspection. | 4

Within NPGD, procedures identify the review and approval requirements for disposition of nonconformances. These include provisions for documenting of all nonconformance-related actions and prompt reporting of any safety concerns to the plant owner or the NRC as required by regulations.

16. CORRECTIVE ACTION

Procedures are established by NPGD to ensure prompt identification and correction of conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances during the design, procurement, fabrication, receipt, installation, and testing of components, systems, and equipment. These procedures require assurance that:

1. Nonconformances and failures are evaluated to determine the need for corrective action.
2. The cause of the nonconformance or failure is determined to preclude the recurrence of conditions adverse to quality.
3. Follow-up is conducted to verify proper implementation and to close out the corrective action documentation
4. Documentation informs appropriate levels of management of significant conditions adverse to quality, the cause of the conditions, and the corrective action taken.

Nonconformance reports are received by NPGD as described in section 15. They are analyzed by QA to determine whether more extensive actions are required in addition to any remedial action applied to the specific nonconformance. The stated cause of the nonconformance is reviewed by QA to determine the following:

1. Whether there have been previous occurrences.
2. Whether the cause may result in subsequent nonconformances if not corrected.
3. Whether the cause indicates a defect or a correctable trend in design, fabrication, processing, personnel training, etc.

Potential problems identified by the QA review are reported to the responsible organization for further action. Subsequent review and follow-up is accomplished by QA to determine the effectiveness of the corrective action taken. 4

Similar procedures are required of NPGD suppliers through the application of QA Specification NPG 09-1212.

QA ensures that reported conditions adverse to quality are corrected on a timely basis and that corrective action conforms to specifications, standards, and codes.

The effectiveness of the corrective action system is evaluated through routine and special audits conducted by QA in accordance with the established audit program. The program encompasses both internal and supplier audits and includes requirements for appropriate follow-up action to ensure timely resolution of findings.

Orders to limit or control further processing of a non-conforming activity are initiated by QA. The order will identify the discrepant condition, the affected organization and the action required to remove the QA restraints. 4

The timely accomplishment of appropriate corrective action is ensured by established procedures covering the use of such orders, nonconformance reports, and audit item reports.

Procurement documents impose corrective action requirements on all suppliers to ensure problem resolutions in a manner acceptable to NPGD QA. QA surveillance and audits of suppliers are used to monitor the supplier's performance to ensure that corrective action requirements are in accordance with the requirments of the procurement documents.

Each of the processes noted above includes requirements for generating and documenting corrective action. QA reviews these documents to monitor corrective actions and maintains files to record them. (Corrective action regarding safety concerns (see section 15) is reported to the plant owner for incorporation into his reports to the NRC.)

17. QUALITY ASSURANCE RECORDS

Procedures are established to collect, retain, and/or distribute to the plant owner records that provide evidence that the design, procurement, fabrication, and testing activities are in accordance with quality requirements.

During the design phase, quality-related records are retained as required by administrative procedures documenting the engineering design activity. These files include such records as design calculations, design reports, equipment specifications, system descriptions, and contract drawings. At the completion of engineering activity, these records are transferred to permanent storage in accordance with document retention policy. Copies of these records are available to the plant owner for storage as agreed to by the plant owner and B&W to satisfy Code and licensing requirements.

Procurement documents require suppliers to establish and maintain quality-related records. These requirements provide for the identification of documents such as inspections; tests; monitoring of work performance and material analysis; qualification of personnel, procedures, and equipment; and calibration procedures and reports to be supplied to NPGD or retained by the supplier subject to traceability and recovery requirements. The inspection and test records controlled by these requirements include information that provides a description of the type of operation, evidence of completion, or verification of a manufacturing inspection or test operation, the results of the inspection or test, information describing and related to nonconformances, identification of the inspector and/or data recorder, evidence of acceptability, and date of inspection or test.

Procedures are established for the maintenance of contract QA documentation files covering each item of equipment. These files contain such items as design specifications, PAs, purchase orders and change orders, technical data, contract variations, and the B&W approved QA data packages

prepared by the supplier. Before shipment, NPGD QA reviews the required QA documents for compliance with purchase order requirements and supplies a certificate to the plant owner to indicate the availability of the QA documents. At the completion of the contract, the NPGD stores the QA records needed to satisfy Code or regulatory requirements or makes them available to the plant owner for storage.

Records maintained by NPGD include, but are not limited to, supplier pre-award and periodic audits, corrective action resolutions, equipment inspection, internal audits, and NPGD QA personnel qualifications.

The record filing and retention procedures and facilities provided by NPGD and required of suppliers by the procurement documents provide for the identification and retrieval of all documents pertinent to the contract and for the protection of these records to prevent deterioration, damage, or loss of the information in the records and will meet the requirements of Regulatory Guide 1.88. Record filing and retention methods and facilities are audited against applicable procedures using an audit check list as part of the audit program defined in section 18.

18. AUDITS

NPGD QA conducts an audit program defined by a series of written instructions providing program definition as well as direction and guidance for audits and the supporting activities concerned. The audits conducted under the QA audit program include an objective evaluation of quality-related practices, procedures, and instructions; the effectiveness of implementation; conformance with policy directives; work areas, activities, processes, and items; and the review of documents and records. These procedures establish the scheduling, preparation, execution, reporting, and follow-up methods to be used in implementing the audit program. Requirements for the audit preparation include reviews of all available data as to requirements and performance and the preparation of check lists in order to provide a base for evaluation of test, inspection and system adequacy. Continuing analysis of the audit information is performed to indicate any trend in quality or the effectiveness of the QA program. Significant problem areas are reported to management. 4

NPGD internal audits, including NPGD consultants activities at sites, are used to evaluate the effectiveness of the NPGD Quality Assurance Program. These audits are scheduled to cover the quality program elements once each calendar year. The reports on findings from these audits are provided to the managers of the areas audited and to the Vice President, NPGD, for review, analysis, and direction. The managers in the areas audited must provide a written response to the findings of the audit. Follow-up is conducted by QA to ensure implementation of appropriate corrective action. When necessary, follow-up will include reaudit of the open audit findings. The program is supported by written instructions to provide trained personnel for the execution of audits and for record keeping to provide ready access to the audit schedule and action item status for identified action items. 4 4

Suppliers and prospective suppliers of items in the NPGD scope of supply are audited to determine the effectiveness of the QA programs in use by the supplier. These audits are conducted before and during procurement activity to provide a continuing evaluation of the supplier's QA program. Audit frequency is based on written criteria that incorporates the safety importance, complexity, and quality requirements of the item being procured. The reports of findings from these audits are provided to the audited supplier, and responses are required on the findings. The open findings are closed when the suppplier can demonstrate effective corrective action in the area of the open finding. The audit reports, supplier responses, and their evaluation provide input for the maintenance of a supplier status list, which provides a ready reference on the status of each supplier.

The audit record system, established by written instructions provides ready reference and traceability for internal and supplier audit reports. replies, follow-up, and corrective action.

Procurement documents imposed on suppliers require that each supplier have administrative procedures requiring the performance of planned and periodic internal and vendor audits to verify compliance with his and his vendors' quality programs and with the NPGD QA Specification.

APPENDIX A

Compliance With Applicable Regulatory Guides and ANSI Standards

NPGD's position with respect to the NRC Regulatory Guides and ANSI Standards pertaining to quality assurance as they apply to the B&W scope of supply is as set forth in this appendix.

1. Compliance With Regulatory Guides

The NPGD QA plan satisfies the applicable requirements of the following USNRC Regulatory Guides as described in the discussion of each:

REGULATORY GUIDE 1.28

Quality Assurance Program Requirements
for Design & Construction, Feb. 1979 (Rev 2)

This guide endorses ANSI N45.2-1977, "Quality Assurance Program Requirements for Nuclear Power Plants," as an appropriate basis for compliance with Appendix B to 10 CFR 50.

REGULATORY GUIDE 1.30
Quality Assurance Requirements for
Installation, Inspection and Testing of
Instrumentation and Electrical Equipment, August 1972

This guide endorses ANSI N45.2.4-1972 (IEEE Std 336-1971), "Installation, Inspection, and Testing Requirements of Instrumentation and Electrical Equipment During the Construction of Nuclear Power Generating Stations," as an adequate basis for compliance with Appendix B to 10 CFR 50. This standard applies to on-site installation, inspection, and testing of safety-related instrumentation and electrical equipment. This function is normally the responsibility of the plant owner, and this standard is reflected in the owner's procedures applicable to this work. B&W provides appropriate drawings, instructions, and consultation to aid the owner in compliance with this guide. This aid is described in sections 2.2.4 and 14 of this report.

REGULATORY GUIDE 1.37

Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants, 3/16/73

This guide endorses ANSI N45.2.1-1973, "Cleaning of Fluid Systems and Associated Components During Construction Phase of Nuclear Power Plants," as an adequate basis for compliance with Appendix I to 10 CFR 50 for on-site cleaning. This function is normally the responsibility of the plant owner, and this standard is reflected in the owner's procedures applicable to this work. B&W provides appropriate instructions and consultation to aid in compliance with this guide as described in sections 2.2.4 and 14 of this report. B&W specifies cleanliness requirements during the fabrication and shipment of safety-related components to ensure that these components arrive at the site in satisfactory conditon. These cleanliness requirements include consideration of chemical compounds that are known to contribute to intergranular cracking or stress corrosion cracking of stainless steel or nickel alloys. In addition to ASTM A-262, B&W considers ASTM A-393 to be a valid test for the detection of sensitization of austenitic stainless steel. Recent action by ASTM reinstated ASTM A-393 as ASTM A-708.

REGULATORY GUIDE 1.38

Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Water-Cooled Nuclear Power Plants, 3/16/73

This guide endorses ANSI N45.2.2-1972, "Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants During the Construction Phase," with some modifications. B&W makes the following clarification to the scope of ANSI N45.2.2-1972, Section 1.1, for the compliance of the B&W scope of supply with Appendix B to 10 CFR 50. The B&W program applies to packaging and shipping requirements for components required (1) to prevent accidents that could cause undue risk to the health and safety of the public and (2) to mitigate the consequences of such accidents if they were to occur. Packaging and shipping of other items in the B&W scope of supply is beyond the scope of Appendix B to 10 CFR 50 or this guide. Receiving, storage, and handling of items onsite is normally the responsibility of the plant owner or erector. B&W

provides appropriate requirements and consultation for these functions as discussed in sections 2.2.4 and 13 of this report.

Special classification of components for packaging is not considered necessary for the B&W scope of supply since components are classified by B&W according to cleanliness requirements. The degree of cleanness required is a function of the particular system or component under consideration and whether adequate cleaning can be facilitated after installation. The assignment of a cleanness classification takes into consideration the following:

1. The susceptibility of the material to corrosion effects during manufacture, shipping, storage, erection, and operation.

2. The consequences of a malfunction or failure.

3. The probability of contaminants contributing to a malfunction or failure.

4. The effects of contaminants in the overall system.

The class of cleanness assigned to a particular component or pieces if equipment may be generally determined as follows:

Class A - Normally applied to those components and pieces of equipment that require a high degree of cleanness, such as that used in clean room fabrication. This degree of cleanness may be necessary for a number of reasons which include the following:

1. Dirt and contamination affecting the functioning of intricate or close-tolerance mechanisms.

2. The component or equipment cannot be adequately cleaned after installation in the system.

3. Contamination in excess of levels permitted by this class will be detrimental to the materials of construction during manufacture, shipping, storage, erection, or operation.

Class B - This class is applied to those components that:

1. Cannot be adequately cleaned after installation in the system.

2. Contamination will be detrimental to the materials of construction during manufacture, shipping, storage, erection, or operation.

3. Contamination in excess of the levels permitted by this class will be detrimental to the materials of construction of the system into which the component or equipment is being installed.

Class C - A lower level of cleanness than Class B normally assigned to components or equipment that:

1. Can be adequately cleaned after installation into the system.

2. The materials of construction or the system into which it is being installed are tolerant to higher levels of contamination than those permitted by Class B.

Class D - This class of cleanness is the lowest and is generally applicable to external surfaces not in contact with process fluids, and the materials are compatible with only a nominal degree of cleanness.

Components and equipment are packaged, shipped, and stored in a manner that will maintain the condition required by the final cleanness class specified. Vendors are required to submit their detailed procedures on packaging and shipping for review by the cognizant B&W designer. This review considers maintenance of internal and external environments, as appropriate, to ensure compliance with the specified cleanliness requirement from physical damage as appropriate to the component under consideration, and identification of the package, both to identify the enclosed parts and to ensure that special handling precautions are identified. Compliance with these procedures is monitored as described in section 13 of this report. These provisions satisfy this guide.

REGULATORY GUIDE 1.54

Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants, June 1973

This Regulatory Guide references ANSI N101.4-1972, "Quality Assurance for Protection Coatings Applied to Nuclear Facilities," and ANSI N45.2- 1971, "Quality Assurance Program Requirements for Nuclear Power Plants," for use in applying protective coatings to surfaces of water-cooled nuclear power plants. Other standards referenced by ANSI N101.4-1972 and ANSI N45.2-1971 are not endorsed by the guide. B&W makes the following clarification to the definition of Class I service in ANSI N101.4-1972

(Section 1.2.2.1) for compliance with Appendix B to 10 CFR 50. B&W de(Section 1.2.2.1) for compliance with Appendix B to 10 CFR 50. B&W defines coatings in Class I service as "coatings inside containment whose integrity are essential to safety-related equipment operation as necessary (1) to prevent postulated accidents that could affect the public health and safety, or (2) to mitigate the consequences of these accidnets. Other coatings may be applied inside or outside the containment meeting ANSI N101.4-1972 or equivalent controls; however, this use of the standard is beyond the scope of Appendix B to 10 CFR 50 or this Regulatory Guide. Applicability of this Regulatory Guide to the B&W scope of supply depends on the containment systems utilized for a particular design. Normally, coatings within the B&W scope of supply constitute less than 0.1% of the coatings in containment. Typical of B&W's scope of supply are the following surfaces:

Major Carbon Steel Components Inside Containment - This includes major reactor coolant system components. These are covered by insulation and receive no permanent protective coating. Temporary coatings may be applied for esthetic purposes or for protection during shipping or extended storage periods. Temporary coatings are either stripped prior to service or allowed to degrade within the insulation during service. Corrosion rates for uncoated carbon steel components under anticipated service conditions have been studied and found to be negligible. This is confirmed by the many yeras of satisfactory performance of uncoated carbon steel in steam and feedwater service.

Minor Carbon Steel and Aluminum Surfaces Inside Containment - Minor carbon steel surfaces include such components as valve operators, fuel handling equipment, motors, and accessories, which require only a small amount of coating. These are normally supplied with a protective primer coat, and the appropriate finish coating is appplied by the owner. Otherwise, surfaces are supplied with a permanent coating system. Aluminum surfaces are either coated or accounted for in analysis of postulated accidents.

B&W requires identification of the primers and coatings used on these surfaces and certification that the coating is applied in accordance with the manufacturer's instructions. These provisions are applied using the procedures of the B&W QA program as described in this report and satisfy this Regulatory Guide.

REGULATORY GUIDE 1.58

Qualification of Nuclear Power Plant
Inspection, Examination, and Testing Personnel, August 1973

This guide endorses ANSI N45.2.6-1973, "Qualifications of Inspection, Examination, and Testing Personnel for the Construction Phase of Nuclear Power Plants" for use in compliance with Appendix B to 10 CFR 50. Although ANSI N45.2.6-1973 is applicable only to the construction phase of a nuclear power plant, this Regulatory Guide states that the provisions of ANSI N45.2.6-1973 are "generaly applicable ... during fabrication prior to receipt of items at the construction site." B&W satisfies this guide through ensuring that off-site inspection, examination, or testing is audited by B&W QA personnel qualified to meet the applicable requirements of ANSI N45.2.6-1973. B&W ensures that nondestructive examinations performed according to the quality requirements of Section III of the ASME Boiler and Pressure Vessel Code are performed by supplier personnel certified to SNT-TC-1A in compliance with section 2 of this guide, and that other inspections, examinations or testing is performed by personnel qualified in accordance with applicable requirements.

REGULATORY GUIDE 1.64, Revision 2

Quality Assurance Requirements for the
Design of Nuclear Power Plants, June 1976

This guide endorses ANSI N45.2.11-1974, "Quality Assurance Requirements for the Design of Nuclear Power Plants" as acceptable for compliance with Appendix B to 10 CFR 50 with noted amplifications.

Details of B&W design control provisions are discussed in section 3 of the topical report.

The following B&W clarifications with respect to section C.2 of Regulatory Guide 1.64 are identified:

1. B&W believes that Section C.2 is overly restrictive and could lead to a lower quality review in some cases. In most cases an independent review is performed, and the four specified conditions are satisfied. However, in exceptional cases involving small groups or special disciplines, the highest review is performed by the supervisor. When this occurs, B&W will (a) follow the other provisions of the

regulatory guide, (b) document the reason for the use of the supervisor as the design verifier and obtain approval of his management, and (c) ensure that quality assurance audits cover frequency and use of supervisors as design verifiers to guard against abuse.

2. NPGD considers it acceptable for a Engineering organizational unit that specifies design requirements to subsequently review the resulting final design of another Engineering organizational unit to ensure that design requirements have been met. (These design requirements, which reflect technical considerations, regulatory rules, or regulatory guides, may effectively limit design alternatives.) When the design reviewed specifies the design inputs, these inputs will be independently verified.

REGULATORY GUIDE 1.74

Quality Assurance Terms and Definitions, February 1974

This guide endorses ANSI N45.2.10-1973, "Quality Assurance Terms and Definitions," for use in describing and implementing quality assurance programs. B&W uses the appropriate definitions of ANSI N45.2.10-1973 and supplements these terms with others considered necessary to provide a common interpretation of the B&W QA Manual. These provisions satisfy this regulatory Guide.

REGULATORY GUIDE 1.88, Revision 2
Collection, Storage, and Maintenance of Nuclear Power Plant Quality Assurance Records, October 1976

This guide endorses ANSI N45.2.9, "Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants," for used in compliance with criterion XVII of Appendix B to 10 CFR 50.

The majority of such records are, of course, the responsibility of the plant owner, and this guide should be considered in planning the QA record keeping system. For those records that are the responsibility of B&W, NPGD's Records Retention Program has been designed to comply with this Regulatory Guide, effective June 16, 1975.

REGULATORY GUIDE 1.146

Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plants, Aug. 1980

This guide endorses ANSI 45.2.23 "Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plants".

NPGD has utilized ANSI 45.2.23 as the basis for the qualification of auditors for the conduct of both internal and supplied audits in meeting Criterion XVIII of 10CFR50, Appendix B. 4

2. Compliance With ANSI Standards

In addition to these Regulatory Guides, two standards in the ANSI N45.2 series (described below) have been utilized in developing the B&W NPGD QA plan. Although these standards may be in draft form, the NPGD QA plan is in conformance with the applicable requirements of these standards as described in this report.

ANSI 45.2.12 (Draft 3, Rev. 4, Feb. 22, 1974) - "Requirements for Auditing of Quality Assurance Programs for Nuclear Power Plants" including NRC Regulatory comments and supplementary guidelines. This standard establishes requirements for internal and external quality assurance audits. B&W NPGD satisfies the requirement for internal audits by auditing each element of the NPGD Quality Assurance Program for organizations concerned at least annually. External (Supplier) audits are regularly scheduled on the basis of status and safety importance of the activities being performed. Periodicity of the audit of individual suppliers, not to exceed three years, is determined by assignment of a frequency based on annual evaluation of the supplier's quality assurance program, history of performance, and implementation of that program. This evaluation considers the complexity of the system or component concerned and the degree of quality and process control required by the manufacturing effort. Audit frequency is varied dependent upon supplier performance, and continued review of reported deficiencies, nonconformances, and the evaluation of supplier responsiveness to identified problems and audit reports.

ANSI N45.2.13 (Draft 2, Rev. 4. April 1974) - "Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants."

3. Regulatory Guides and Standards Not Applicable to B&W's Scope of Supply

B&W's review and analysis of the following guides and standards have indicated that they are not applicable to the B&W scope of supply:

Regulatory Guide 1.39, "Housekeeping Requirements for Water-Cooled Nuclear Power Plants," 3/16/73, and ANSI N45.2.3-1973, "Housekeeping During the Construction Phase of Nuclear Power Plants."

Regulatory Guide 1.94, "Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear power Plants" and ANSI N45.2.5- 1974, "Supplementary Quality Assurance Requirements for Installation, Inspection and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear Power Plants."

Regulatory Guide 1.116, "Supplementary Quality Assurance Requirements for Installation, Inspection and Testing of Mechanical Equipment and Systems for the Construction Phase of Nuclear Power Plants."

APPENDIX B

Acronyms/Abbreviations Used in This Report

ADL	Applicable Documents List
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
B&W	Babcock & Wilcox
B&WCC	Babcock & Wilcox Construction Company
CCI	Commercial Contract Information
CCI	Control Components, International
CCRL	Core Contract Requirements List
CFR	Code of Federal Regulations
CI	Contract Information
CIS	Contract Information Sheet
CNFP	Commercial Nuclear Fuel Plant
CO	Change Order
CTR	Contract Technical Requirements
CVAR	Contract Variation Approval Request
FCDR	Fuel Cycle Design Requirement
FOAK	First-of-a-Kind
FOB	B&W-Manufactured Components
FSAR	Final Safety Analysis Report
HDS	Hardware Data Sheet
IEEE	Institue of Electrical and Electronics Engineers, Inc.
MTV	Mt. Vernon
ND	Nuclear Divisions
NDE	Nondestructive Examination
NMMD	Nuclear Materials & Manufacturing Division
NED	Nuclear Equipment Division
NPG or NPGD	Nuclear Power Generation Division
NRC	Nuclear Regulatory Commission
NSC	Nuclear Steam Core
NSSS	Nuclear Steam Supply System

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OFR	Old Forest Road
PA	Procurement Authorization
PO	Purchase Order
PPL	Plant Parameter List
PS&P	Policies, Systems & Procedures
PSAR	Preliminary Safety Analysis Report
QA	Quality Assurance
QAA	Quality Assurance Audits
Q&E	Quality and Evaluation
QAE	Quality Assurance Engineer or Quality Assurance Engineering
QAP	Quality Assurance Program
QC	Quality Control
QCS	Quality Control Surveillance
RCS	Reactor Coolant System
RV	Reactor Vessel
SAR	Safety Analysis Report
SSL	Supplier Status List
SVC	Special Vessel Contract
USAEC	United Stated Atomic Energy Commission
USNRC	United States Nuclear Regulatory Commission

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APPENDIX C

B&W Policy and Management Guide

APPLICABILITY

CORPORATE: All Divisions

PURPOSE

To ensure compliance with the QA Program of the Nuclear Power Generation Division.

Policy

In their transactions with the NPGD, all divisions will comply with the NPGD quality asurance requirements as defined in its procurement documents.

General

The Nuclear Power Generation Division has documented its Quality Assurance Program Requirements in a Topical Report - BAW-10096. This report will be referenced in NPGD Safety Analysis Reports. The report governs the quality assurance activities of the NPGD, including the methods used by NPGD for establishing quality assurance requirements in procurement documents, i.e., Purchase Orders, Interdivisional Work Authorizations, and Engineering and Manufacturing Instructions.

This Program has been approved by the Nuclear Regulatory Commission (NRC). The NRC will be auditing NPGD for verification that the QA Program is being implemented by NPGD both internally and with its suppliers. Lack of QA Program implementation can result in civil penalties against Company officers.

The implementing document for the Topical Report QA Program is the NPGD-QA Manual 19A-N.1. The NPGD procurement documents specify the NPGD quality assurance requirements as appropriate for the equipment or services being procured.

Procedure

Responsibility	Action
NPGD-QA Manager	1. Monitor compliance and initiate action to keep the NPGD Quality Assurance Program up-to-date.
	2. Provide the interpretations necessary for its understanding and application.
B&W Divisions	1. Comply with requirements of NPGD Quality Assurance Program.

END