



Department of Energy  
Washington, D.C. 20545

Docket No. 50-537  
HQ:S:82:167

DEC 28 1982

Mr. Paul S. Check, Director  
CRBR Program Office  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear Mr. Check:

ADDITIONAL INFORMATION CONCERNING PROJECT TECHNICAL RESOURCES, TRAINING,  
AND UTILIZATION OF INDUSTRY EXPERIENCE

Enclosed are updated responses to Nuclear Regulatory Commission questions 412.1, 2, and 4. The enclosed responses update the previously submitted descriptions of project technical resources as of November 1982. Also enclosed are updated Preliminary Safety Analysis Report (PSAR) pages H-7 and 8 that clarify the divisional responsibilities for incorporating applicable industry experience to the Clinch River Breeder Reactor Plant (CRBRP). The enclosed question/responses and PSAR pages will be incorporated in a future PSAR amendment.

Questions concerning this letter may be directed to Don Robinson  
(FTS 626-6098) of the Oak Ridge staff.

Sincerely,

*J. E. Stader*  
for

John R. Longenecker  
Acting Director, Office of  
Breeder Demonstration Projects  
Office of Nuclear Energy

Enclosure

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Question: Regarding TMI item I.C.5, a description of the specific position responsible for the programs and assurance of acceptable companion programs for the principal contractors should be provided. A commitment to make use of all significant input data such as the INPO SEE-IN Program should be made.

Response: See amended PSAR pages H-7 and 8.

Question: Question/responses 412.1, 2, and 4 should be revised.

Response: Updated question/responses 412.1, 2 and 4 and updated PSAR Section 1.4 is attached.

~~Question: A commitment to meet the requirements of training for mitigating core damage should be made.~~

~~Response. See amended PSAR page 13.2-2.~~

1.C.5 PROCEDURES FOR FEEDBACK OF OPERATING, DESIGN AND CONSTRUCTION EXPERIENCE

~~1.C.5 PROCEDURES FOR FEEDBACK OF OPERATING, DESIGN, AND CONSTRUCTION EXPERIENCE~~

REQUIREMENT:

Applicants shall submit a description of their administration procedures for evaluating operating, design, and construction experience and describe how they will assure that applicable important industry experiences originating from both within and outside the applicant's construction organization will be provided in a timely manner to those designing and constructing the plant. Applicants shall submit a general discussion of how the requirements will be met. These procedures shall: (1) Clearly identify organization responsibilities for review and identification of these important experiences and the feedback of pertinent information to those responsible for designing and constructing the plant; (2) identify the administrative and technical review steps necessary in implementing applicable important experiences; (3) identify the recipients of various categories of information from these experiences or otherwise provide means through which such information can be readily related to the job functions of the recipients; (4) assure that applicant and contractor personnel do not routinely receive extraneous and unimportant experience-related information in such volume that it would obscure priority information or otherwise detract from overall job performance and proficiency; (5) provide suitable checks to assure that conflicting or contradictory information is not conveyed to applicant and contractor personnel for implementation until resolution is reached; and (6) provide practical interim audits to assure that the feedback program functions effectively at all levels. Sufficient detail shall be presented to provide reasonable assurance that the requirements will be implemented properly prior to the issuance of construction permits or manufacturing license.

APPLICATION TO CRBRP:

This requirement is applicable to CRBRP.

IMPLEMENTATION:

*Project Office and principal contractors have*

The CRBRP ~~has~~ established procedures to evaluate major sources of pertinent industry experience, including:

1. Light water reactor experience described in NRC's Office of Inspection and Enforcement bulletins, circulars, and notices.
2. Liquid Metal Fast Breeder Reactor Experience from the Fast Flux Test Facility (FFTF).
3. Each unusual or unplanned event (unusual occurrence) in the CRBRP Project having programmatic significance.
4. *The Project commits to active interactions with INPO. The details will be developed further in meetings with INPO personnel planned for early January, 1983.*

The Assistant Director for Public Safety ensures that NRC I&E Bulletins, Circulars and Notices are properly evaluated by the responsible CRBRP Project Divisions, who implement and follow-up on the necessary activities.

#### NRC's I&E Bulletins, Circulars, and Notices

When an NRC I&E Bulletin, Circular, or Notice is received, a responsible Project Office organization evaluates the NRC bulletin, circular or notice, confirms its applicability to CRBRP, informs and involves contractors to the degree required, determines the actions required for resolution, and subsequently develops any formal response that may be required or desired. Status logs and files are maintained.

The procedure fulfills the specific requirements of Item 1.C.5 as follows:

1. Organization responsibilities are clearly identified.
2. The administrative steps necessary to implement applicable important experiences are clearly established.
3. The procedure assigns a project organization responsibility to determine the necessary recipients of the information.
4. Assurance that extraneous material does not overwhelm personnel is accomplished by: (1) initial screening to determine appropriate applicability, (2) further assessment by the responsible line organizations that the item is applicable before assigning it for action.
5. Assurance that conflicting or contradictory information is not conveyed to personnel assigned action is accomplished by multiple levels of screening.
6. The procedure is audited regularly for compliance and effectiveness in accordance with established Project requirements.

#### FFTF Experience

The "FFTF Experience Integration" procedure's objective is to evaluate and utilize experiences from the construction, test, start-up and operation of the Fast Flux Test Facility (FFTF) operated by the Westinghouse Hanford Company for the Department of Energy in Richland, Washington.

A CRBRP representative was onsite at FFTF during construction, and start-up and provided valuable feedback of experience and recommendations. Following start-up the FFTF Project Office is assigned the responsibility to provide CRBRP with descriptions of FFTF operating experience. Weekly reports are provided to the Lead Reactor Manufacturer for initial evaluation; important experiences are identified and recorded. A CRBRP Project organization is assigned responsibility for implementation of the experience.

The organization assigned the action has the responsibility to evaluate and resolve the experience, document the implementation and provide a description of the resolution action to the Lead Reactor Manufacturer and the Project Office for approval. The FFTF experience is maintained in the "FFTF Experience Items Semi-annual Report" and the responsible organization is required to present the results of the resolution action at the appropriate system final design review.

The Assistant Director for Engineering has responsibility for ensuring FFTF experience is implemented into the CRBRP Project. He appoints an Experience Coordinator to coordinate Project Office activities relative to industry experience identification and evaluation.

H-8

Amend. 66

Mar. 1982



competent applicants from outside TVA. All CREBP personnel will be given comprehensive training to produce personnel who have that combination of education, experience, and skills commensurate with their level of responsibility. This will provide reasonable assurance that decisions and actions during all normal and off-normal conditions will be such that the plant is operated in a safe and efficient manner.

WILL MEET THE GUIDELINES & REQUIREMENTS OF

The program, as being developed, complies with 10 CFR 55-1980, TMI Action Plan Items, I.A.1.1, I.A.2.1, I.A.2.3, I.A.3.1, and II.B.4 of NUREG-C737-1980, NRC Regulatory Guides 1.149-1981 and 1.8-1-R-1977, Item I.A.4.2 of NUREG-C716-R2-1982, and BTP CMEB 9.5-1-R3-1981.

Emphasis is placed on simulator use as an integral part of the training program. A plant-specific simulator will be available for the CREBP to be located onsite and operational at the time of commencing preoperational testing. It will serve as a device for procedure checkout as well as a vital component of the operator training program. The training program for all candidates seeking NRC SRO and RO licenses will include significant time at the simulator. Selected personnel in the non-NRC licensed category will also receive training at the simulator. The simulator will accurately reproduce the general operating characteristics of the CREBP, and the arrangement of the instrumentation and controls of the simulator will closely parallel that of the CREBP.

The program will provide training for the following categories:

- a. Individuals with no previous power plant experience
- b. Individuals with no previous nuclear power plant experience
- c. Individuals who have had nuclear experience but not NRC licensed
- d. Individuals who hold, or have held, an NRC license for a LWR facility or a facility comparable to CREBP
- e. Individuals who will obtain an NRC SRO or RO 'cold' license
- f. Individuals who will obtain an NRC SRO or RO 'hot' license
- g. Individuals who will take the training for an NRC license but may not take the NRC exam [e.g. The Plant Manager or Assistant Plant Manager (Engineering and Operation) and the Shift Technical Advisor]
- h. Individuals who will not be taking the license-type training, i.e., all plant staff whose positions do not require an NRC license

Table 13.2-1 includes detailed information on the training program, such as: Subject matter of each course, the duration of the course, the organization teaching the course, and the position titles for which the course will be given. Figure 13.2-1 presents a proposed training schedule for the CREBP staff which is in accordance to NRC Regulatory Guide 1.8-1-R-1977. It is planned that the following personnel will obtain a 'cold' license in accordance with the requirements of 10 CFR 55-1980 before initial fuel loading: SRO license for the Operations Supervisor, at least five Shift Engineers, and at least five Assistant Shift Engineers; and obtain RO licenses for at least ten Unit Operators. The Plant Manager or the Assistant Plant Manager will obtain the training required for an SRO license. Since the 'cold' license will be obtained prior to criticality,

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13.2-2

Amend. 70  
August 1982

Question 412.1 (13.1.1.1)

It is our understanding that you are revising the project organization for management of the Clinch River Breeder Reactor Plant Project. In regard to this revised organization, provide the following information:

- (1) An updated set of organization charts reflecting the revised organizational arrangements.
- (2) An updated description of the responsibilities and authority of the new organization and chief contractors relative to the following items:
  - (a) Principal site-related engineering work such as meteorology, geology, seismology, hydrology, demography, and environmental effects.
  - (b) Design of plant and ancillary systems.
  - (c) Review and approval of plant design features.
  - (d) Site layout in respect to environmental effects and security provisions.
  - (e) Development of safety analysis reports.
  - (f) Material and components specification review and approval.
  - (g) Procurement of materials and equipment.
  - (h) Management and review of construction activities.
  - (i) Development of human engineering design objectives and design phase review of proposed control room layout.
  - (j) Development and implementation of staff recruiting and training programs.
  - (k) Development of plans for initial testing.
  - (l) Development of plant maintenance programs.
- (3) The general qualification requirements in terms of numbers, educational backgrounds, and experience for identified positions or classes of positions, and personnel resumes of assigned persons holding key or supervisory positions relative to the management organization for the Project.

Response:

- (1) An updated set of organizational charts reflecting the revised organizational arrangements ~~has been~~ <sup>are</sup> provided in revised PSAR Section 1.4
- (2) Revisions to Section 1.4 are supplied to reflect the revised organizational arrangements of the CRBRP Project. While most of the information requested in item (2) of Q412.1 has been provided in these revisions, some was considered inappropriate for the text and therefore each item is addressed below.
  - (a) Principal site-related engineering work such as meteorology, geology, seismology, hydrology, demography, and environmental effects as it relates to the plant design are the responsibility of the CRBRP Project Office Engineering Division. Those aspects that relate to public safety and environmental acceptability are the responsibility of the CRBRP Project Office Public Safety Division. Organizations responsible for site related work are TVA, Burns and Roe, Stone & Webster, ~~and Westinghouse Environmental Systems Division.~~ <sup>and</sup>
  - (b) Design of plant and ancillary systems is managed by the CRBRP Project Office Engineering Division and is performed by the major contractors under the review responsibility of Westinghouse as the Lead Reactor Manufacturer, as described in Section 1.4.2.5.
  - (c) Review and approval of Plant Design Features is the responsibility of the CRBRP Project Office Engineering Division. PMC's contractual rights in regards to changes of Plant Design Features are described in Section 1.4.2.2.
  - (d) Site layout with respect to security provisions is the responsibility of the CRBRP Project Office Engineering Division. With respect to environmental effects, the CRBRP Project Office Public Safety Division assures that no adverse environmental effects will result from site layout consideration. TVA's role with respect to environmental effects and security is described in Section 1.4.2.4.2 and Section 13.7.
  - (e) Development of safety analysis reports is the responsibility of the CRBRP Project Office Public Safety Division. Overall preparation has been assigned to Westinghouse Electric Corporation, with each Project contractor providing material in his area of cognizance.
  - (f) Material and components specification review and approval is the responsibility of the CRBRP Project Office Engineering Division.
  - (g) Procurement of materials and equipment is the responsibility of CRBRP Project Office Procurement Division, as well as the procurement offices at each of the contractor organizations. The major

contractors (LRM, B&R, S&W) are responsible for delivery to the Project of the items and/or services specified and have authority to enter into subcontracts where necessary to secure those services, materials, and equipment required to meet their responsibilities. The major contractors' subcontracting activities are subject to approval by the Project Office above specified dollar values depending upon subcontract type.

- (h) Management and review of construction activities is the responsibility of the CRBRP Project Office Construction Division. Stone and Webster Engineering Corporation has been contracted for construction of the CRBRP as described in Section 1.4.2.5.6.
  - (i) Development of human engineering design objectives and design phase review of proposed control room layout is the responsibility of the CRBRP Project Office Engineering Division. Input will be provided by TVA as described in Section 1.4.2.4.
  - (j) Development and implementation of staff recruiting and training programs for the CRBRP is the responsibility of TVA as described in Section 13.2.
  - (k) Development of plans for initial testing are performed by the contractors for their systems and/or components. Review and approval of these plans is the responsibility of the CRBRP Project Office Engineering Division. The responsibilities for the initial test program are described in Section 14.1.3.1.
  - (l) Development of plant maintenance programs is the responsibility of TVA. A description of the CRBRP Maintenance Section is included in Section 13.1.2.1.3.
- (3) The general qualification requirements for key positions relative to the management organization of CRBRP are described in revised PSAR Section 1.4.4.1. Personal resumes of assigned persons holding these positions will be provided under separate cover.



Question 412.2 (13.1.1.3)

Provide the following information relative to the chief contractors for the Clinch River Breeder Reactor Plant:

- (1) A synopsis of their past experiences in projects in similar fields and complexity.
- (2) General qualifications requirements in terms of numbers, educational backgrounds, and experience for identified positions or classes of positions.

Response:

- (1) A synopsis of the past experiences in projects in similar fields and complexity are described below for the chief contractors to CRBRP.
- (2) The general qualification requirements for positions or classes of positions for the major contractors are described in revised Sections 1.4.4.2, 1.4.4.3, 1.4.4.4, 1.4.4.5, and 1.4.4.6.

Westinghouse Advanced Reactors Division (WARD)

Westinghouse experience with LMFBRs began when the Corporation became one of the contributing supporters of the Enrico Fermi Atomic Power Plant. Beginning in the early 1960's, participation in AEC-funded LMFBR design studies provided a nucleus of LMFBR specialists within the Corporation.

Advanced Reactors Division (ARD)

Westinghouse ~~has~~ participated in the design and development of the Fast Flux Test Facility (FFTF) since 1968. In 1970, the reactor design contract for the FFTF was awarded to Westinghouse Advanced Reactors Division. Total responsibility for FFTF was later transferred to Westinghouse Hanford Company.

← **INSERT A**

Westinghouse Hanford Company, a subsidiary of Westinghouse, was created in 1970 to manage the Hanford Engineering Development Laboratory and the FFTF project.

Since 1970, Westinghouse Hanford has:

- Managed the design, development and procurement, and completed ~~about 50 percent of~~ the construction of the FFTF. Westinghouse is now operating the reactor facility.
- Designed, built and is now operating the High Temperature Sodium Facility (HTSF) for testing large LMFBR components in a high temperature sodium environment.
- Designed, built and is now operating sodium facilities for testing LMFBR components and component parts and for examining physical characteristics of LMFBR systems.



INSERT "A" (for page Q412.2-1)

Since 1968, Westinghouse Advanced Reactors Division has:

- Designed and developed and procured significant components of the FFTF and has assisted in construction of that reactor facility.
- Undertaken development programs for system designs, fuel, materials, safety, reliability and sodium technology. These activities include major emphasis on fuels, materials and coolant technology with a large number of out-of-pile sodium loops (25).
- Managed and directed the design, development and procurement of the CRBRP reactor system and the containment. The CRBRP design is now 90% complete.
- Provided full licensing support for the CRBRP including the production of its PSAR.
- Designed large pool and loop-type LMFBR plants under EPRI and DoE sponsorship including assessments of their reliability and safety, as well as their maintainability, constructability and costs.
- Worked jointly with other nations in LMFBR activities.
- Contributed strongly to national LMFBR standards activities, including especially necessary code cases to the ASME Code to address the LMFBR at high temperature.

Developed and obtained commercially manufactured mixed oxide fuel and control assemblies for FFTF.

**INSERT B**

In addition to the major LMFBR reactor projects, Westinghouse ARD has undertaken many development programs for systems design, component development, fuels, material, safety, reliability and sodium technology. The activities include major emphasis in the fuels, materials, components, and coolant technology development areas for LMFBR application, together with advanced systems concepts. The Technology Department is staffed with professional engineers and scientists whose expertise encompasses more than 700 years of nuclear experience. ARD operates 23 sodium loops with a total inventory of over 30,000 pounds of sodium. The Hybrid Computer Facility operating at ARD is one of the most powerful hybrid installations in the nuclear industry.

Atomics International (AI)

AI has been a leader for 25 years in liquid metal technology. The extent of this endeavor on LMFBR programs can be seen from the following programs that AI has pursued either as a major or as a program participant:

Clinch River Breeder Reactor Program - major subcontractor;  
LMFBR base technology programs;  
Staffing and managing of Liquid Metal Engineering Center;  
Sodium Reactor Experiment;  
Hallam Nuclear Power Facility;  
Nuclear Fuel Laboratory test facilities;  
Systems for Nuclear Auxiliary Power (SNAP)  
First LMFBR demonstration plant safety report  
for ACRS-DRL review;  
Fast Flux Test Facility - major subcontractor.

In addition to these activities, AI has expanded its marketing base to LMFBR utility-sponsored programs, utility products and operation, and training in applied sodium technology. AI also has major fabrication capability and test facilities for reactors, liquid metals, and liquid metal loops.

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General Electric Company (GE)

Management experience in the Fast Breeder Reactor Department spans the complete spectrum of pre-LMFBR programs, LMFBR development, and demonstration plant programs. In addition to LMFBR management experience, the management of FBRD has significant BWR experience, including all phases of plant design, manufacturing, and construction.

General Electric experience in sodium reactors has been acquired over two decades. In the early 1950's, the company obtained extensive experience in the design, construction, and operation of two high-performance sodium-cooled reactors; the Submarine Intermediate Reactor Mark A and B. In 1959, General Electric began developing the sodium-cooled fast breeder reactor starting with the development of long-lived oxide fuel.

INSERT "B" (for page Q412.2-2)

In addition, Westinghouse has other divisions such as the Research and Development Division which has performed significant LMFBR development work over the past 15 years. Also, not included in the above listing, are the extensive Westinghouse activities in light water reactors.

Rockwell International Corporation

Atomics International (AI), a division of the Energy Systems Group of Rockwell International Corporation, has been a leader in liquid metal technology for over 30 years. The extent of this leadership can be seen from the following list of programs which AI has pursued either as a major subcontractor or as a program participant:

- . Clinch River Breeder Reactor Plant - Program participant responsible for design and procurement of the Fuel Handling, Nuclear Island Maintenance, Sodium Fire Protection, Auxiliary Liquid Metal, Inert Gas Receiving and Processing, Impurity Monitoring and Analysis, Leak Detection, and Fuel Failure Monitoring Systems
- . LMFBR Base Technology Programs - Program participant responsible for a large variety of development and test programs over more than 20 years
- . Staffing and managing the Energy Technology Engineering Center, formerly the Liquid Metal Engineering Center, under contract to DOE and its predecessor organizations, ERDA and AEC
- . Sodium Reactor Experiment (SRE) - Program participant responsible for design, construction, and operation of experimental reactor which generated 30 MWt (7 MWe) which was fed to the Southern California Edison grid
- . Hallam Nuclear Power Facility (HNPF) - Program participant responsible for design and construction of 250 MWt demonstration plant
- . Nuclear Fuel Laboratory Test Facilities - Program participant responsible for design, construction and operation of Small Component Test Loop, Sodium Component Test Installation, Sodium Pump Test Facility, and other small facilities
- . Systems for Nuclear Auxiliary Power (SNAP) - Program participant responsible for design and development of reactor-powered electrical energy sources for space and remote terrestrial applications
- . Large Development Plant - Program participant with major role in 1000-MW LMFBR project
- . Fast Flux Test Facility (FFTF) - Major subcontractor responsible for design, development, and procurement management of several facility systems and the manufacture of some component hardware; designed and constructed a storage facility for irradiated fuel from the FFTF
- . Reactor Fuel Fabrication - Major subcontractor responsible for fabricating fuel assemblies for the Experimental Fast Breeder Reactor II, the Advanced Test Reactor, other research test reactors, and the FBR fuel development program.

In addition to these activities, AI has expanded its marketing base to LMFBR utility-sponsored programs, utility products and operation, training in applied sodium technology, decontamination and decommissioning, and inspection and monitoring systems. AI also has major fabrication and test facilities for reactors, liquid metal components, and liquid metal loops.

Some of the highlights of the technical accomplishments of General Electric in the development and design of the LMFBR are:

First (worldwide) demonstration of capability of oxide fuel to attain 100,000 MWd/Te exposure (in thermal flux).

Announced calculation results showing effectiveness of Doppler coefficient as a safety feature of large fast oxide fueled reactor.

Received SEFOR construction permit and achieved initial criticality of SEFOR critical experiment; world's first large plutonium fuel physics experiment.

Performed the first tests in the TREAT reactor using high burnup mixed oxide fuel to identify mechanisms and thresholds for fuel failure under hypothetical overpower transient conditions.

Demonstrated successful vented fuel concept to 47,500 MWd/Te.

Organized and initiated design study of 350 MWe Fast Ceramic Reactor Demonstration Plant - supported by twenty-one foreign and domestic utilities; started component development work supported by ESADA.

Completed 1000 MWe LMFBR design study for AEC showing technical feasibility and potential economic attractiveness.

Completed conceptual design of a 1000 MWe breeder reactor core showing that irradiation induced steel swelling could be accommodated.

Completed ESADA test program; successfully demonstrated hot-cell refueling mechanisms and completed a 3800-hour thermal endurance test of a 2-MWe steam generator full-length segment test section in the Breeder Test Facility at General Electric.

Demonstrated successful performance of first mixed oxide fuel specimens at 115,000 MWd/Te in a fast flux environment.

Operated seven sodium loops at near prototypical LMFBR conditions for a total of 250,000 hours. Loops and test rigs were used to measure materials properties at temperatures up to 1300°F.



Completed design study which established the technical feasibility of large breeder power plants (greater than 2000 MWe).

Performed simulated loss-of-flow tests in reactor to determine effects of fuel-coolant interaction.

Completed the SEFOR program; first worldwide demonstration of Doppler effect in a superprompt critical transient in a fast reactor; conclusively establishing the reliability of this effect in contributing to the safety of fast reactors.

Designed, fabricated and inserted first two grid-spaced fuel assemblies in EBR-II designed as diagnostic tests for FFTF driver assemblies.

These accomplishments demonstrate GE's capability to contribute materially to a firm technological base for the design of the prototype commercial breeder power plant. Not included in the above list are GE's activities in light water reactors.

Burns and Roe, Incorporated (B&R)

~~Burns and Roe has provided 40 years of architect-engineering services as an independent organization devoted to the practice of engineering and design, construction, construction management and related supporting services required for the various types of projects. The Company activities on these projects cover the entire spectrum of services from the inception of a project through its startup and operation. During the past ten years for example, Burns and Roe has been designated as Architect or Engineer of Record on 4 controlled thermonuclear research projects, 184 environmental activities and projects, 14 advanced power and fuel systems activities and projects, 24 nuclear research projects, 36 wind tunnel and engine test projects, 36 laboratory projects, 61 communications and electronics projects and 324 power projects.~~

~~This summary is provided to demonstrate a variety of project complexities, pioneering skill or special technical skills such as cryogenic work, ionic, vacuums, special structures, heavy concrete and massive foundations, clean rooms, and close working relationships with many agencies and contractors.~~

~~In addition the following is a list of the Company's more recent engineering and design services provided for large scale nuclear power plants:~~

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## BURNS AND ROE, INCORPORATED (BRI)

Burns and Roe, Inc., established in 1932, is a consulting engineering organization devoted to the practice of engineering and design, construction management, and related supporting services. The Company's activities cover the entire spectrum from the inception of a project through its startup and operation. This broad experience includes planning, financing, study, cost estimating, site selection, engineering, design, plant scale modeling, purchasing, logistic support, construction management, quality control and assurance, startup and test, operator recruitment and training, technical manual preparation and actual plant operation. For over twenty years, BRI has been responsible for work on many of the major nuclear power and nuclear research facilities both in the United States and abroad.

The BRI engineering staff includes physicists and engineers specializing in reactor core physics, health physics, shielding design, remote handling, stress analysis, hazards analysis, nuclear materials, and metallurgy, nuclear fuels, radioactive waste handling and contamination, nuclear heat exchanger and pump design, factory practices for fabrication, test and inspection of nuclear equipment. It has wide experience in the design of shielding, containment, power distribution, inert gas systems, ventilation, water treatment, and heavy concrete and massive foundations.

A list of BRI's more recent engineering and design services for large scale nuclear power plants includes:

<u>Project</u>	<u>Rating</u>	<u>Reactor Type</u>
Forked River Nuclear Power Station Forked River, New Jersey Unit No. 1	1190MW	PWR
WPPSS Nuclear Project No. 2 Richland, Washington Unit No. 1	1150MW	BWR (1)
Three Mile Island Nuclear Pwr Station Dauphin County, Pennsylvania Unit No. 2	960MW	PWR
Cooper Nuclear Power Station Brownville, Nebraska Unit No. 1	835MW	BWR (1)

(1) Construction management services also provided.

<u>Project</u>	<u>Rating</u>	<u>Reactor Type</u>
Philippine Nuclear Power Plant Republic of the Philippines Unit No. 1	626ME	PWR
Oyster Creek Nuclear Power Station Oyster Creek, New Jersey Unit No. 1	640MW	BWR <sup>(1)</sup>
Hanford Electric Generating Project Richland, Washington Units No. 1 and 2	2x430MW	GRAPHITE <sup>(1)</sup>

(1) Construction management services also provided.

Burns and Roe for the CRBRP has augmented its services by subcontracting Holmes and Narver, Inc. for sodium technology. Holmes and Narver has been providing engineering services to DOE's Energy Technology Engineering Center (ETEC) since 1969. The company has completed or is currently engaged in engineering and design of several ETEC facilities including:

1. Small Components Test Loop
2. Sodium Components Test Facility (SCTF)
3. SCTF Heat Exchanger Bay
4. Instrument Test Rig
5. Component Handling and Cleaning Facility
6. Piping and Valve Test Insert

In addition to the above experience with sodium systems, Holmes and Narver staff has had project manager experience of the sodium pump test facility, operations supervision of the sodium reactor experiment, and Nuclear Safety Office responsibility for the Fermi Reactor.

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Stone & Webster is a worldwide organization specializing in engineering and management consulting. It started with an engineering partnership founded in Boston in 1889 by Mr. Charles A. Stone and Mr. Edwin S. Webster.

Stone & Webster Engineering Corporation provides engineering, design, construction, consulting engineering and appraisal services to public and private utilities, to the petroleum and petrochemical industries and to other industrial organizations. It is a leading engineer-constructor, having worldwide operations.

The Engineering Corporation to date has been associated with the installation of over 77 million kw of hydro, nuclear and fossil-fired electric generating facilities for the electric utility industry. It has also designed and/or constructed over 11,000 miles of transmission lines and associated substations.

Stone & Webster has been actively engaged in nuclear engineering and construction since its participation in 1942 in the first reactor project at the University of Chicago. The firm's experience covers projects ranging from ore concentration, production of fissionable materials and nuclear research facilities to heavy and light water-moderated and gas-cooled nuclear power plants.

Stone & Webster provided the engineering-design for the first commercial-scale nuclear power plant in the United States at Shippingport, Pennsylvania. After Shippingport, the firm provided engineering and construction services on completed projects such as the Army Package Power Reactor; the Yankee Nuclear Power Station at Rowe, Massachusetts; the Carolinas Virginia Prototype Nuclear Power Plant at Farr Shoals, South Carolina; the Connecticut Yankee Atomic Power Plant at Haddam, Connecticut; Units 1 and 2 of Surry Power Station for Virginia Electric and Power Company and the Maine Yankee Atomic Power Station at Wiscasset, Maine.

Presently, the company has over twenty nuclear power units under varying stages of engineering, design and construction, totaling over 22,000 Mw of capacity. Its plants have included reactors furnished by all four U.S. reactor manufacturers - pressurized water by Babcock & Wilcox Company, Combustion Engineering, Inc. and Westinghouse Electric Corporation; and boiling water by General Electric Company.



Question 412.2 (13.1.1.3)

Provide the following information relative to the chief contractors for the Clinch River Breeder Reactor Plant:

- (1) A synopsis of their past experiences in projects in similar fields and complexity.

Response

- (1) A synopsis of the past experiences in projects in similar fields and complexity are described below for the chief contractors to CRBRP.

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Stone & Webster provided the engineering-design for the first commercial-scale nuclear power plant in the United States at Shippingport, Pennsylvania. After Shippingport, the firm provided engineering and construction services on completed projects such as the Army Package Power Reactor; the Yankee Nuclear Power Station at Rowe, Massachusetts; the Carolinas Virginia Prototype Nuclear Power Plant at Parr Shoals, South Carolina; the Connecticut Yankee Atomic Power Plant at Haddam, Connecticut; Units 1 and 2 of Surry Power Station and Units 1 and 2 of North Anna Power Station for Virginia Electric and Power Company; Unit 1 of the Beaver Valley Power Station for Duquesne Light Company; and the Maine Yankee Atomic Power Station at Wiscasset, Maine.

Presently, the company has many nuclear power units under varying stages of engineering, design and construction. Its plants have included reactors furnished by all four U. S. reactor manufacturers - pressurized water by Babcock & Wilcox Company, Combustion Engineering, Inc. and Westinghouse Electric Corporation; and boiling water by General Electric Company.

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In May 1976, Stone & Webster was the first engineer-constructor to have a standard (reference) nuclear power plant design approved by the NRC. The first approved version of the reference plant uses the 1300 MWe Westinghouse reactor. The NRC has also issued preliminary design approval for two additional versions of the Stone & Webster reference plant, one that uses a 1300 MWe Combustion Engineering, Inc. reactor, and one that uses a 1200 MWe Westinghouse reactor. NRC approval of the use of a 1300 MWe Babcock & Wilcox reactor in a fourth reference plant version is pending.

In 1978, Stone & Webster was appointed as the Construction Manager for the Gas Centrifuge Uranium Enrichment Plant by the U. S. Department of Energy. As Construction Manager, Stone & Webster's responsibilities include contracting, negotiating project labor agreements, constructibility design review, construction planning, scheduling testing, quantity control, purchasing, safety, construction, and preoperations testing. This project is divided into two phases. Phase I - construction planning, and Phase II - general construction.

A representative partial listing of Stone & Webster Nuclear Power Plant projects follows:

<u>Client &amp; Location</u>	<u>Project/ Station</u>	<u>MW</u>	<u>Reactor Type &amp; Mfr.</u>	<u>Services Provided</u>
Alco Products Incorporated (AEC/U.S. Army), Ft. Belvoir, Virginia	Army Package Power Reactor	2.5	PWR - A	Engineering & Construction
Westinghouse Electric Corporation/ Duquesne Light Company	Shippingport No. 1	90	PWR - W	Architect - Engineer for Nuclear Plant
Yankee Atomic Electric Company	Yankee Nuclear Power Station	185	PWR - W	Engineering & Construction
Carolinas Virginia Nuclear Power Associates, Inc., Parr Shoals, South Carolina	Prototype Nuclear Power Plant	17	PWR - W	Engineering, Design and Construction Liaison
Connecticut Yankee Atomic Power Company	Connecticut Yankee Atomic Power Plant	600	PWR - W	Engineering & Construction

Insert "E"

<u>Client &amp; Location</u>	<u>Project/ Station</u>	<u>MW</u>	<u>Reactor Type &amp; Mfr.</u>	<u>Services Provided</u>
Niagara Mohawk Power Corp.	Nine Mile Point No. 1	590	BWR - GE	Management of Construction
Virginia Electric and Power Company Surry County, Virginia	Surry Power Station No. 1	819	PWR - W	Engineering & Construction
Maine Yankee Atomic Power Company	Maine Yankee Atomic Power Station	825	PWR - CE	Engineering & Construction
Virginia Electric and Power Company Surry County, Virginia	Surry Power Station No. 2	819	PWR - W	Engineering & Construction
Power Authority of the State of N.Y.	James A. FitzPatrick	821	BWR - GE	Engineering & Management of Construction
Duquesne Light Company	Beaver Valley No. 1	883	PWR - W	Engineering & Construction
Virginia Electric and Power Company	North Anna No. 1	938	PWR - W	Engineering & Construction
Virginia Electric and Power Company	North Anna No. 2	938	PWR - W	Engineering & Construction
Long Island Lighting Company	Shoreham No. 1	820	BWR - GE	Engineering & Management of Construction
Virginia Electric and Power Company	North Anna No. 3	975	PWR - B&W	Engineering
Niagara Mohawk Power Corporation	Nine Mile Point No. 2	1100	BWR - GE	Engineering & Construction
Duquesne Light Company	Beaver Valley No. 2	883	PWR - W	Engineering & Construction
Northeast Utilities Service Company	Millstone No. 3	1100	PWR - W	Engineering & Construction
Gulf States Utilities Company	River Bend No. 1	900	BWR - GE	Engineering & Construction

Insert "E"

<u>Client &amp; Location</u>	<u>Project/ Station</u>	<u>MW</u>	<u>Reactor Type &amp; Mfr.</u>	<u>Services Provided</u>
U.S. Department of Energy (formerly ERDA)	Gas Centrifuge Uranium Enrichment Plant	-	-	Manager of Construction
U.S. Department of Energy (formerly ERDA)	Clinch River Liquid Metal Fast Breeder Reactor	350	-	Construction

Question 412.4 (13.1.1.3)

Expand on the information submitted in response to Question 412.2 to provide an overview or perspective on the overall staffing levels and competence (education and experience) of personnel currently assigned to CRBR for Westinghouse Electric Corporation, ARD-LRM (Figure 1.4-5), Westinghouse Electric Corporation, ARD-RM (Figure 1.4-6), Burns and Roe (Figure 1.4-7), General Electric Organization (Figure 1.4-8), and Atomics International Organization (Figure 1.4-9), where not already provided:

A table of the number of persons assigned to each of the functional blocks shown in the figures noted above summarized by educational degree and years of experience in each field (where appropriate) such as reactor physics, reactor instrument and control, chemical engineering, electric engineering, mechanical engineering, civil engineering and metallurgical engineering (liquid metal technology). An example of an appropriate format would be Table 13.1 of the Tennessee Valley Authority's recent applications of Yellow Creek (docket No. 50-566), Phipps Bend (Docket No. 50-533) or Hartsville (Docket No. 50-518).

Response:

The information requested is provided in Figures Q412.4-1 through Q412.4-5. The Technical Support Summaries reflect overall staffing levels as of January, 1977.

*September, 1982.*  
*November*

40

Office or Dept.	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
CRBRP Project Manager	1						1				
Education											
BS											
MS	1						1				
Ph.D.											
Exp. Man-Yrs	31						31				

Office or Dept.	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Program Control	14*					1					12
Education											
BS	9					1					8
MS	4										4
Ph.D.											
Exp. Man-Yrs	163					30					109

\* No Degree (1) 24 years

Figure Q412.4-1. Westinghouse Electric Corporation Technical Support Summary - Oak Ridge Site



## Office or Dept.

Systems Integration	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
	35*		1		6	1	6		5	4	9
Education											
BS	24		1		5	1	6			3	8
MS	6				1				3	1	1
Ph.D.	2									2	
Exp. Man-Yrs	490		19		119	10	118		27	34	160

\* No Degree (3) 3 years

## Office or Dept.

Technical Director/LMFBR Licensing Coord	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
	11*						1		5	1	3
Education											
BS	4						1		2		1
MS	5								3		2
Ph.D.	1									1	
Exp. Man-Yrs	129						26		59	19	19

\* No Degree (1) 6 years

Figure Q412.4-1 (Cont.) Westinghouse Electric Corporation Technical Support Summary - Oak Ridge Site

Q412.4-4

Office or Dept.	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
GE Programs	14*		1				6		2		4
Education											
BS	10		1				4		2		3
MS	3						2				1
Ph.D.											
Exp. Man-Yrs	186		26				115		2		31

\* No Degree (1) 12 years

Office or Dept.	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
AI Programs	15		1	1	2		5		1	2	3
Education											
BS	11		1	1	2		3			2	2
MS	4						2		1		1
Ph.D.											
Exp. Man-Yrs	232		20	15	22		97		10	33	35

Figure Q412.4-1 (Cont.) Westinghouse Electric Corporation Technical Support Summary - Oak Ridge Site

Q412.4-5

Office or Dept.

W-OR Procurement	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
	5					1					4
Education											
BS	4					1					3
MS	1										1
Ph.D.											
Exp. Man-Yrs	68					26					42

Office or Dept.

Quality Assurance	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
	7*				1		2				3
Education											
BS	5				1		2				2
MS	1										1
Ph.D.											
Exp. Man-Yrs	101				14		39				43

\* No Degree (1) 5 years

Figure Q412.4-1 (Cont.) Westinghouse Electric Corporation Technical Support Summary - Oak Ridge Site

Office or Dept.

Deputy Project Manager	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
	1						1				
Education											
BS	1						1				
MS											
Ph.D.											
Exp. Man-Yrs	33						33				

Office or Dept.

Project Management Services	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
	47*	2		1	2	1	6			1	26
Education											
BS	28	2		1	2		5			1	17
MS	11					1	1				9
Ph.D.											
Exp. Man-Yrs	678	45		19	51	18	138			24	261

\* No Degree (8) 122 years

Figure Q412.4-2. Westinghouse Electric Corporation Technical Support Summary - Waltz Mill Site



Q412.4-7

Office or Dept.	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Nuclear Safety and Reliability	27*	2	4	2	1		2		6	3	7
Education											
BS	13	2	2	2	1		1		1	2	2
MS	11		1				1		3	1	5
Ph.D.	3		1						2		
Exp. Man-Yrs	361	42	21	18	26		24		66	61	68

\* No Degree (2) 35 years

Office or Dept.	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
CRBRP Program Management	7*		1				2		1	1	
Education											
BS	3		1				2				
MS	2								1	1	
Ph.D.											
Exp. Man-Yrs	177		28				59		24	27	

\* No Degree (2) 39 years

Figure Q412.4-2 (Cont.) Westinghouse Electric Corporation Technical Support Summary - Waltz Mill Site

Q412.4-8

Office or Dept.

Office or Dept.	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Steam Generator Program	23					18		1			4
Education											
BS	11					7					4
MS	9					8		1			
Ph.D.	3					3					
Exp. Man-Yrs	213					173		1			39

Office or Dept.

Office or Dept.	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Reactor Engineering	26*			1			14		2	1	4
Education											
BS	14			1			9				4
MS	6						5			1	
Ph.D.	2								2		
Exp. Man-Yrs	430			8			214		27	28	69

\* No Degree (4) 84 years

Figure Q412.4-2 (Cont.) Westinghouse Electric Corporation Technical Support Summary - Waltz Mill Site

Office or Dept.

Office or Dept.	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Plant Engineering	51*		4	1	17	1	15		3	1	5
Education											
BS	30		4		13	1	10				2
MS	13			1	4		4		2		2
Ph.D.	4						1		1	1	1
Exp. Man-Yrs	692		35	11	248	21	202		16	24	41

\* No Degree (4) 94 years

Office or Dept.

Office or Dept.	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Nuclear Systems Engineering	40	1	1		2		17		11	3	2
Education											
BS	13				2		6		2	2	1
MS	19	1					11		6		1
Ph.D.	5		1						3	1	
Exp. Man-Yrs	528	25	19		53		210		120	18	22

\* No Degree (3) 61 years

Figure Q412.4-2 (Cont.) Westinghouse Electric Corporation Technical Support Summary - Waltz Mill Site

Q412.4-9

Office or Dept.

Structural Mechanics and Computer Sys.	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
	33*			3	4		13		1		11
Education											
BS	13			1	3		1				8
MS	9			1	1		6				1
Ph.D.	10			1			6		1		2
Exp. Man-Yrs	298			22	55		135		9		68

\* No Degree (1) 9 years

Office or Dept.

Product Assurance	No. Pers.	Chem.	Chem. Eng.	Civil Eng.	Elect. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
	12*						4		1		3
Education											
BS	5						4				1
MS	3								1		2
Ph.D.											
Exp. Man-Yrs	172						21		7		56

\* No Degree (4) 88 years

Figure Q412.4-2 (Cont.) Westinghouse Electric Corporation Technical Support Summary - Waltz Mill Site



OFFICE OR DEPARTMENT	NO. OF PERSONNEL	CHEM. ENG.	CIVIL. ENG.	ELECTRICAL ELECTRON. ENG.	INDUS. MFG. ENG.	MECH. ENG.	NATLS. ENG.	NUC. ENG.	PHYSICS	OTHER
Project Management*	13									
Education										1-No Degree
BS		1	1			1				
MS			1	1		4				1-Naval Arch. & Marine Eng. 1-Business
Ph.D		1								
Experience Man Years	281	55	38	22		85				81

FIGURE 412.4-3 BURNS AND ROE, INC.  
TECHNICAL SUPPORT SUMMARY

\*Includes the following functional blocks  
(See Figure 1.4-7):

Sr. Corp. Vice Pres.  
Vice President  
Project Manager

Asst. Proj. Mgr. - Engineering and Design Services  
Asst. Proj. Mgr. - Licensing and Procurement Services  
Resident Mgr. - Project Office - Oak Ridge

Project Engineers

OFFICE OR DEPARTMENT	NO. OF PERSONNEL	CHEM. ENG.	CIVIL. ENG.	ELECTRICAL ELECTRON. ENG.	INDUS. MFG. ENG.	MECH. ENG.	MATLS. ENG.	NUC. ENG.	PHYSICS	OTHER
Auxiliary Systems Engineering	20									
Education										1-No Degree
BS			2			9				
MS						8	1			
Ph.D										
Experience Man Years	297		23			234				40

FIGURE 412.4-3 BURNS AND ROE, INC.  
TECHNICAL SUPPORT SUMMARY

OFFICE OR DEPARTMENT	NO. OF PERSONNEL	CHEM. ENG.	CIVIL. ENG.	ELECTRICAL ELECTRON. ENG.	INDUS. MFG. ENG.	MECH. ENG.	MATLS. ENG.	NUC. ENG.	PHYSICS	OTHER
Civil/Structural Engineering	36									
Education										
BS			12							
MS			21							
Ph.D			3							
Experience Man Years	744		744							

FIGURE 412.4-3 BURNS AND ROE, INC.  
TECHNICAL SUPPORT SUMMARY

ICE OR DEPARTMENT	NO. OF PERSONNEL	CHEM. ENG.	CIVIL. ENG.	ELECTRICAL. ELECTRON. ENG.	INDUS. MFG. ENG.	MECH. ENG.	MATLS. ENG.	NUC. ENG.	PHYSICS	OTHER
Electrical/Instrumentation & Control Engineering	29									
Education				11		1				
BS				13			1			
MS				2						47
Ph.D				401		14				
Experience Man Years	462									

FIGURE 412.4-3 BURNS AND ROE, INC.  
TECHNICAL SUPPORT SUMMARY

OFFICE OR DEPARTMENT	NO. OF PERSONNEL	CHEM. ENG.	CIVIL. ENG.	ELECTRICAL ELECTRON. ENG.	INDUS. MFG. ENG.	MECH. ENG.	MATLS. ENG.	NUC. ENG.	PHYSICS	OTHER
Engineering and Construction Services	13									
Education										4-No Degree
BS				2	1	2	1			1-Chemistry 1-Biology 1-Gen. Engrg.
MS							1			
Ph.D										
Experience Man Years	228			30	32	12	30			124

FIGURE 412.4-3 BURNS AND ROE, INC.  
TECHNICAL SUPPORT SUMMARY



OFFICE OR DEPARTMENT	NO. OF PERSONNEL	CHEM. ENG.	CIVIL. ENG.	ELECTRICAL ELECTRON. ENG.	INDUS. MFG. ENG.	MECH. ENG.	MATLS. ENG.	NUC. ENG.	PHYSICS	OTHER
Holmes and Narver	5									
Education										3-No Degree
BS						1				
MS						1				
Ph.D										
Experience Man Years	94					60				34

FIGURE 412.4-3 BURNS AND ROE, INC.  
TECHNICAL SUPPORT SUMMARY

OFFICE OR DEPARTMENT	NO. OF PERSONNEL	CHEM. ENG.	CIVIL. ENG.	ELECTRICAL ELECTRON. ENG.	INDUS. MFG. ENG.	MECH. ENG.	MATLS. ENG.	NUC. ENG.	PHYSICS	OTHER
Licensing and Environmental	10									
Education										
BS						1				1-Env. Sci. 1-Marine Eng.
MS		1	2	1		2	1		1	
Ph.D		1								
Experience Man Years	179	22	53	21		41			8	34

FIGURE 412.4-3 BURNS AND ROE, INC.  
TECHNICAL SUPPORT SUMMARY

OFFICE OR DEPARTMENT	NO. OF PERSONNEL	CHEM. ENG.	CIVIL. ENG.	ELECTRICAL ELECTRON. ENG.	INDUS. MFG. ENG.	MECH. ENG.	MATLS. ENG.	NUC. ENG.	PHYSICS	OTHER
Nuclear/Mechanical Engineering	21									
Education										1-No Degree
BS		1	5			4		2		1-Engineering
MS						5		1		
Ph.D						1				
Experience Man Years	229	14	61			117		14		23

FIGURE 412.4-3 BURNS AND ROE, INC.  
TECHNICAL SUPPORT SUMMARY

OFFICE OR DEPARTMENT	NO. OF PERSONNEL	CHEM. ENG.	CIVIL. ENG.	ELECTRICAL ELECTRON. ENG.	INDUS. MFG. ENG.	MECH. ENG.	MATLS. ENG.	NUC. ENG.	PHYSICS	OTHER
Quality Assurance	10									
Education										2-No Degree
BS				2		1				1-Geology
MS			1	1		2	1			
Ph.D										
Experience Man Years	214		27	55		86				46

FIGURE 412.4-3 BURNS AND ROE, INC.  
TECHNICAL SUPPORT SUMMARY

OFFICE OR DEPARTMENT	NO. OF PERSONNEL	CHEM. ENG.	CIVIL. ENG.	ELECTRICAL ELECTRON. ENG.	INDUS. MFG. ENG.	MECH. ENG.	MATLS. ENG.	NUC. ENG.	PHYSICS	OTHER
Stress Analysis Engineering	21									
Education										2-No Degree
BS			1			8				1-Met. Engrg.
MS			1			8	1			
Ph.D										
Experience Man Years	262		6			208				48

FIGURE 412.4-3 BURNS AND ROE, INC.  
TECHNICAL SUPPORT SUMMARY



Figure Q412.4-4  
GENERAL ELECTRIC TECHNICAL SUPPORT SUMMARY

Office or Department	No. of Personnel	Chem.	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physic.	Other
GE Summary	170	4	10	3	22	4	76	7	8	3	33
Education											
BS	97	4	7	2	20	2	42	1	-	2	17
MS	58	-	3	1	2	2	22	6	6	1	15
Ph.D.	15	-	-	-	-	-	12	-	2	-	1
Experience Man Years	3298	48	235	36	497	31	1611	130	111	85	514

Office or Department	No. of Personnel	Chem.	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physic.	Other
Plant Systems	32		6			2	22		1		1
Education											
BS	18		4			1	12				1
MS	10		2			1	7				
Ph.D.	4						3		1		
Experience Man Years	654		123			21	454		31		25

Figure Q912.4-4

Office or Department	No. of Personnel	Chem.	Civil Eng.	Electrical Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Proj. Integration and Control	7	1				2	1			3
Education										
NS	5	1				2				2
MS	2						1			1
Ph.D.										
Experience Man Years	185	32				62	15			76

Office or Department	No. of Personnel	Chem.	Civil Eng.	Electrical Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Equipment Projects	11		1	2		8				
Education										
NS	7		1	2		4				
MS	4					4				
Ph.D.										
Experience Man Years	319		26	62		231				

Figure Q 412.4-4

Office or Department	No. of Personnel	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Procurement	14	3		1	1	1				8
Education										
BS	9	3		1	1	1				3
MS	4									4
Ph.D.	1									1
Experience Man Years	106	35		7	0	32				32

Office or Department	No. of Personnel	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
SCRS Program	8			1		3				4
Education										
BS	5			1		2				2
MS	3					1				2
Ph.D.										
Experience Man Years	126			11		56				59

Figure Q412.4-4

Office or Department	No. of Personnel	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Licensing and Reactor Systems	8	1		2		2				3
Education										
BS	6	1		2		1				2
MS	2					1				1
Ph.D.										
Experience Man Years	219	32		63		32				92

Office or Department	No. of Personnel	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Product Assurance and Services	22			4	1	9	2		1	5
Education										
BS	18			4		8	1		1	4
MS	4				1	1	1			1
Ph.D.										
Experience Man Years	510			110	10	222	52		32	84

Figure 412.4-4

Office or Department	No. of Personnel	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physical	Other
Plant Control	15		1	11		1		2		
Education										
BS	9			9				2		
MS	5		1	2		1				
Ph.D.	1					19		17		
Experience Man Years	299		23	240						

Office or Department	No. of Personnel	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physical	Other
Systems Engineering	4					2				2
Education										
BS	2					1				1
MS	2					1				1
Ph.D.										
Experience Man Years	90					60				30



Figure Q412.4-4

Office or Department	No. of Personnel	Chem.	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Component and System Design	20		1	2	1		13			1	2
Education											
BS	11		1	1	1		8				
MS	8			1			4			1	2
Ph.D.	1						1				
Experience Man Years	322		25	10	4		225			33	25

Office or Department	No. of Personnel	Chem.	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physics	Other
Materials Engineering	6	1						4		1	
Education											
BS	2	1								1	
MS	4							4			
Ph.D.											
Experience Man Years	96	13						63		20	

Figure Q412.4-4

Office or Department	No. of Personnel	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physicls.	Other
Core Design	6					5		1		
Education										
BS	1					1				
MS	1							1		
Ph.D.	4					4				
Experience Man Years	82					76		6		

Office or Department	No. of Personnel	Chem. Eng.	Civil Eng.	Electrical Electron. Eng.	Indus. Mfg. Eng.	Mech. Eng.	Matls. Eng.	Nuc. Eng.	Physicls.	Other
Reliability and Safety Engineering	17					8		4		5
Education										
BS	4					2				2
MS	9					3		3		3
Ph.D.	4					3		1		
Experience Man Years	290					142		57		91

Figure Q412.4-5

ATOMICS INTERNATIONAL

## TECHNICAL SUPPORT SUMMARY

(Sheet 1 of 4)

Office or Department	Number of Personnel	Chem.	Chem. Engr.	Civil Engr.	Electric. Electron. Engr.	Indus./Mfg. Engr.	Mech. Engr.	Mat'ls. Engr.	Nuc. Engr.	Physics	Other
<u>CRBRP Program</u>											
Program Managers	6										
Education											
BS					4		1				2
MS					1						2
Experience (Man-Yr)					75		30		70	25	35
Planning	2										
Education	1*										
BS											1
Experience (Man-Yr)							8				32
Fuel Handling	8										
Education											
BS							5			2	1
MS							1			2	
Experience (Man-Yr)						10	122	10	25	30	25
Auxiliary Systems	7										
Education	1*										
BS			1				5				
MS							2				
Experience (Man-Yr)			10				92		50		31

# Figure Q412.4-5

ATOMICS INTERNATIONAL

TECHNICAL SUPPORT SUMMARY

(Sheet 2 of 4)

Office or Department	Number of Personnel	Chem.	Chem. Engr.	Civil Engr.	Electric. Electron. Engr.	Indus./Mfg. Engr.	Mech. Engr.	Mat'ls. Engr.	Nuc. Engr.	Physics	Other
CRBRP Program (Cont.)											
Elect. & Inst. Sys.	4										
Education											
BS			2		1					2	
MS										1	
Experience (Man-Yr)			11		91					17	
Plant Components	7										
Education	1*										
BS			1				2	1	1		1
MS					1			1			1
Experience (Man-Yr)			5		10	22	80	20	20		34
Quality Assurance	2										
Education											
BS							1	1			
MS											1
Experience (Man-Yr)							5	20			15

Figure Q412.4-5

ATOMICS INTERNATIONAL  
TECHNICAL SUPPORT SUMMARY  
(Sheet 3 of 4)

Office or Department	Number of Personnel	Chem.	Chem. Engr.	Civil Engr.	Electric. Electron. Engr.	Indus./Mfg. Engr.	Mech. Engr.	Mat'ls. Engr.	Nuc. Engr.	Physics	Other
<u>Engineering &amp; Test</u>											
Engr. & Design	47										
Education	14*										
BS			1	2			23				7
MS				1			9				1
Ph.D							1				
Experience (Man-Yr)			5	15		12	701		45		88
EI&C Engr.	21										
Education	3*										
BS			1		11				1	3	1
MS					2						3
Experience (Man-Yr)					352		20		30		37
Dev. & Test	9										
Education	2*										
BS			3		1			1		1	2
MS		1						1		1	1
Experience (Man-Yr)					33		45	26	21		65



Figure Q 412.4-5

ATOMICS INTERNATIONAL  
TECHNICAL SUPPORT SUMMARY  
(Sheet 4 of 4)

Office or Department	Number of Personnel	Chem.	Chem. Engr.	Civil Engr.	Electric. Electron. Engr.	Indus./ Mfg. Engr.	Mech. Engr.	Mat'ls. Engr.	Nuc. Engr.	Physics	Other
<u>Engr. &amp; Test (Cont.)</u>											
System Engr.	20										
Education											
BS			5	1	1		11	1			1
MS			1	1			7	1	1		
Ph.D							1				
Experience (Man-Yr)			20				226	31	65		9
Advanced Tech.	9										
Education	2*										
BS		1	2					3		1	
MS		1	2					3			
Ph.D		1	1								
Experience (Man-Yr)		37	36				37	129			12

\*No degree

## 1.4 IDENTIFICATION OF PROJECT PARTICIPANTS

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### BACKGROUND

In July, 1969, Statutory authority was provided by the Congress for the Atomic Energy Commission (AEC) to embark on a two-phase approach for the first LMFBR Demonstration Plant. The first phase, the Project Definition Phase (PDP) work, permitted all participants to better understand and define the technical and economic characteristics of the proposed undertakings. Atomics International, General Electric and Westinghouse and associated utilities participated in this phase of the program. The second phase, the Definitive Cooperative Arrangement phase (DCA), provided for the design, construction and operation of the first LMFBR Demonstration Plant.

Early in 1971, it was determined that, due to the magnitude of the undertaking, the LMFBR Demonstration Plant must have the full support and backing of essentially the entire electric utility industry including the investor-owned and publicly-owned sectors of this very large industry. To seek advice and assistance in obtaining such general support from the utility industry, in April 1971 the AEC established two committees, the Senior Utility Steering Committee and the Senior Utility Technical Advisory Panel. These committees consisted of top senior management and engineering executives from the utility industry.

This coordinated AEC-Utility effort resulted in proposals being made by a group of major utilities from New England, the Pennsylvania-New Jersey-Maryland Interconnection, Empire State Atomic Development Associates, the Southern Company-Middle South Utilities, and Commonwealth Edison-Tennessee Valley Authority for the design, construction, and operation of an LMFBR Demonstration Plant. | 25

The two senior utility advisory committees recommended and the AEC selected the joint submission from Commonwealth Edison (CE) and the Tennessee Valley Authority (TVA) as the basis for negotiations leading to a contract for the design, construction and operation of the first demonstration plant. This action resulted in a shift of program emphasis from the reactor manufacturers to the utility industry. | 25

In March, 1972, based on the CE-TVA proposal, two new corporations - Project Management Corporation (PMC) and the Breeder Reactor Corporation (BRC) - were created. PMC was organized to manage the design, construction, and operation of the demonstration plant and BRC was created to serve as interface between the electric utility industry and the LMFBR Demonstration Plant Project, to provide senior counsel, and to coordinate the electric utility industry's assignment of people and financial contribution to the Project.

The CE-TVA proposal provided for a seven-man Board of Directors comprised of two members each from CE, TVA, and AEC and one member from BRC. However, the Atomic Energy Act of 1954 did not permit AEC employees to serve on the Board of a private corporation. As a result, an interim arrangement with a five-member board was established until legislation could be introduced and passed by Congress to permit AEC participation on the Board. In order to assure the AEC's full participation in the Project, a three-man Project Steering Committee (PSC) with one representative each from TVA, CE and AEC was established. The Project Steering Committee's function is to implement the general policies established by the PMC Board of Directors. | 25

45| The arrangements for carrying out the LMFBR Demonstration Plant Project were formalized in Contract AT(49-18)-12. The parties to the contract were the Atomic Energy Commission (AEC), the Tennessee Valley Authority (TVA), the Commonwealth Edison Company (CE), and the Project Management Corporation (PMC). The United States Department of Energy (DOE) has since succeeded to the role of the AEC in carrying out the Federal Government's responsibilities in connection with the Project. Contract AT(49-18)-12 identifies the roles of various participants in the design, construction and operation of the liquid metal fast breeder reactor demonstration plant.

25

In June, 1974, the Reference Design for the Clinch River Breeder Reactor Plant was established. Based on this design, a detailed cost projection for the Project was prepared. This cost projection was significantly greater than the estimated cost of the Project that was made in 1972 before the design had been definitized.

25

Contract AT(49-18)-12 provides for the Federal Government to fund any Project cost in excess of contributions of the utility industry. As a result of the significant increase in the cost estimate for the Project, it was agreed that the Federal Government's authority in the Project was not in proper proportion to its financial participation. Modifications to the Project arrangements to increase such authority were agreed to in principle in March, 1975. Changes in the management structure were planned. A single integrated CRBRP Project Office, comprised of both government and utility industry personnel has since been established to manage the Project.

25

#### 1.4.1 FUNCTIONS, RESPONSIBILITIES, AND AUTHORITIES OF PROJECT PARTICIPANTS

45| The general Project management authority and responsibility is now vested in the Department of Energy (DOE). This authority and responsibility is carried out on a day-to-day basis by the Clinch River Breeder Reactor Plant (CRBRP) Project Office. Thus, DOE is responsible for all activities of the Project in the accomplishment of the design, licensing, construction, testing and operation of the CRBRP. DOE will provide financial support for the CRBRP Project as well as support from its LMFBR Base Technology programs. With respect to the supporting R & D work, DOE will provide information to PMC, TVA and CE and notice of events having a significant potential impact on Project cost and schedule. DOE will also provide all source and special nuclear material required for the CRBRP during the term of the Project in the form of completed fuel assemblies.

45| DOE, PMC and TVA are co-applicants for the CRBRP Construction Permit and will receive such support as they may require from the Project contractors in meeting such responsibilities.

PMC is responsible for administering the utilities' interests

25

in the Project and providing utility personnel and financial support for the Project. The PSC will function as a tripartite review mechanism for the overall Project and is responsible for keeping the PMC Board fully and currently informed about Project activities.

TVA and CE will supply key personnel and staff to PMC to meet its obligations for staffing the integrated CRBRP Project Office. In addition, TVA will provide the site and certain transmission facilities and purchase the electrical energy produced.

- 45| Through separate contractual arrangements between TVA and DOE, TVA will operate and maintain the plant and provide supervision of plant safety, operation and maintenance. 25

#### 1.4.2 DESCRIPTION OF ORGANIZATIONS

- 45| DOE is a Cabinet level department of the Federal Government with responsibility for policy planning, coordination, support and management of Government research and development programs for all energy sources. The Department is headed by a Secretary who is appointed by the President and confirmed by the Senate. 25

Project Management Corporation is a non-profit corporation organized to participate in the development, testing and demonstration of generating electric power using the LMFBR concept. The general policies of the Corporation are established by its five-member Board of Directors. 25

TVA is a corporate agency of the Federal Government with responsibility for planning for the proper use, conservation and development of the natural resources of the Tennessee River drainage basin and its adjoining territory. TVA's major policies, programs and organizations are determined by a full-time, three-member Board of Directors who are appointed by the President and confirmed by the Senate for nine-year terms. TVA operates with a reasonable degree of the autonomy and flexibility which characterizes a private corporation. It is an independent agency, not part of any Federal cabinet department. 25

Commonwealth Edison is a private corporation primarily concerned with the production of electric power and is especially interested in advancements in the field of nuclear power production. CE's major policies and programs are established by a Board of Directors who are elected by the stockholders of the Corporation. 25

##### 1.4.2.1 INTEGRATED PROJECT ORGANIZATION

The four parties to the Project Contract AT(49-18)-12 have agreed (Modification No. 1) to the formation of a single, integrated project management organization, staffed by both government and industry personnel. 25



This management structure has been designated the Clinch River Breeder Reactor Plant (CRBRP) Project Office. The CRBRP Project Director, a DOE official serving under the supervision of the Manager, Oak Ridge Operations Office of DOE will direct the entire CRBRP Project Office staff and manage the Project.

The CRBRP Project Office is expected to consist of about 34 DOE and 120 PMC professional and managerial employees by October, 1982. Most of the PMC professional and managerial staff will be personnel assigned by CE and TVA. In addition, BRC member utilities and other companies may assign personnel to the CRBRP Project Office. Some professional employees will be hired directly by PMC.

The Integrated Project Office includes the Project Director and his staff, fourteen division chiefs and their staffs, <sup>and a site representative who reports to the Director.</sup> The Director's staff consists of a Deputy Director, an Assistant Director and an Executive Assistant. The division chiefs reporting to the Director include Administrative Services, Audit, Automatic Data Processing, Construction, Counsel, Engineering, Financial Management, Information, Operations, Project Control, Public Safety and Quality Assurance. The CRBRP Project Office organization chart is included as Figure 1.4-1.

The Project Office functions and responsibilities are to plan and conduct programs and activities for the design, development, manufacture, licensing, construction and operation of the CRBRP through the demonstration period and to identify and arrange for services for engineering, research, development and testing of systems and components to support successful project completion. The specific functions within the Project Office are:

#### Project Director's Office

The Project Director directs all activities of the CRBRP Project to accomplish the design, manufacturing, licensing, construction, testing and operation on a utility network of a liquid metal cooled fast breeder reactor demonstration plant. He performs delegated contracting office functions.

The Deputy Director assists the Director in directing, supervising and managing the Project. He performs delegated contracting office functions. In the absence of the Director, he acts in his stead.

The Assistant Director, as the General Manager of PMC, represents the interest of the utility industry in the Project. He participates actively and closely in reviews of engineering, cost and schedule, planning and execution so as to provide the Director the benefit of the utilities' interest in Project activities. He leads the public information program. He represents the



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utilities' interest in the formulation of a licensable design that will be commercially viable. He serves as leader of task teams for problem resolution as assigned.

The Executive Assistant acts in a staff capacity in the formulation and executive direction of Project activities, with primary concern for the administrative and managerial aspects of the organization.

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### Construction

The Construction Division is responsible for management of the construction of the Project, including the quality, timeliness and cost of the constructed work.

### Engineering

The Engineering Division is responsible for management of the design, engineering and fabrication of systems, processes, equipment and facilities, including quality, cost estimates, schedule and research and development activities.

### Procurement

The Procurement Division is responsible for planning, developing, coordinating and executing policies for contractor selection, contract negotiations, administration of contracts, review and approval of subcontracts and procurement management appraisal. It may also directly procure goods and services...

### Public Safety

The Public Safety Division is responsible for planning, developing, coordinating and executing policies and plans in the areas of public safety, environmental affairs, nuclear safeguards, licensing and reliability. The division is also responsible for management of environmental monitoring activities, including quality, cost, and schedule.

### Operations

The Operations Division is responsible for overseeing TVA's operation of the plant. Before the operating phase, it is responsible for development and implementation of an integrated plant operating program and the orderly transition from the design and construction phases to the operating phase.

### Quality Assurance

The Quality Assurance Division is responsible for planning, developing and assuring effective execution of the integrated quality assurance program including the conduct of the owner program and the integration and coordination of all the quality assurance programs of the Project participants.

### Information

The Information Division is responsible for planning, developing and administering the Project activities in community relations and public education. It coordinates the dissemination of technical information to the utility industry and the general public, and coordinates information activities by all Project participants and major industry organizations.

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### Project Control

The Project Control Division is responsible for designing, developing and implementing the management control systems for the Project. It monitors the integrated costs, schedule and technical performance of the contractors.

### Financial Management

The Financial Management Division is responsible for developing and coordinating policies, programs, and procedures for budgeting and accounting, to ensure financial control.

### Audit

The Audit Division is responsible for developing and coordinating policies, programs, and procedures to ensure the conduct of professional audits.

### Counsel

The division of Counsel is responsible for providing legal advice and assistance on all matters of law and legal policy for the Project.

### Administrative Services

The Administrative Services Division is responsible for planning, developing and implementing support services for the Project Office and support services rendered commonly to other Project participants at Oak Ridge.

### Automatic Data Processing

The Automatic Data Processing (ADP) Division is responsible for providing guidance, advice and assistance to the Project Office in technical and business management applications of ADP.

### Labor Relations

The Labor Relations Division is responsible for providing guidance, advice and assistance to the Project Office on industrial relations with contractors.

### 1.4.2.2 PMC ORGANIZATION

The PMC organization is headed by the General Manager and consists of professional employees who perform PMC's contract obligations.

The PMC staff is responsible for administering the utilities' interests in the Project including continuous monitoring of the Project, preparation and dissemination of Project Information, arranging for the participation of utility personnel in the Project, investment and disbursement of utility funds

and exercising the various contractual rights designed to protect the utilities' interests, including approving any proposed changes in Project scope or deviation from the approved Reference Design or specifications, maintaining access to information and data, either in the possession of the Government or any of the Project contractors, seeing that the conditions for the disbursement of utility funds are met, and exercising the rights of termination of the Project in the event a contractually based termination occasion arises.

#### 1.4.2.3 DOE ORGANIZATION

The overall DOE organization is shown in Figure 1.4-2. Prime responsibility for the CRBRP Project is assigned to the Director, CRBRP Project. The line of authority is from the Secretary of Energy to the Under Secretary, to the Manager, Oak Ridge Operations, and then to the Project Director as shown on Figure 1.4-2A.

The Assistant Secretary for Nuclear Energy provides program management direction to the Project through the Manager, Oak Ridge Operations. Licensing is the responsibility of the Assistant Secretary for Nuclear Energy under his office of Nuclear Reactor Programs, Plant Development Division. This latter office also provides licensing direction to the CRBRP Project.

The Deputy Assistant for Nuclear Reactor Programs, in consultation with the Project Director, manages the Base Technology program which contributes support to the CRBRP.

#### 1.4.2.4 TVA ORGANIZATION

The organization of TVA is shown in Figure 1.4-4. The responsibility for TVA's activities will be met by or through the Office of Power, shown in Figure 1.4-3. The staff and divisions that will carry out, support, or have the potential to support TVA's role as operator are discussed in the following paragraphs:

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#### 1.4.2.4.1 OFFICE OF POWER (Figure 1.4-3)

##### Nuclear Licensing Staff

The Nuclear Licensing Staff (NLS) is responsible for coordinating the licensing activities of TVA nuclear power plants with the Nuclear Regulatory Commission. The NLS is responsible for providing the interface between TVA and all the Project participants for the CRBRP regarding licensing.

##### Division of Nuclear Power

The Division of Nuclear Power has the responsibility for the operation and maintenance of all TVA nuclear electric generating plants and will have this responsibility for the CRBRP. Additional information about the responsibilities of the Division of Nuclear Power for the CRBRP is included in Section 13.1.

##### Division of Power System Operations

This division provides the services of its central electrical, instrumentation, and chemical laboratory and technical staff. In addition, field test engineers are provided for chemical and laboratory tests and for solution of special electrical engineering and chemical problems. Engineers and technicians from this division are responsible for the maintenance and testing of the relaying associated with the transmission system and the inter-TVA communications system.

##### Office of Quality Assurance

The Office of Quality Assurance will be responsible for assuring the implementation and maintenance of an effective quality assurance program, including the auditing of all safety-related activities of the CRBRP. Through the audit program, existing and potential deficiencies are identified and appropriate corrective actions are assigned. Through formal audit reports, the Nuclear Safety Review Board and Manager of Power are advised of any identified deviations from procedural requirements and licensing commitments. Its relationship within the TVA corporate structure is indicated in Figure 1.4-4.



#### 1.4.2.4.2 BALANCE OF TVA ORGANIZATION (Figure 1.4-4)

##### 1.4.2.4.2.1 DIVISION/OFFICE/STAFF OUTSIDE THE OFFICE OF POWER THAT PROVIDE A DIRECT SERVICE:

###### Division of Occupational Health & Safety

The Division of Occupational Health & Safety has corporate responsibility for formulating TVA occupational health and safety plans and policies. It develops and issues criteria and standards for control of hazards in the workplace. It audits and appraises the effectiveness of occupational health and safety programs throughout TVA, supports the investigation of serious accidents, investigates employee complaints of unsafe or unhealthful working conditions referred to the "designated Agency safety and health official," and ensures appropriate follow through. It ensures through program evaluation that the occupational health and safety program is adequately implemented in TVA organizations consistent with corporate policies and plans and in compliance with applicable standards and regulations.

It coordinates TVA review of regulatory requirements and industry trends relating to occupational health and safety practices and coordinates the development of Agency comments on proposed regulations.

It provides industrial hygiene services for the Agency, including surveys to measure employee exposure to noise, toxic chemicals, and physical agents, and recommends appropriate administrative and engineering control methods. It plans and coordinates emergency response capability for dealing with major spills or releases of hazardous and toxic materials on TVA property. It is responsible for handling workplace and community noise prevention programs.

It provides accident prevention and safety consulting services, as requested, including fire protection, handling of explosives, and management of hazardous and toxic materials.

###### Radiological Health Staff

The Radiological Health Staff provides program definition, oversight and performance evaluation for TVA radiological control and protection.

###### Division of Medical Services

The Division of Medical Services is responsible for TVA's overall health program. This will include employee health services for the CRBRP.

###### Public Safety Services Staff

The Public Safety Services Staff will share industrial-radiological security responsibilities for the CRBRP with the Division of Nuclear Power in the Office of Power. The functional relations between these groups and how they share industrial-radiological security responsibilities are discussed in Section 13.7 under Radiological Security Program.

#### Office of Natural Resources

This office through its Environmental Quality Staff, Air Resources Program, and Water Resources Program provides environmental technical guidance, assistance, and services as needed to assure activities are in compliance with Federal environmental regulations and legislation.

#### Nuclear Safety Review Staff

The Nuclear Safety Review Staff is a top-management level group which acts independently of TVA organizations concerned with the design, construction, operation, and support of nuclear plants to monitor, review, and audit TVA's nuclear activities and advise the Board on nuclear safety policy.

#### 1.4.2.4.2.2 Other Organizations

In addition to the organizations listed in Section 1.4.2.4.2.1, any other TVA Organization is available to provide service for the CRBRP.

The personnel involved with AED's activities related to CEREP are located at two sites. The W-DR activities take place in Oak Ridge, Tennessee and the W-WM activities take place at the Waltz Mill site near Madison, Pennsylvania. Division management is located at the Waltz Mill site.

#### 1.4.2.5 CONTRACTOR ORGANIZATIONS

1.4.2.5.1 WESTINGHOUSE ELECTRIC CORPORATION (Figures 1.4-5,6)

45 The Advanced Reactors Division (ARD) is part of the Advanced Power Systems Divisions which are responsible for all of the fast reactor programs within the corporation. In the Clinch River Breeder Reactor Plant Program Project ARD has been contracted to perform a dual responsibility. As one of the Reactor Manufacturers (RM), ARD has been given the responsibility for the design and procurement of the primary reactor system including the fuel, reactor internals, reactor enclosure and guard vessels, and primary piping. As the Lead Reactor Manufacturer (LRM) ARD has the overall responsibility for designing and supplying the entire Nuclear Island (NI) of the plant and for conducting the overall demonstration plant program. This responsibility a project includes management of (RM) functions at ARD, Atomic International (AI) and General Electric (GE) and interfacing with Burns & Roe regarding the Nuclear Island which is discussed in more detail in Section 1.4.2.5.1.1. The following paragraphs describe functions of senior managers directly concerned with the Clinch River Project. In addition, Westinghouse is able to draw on the expertise of engineering and management personnel associated with the FFTF Project and R & D programs, both at the Advanced Reactors Division and at the Hanford Engineering Development Laboratories, managed by Westinghouse Hanford Company.

~~Vice President and General Manager, Advanced Power Systems Divisions~~

The Vice President and General Manager of the Advanced Power Systems Divisions is the senior corporate official responsible for all Liquid Metal Fast Breeder Reactor (LMFBR) activities in Westinghouse. This includes direction of both the Advanced Reactors Division and the Westinghouse Hanford Company. He reports to the Executive Vice President, Nuclear Energy Systems, and is thus able to draw upon the required corporate resources to assure the necessary support of the Project.

the Project Management Services Manager,

General Manager, Advanced Reactors Division

6 The General Manager of the Advanced Reactors Division reports to  
53 45 the ~~Vice President and~~ General Manager of the Advanced Power Systems Divisions  
and is responsible for all the design, development and other activities of the  
Division. He provides direction and guidance to the CRBRP Project Manager,  
45 other Project Managers, the Technology Managers, the Product Assurance Manager,  
40 the Controller, the ~~Administration Manager~~ and the Nuclear Safety and Reliability  
53 Manager. He conducts reviews of progress being made on the Clinch River  
Project, and assures that any problems requiring special attention by senior  
corporate management are immediately made visible.

## Product Assurance Manager

The Product Assurance Manager is responsible to the General Manager, Advanced Reactors Division for providing overall ARD Quality Assurance functions. Since the Product Assurance Manager reports directly to the Division General Manager, he has the organizational freedom to initiate and evaluate solutions to product problems and avoid any compromise in product quality resulting from other requirements such as cost, scheduling, production and manufacture. He directs matters of Corporate and Divisional Quality Assurance Policy throughout the Division, ~~including the ARD Quality Assurance function~~

1.4-9

Amend. 53  
Jan. 1980

TO: BOB GEORGE  
ATTN: Don ROBINSON  
FROM: R. KIRK/2 KNIGHTLY

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1.4.2.5.1.1 ARD ~~(LRM)~~ Organization (Figure 1.4-5)

CRBRP Project Manager

The CRBRP Project Manager reports to the General Manager, Advanced Reactors Division and is responsible for discharging the tasks associated with the Westinghouse role for the Nuclear Steam Supply System (NSSS). The Project Manager is responsible for the NSSS technical integration and program management, for all technical and program planning, contract and project administration, customer liaison, and direction of all NSSS development, design, procurement, component fabrication, testing efforts and the ~~(LRM)~~ <sup>Q-W-OR</sup> Quality Assurance Program. In addition, he is responsible for providing the necessary technical requirements to the Architect-Engineer (A-E) regarding NSSS facilities requirements and support, and for providing the necessary construction liaison for the NSSS. He is responsible for the identification and timely resolution of project problems in the above areas.

CRBRP Technical Director

The CRBRP Technical Director reports to the CRBRP Project Manager and is responsible for technical decisions in the discharge of the ~~(LRM) Reactor Manufacturer~~ <sup>Q-W-OR</sup> NSSS tasks. He is also responsible for NSSS Licensing and Reliability.

<sup>Q-W-OR</sup> CRBRP  
~~(LRM)~~ Quality Assurance Manager

<sup>Q-W-OR</sup> CRBRP  
~~(LRM)~~ Quality Assurance Manager reports to the CRBRP Project Manager and has been delegated the authority and execution responsibility by the CRBRP Project Manager for establishing, maintaining, directing and managing the ~~(LRM)~~ quality assurance program as described in Chapter 17, Appendix 17D.

<sup>Q-W-OR</sup> CRB'P NSSS  
CRBRP Program Control Manager

The CRBRP Program Control Manager is responsible to the CRBRP Project Manager for NSSS plans and schedules, estimates, budgets, cost control, development of project policies and requirements, cost reduction efforts, project administration, and data and systems management.

<sup>Q-W-OR</sup>  
~~(LRM)~~ Procurement Manager

<sup>Q-W-OR</sup>  
The ~~(LRM)~~ <sup>Q-W-OR</sup> Procurement Manager is responsible to the CRBRP Project Manager for <sup>Q-W-OR</sup> ~~(LRM)~~ Procurement activities. He administers and controls the ~~(LRM)~~ <sup>Q-W-OR</sup> contracts with the RMs and ~~(LRM)~~ <sup>Q-W-OR</sup> suppliers to assure that the required systems, structures and components are procured consistent with contract requirements.



~~ARD Program Manager~~

~~The ARD Program Manager reports to the CRBRP Project Manager and is responsible for the coordination of ARD RM activities.~~

GE Program Manager

The GE Program Manager reports to the CRBRP Project Manager and is responsible for the coordination of GE RM activities.

AI Program Manager

The AI Program Manager reports to the CRBRP Project Manager and is responsible for the coordination of AI RM activities.

CRBRP Systems Integration Manager

The CRBRP Systems Integration <sup>Q-W-OR/AE - Constructor</sup> Manager reports to the CRBRP Project Manager and is responsible for control and integration of the NSSS design and system interface including the LRM/AE Constructor interface and development activities. In addition, he is responsible for the plant systems and safety-related design activities.

~~Steam Generator Program Manager~~

~~The Steam Generator Program Manager reports to the CRBRP Project Manager and is responsible for the Steam Generator component design and fabrication program activities.~~



1.4.2.5.1.2 ~~ARD (RM) Organization (Figure 1.4-6)~~ <sup>W-WM</sup> ~~CRBRP Project Manager~~ <sup>Deputy</sup> ~~INSERT 1.4-0~~ <sup>Project Management Services assigned to W-WM</sup>

The CRBRP Project Manager reports to the ~~General~~ <sup>W-WM</sup> Manager, Advanced Reactors Division and is responsible for discharging the tasks associated with the division's role as a Reactor Manufacturer (RM). In this capacity the Project Deputy Manager has the responsibility for all the technical and financial planning associated with the Westinghouse RM activities. The CRBRP Project Deputy Manager takes direction from the CRBRP Project Manager.

~~CRBRP Reactor Plant Project Manager~~

The CRBRP Reactor Plant Project Manager is responsible to the CRBRP Project Manager and through him to the ARD General Manager for the overall management of CRBRP RM activity at ARD. This includes the administration, design, documentation, procurement, shipment, and installation support of the NSSS systems, components, and licensing, safety and reliability related activities as well as all required software as assigned by the CRBRP Project Manager.

~~Reactor Engineering Manager~~ <sup>Deputy</sup> ~~INSERT 1.4-1~~

The Reactor Engineering Manager <sup>takes direction, through the Engineering Manager, from</sup> is responsible to the CRBRP Reactor Plant Project Manager for establishing system requirements for the reactor enclosure, internals, and control rod systems; and the design, documentation, shipment, and installation support of the reactor vessel, reactor internals, reactor primary control rod system, reactor guard vessel, reactor closure head, and the components for the head access area and the reactor cavity and for the stress and thermal/hydraulic analysis of the permanent reactor components.

~~Nuclear Systems Engineering Reactor Analysis and Core Design Manager~~ <sup>takes direction, through the Engineering Manager, from</sup>

The ~~Reactor Analysis and Core Design Manager~~ <sup>Nuclear Systems Engineering</sup> is responsible to the CRBRP Reactor Plant Project Manager for structures analyses, nuclear design, core thermal and hydraulic analyses, shielding analyses, and the design, documentation, and installation support of the fuel and removable assemblies.

~~Program Control and Design Integration Manager~~ <sup>Deputy</sup>

The Program Control and Design Integration Manager is responsible to the CRBRP Reactor Plant Project Manager for establishing reactor system requirements, integration of ARD systems (particularly interface control), maintaining cost and schedule visibility and control, planning, configuration management, and preparation of RM procedures.

INSERT 1.4-0

Management

Project Services Manager

Management

The Project Services Manager reports to the General Manager, Advanced Reactors Division and is responsible for divisional program control, engineering services functions, administration of staff functions, preparation and maintenance of divisional policies/procedures, coordination of standards and patent activities, procurement and the functions of the CRBRP Project Deputy Manager.

Program Control Manager

Management

The Program Control Manager is responsible to the Project Services Manager for division planning, scheduling, budget and cost control, data management, procedure development and maintenance, cost/schedule analysis and reporting and for standards and patent coordination.

Procurement Manager

The Procurement Manager is responsible to the Project Management Services Manager for all W-WM procurements related to CRBRP.

#### INSERT 1.4-1

##### CRBRP Program Management Manager

The CRBRP Program Management Manager is responsible to the CRBRP Project Deputy Manager for directing, integrating, coordinating and monitoring the engineering, safety and licensing, quality assurance, program control and external interfacing efforts required at W-WM.

##### Steam Generator Program Manager

The Steam Generator Program Manager is responsible to the CRBRP Project Deputy Manager for all activities related to the steam generator components design and fabrication program.

##### Engineering Manager

The Engineering Manager reports to the General Manager, Advanced Reactors Division and is responsible for engineering and design of the division-wide technical projects. In this capacity the Engineering Manager ~~takes direction~~ from the CRBRP Project Deputy Manager for the engineering and design of CRBRP NSSS systems and components.

#### ~~Reactor Plant Procurement Manager~~

~~The Reactor Plant Procurement Manager is responsible to the CRBRP Reactor Plant Project Manager for all CRBRP procurement. This includes establishing internal purchasing procedures to assure procurement is conducted in accordance with contractual and corporate procurement requirements.~~

#### Plant Engineering Manager

~~The Plant Engineering Manager is responsible to the CRBRP Reactor Plant Manager for establishing system requirements for the reactor heat transport system, plant control, data handling, reactor and vessel instrumentation systems, plant protection systems, as well as the design, fabrication documentation, shipment, and installation support of the components in those systems. In addition, he is responsible for providing overall plant performance and reliability analyses, and the manufacturing engineering support for all ARD-RM NSSS components.~~

↳ Takes direction, through the Engineering Manager, from Project Deputy

#### ~~CRBRP Licensing and Safety Manager~~

~~The CRBRP Licensing and Safety Manager is responsible to the CRBRP Reactor Plant Project Manager for all activities necessary for licensing and the required safety analysis. He is responsible for assuring that nuclear safety and licensing requirements have been satisfied, for the preparation and coordination of licensing documentation generated within the ARD-RM, for assuring that the required safety analyses are performed, and for directing safety analyses conducted by GE as the agent of the LRM.~~

↳ W-WM

#### RM Quality Assurance Activities

↳ W-WM

All ARD-RM Quality Assurance activities are performed by the Division's Product Assurance Department which is totally independent from the RM Engineering and Procurement Organizations. For the description of the Divisional RM Quality Assurance Organization and its duties and responsibilities, see Chapter 17 Appendix 17H.

↳ with respect to W-WM activities

#### 1.4.2.5.2 Burns and Roe, Inc. - Breeder Reactor Division (Figure 1.4-7)

#### Breeder Reactor Division Senior Corporate Vice President

The Senior Corporate Vice President and Director of the Breeder Reactor Division is the senior corporate officer assigned to the project and reports to the President. He draws upon the total resources of the corporation to assure that all necessary actions and support are forthcoming. He provides senior technical guidance as necessary. He assures that any problems requiring attention and resolution are being acted on in a timely manner.

INSERT 1.4-2

Structural Mechanics and Computer Systems Manager

The Structural Mechanics and Computer Systems Manager takes direction, through the Engineering Manager, to the CRBRP Project Deputy Manager for the performance of structural and stress analysis in support of CRBRP activities at W-WM.

↳ from

W-WM Safety and Licensing Activities

All W-WM safety and licensing activities are performed by the Division's Nuclear Safety and Reliability Department which is independent from the W-WM Engineering and Procurement Organizations. This department is responsible to the General Manager for assuring that all W-WM nuclear safety and licensing requirements have been satisfied. To accomplish this the Nuclear Safety and Reliability Department reviews all W-WM design documentation, prepares and coordinates licensing documentation within W-WM, performs reliability analyses, and performs safety analyses.

↳ and



See 1.4-13 for BRD Section

### Breeder Reactor Division Vice President

The Vice President and Deputy Director of the Breeder Reactor Division (BRD) reports to the senior corporate officer assigned to the project. He provides guidance and direction to the Project Manager and the Project Quality Assurance Manager in the conduct of the project. He performs special reviews of the engineering and design work being conducted on the project and of progress being made. He assures that any problems requiring attention and resolution are being acted on in a timely manner. He contacts senior representatives of DOE and the LRM as necessary to assure satisfactory completion of overall project effort.

### CRBRP Project - Project Manager

The Project Manager reports to the BRD Vice President and is assigned overall responsibility and authority for carrying out Burns and Roe's contractual commitments to DOE. He directs and coordinates all project activities in a manner to assure that all Burns and Roe efforts are proceeding in an integrated fashion which will support procurement and construction efforts and will produce a satisfactory technical product, on time, and at minimum cost to DOE. He assures that the engineering and design work by Burns and Roe provides a safe and reliable plant with minimum environmental impact, and a plant which has good operability, availability, maintainability, flexibility, inspectability, and prospect for future economy. He is the official point of contact for the project within Burns and Roe and assures that Burns and Roe's efforts are carried out in a satisfactory manner. He issues management reports and information concerning the project.

### Assistant Project Manager, Engineering and Design Services

The Assistant Project Manager, Engineering and Design Services, reports to the Project Manager and is assigned responsibility and authority for the overall direction and coordination of the engineering and design effort including those performed under subcontracts by Holmes and Narver, Inc. He integrates the engineering and design effort in the various areas to assure a sound and technically satisfactory and licensable design which is completed on schedule and within budget. He approves initial issues and revisions, as required, of system design descriptions, drawings, specifications and all technical work on the Project and is assisted in these activities by Project Engineers. He assures that engineering and design efforts are properly interfaced, as to both scope and schedule, with the engineering and design work of the Reactor Manufacturers as applicable.

### Assistant Project Manager, Licensing and Procurement Services

The Assistant Project Manager, Licensing and Procurement Services, reports to the Project Manager and is assigned responsibility and authority for the overall direction of licensing and environmental activities for the SAR and ER. His responsibilities also include the overall direction of procurement management, procurement coordination, vendor documents, and coordinating with engineering and quality assurance in support of such responsibilities.

### Project Operations Manager

The Project Operations Manager reports to the Project Manager and is responsible for the administrative, business, planning, scheduling, cost engineering of the Project. For the administrative and business systems, he is responsible for Project cost control and reporting, manpower control, commitment control, and the formulation and monitoring of the Project data bank. He is also responsible for the Management Information Center and for development, custody and control of Project procedures together with the required indoctrination of Project personnel. For the planning, scheduling and cost engineering systems, he provides the necessary controls and monitors overall Project progress and plant capital costs. Under these systems, he is also responsible for the preparation and maintenance of all Project schedules. He is responsible for all project personnel training related to the above systems as required.

### Project Office - Resident Manager

The Project Office Resident Manager reports to the Project Manager and coordinates all Burns and Roe operations in Tennessee. He interfaces as necessary and as directed with DOE, PMC, and LRM and the General Constructor. He is supported by a Systems Integration Manager, Planning and Construction Liaison Manager (future Site Manager), Program Manager, and a Licensing and Environmental Representative. He is responsible for the activities conducted at the Project Office and at the construction site, other than Quality Assurance. He shall keep the DOE Project Director advised on as frequent a basis as necessary of status and problems. He is empowered to speak and act for the Burns and Roe Project Manager where necessary.

### Contract Supervisor

The Contract Supervisor directs the contract administration functions for the project. He reports to the CRBRP Project Manager as the central point of contact for the project on contract administration matters. Included in contract administration matters are preparation of documentation, compliance with notification provisions, cost segregation and negotiation.

### Quality Assurance Manager

The responsibility and authority of the Quality Assurance Manager is discussed in Section 17E-1.3.

### Procurement Manager

The responsibilities of the Procurement Manager, who reports to the Assistant Project Manager, Licensing and Procurement Services, are governed by the scope of work included in Burns and Roe's contract with the CRBRP Project Office. Where Burns and Roe has procurement support responsibility, the Procurement Manager is responsible for the preparation

of the potential offeror's lists; review of technical specifications for procurement suitability; administration of Burns and Roe support responsibilities for each subcontract and provides Burns and Roe contact with vendor subcontract administration personnel. Where Burns and Roe has complete procurement responsibility, the Procurement Manager is also responsible for the conduct of the contracting process including negotiations and award of subcontracts and administration of subcontracts.

#### Licensing and Environmental Manager

The Licensing and Environmental Manager reports to the Assistant Project Manager, Licensing and Procurement Services and coordinates all Burns and Roe licensing activities for the SAR and the ER. He assures that the requirements of all cognizant regulatory bodies - federal, state and local - are recognized and included in the design. He is responsible for insuring that all revisions to regulations during the course of the work are properly evaluated and included as may be required.



#### 1.4.2.5.3 General Electric Company (Figure 1.4-8)

The Advanced Reactor Systems Department (ARSD) is a part of the Energy Systems and Technology Division (ES&TD) of General Electric Co. (GE). The General Manager of the GE-ARSD reports to the Vice President and General Manager of the ES&TD and is responsible for organizing the resources to carry out such programs and for developing corporate programs that will lead to the eventual commercialization of Advanced Nuclear Power Programs, including LMFBR technology.

The GE-ARSD General Manager conducts review of progress being made on projects within the department and provides direction and guidance to the Section Managers reporting to him. He has the responsibility and authority to issue Department policy and to establish quality goals and objectives. (See Chapter 17, Appendix I for details of the General Managers' QA responsibility).

The GE-ARSD consists of ~~five~~<sup>SIX</sup> sections and the Legal Operation. Each section is headed by a Section Manager who reports to the General Manager and is responsible for an assigned area of responsibility as defined in the following paragraphs.

##### Clinch River Project Section

*IN SZAT*

The manager of the Clinch River Project Section is responsible to the Department General Manager, GE-ARSD, for performance of work related to contracts on the Clinch River Breeder Reactor Plant Project. Major functional responsibilities (engineering, design, and supply) include engineering of the intermediate heat transport system, steam generator system, and decay heat removal system, as well as primary and intermediate sodium pump development, steam generator development, trace heating, IHTS control and instrumentation, SCRS projects, safety evaluations and licensing support activities. The Clinch River Project Section serves as the GE-ARSD interface with all other CRBRP Project participants. Functionally, the Clinch River Project Section is divided into five subsections (Figure 1.4-8), each with specific assigned responsibilities. Project management responsibilities include functional work performed in other GE-ARSD Sections, subcontractors, and vendors.

##### Design Engineering Section

The Manager of the ~~Design~~<sup>DESIGN</sup> Engineering Section is responsible to the Department General Manager. The responsibilities of the ~~Design~~<sup>DESIGN</sup> Engineering Section in support of the Clinch River Breeder Reactor Plant Project include providing analytical and design engineering services in the areas of structural and thermal hydraulic analyses, safety analyses, reliability engineering and SCRS Design. The ~~Design~~<sup>DESIGN</sup> Engineering Section ~~also~~<sup>also</sup> provides nuclear engineering support primarily related to the evaluation of critical experiments for the Clinch River Core, and systems Engineering Support.

Insert

1.4-16

### CLINCH RIVER PROJECT SECTION

The Manager of the Clinch River Project Section is responsible to the Department General Manager, GE-ARSD, for performance of work on the Clinch River Breeder Reactor Plant. Major functional responsibilities related to the plant include engineering, design and supply of hardware for the Intermediate Heat Transport System, Steam Generation System, Auxiliary Heat Removal System, Reactor Heat Transport Instrumentation System, Piping and Equipment Electrical Heating and Control System; and similar responsibilities related to furnishing equipment which is part of systems by others, specifically - the Secondary Control Rod System, Secondary Control System Controls, and the Primary Sodium Pump. Also, Licensing support and Procurement is provided for all Plant related activities. In addition, functional responsibilities include development and test of prototypes for the Secondary Control Rod System, Sodium Pump, and Sodium Pump Drive System. The Clinch River Project Section is comprised of six sub-sections with major responsibilities as identified on Figure 1.4-8. Support is provided to the Clinch River Project Section by the other ARSD Sections as required.



#### Development Engineering Section

The Manager of the Development Engineering Section is responsible to the Department General Manager for planning, organization and management of major programs of research and development, engineering test support, and experimental facility design and construction for LMFBR programs. Such programs include work in support of assigned projects as well as the development of new systems and components for future LMFBR product lines.

#### Procurement Section

The Manager of the Procurement Section is responsible to the Department General Manager for procurement of material, hardware and services. Procurement locates and maintains adequate vendor sources of supply, executes all vendor relations in a fair and equitable manner, conducts vendor negotiations, awards and manages purchase orders and insures proper execution of all contractual matters consistent with applicable General Electric policy, DOE/Government procurement regulations and other customer requirements as they relate to purchasing activity.

#### Product Assurance and Services Section

The Manager of the Product Assurance and Services Section is responsible for ensuring an acceptable level of quality in all GE-ARSD products and services. It is the responsibility of Quality Assurance to assure that all technical activities of the Clinch River Project, including those performed by subcontractors, are consistent with the customer quality requirements and company quality policy (see Chapter 17, Appendix I for further detail). He also provides leadership and coordinates development of management systems and procedures, to guide and control all Department activities; and provides centralized engineering, technical and administrative support services for the Department.

#### Applications Engineering and Planning Section

The Manager of Applications Engineering and Planning Section is responsible to the Department General Manager for recommending goals and objectives and formulating and implementing strategies and action plans relating to the marketing of current Department services and products and related contract negotiation and administration and the market development for the Department's new products and services. Applications Engineering and Planning is also responsible for the negotiation and administration of all contractual matters related to the Clinch River Project.

Insert

1.4.17

#### Product Assurance and Services Section

The Manager of the Product Assurance and Services section is responsible for ensuring an acceptable level of quality in all GE-ARSD products and services. It is the responsibility of Quality Assurance to assure that all technical activities of the Clinch River Project, including those performed by sub-contractors, are consistent with the customer quality requirements and company quality policy (see Chapter 17, Appendix I for further detail). He also provides leadership and coordinates development of management systems and procedures to guide and control all Department activities; and provides centralized engineering, technical and administrative support services for the Department. Services include test operations in support of engineering development, plant materials, laboratory activities, and experimental facility design and construction for LMFBF programs. Such activities include work in support of assigned projects as well as the development of new systems and components for future LMFBF product lines.

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#### Technology and Special Project Section

The Manager of the Technology and Special Projects Section is responsible for coordinating and directing the overall management and execution of all projects undertaken by the GE-ARSD with the exception of those specifically assigned to other sections in the department by the Department General Manager. Similarly, he is responsible for coordinating the funding, reporting and measurement or progress of the department Development Authorizations (DA's). He provides the primary technical and programmatic interface between the Department and the Department of Energy (DOE) and other customer organizations on projects and related matters. He also provides technical and programmatic leadership and assistance to the Applications Engineering and Planning Section on project proposal and contract activities, product planning, product applications, and market development.

#### GE-ARSD Legal Operation

The GE-ARSD Legal Operation is staffed by the Department Counsel who is responsible to the Department General Manager for advice and counseling of department management regarding legal implications of contracts and other arrangements which legally bind the Company. In addition, Counsel participates with other members of the staff in the general operation of the business, advises on antitrust, labor, government regulatory, equal employment and other matters of legal significance. Counsel is assisted by patent counsel on matters involving patents and data.

#### GE-ARSD Financial Section

The Manager of the Financial Section is responsible to the Department General Manager for reporting financial results of the Department, establishing the financial policies of the Department and providing financial service and counsel to the other GE-ARSD sections. In addition, the Financial Section is responsible for interpretation of financial contract language, establishment and negotiation of overhead rates, and development of operating budgets and long range forecasts of GE-ARSD.

#### GE-ARSD Employee Relations Section

The Manager of the GE-ARSD Employee Relations Section is responsible to the Department General Manager for identifying, developing and implementing relations programs responsive to the Department needs; for establishing goals, objectives and assuring timely employment of qualified personnel. He also provides coordination, counseling and direction for all Department components in relations areas including Manpower Development and Equal Employment Opportunity and Minority Relations and maintains procedures and records and to assure compliance with federal and state laws in the areas of fair employment practices.

#### 1.4.2.5.4 Rockwell International Corporation (Figure 1.4-9)

52| The LMFBP Program is being undertaken at Atomics International (AI),  
52| a division of the Energy Systems Group of Rockwell International Corporation.  
The principal organizational entities directly involved in this program  
at ESG are described below.

##### Atomics International Division Vice President and General Manager

41| The Atomics International Division Vice President and General  
52| Manager is responsible for the management of the CRBRP Program and related  
LMFBP Programs. Related LMFBP Programs include LMFBP Base Technology  
Program activities and a steam generator development and manufacturing  
program. Therefore, the responsibility for ESG's overall performance on  
the CRBRP is vested in the General Manager.

##### CRBRP Program Director

52| The CRBRP Program Director is responsible for the management of the  
CRBRP Program at ESG. In this capacity, he is responsible for managing the  
CRBRP Program work in accordance with the contract requirements and providing  
31| direction to the functional organizations within ESG for CRBRP development,  
design and procurement with exception of the Steam Generator Program.

##### CRBRP Steam Generator Program Director

52| The Steam Generator Program Director is responsible for the  
52| management of the Steam Generator Program at ESG. In this capacity, he is respon-  
sible for managing the program work in accordance with the contract require-  
41| ments and providing direction to the functional organizations within ESG  
for steam generator development, design, procurement and fabrication.

##### LMFBP Programs Director

*The LMFBP Program Director has overall responsibility for  
the LMFBP business segment, including CRBRP Program  
activities, large plant design projects, and LMFBP  
Base Technology.*



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### Quality Assurance Director

The responsibilities of the Quality Assurance Director are discussed in Chapter 17, Appendix J, Section 2.Q.

### Research and Engineering Vice President

The Research and Engineering Vice President is responsible for the management of ESG's centralized engineering activities. On the CRBRP Program, engineering work in support of conceptual design, preliminary design, and final design is assigned to the Engineering Department. Engineering and design work conducted by the Engineering Department includes: Mechanical Design, Drafting and Checking, Electrical and Control Engineering, Materials and Process, Piping and Structural Design, Thermal and Process systems Pressure Components Stress Analysis, Structural Systems Stress Analysis, Specifications and Manuals, Engineering Assurance and Data Management and the verification of design through developmental and acceptance testing.

### Operations Director

The Director of Operations is responsible for the product manufacturing, material purchasing and warehousing in support of the CRBRP in accordance with the controlling programmatic documents. The material purchasing function is responsible for selecting sources, procurement, subcontract administration, assuring adherence to work statements, prices and delivery schedules, receiving, inspection, storage, issuance, payment of invoices, and observing the performance quality of the articles purchased. The manufacturing manager is responsible for reviewing engineering and design work performed by ESG to assure manufacturability. On the CRBRP Program, as with other programs, the Manager of Manufacturing Engineering is responsible for conducting on-the-board reviews, participating in design reviews, and reviewing supplier design information to assure component designs can be fabricated and assembled expeditiously and at minimum cost.

### Finance and Administration Vice President and Controller

The CRBRP administration is under the cognizance of the Finance and Administration Vice President. The Finance Controller reports administratively to the Finance and Administration Vice President and organizationally to the AI Division Vice President and General Manager. Within the Finance and Administration Organization, the Program Business Management function is responsible to the individual projects for assistance in the budgeting and planning of manpower and dollar expenditure rate; for maintaining and reporting project costs and remaining balances; for monitoring and satisfying contractual requirements; for maintaining contract data control systems; and for providing assistance in preparation of project schedules. On the CRBRP Program, Program Administration provides the CRBRP Project management with detailed weekly summaries of manpower expenditures, monthly cost information, projection of figure costs at various subaccount levels, commitment control system reports, and various other reports required by the Project and the customer.



1.4.2.5.5 Worthington Environmental  
Systems Department (Figure 1.4-10)

Delete

#### 1.4.2.5.6 Stone & Webster Engineering Corporation (Figure 1.4-11)

The construction of the CRBRP is being undertaken by Stone & Webster Engineering Corporation (SWEC) a wholly owned subsidiary of Stone & Webster, Inc. As a general contractor, SWEC will prepare the site, construct permanent plant structures and install both NSSS and BOP components, systems, and equipment.

##### CRBRP Senior Project Manager

The Senior Project Manager for the CRBRP construction effort is a SWEC Vice President and is the senior corporate official responsible for SWEC activities on the CRBRP Project. As Senior Project Manager, he will be responsible for coordinating all SWEC headquarters and field operations required to perform the construction of the Project in accordance with contract requirements. He reports to the President of SWEC and is thus able to draw upon the required corporate resources to assure the necessary support for the Project.

##### CRBRP Deputy Director of Construction

The Deputy Director of Construction is a SWEC Vice President and the Construction Manager of the CRBRP Project. As Construction Manager, he is responsible for the construction organization and assignment of construction personnel. He participates in establishing company-wide SWEC construction policies and procedures.

##### CRBRP Project Managers

Management of the SWEC CRBRP construction activities is divided into two areas; control and production. Managers of these areas are accountable to the Senior Project Manager and work directly with the Project participants to support the Project schedule and budget. The Project Manager - Control is responsible for establishing Project construction criteria and determining schedules, estimates, and expenditure forecasts. The Project Manager - Production is responsible for providing the necessary manpower and resources to meet the construction goals, coordinating with other groups, and for the quality of the work.

##### CRBRP Project Quality Assurance Manager

The Project Quality Assurance Manager is responsible for assuring that an adequate quality assurance program is established, implemented, and documented to meet the requirements of Appendix B, 10CFR50 and RDT F2-2, August 1973, with Addenda I dated 12/73, Addenda II, dated 3/74, and Addenda III, dated 7/11/75, within the scope of the SWEC construction effort. He receives quality assurance guidance from the SWEC Manager of Quality Assurance in SWEC Headquarters.

#### Senior Site Construction Representative

The Senior Site Construction Representative is in charge of the construction organization at the site and directs the day-to-day activities. He responds to the goals set by the SWEC Project Managers and acts under the guidance of the Deputy Director of Construction.

#### Superintendent of Field Quality Control

The Superintendent of Field Quality Control is in charge of the quality control organization at the site and directs the day-to-day activities. He is responsible for the implementation of the quality assurance program at the construction site and acts under the direction of the SWEC Project QA Manager. Corporate administration, corporate policy, and corporate resource support are received from the Manager, Field Quality Control Division in SWEC Headquarters.

#### Contract Administrator

The Contract Administrator provides liaison activities related to the SWEC contract with DOE, reviews contract related material, monitors performance, and provides the interface with DOE on contractual matters related to construction site activity. The Contract Administrator acts under the direction of the Senior Construction Site Representative.

#### Engineering Liaison

Engineering Liaison is responsible for providing the <sup>SWEC</sup> S&W interface in the offices of the Architect-Engineer. Acting under the guidance of the Senior Site Construction Representative, he is responsible for providing SWEC input to the design and engineering process and for providing SWEC with timely information on engineering and design matters which impact construction.

#### Superintendent of Cost and Scheduling

The Superintendent of Cost and Scheduling acts under the direction of the Senior Construction Site Representative and supervises the project site cost and scheduling program to provide coordinated and integrated cost and planning control necessary for the completion of the construction effort in accordance with master schedules and projected costs.

#### Construction Administrator

The Construction Administrator reviews design information for constructibility and furnishes technical assistance to the Senior Site Construction Representative in planning and execution of the construction program with special attention to areas unique to sodium systems. He is responsible for the daily contact with the Reactor Manufacturers.

### Superintendent of Construction

The Superintendent of Construction acts under the direction of the Senior Construction Site Representative and is responsible for the construction of a complete and operating plant in accordance with engineering plans and specifications and planned schedules for the least cost consistent with good quality.

### Assistant Superintendent of Construction Engineering

The Assistant Superintendent of Construction Engineering acts under the direction of the Senior Construction Site Representative and directs all SWEC Construction engineering activities for the Project. He directs and controls the distribution of engineering documentation, requisitions permanent plan materials and coordinates with Field Quality Control and the Architect-Engineer in the resolution of problems encountered during the construction phase.

### Assistant Superintendent of Construction Services

The Assistant Superintendent of Construction Services acts under the direction of the Senior Construction Site Representative and is responsible for providing the personnel, purchasing, accounting, and office service functions necessary to support the construction effort so that it may proceed in accordance with plans and specifications and according to schedules and budgets.

### Safety Supervisor

The Safety Supervisor acts under the direction of the Senior Construction Site Representative and is responsible for the administration of the construction site safety, accident, and fire prevention programs, ensuring adherence to Federal, State, and Local safety regulations and fire ordinances and the SWEC safety program.



#### Superintendent of Construction

Acting under the direction of the Senior Construction Site Representative, the Superintendent of Construction is responsible for the construction of a complete and operating plant in accordance with engineering plans and specifications and planned schedules for the least cost consistent with good quality.

#### Assistant Superintendent of Construction Engineering

Under the direction of the Senior Construction Site Representative, the Assistant Superintendent of Construction Engineering directs all S&W Construction engineering activities for the Project. He directs and controls the distribution of engineering documentation, requisitions permanent plant materials and coordinates with Field Quality Control and the Architect-Engineer in the resolution of problems encountered during the construction phase.

#### Assistant Superintendent of Construction Services

The Assistant Superintendent acts under the direction of the Senior Construction Site Representative and is responsible for providing the personnel, purchasing, accounting and office service functions necessary to support the construction effort so that it may proceed in accordance with plans and specifications and according to schedules and budgets.

#### Safety Supervisor

Under the direction of the Senior Construction Site Representative, the Safety Supervisor is responsible for the administration of the construction site safety, accident and fire prevention programs, ensuring adherence to Federal, State, and Local safety regulations and fire ordinances and the S&W safety program.

#### Chief Construction Inspector

Under the direction of the Senior Construction Site Representative, the Chief Construction Inspector administers the quality inspection program in areas assigned to the construction department.

### 1.4.3 INTERRELATIONSHIPS WITH CONTRACTORS AND SUPPLIERS

PMC has contracted with Westinghouse Electric Corporation, acting through its Advanced Reactors Division (ARD), to perform the function of Lead Reactor Manufacturer (LRM) for design, manufacture, and provision of test support for the Nuclear Steam Supply System (NSSS) for the Clinch River Breeder Reactor Plant. Westinghouse also has RM responsibilities and has subcontracted with General Electric Company Energy Systems and Technology Division and Rockwell International (Atomics International Division, AI) to provide the design and manufacture of certain systems for the NSSS. PMC has assigned the administration of its contract with ARD to DOE.



45 | PMC has contracted with Burns and Roe, Inc., to provide the architect-engineer services required for the Project. Burns and Roe has subcontracted with Law Engineering and Testing Company to carry out investigations to determine the suitability of the site geology in support of foundation designs for permanent structures. Burns and Roe also has a subcontract with Holmes and Narver, Inc. to provide services in liquid metal engineering technology. PMC has assigned the administration of its contract with Burns and Roe, Inc. to DOE. | 25

45 | PMC has contracted with Westinghouse Electric Corporation to provide services needed in the preparation of the Environmental Report for the Project and to perform certain other associated tasks. PMC has assigned the administration of its contract with Westinghouse to DOE. | 25

PMC has contracted with Stone & Webster for the construction of the plant. Stone and Webster may subcontract portions of the work to others. PMC has assigned the administration of its contract with Stone and Webster Engineering Corporation to DOE. | 25

45 | The DOE provides R&D information in support of the CRBRP Project through its LMFBR base technology programs being carried out by its national laboratories and contractors. A description of related base technology programs is provided in Section 1.5.

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#### 1.4.4 GENERAL QUALIFICATION REQUIREMENTS OF CRBRP PROJECT PARTICIPANTS

The general qualification requirements for key positions in the management organizations of the CRBRP Project Office and its chief contractors are described in the following sections:

##### 1.4.4.1 CRBRP Project Office Organization

The general qualification requirements for key positions in the CRBRP Project Office are identified by Project Office Divisions.

##### Project Director's Office

Qualification requirements for the Project Director include a broad knowledge of engineering and construction theory, technology, systems, components, and applications with particular emphasis on the design, development construction, and operation of large advanced, complex, first-of-a-kind facilities. Such knowledge must be sufficient to permit the formulation of broad programs encompassing unique studies and projects that will substantially advance the application of technology to competitive industrial operations.

This broad knowledge of engineering technology shall be sufficient to permit authoritative technical judgements on concepts, proposals and experiments that will have the effect of determining major direction in program activities. This knowledge would be evidenced by: (1) degree and advanced study in metallurgy, mechanical engineering, chemical engineering, thermodynamics; (2) by many years of progressively responsible experience in design, development, operation and testing programs of large, first-of-a-kind facilities; or by (3) a combination of items one and two.

##### Deputy Director

Qualification requirements include a broad knowledge of engineering, instruction, office contract administration which is evidenced by at least a B.S. degree in a scientific field and many years of responsible experience in project and contract administration.

##### Assistant Director

Qualification requirements include ten years of professional experience including five years in a technically-oriented field, two years of supervisory experience of groups of more than ten people, and one year of experience with total responsibility for the conduct of a specific operation or program. A minimum of a B.S. degree or equivalent in a scientific field is required.

##### Executive Assistant

The minimum qualification requirements are eight years experience in the supervision of technical activities, including three years experience in personnel acquisition and evaluation functions and office administration functions. He must be capable of working effectively and cooperatively

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with department heads within the Project, with other Project participants and with the public. The minimum educational requirement is a B.S. degree in a scientific field with experience in the design, maintenance or operation of electric generating stations.

#### Construction Division

##### Assistant Director for Construction

A minimum of fifteen (15) years of progressive experience and responsibility in the planning, management, and supervision of all phases of contract construction efforts is required with major emphasis on heavy construction and complex mechanical systems. He must have a thorough knowledge of contract administration particularly with respect to cost reimbursable contracts and must have a Bachelor's degree in engineering.

#### Engineering Division

##### Assistant Director for Engineering

The qualification requirements include a broad knowledge of engineering and construction, both nuclear and conventional, with particular emphasis on the various phases of design, procurement, fabrication, construction, testing and operation. He must have 10 years experience demonstrating progressively more responsible assignments in reactor design, research, development, tests and evaluations and in power plant design, construction, maintenance and operation. He must also have knowledge of the entire reactor development program, utility systems, and major problems besetting the adoption of reactor systems for the economic production of power. He must have the capability to effectively organize the efforts of several technical organizations to perform timely and responsible reviews, evaluations, and work, and maintain close liaison and communication with all participants. A minimum of a Bachelor of Science degree in a scientific field is required.

#### 45| Public Safety Division

##### Assistant Director for Public Safety

The qualification requirements include a broad knowledge of the LMFBR technology as it applies to safety, reliability, nuclear safeguards, and environmental concerns. A broad knowledge of licensing procedures for nuclear facilities is required with five years experience in supervision of a technical staff. A Bachelor of Science degree in an engineering or scientific field is required.

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Operations Division

Assistant Director for Operations

Minimum qualification requirements include eight years of practical training and experience in the operation and maintenance of a Steam Electrical Generation Plant, including a minimum of three years experience in a nuclear power plant. Familiarity with the CRBRP design and the theory upon which its operation is based is required. A Bachelor of Science degree in electrical, mechanical, or chemical engineering is desirable.

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## Quality Assurance Division

### Chief of Quality Assurance

Qualification requirements for the Chief of Quality Assurance is contained in Appendix A, Section 1.4.1 of Chapter 17.

## Procurement Division

### Assistant Director for Procurement

The qualification requirements include a broad knowledge of laws and regulations applicable to Government contracting, procurement, property management, and traffic management functions. He must have a minimum of five years experience in contract administration and negotiations involving supply, construction, engineering, and R&D contracts and a Bachelor's degree with emphasis in business related subjects such as economics, business administration, accounting, law, and public administration.

## Project Control Division

### Chief of Project Control

Minimum qualification requirements include ten (10) year experience in the installation, operation, and maintenance of management control systems for research and development projects or programs. This experience should cover cost and schedule controls of contractors; financial controls; contracts; analysis of reports; and interfaces with ERDA Headquarters. A Bachelor's degree in Business Administration or Engineering is required.

## Financial Management Division

### Chief, Financial Management

The qualification requirements include a knowledge of the theories underlying general accounting, industrial cost accounting, construction accounting, and government fiscal accounting sufficient to advise and assist contractors in the establishment and maintenance of accounting systems.

Knowledge of auditing principles and practices adequate to plan and direct a program of examinations of the financial transactions and business practices of contractors.

Knowledge of the principles, theories and techniques of budget administration and analysis required in budget preparation and review of actions proposed or taken in the day-to-day execution of the budget.

To meet these requirements, an individual would normally have a university degree (accounting major) and 15 years experience in government, industry and public accounting.



no change

#### 1.4.4.2 Westinghouse - ARD - LRM Organization

45 | There are no specific qualification requirements identified for the management positions in the Westinghouse - ARD Organization except as defined in Appendices D and H of Chapter 17. However, the capability of their personnel is demonstrated by the experience and qualifications summarized in the following paragraphs. 25

Over 400 ARD professionals are working directly on CRBRP. Approximately 100 of these are in management positions. 35

Essentially 100% of all professionals involved in the Project have Bachelor's degrees and approximately 40% have advanced degrees. The average professional has over seven years experience in LMFBR related work. Approximately 50% of the managers have advanced degrees and the average manager has approximately 12 years of experience in LMFBR related work.

The Bachelors and advanced degrees held by the professionals blanket the following fields:

- Chemistry
- Chemical Engineering
- Civil Engineering
- Electrical/Electronics Engineering
- Industrial/Manufacturing Engineering
- Mechanical Engineering
- Materials Engineering
- Nuclear Engineering
- Physics

ARD utilizes consultants and specialists from other Westinghouse divisions whose background and experience are required for independent design reviews, ASME code expertise, manufacturing engineering, metallurgical problems, stress/thermal/inelastic/structural analysis, and safety related activities.

#### 1.4.4.3 Rockwell International Corporation

52 | There are no specific qualification requirements identified for specific management positions at Atomics International (AI), a division of the Energy Systems Group of Rockwell International Corporation except as defined in Appendix J of Chapter 17. However, the capability of their personnel is demonstrated by the experience and qualifications summarized in the following paragraphs. 25

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There are nearly 30 managers and cognizant engineers assigned to the CRBRP program at AI. These people are supported in their activities by many disciplines and skills in other departments at ESG. However, as an indication, the following statistics are provided for these lead individuals.

The individuals have an average of nearly 17 years in the nuclear field; they have an average of over 13 years experience in liquid metal technology. All of the individuals have Bachelor's degrees, and over 50% have advanced degrees. The disciplines of degrees held include the following:

Mechanical Engineering  
Electrical Engineering  
Civil Engineering  
Chemical Engineering  
Chemistry  
Physics  
Radiological Physics  
Control Systems Engineering

25

#### 1.4.4.4 GENERAL ELECTRIC COMPANY

There are no specific qualification requirements identified for management positions at the Fast Breeder Reactor Department (FBRD) of the General Electric Company except as defined in Appendix I of Chapter 17. However, the capability of their personnel is demonstrated by the experience and qualifications summarized in the following paragraphs.

There are about 90 professional people assigned to the CRBRP program at GE and approximately 20 of them are in management positions. Essentially all of these individuals have Bachelor's degrees and about 50% hold advanced degrees. The degrees held by these professionals include the following disciplines:

Chemical Engineering  
Civil Engineering  
Electrical Engineering  
Mathematics  
Mechanical Engineering  
Nuclear Engineering  
Physics  
Structural Engineering

These individuals are supported in their activities by the many skills and disciplines available within FBRD. In addition specialists and consultants from other divisions of GE are utilized to support their project activities.

#### 1.4.4.4. General Electric Company (GE)

GE has no pre-determined sets of qualification requirements for management positions at its Advanced Reactor Systems Department (ARSD), with the exception of the managers within the Quality Assurance Section (ref. Ch. 17, App.I). Rather, an evaluation of the requirements is made when a position becomes open and the best qualified candidate is sought to fill it.

Nearly all of the management level personnel have at least Bachelor's degrees in disciplines appropriate to their areas of responsibility, and about half have advanced degrees.

For those situations where the technical expertise does not exist within the department or where an independent assessment may be desired, specialists and consultants from other divisions within GE are available to provide such assistance as may be required. Outside specialists and consultants are utilized under some circumstances, including personnel from other participants on CRP when appropriate.

no  
change

1.4.4.5 BURNS AND ROE, INC. - BREEDER REACTOR DIVISION

Specific qualification requirements at the Breeder Reactor Division of Burns and Roe, Inc. are described for key positions identified and described in Section 1.4.2.5.2.

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#### Breeder Reactor Division Vice President

A minimum of 15 years of progressive responsibilities in the management and supervision of all phases of engineering efforts is required, with primary emphasis in the nuclear field. He must have a working knowledge of the corporation's resources and also have a Bachelor's degree in Business and/or Science with additional education and/or training in nuclear technology.

#### CRBRP Project Manager

A minimum of 12 years of progressive responsibility for the management and supervision of technical efforts is essential, with primary emphasis on the development of nuclear power plants. He must have at least a Bachelor of Science degree and education and training in nuclear reactor technology with some training in Business Administration or Management preferred.

#### Assistant Project Managers

A minimum of 8 years experience in progressively responsible positions for the management and/or supervision of technical efforts primarily in nuclear power plant technology. They must have at least a Bachelors degree in Science or Engineering with some training in business administration or management.

#### Contract Supervisor

A minimum of 5 years of practical contract administration experience in the administration and negotiation of government and/or commercial contracts and possess a knowledge of federal procurement regulations and policies. He must have a minimum of a Bachelors degree in Business Administration or Engineering.

#### Licensing and Environmental Manager

A minimum of 5 years experience in supervision of nuclear power plant licensing and/or engineering is required. At least a Bachelor of Science degree with education and training in nuclear reactor technology is required.

#### Project Operations Manager

A minimum of 8 years of experience is required in the management of technical efforts with a detailed knowledge of project management techniques. He must have at least a Bachelor of Science degree with education in management principles.

#### Procurement Manager

A minimum of 8 years of practical procurement experience in the negotiations and administrations of government and/or commercial contracts and possesses a knowledge of federal procurement regulations and policies. He must have a minimum of a Bachelor degree in Business Administration.



no change

#### Quality Assurance Manager

The minimum requirements for the Quality Assurance Manager are shown in Section 17E 1.4.1.

#### Project Office Resident Manager

A minimum of 5 years of progressive responsibility for the management and supervision of technical efforts with primary emphasis in nuclear technology. He must have at least a Bachelor of Science degree or equivalent experience and education and training in nuclear reactor technology.

#### 1.4.4.6 Stone and Webster Engineering Corporation

Specific qualification requirements at Stone and Webster Engineering Corporation are identified for key positions identified and described in Section 1.4.2.5.6. For all the qualification requirements, in lieu of a degree, equivalent qualifications may be substituted based on other educational accomplishments, experience in related fields and technical achievements, such as holding a license as a Professional Engineer or Certification as a Quality or Reliability Engineer by the American Society for Quality Control.

#### CRBRP Senior Project Manager

A minimum of ten years of progressive responsibilities in the supervision and management of various phases of engineering, construction, and/or quality assurance efforts is required, with primary emphasis in the nuclear power plant field. He must have a working knowledge of the Corporation's resources and also have a Bachelor of Science or Arts degree with additional and/or training in power plant technology.

#### CRBRP Deputy Director of Construction

A minimum of ten years of progressive responsibilities in the supervision and management of heavy construction projects, with emphasis on the construction of power and/or process facilities. He must have a working knowledge of the Corporation's resources and also have a Bachelor of Science or Arts degree.

#### CRBRP Project Manager

A minimum of ten years of progressive responsibility in the management and supervision of technical efforts is essential, with emphasis in the nuclear power plant field. He must have a Bachelor of Science or Arts degree, with additional education and training in management and power plant technology.

Reviewed  
CIC  
OK

no change

CRBRP Project Quality Assurance Manager

A minimum of five years in responsible assignments in quality assurance and control, and/or construction of a power station is required. He must have a Bachelor of Science or Arts degree.

Senior Site Construction Representative

A minimum of five years in responsible assignments in field engineering and construction activities, with emphasis in the construction of power and/or process facilities. He must have a Bachelor of Science or Arts degree.

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Reviewed 5/12  
is OK

# CLINCH RIVER BREEDER REACTOR PLANT PROJECT OFFICE

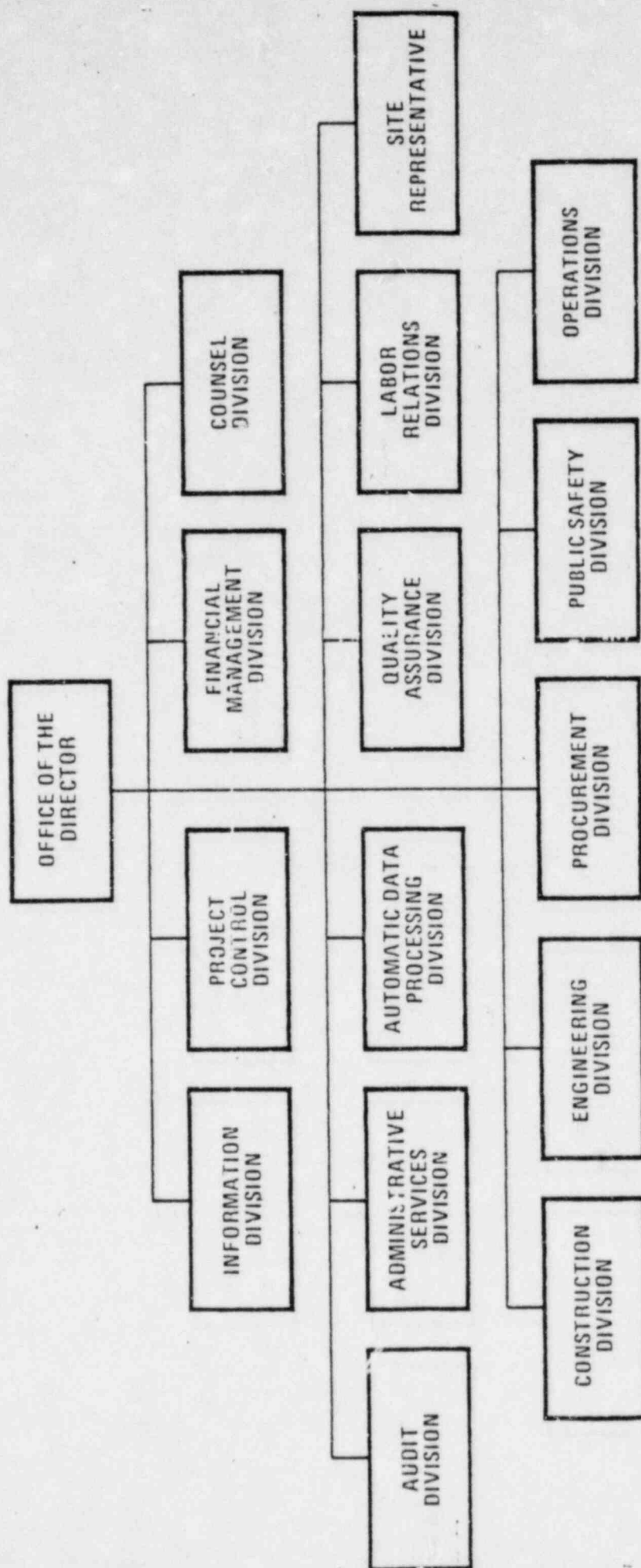
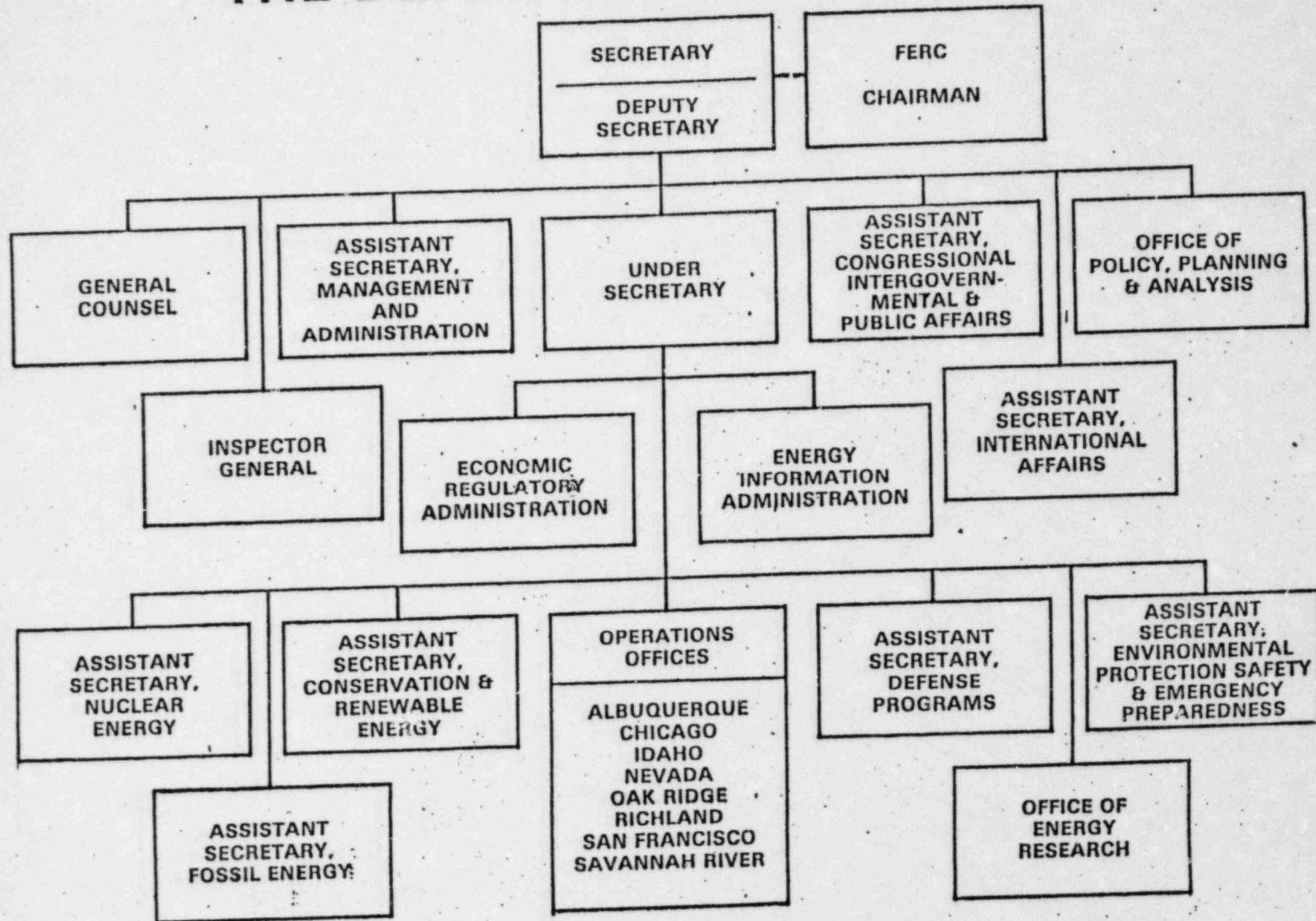


Figure 1.4-1 CRBRP Project Office Organization

377-P0921-7-2

Amend. 45  
July 1978

# THE DEPARTMENT OF ENERGY



# CRBRP PROJECT ORGANIZATION

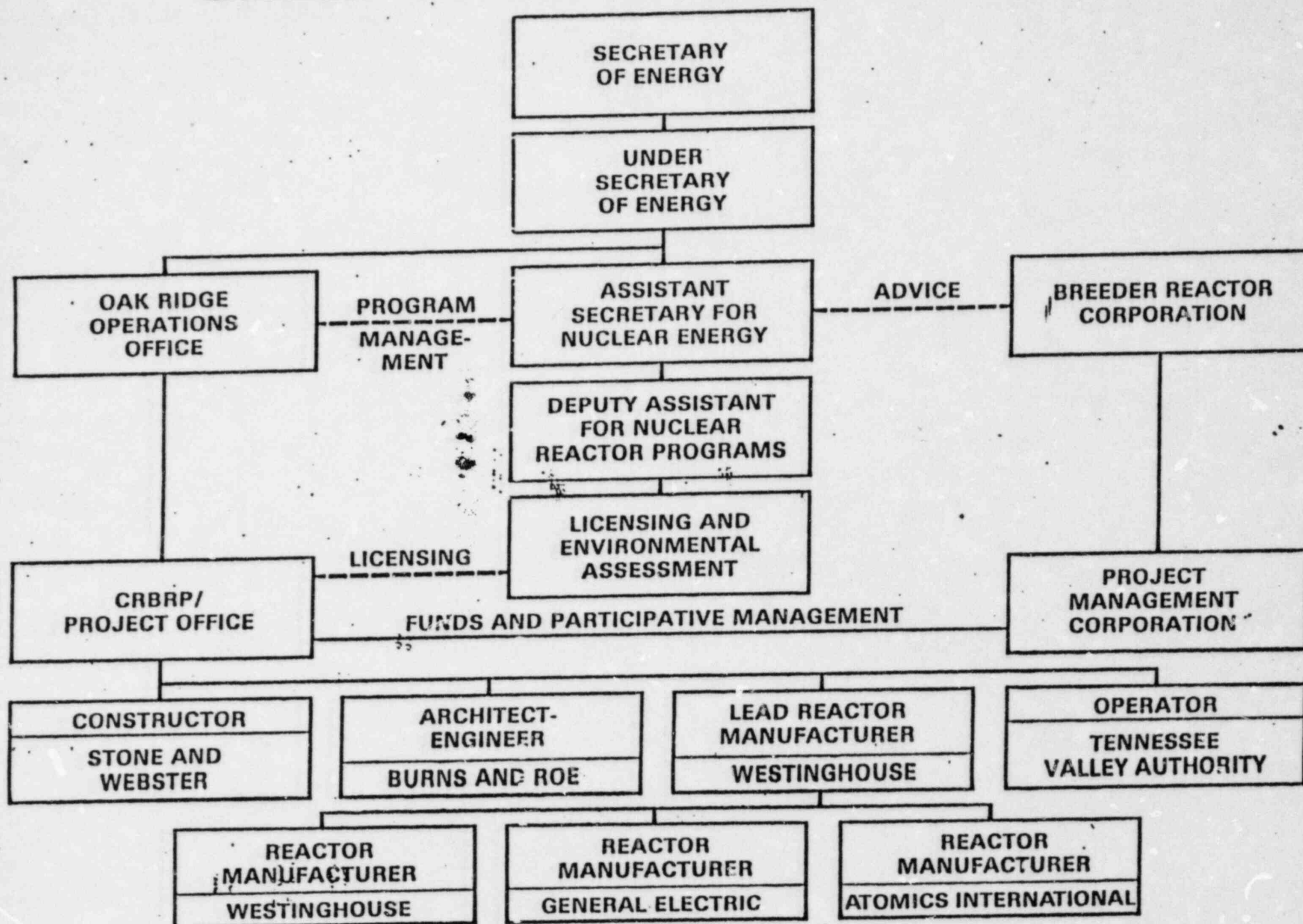
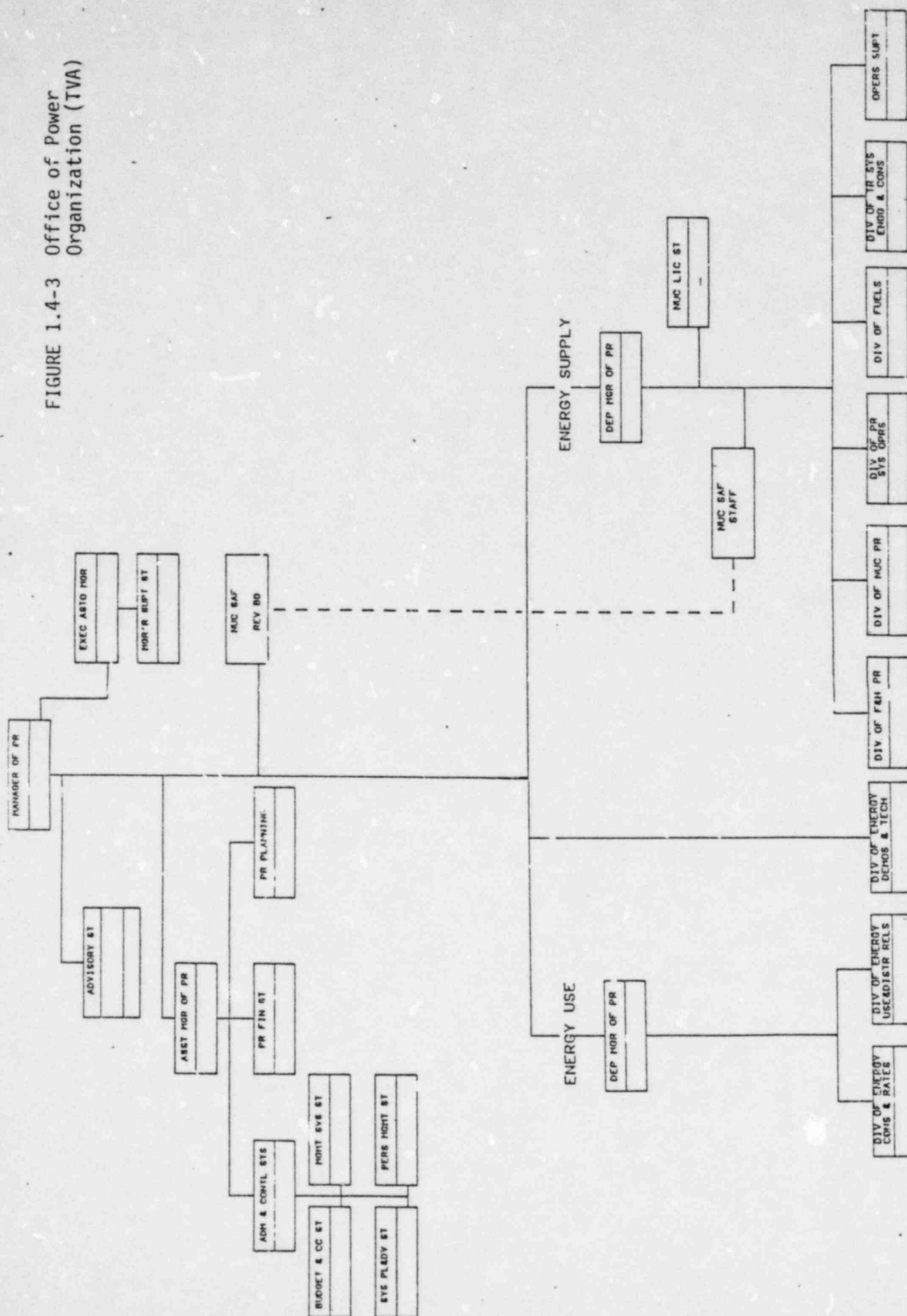


FIGURE 1.4-2A



FIGURE 1.4-3 Office of Power  
Organization (TVA)



BOARD OF DIRECTORS

OFFICE OF THE GENERAL MANAGER

OFC OF PLANNING AND BUDGET  
INFORMATION OFFICE  
NUCLEAR SAFETY REVIEW STAFF  
OFFICE OF QUALITY ASSURANCE

DIVISION OF FINANCE  
WASHINGTON OFFICE  
EQUAL OPPORTUNITY COMPLIANCE STAFF  
DISTRICT ADMINISTRATORS

OFC OF COAL GASIFICATION

OFC OF THE GENERAL COUNSEL

OFC OF AUDIT & EVALUATION

OFC OF PR

DIVISIONS  
ENERGY CONS & RATES  
ENERGY USE AND DISTR  
RELATIONS  
FUELS  
TRANS SYSTEM ENGG  
AND CONSTRUCTION  
POWER SYSTEM OPERS  
NUCLEAR POWER  
FOSSIL & HYDRO POWER  
ENERGY DEMS & TECH

OFC OF AGRIC & CHEM DEV

DIVISIONS  
AGRIC DEV  
CHEM DEV  
CHEM OPERS

OFC OF NATURAL RESOURCES

DIVISIONS  
LAND & FOREST RESOURCES  
WATER RESOURCES  
NATL RESOURCE OPERS  
LAND BETW THE LAKES

OFC OF MGMT SERVICES

LABOR RELS STAFF  
PUBLIC SAFETY SERVICE  
DIVISIONS  
PROPERTY & SERVICES  
PURCHASING  
PERSONNEL  
MANAGEMENT SYSTEMS  
MEDICAL SERVICES  
OCCUP HLTH & SAFETY

OFC OF ENGG DES & CONSTR

DIVISIONS  
ENGG DES  
CONSTR

OFC OF ECON & COMM DEV

DIVISIONS  
COMM DEVELOPMENT  
ECONOMIC DEVELOPMENT

SEPTEMBER 1982

Figure 1.4-4  
Tennessee Valley  
Authority

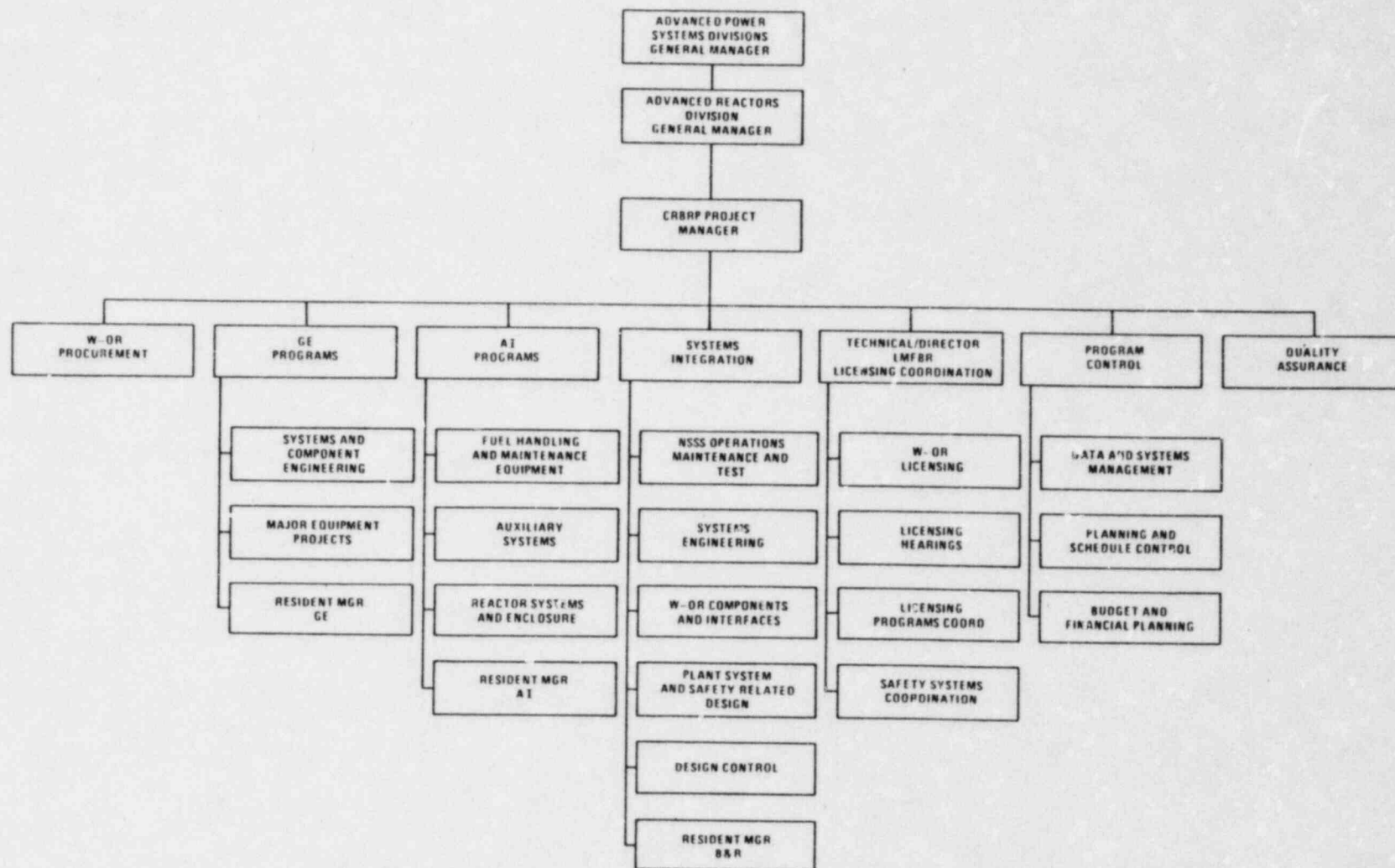


Figure 1.4-5. Westinghouse Electric Corporation - W-OR Organization

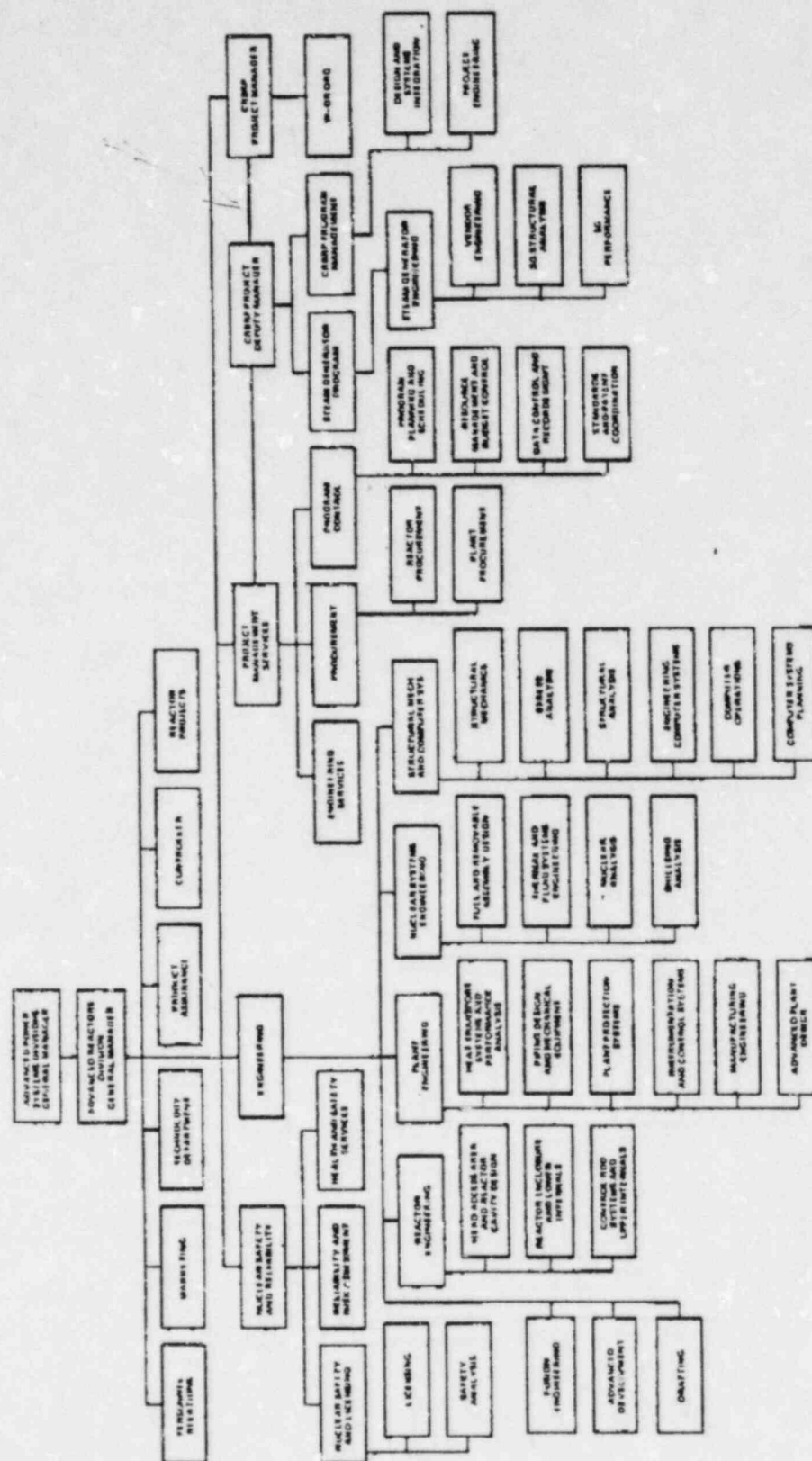


Figure 1.4-6. Westinghouse Electric Corporation - W - WM Organization

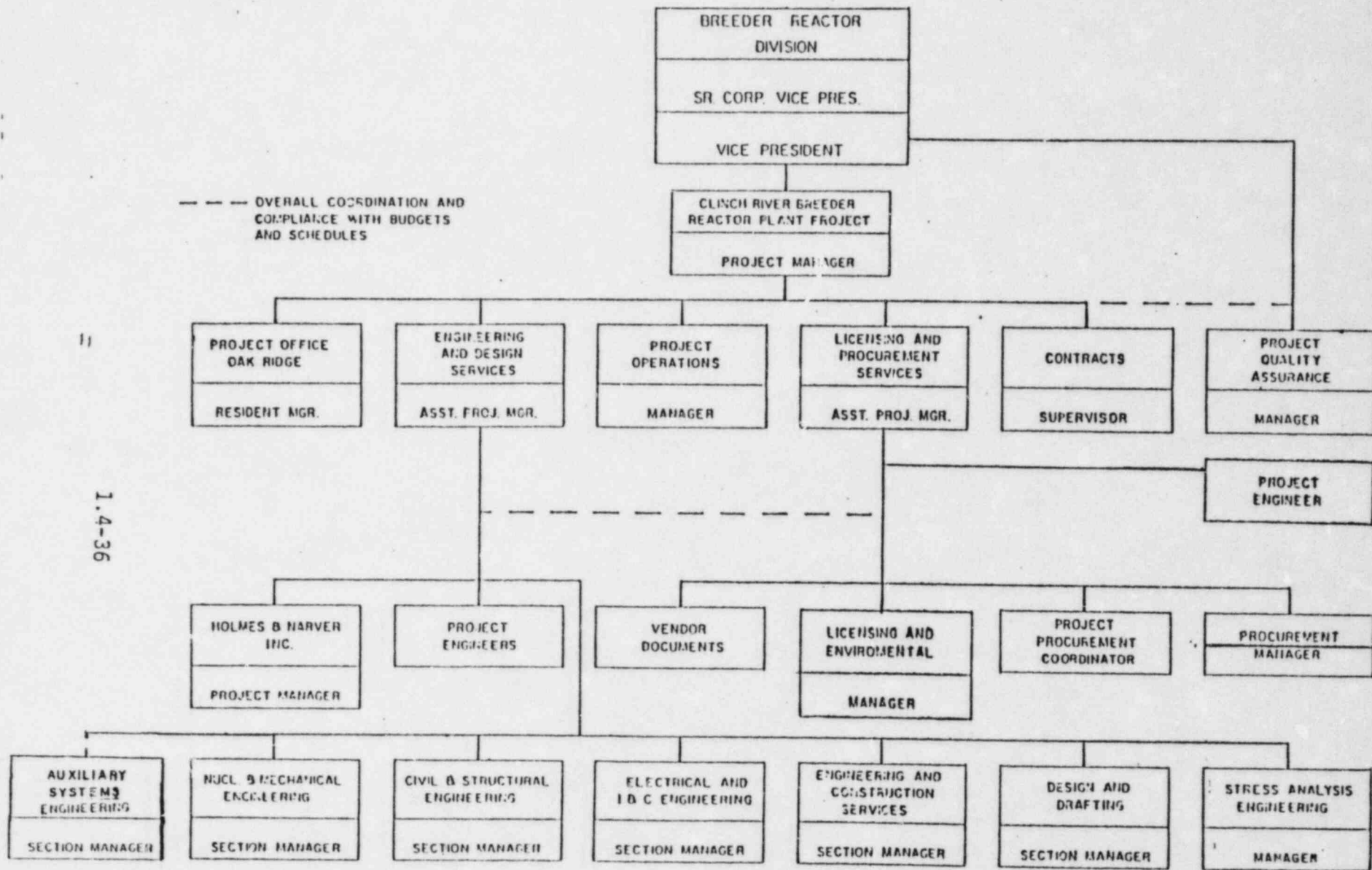


FIGURE 1.4-7 BURNS & ROE INC. CRBRP PROJECT ORGANIZATION CHART



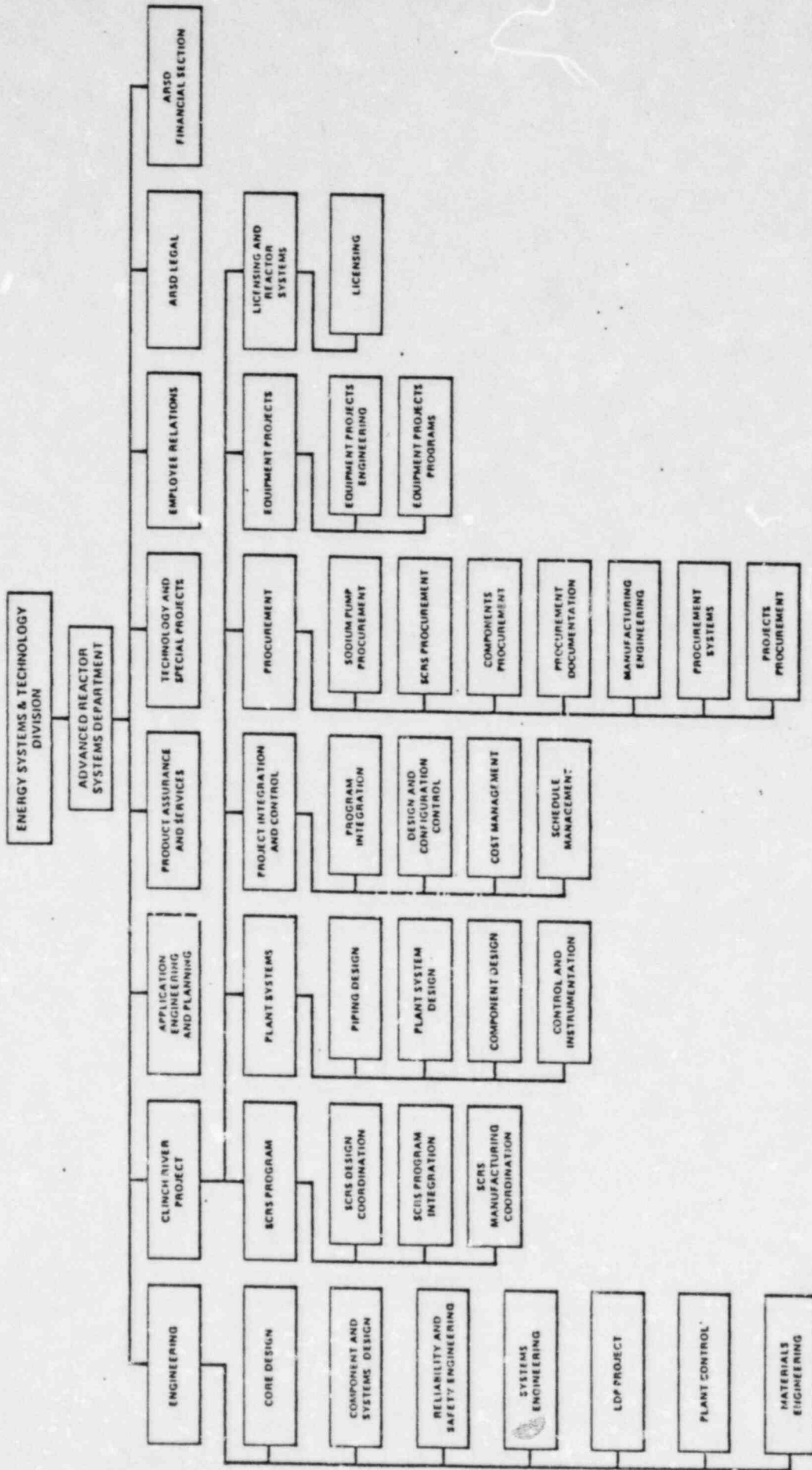


Figure L.4-8. General Electric Organization

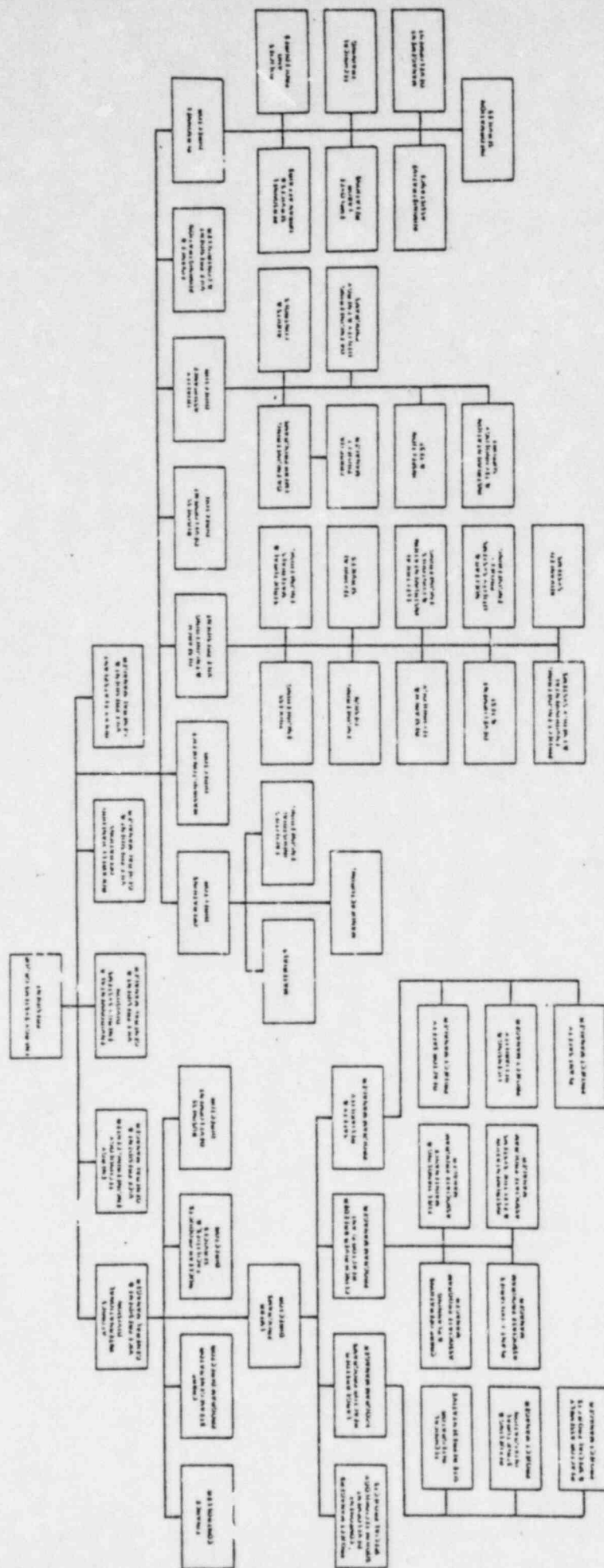
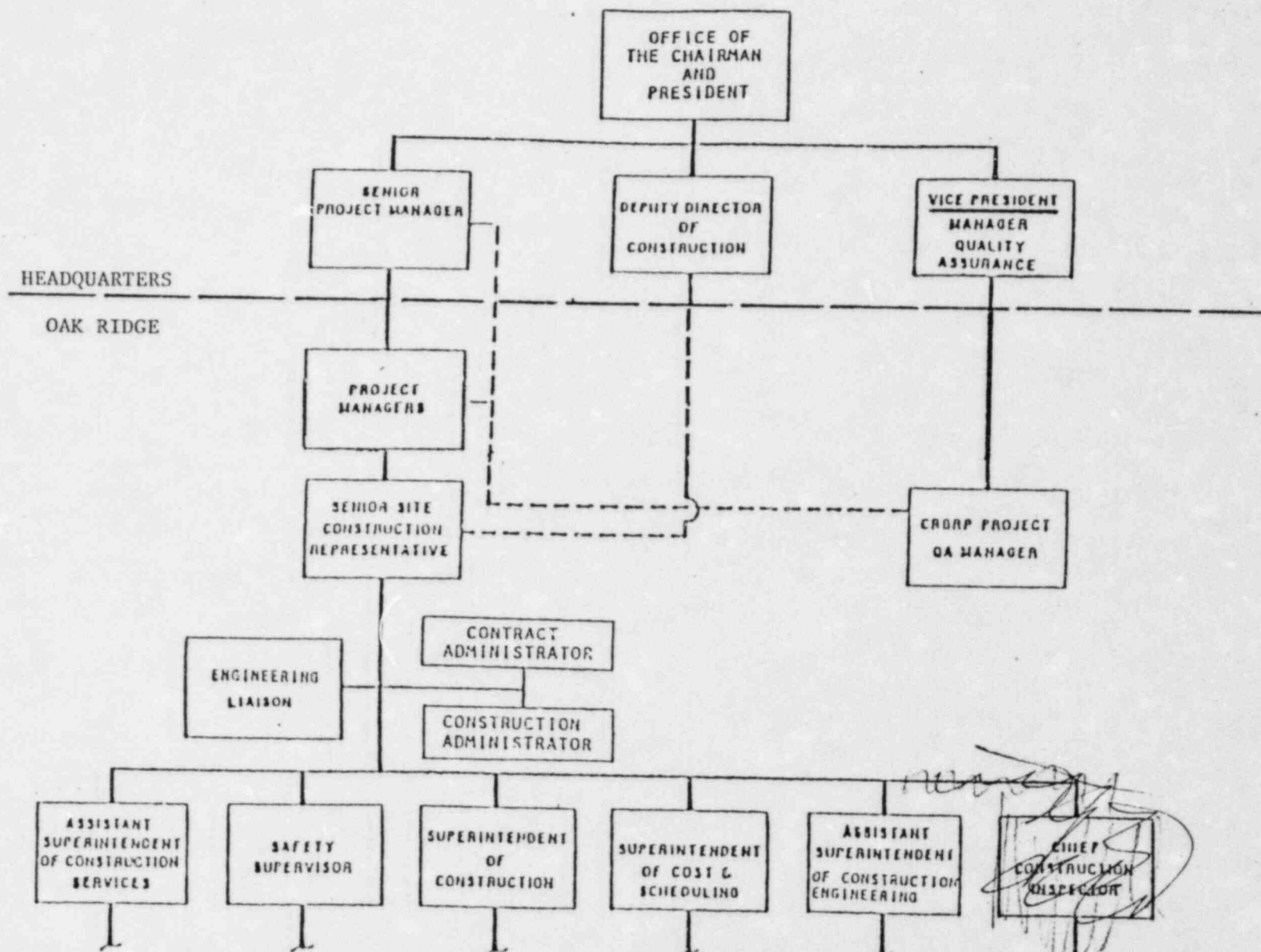


Figure 1.4-7 Rockwell International - Energy System Group

Figure 1.4-10 W-ESD

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# PROJECT ORGANIZATION

CLINCH RIVER BREEDER REACTOR PLANT  
STONE & WEBSTER ENGINEERING CORPORATION

Figure 1.4-11. Stone and Webster Engineering Corporation Organization