SAFETY EVALUATION REPORT

BY THE

DIVISION OF FUEL CYCLE AND MATERIAL SAFETY

RELATED TO THE

NRC MATERIALS LICENSE

FOR THE

BABCOCK & WILCOX COMPANY

LYNCHBURG RESEARCH CENTER

LYNCHBURG, VIRGINIA

DOCKET NO. 70-824

LICENSE NO. SNM-778

JULY 1, 1980

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I. INTRODUCTION

A. General

By letter dated December 21, 1978, the Babcock & Wilcox (B&W) Lynchburg Research Center (LRC) filed a renewal application of its Materials License No. SNM-778. Since that time, the license has remained in effect in accordance with the timely renewal provisions pursuant to Subsection 70.33(b) of 10 CFR Part 70. The LRC is engaged in research and development activities associated with the development of uranium and plutonium fuels, overall fuel cycles, and in the examination and testing of irradiated fuels.

B. Location Description

The LRC is located on the James River about four miles east of Lynchburg, Virginia. The site, which comprises 525 acres, is located in Campbell County. As shown in Figure 1, the site also contains the Commercial Nuclear Fuel Plant (CNFP) and the Naval Nuclear Fuel Division (NNFD), owned and operated by Babcock & Wilcox (a wholly owned subsidiary of J. Ray McDermott & Company) under separate NRC licenses. Only 13.6 acres of the 525 acre site are utilized by the LRC.

The licensed material is used in Buildings A, B, and C, in a radioactive waste storage building and at the liquid waste disposal facility (see Figure 2). In addition sealed and tracer quantities of radioactive materials may be used at temporary sites in any state except Agreement States.

C. License History

The first of the principal fuel handling buildings, Building A, was constructed in 1956 and licensed in August 1956 under license SNM-32. Subsequently, the Company expanded its nuclear research activities, constructed the Building B complex in 1963 and later constructed Building C. During this period a separate source material license, byproduct material license, and special nuclear material license were issued. On July 16, 1966, all the activities authorized by these licenses were combined into Materials License No. SNM-778 with an expiration date of September 30, 1969. Since that time the date to provide a consolidated application was extended several times until the current license was renewed on February 19, 1974, with an expiration date of January 31, 1979. Although somewhat limited in scope, it allows the applicant to make internally authorized changes within the framework of the specified license conditions for processes in facilities included in the demonstration section of the license. Ten amendments were issued during the period of this license. By letter dated December 21, 1978, a renewal application was filed. Since that time, the license has remained in effect in accordance with the timely renewal provisions pursuant to Subsection 70.33(b) of 10 CFR Part 70. Two additional amendments have been issued since the filing of the renewal application.

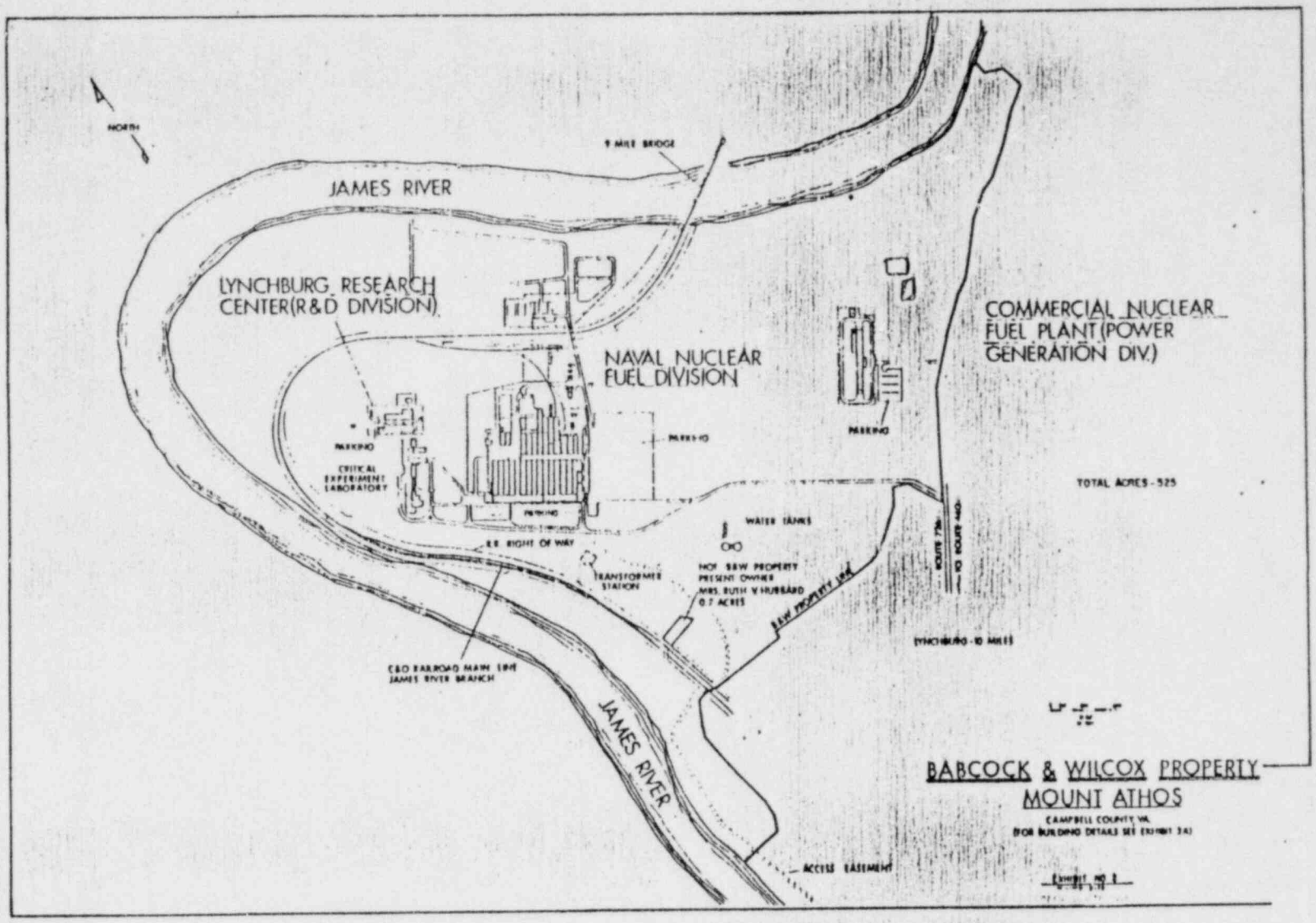

Figure 1. Site Layout

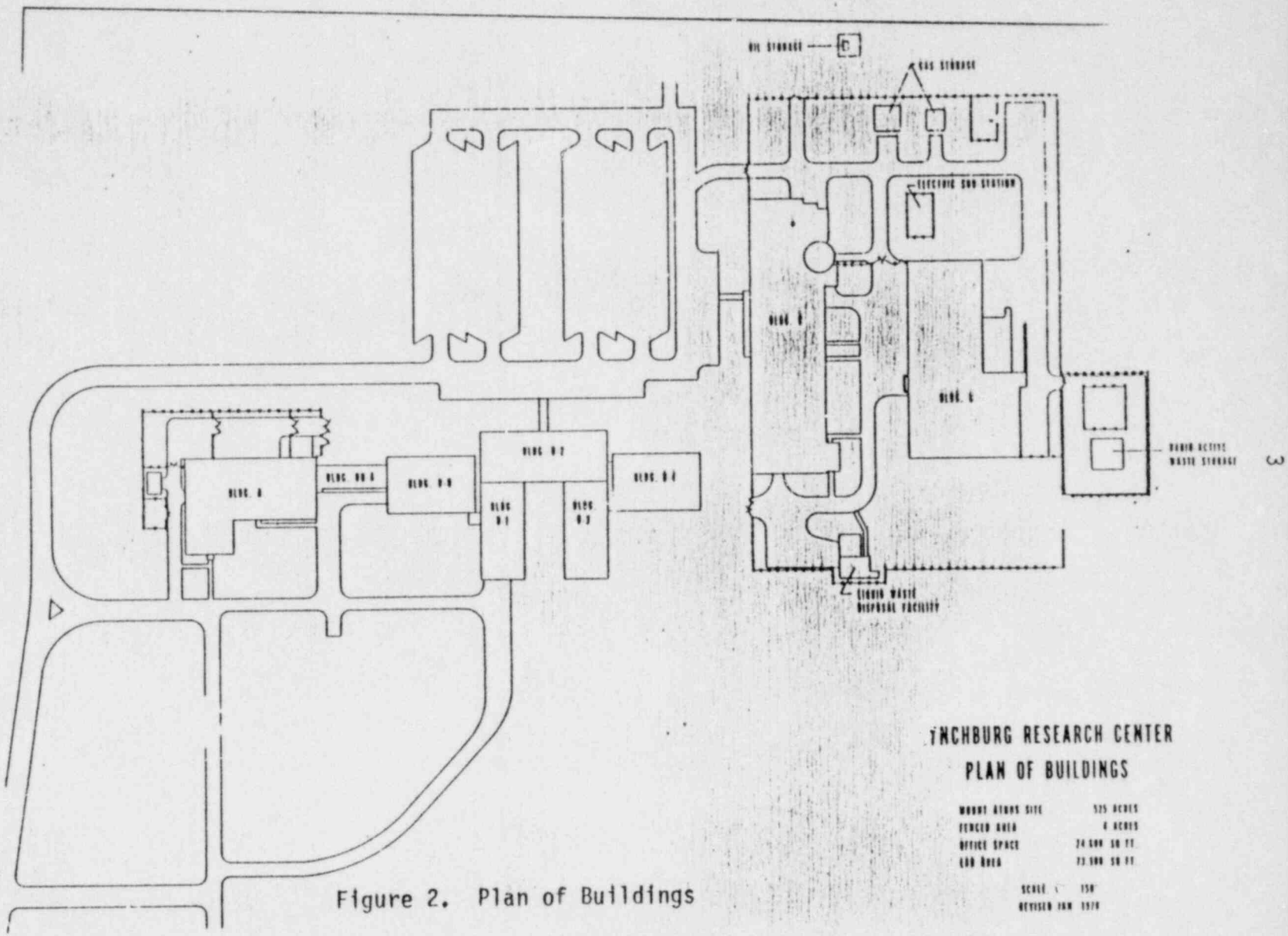

Figure 2. Plan of Buildings

II. AUTHORIZED ACTIVITIES

The renewed license will authorize the LRC to use byproduct, source and special nuclear material in the performance of research and development activities as defined in Sections 30.4(q) and in 70.4(j) of Title 10 of the Code of Federal Regulations, Parts 30 and 70.

The types of research and development activities performed are identified in demonstration sections of the license. They are associated with the development of uranium and plutonium fuel fabrication processes, investigation of improvements in present fuel cycle technology, and the examination and testing of irradiated and unirradiated fuels. The license condition section specified the specific research and development activities authorized with unirradiated plutonium and excludes any activities with uranium hexafluoride.

The facility also includes a Critical Experiment Facility and the Lynchburg Pool Reactor, both licensed under 10 CFR Part 50. Nonreactor related special nuclear material is handled in the same building under 10 CFR Part 70.

III. POSSESSION LIMITS

	Material	Form	Quantity
A.	Uranium enriched to or greater than 20. wt% in the ^{235}U isotope	Any	4.9 kilograms of ^{235}U
B.	Uranium enriched to less than 20. wt% in the ^{235}U isotope	Any	900 kilograms of ^{235}U
C.	^{233}U	Any	1 kilogram of ^{233}U
D.	Pu	Any	1.9 kilograms total Pu
E.	Source material (U & Th)	Any	6000 kilograms U & Th
F.	Byproduct, SNM & Source Material	Unseparated	Quantity contained in 40 irradiated LPR fuel elements
G.	Byproduct, SNM & Source Material	Unseparated	Quantity produced during irradiation of 250 kilograms of source material

	Material	Form	Quantity
H.	Fission products & trans-uranium elements	Neutron irradiated fuels	Quantity contained in 3 irradiated commercial fuel assemblies
I.	Fission products & trans-uranium elements	Neutron irradiated fuels	5,000,000 curies
J.	Any byproduct material	Neutron irradiated structural material & components	50,000 curies
K.	Any byproduct material with atomic numbers 3 through 83 inclusive	Any	3,000 curies; total not to exceed 1,000,000 curies
L.	Transuranium elements	Any	20 millicuries each
M.	Californium-252	Sealed sources	4 milligrams
N.	Americium-241	Sealed sources	30 curies
O.	Hydrogen-3	Sealed sources	100 curies
P.	Hydrogen-3	Ni alloy plated Sc tritide foil	3 curies
Q.	Hydrogen-3	Oxide	3 curies

IV. FACILITIES

The LRC licensed operations are conducted in Buildings A, B, C and J (the radioactive waste storage building) and at the Liquid Waste Disposal Facility.

Building A houses the Lynchburg Pool Reactor (LPR) and the Critical Experiment Facility (CX-10). Both are licensed pursuant to 10 CFR Part 50 and license SNM-778 does not provide for the possession and use of licensed material in either reactor. However, license SNM-778 does allow for the possession and use of licensed material in both areas outside the reactor. Building A is utilized for computer studies and development, instrument development and testing of ceramic linings in pressure vessels, in addition to reactor studies. Very little licensed material is currently utilized in this building outside the reactor areas.

Building B contains a four cell hot cell facility with its associated operations area, a cask handling area, a transfer canal and storage pool, and various laboratories associated with the examination of radioactive materials. It also houses a demineralizer for the cleanup of the pool water.

Building C contains the plutonium fuels development laboratory and the laboratories for the research and development of processes for other nuclear fuels.

Building J is the solid waste storage facility. It contains two shielded areas for the storage of intermediate and high level wastes. A temporary addition to Building J has been constructed for the storage of transuranium wastes until a licensed contractor is identified to receive the waste. The licensee was notified, in October 1979, that the disposal facility was no longer accepting transuranic wastes. Dry waste containing source and byproduct material is also stored in the fenced area adjacent to the building. The dry waste stored in the fenced area is in closed metal containers suitable for offsite shipment. There is no more than Type A quantities of licensed material in each container. High level solid waste is also stored underground in covered storage.

An underground tank farm adjoins Building B and provides intermediate holdup of the potentially contaminated liquid wastes emanating from the laboratory hoods, process areas, and the floor and sink drains of Buildings A, B, and C.

Building D is a complex of six buildings. It is not used for the handling of licensed materials.

V. LICENSE APPLICATION

A. Scope of Review

The safety review of the Lynchburg Research Center's (LRC) application included a review of the application dated December 21, 1978, and supplements submitted September 5, October 26, December 4, and December 20, 1979. Additional supplements were submitted on January 25, February 18, February 28, March 24, March 25 (2 supplements), April 8, May 9, May 20, May 30, and June 16, 1980. The safety review also included a review of the compliance history and a detailed review of the organization, administration, radiation protection and nuclear criticality safety programs.

The review of the December 21, 1978, application resulted in extensive revisions to the application. These revisions were submitted to the NRC on September 5, 1979.

Additional revisions to the application were required as a result of the review of the modified application. These revisions were submitted on October 26, 1979, December 4, 1979 and December 20, 1979. Additional supplements were submitted on January 25, February 18, February 28, March 24, March 25 (2 supplements), April 8, May 9, May 20, May 30, and June 16, 1980.

Meetings were held with LRC personnel during the review period to discuss various aspects of the review work. A site visit was made by N. Ketzlach and A. L. Soong (June 11-13, 1979) and a member of the Region II IE staff to discuss NRC outstanding questions on the renewal application. Region II

comments were discussed with the IE staff member prior to, during, and after the site visit.

A familiarization tour of the facility was made with the Region II IE inspector during the period. D. Notley, NRC Fire Protection Engineer, made a site visit on July 23, 1979, to discuss the outstanding fire safety questions resulting from the application review. The LRC License Administrator met with NRC staff members on September 26, 1979, to discuss questions still outstanding after review of the LRC submittal of September 5, 1979.

The application, as it now exists in amended form and coupled with license conditions developed by the staff, is an adequate basis for licensing action.

B. Compliance History

The licensee's compliance history was reviewed using reports of inspections made by Region II Office of Inspection and Enforcement personnel. The period examined was February 15, 1974 through June 1979. In this period, 25 safety inspections were made resulting in 15 items of non-compliance. These items can be generally categorized as failure to follow established procedures and inadequate record keeping. During the period reviewed, no violations (the most severe items of non-compliance) were found. None of the infractions or deficiencies identified in the period examined reflected basic weaknesses in the program or resulted in measurable adverse effects to the health of the employees, or to the health and safety of the public.

The LRC has been responsive to the IE reports and has taken appropriate action, satisfactory to IE, to resolve the safety problems identified during the inspections, and to limit the potential for overexposure of personnel.

C. Current Application

In their application, the LRC has demonstrated that it has the necessary technical staff with the proper qualifications to administer effective and safe nuclear criticality and radiation safety programs. The following sections contain a description of the principal aspects of the LRC organization, administrative procedures and nuclear and radiation safety programs, as proposed by the LRC, and the additional license conditions developed by the staff of the Uranium Fuel Licensing Branch (FCUF), Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards (NMSS).

VI. ORGANIZATION AND ADMINISTRATIVE PROCEDURES

A. Organization and Responsibilities

The Director of the Lynchburg Research Center is responsible for all LRC operations. The LRC line organization is shown in Figure 3. Two laboratory managers report to the Director. The laboratory managers are responsible for operations that fall within the areas of expertise encompassed by the sections under their control. Section managers report to the laboratory managers and are responsible for the safe performance of projects under their control.

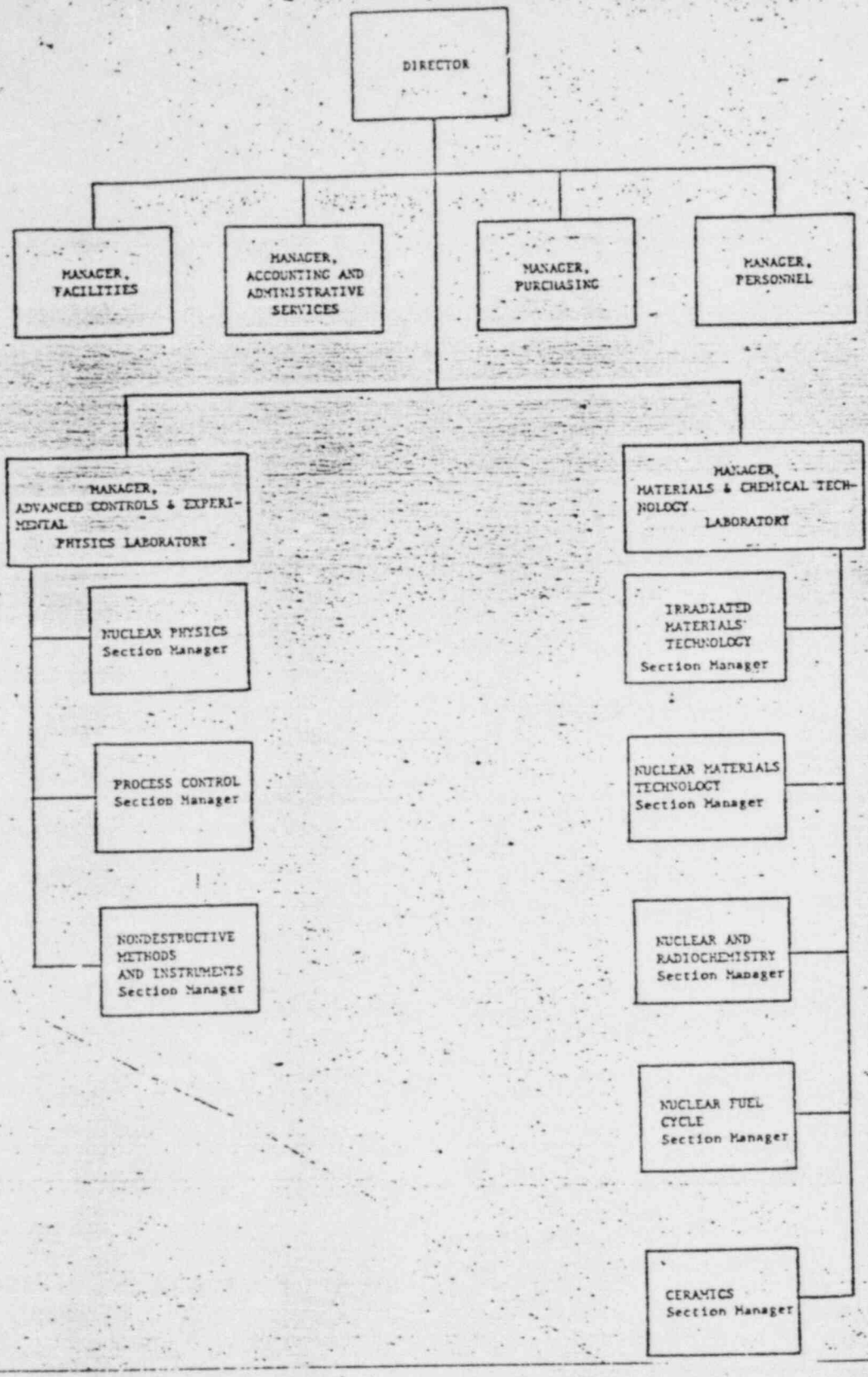

Figure 3. LRC Line Organization

Since research and development performed at the LRC may result in projects being performed by sections of different laboratories in the same building, the Director has established the position of Facility Supervisor. The latter reports to the Director (see Figure 4) and advises the laboratory and section managers in the safety aspects and control of licensed material, and coordinates the safety program within his assigned building. Figure 4, the facility organization, also shows the independence of the safety and licensing functions of the laboratory managers who are responsible for all research and development activities associated with licensed material.

Supervisor, Health and Safety

The Supervisor, Health and Safety, reports to the Manager, Facilities, and has direct access to the LRC Director in health and safety concerns. The Supervisor, Health and Safety, is responsible for health physics and industrial safety activities. His unit is responsible for performing monitoring and surveillance, approving area operating procedures, conducting radiation safety training, and evaluating routine data and unusual occurrences as necessary to (1) assure safe and healthful working conditions and (2) maintain radiation exposures to workers and maintain releases of radioactivity in effluents to as low as reasonably achievable (ALARA). He performs radiation safety audits to assure compliance with regulatory agency licenses and permits in the areas of health, safety and environmental protection.

Industrial Safety Officer

The Industrial Safety Officer reports to the Supervisor, Health and Safety, and is responsible for administering the industrial safety program. This includes both the Occupational Safety and Health Administration (OSHA) and the fire safety requirements.

Nuclear Safety Officer

The Nuclear Safety Officer reports directly to the Director of the LRC. He assures the application of approved nuclear criticality safety principles as necessary to protect the health and safety of employees and the proximate general public environs from potential hazards arising from an accidental criticality at the facilities. He reviews and approves area operating procedures, conducts inspections and audits of all operations where special nuclear materials are being stored and processed, and is responsible for training in nuclear safety.

Safety Review Committee

The Safety Review Committee reports to the Director of LRC. This committee is composed of senior technical personnel from within and outside the LRC. It assures management attention is devoted to the health and safety of the employees and the public and that adequate environmental protection is provided. It reviews and approves all area operating procedures for radiological, nuclear criticality and industrial safety. They also perform audits of LRC operations at least three times a year to assure compliance with safety

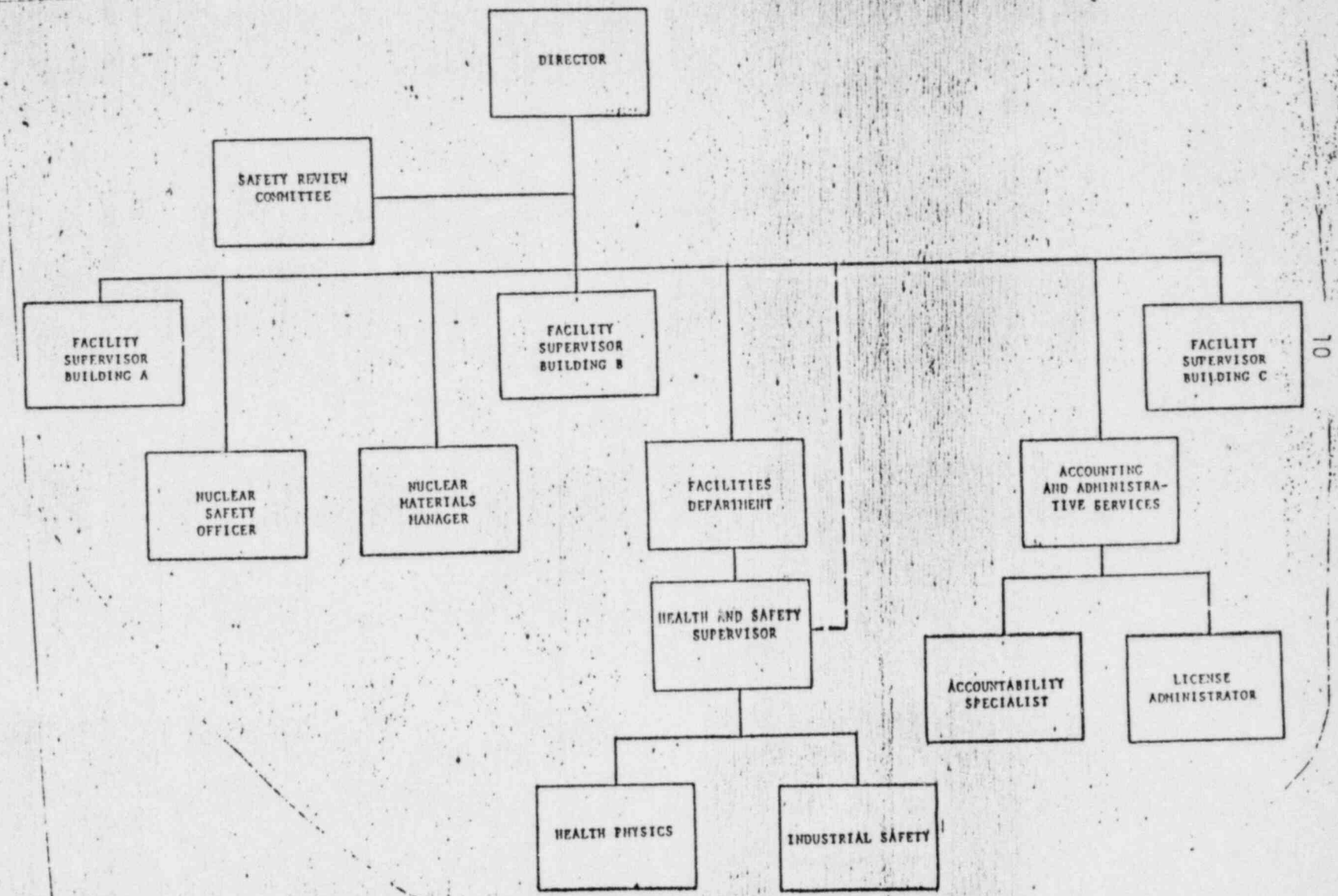

Figure 4. LRC Facility Organization

requirements. The FCUF staff has added a license condition to clarify the requirement that all appointments made by the LRC Director to the Safety Review Committee and its activities be in writing.

License Administrator

The License Administrator reports to the Manager, Accounting and Administrative Services. He prepares license and permit applications and amendment requests for submittal to, and approval by regulatory agencies. He is the coordinator of the Safety Review Committee and Audit Subcommittee and represents management on both.

B. Minimum Technical Qualifications

Minimum technical qualifications have been established for the safety related staff positions. They are:

Section Manager

Bachelor of Science degree and three (3) years' post graduate work or equivalent training in the pertinent technical field. Those involved in handling licensed material have demonstrated knowledge in the application of radiation and nuclear criticality safety criteria to the associated research activities.

Facility Supervisor

Bachelor's degree in his related work or five (5) years' additional experience in the use and handling of licensed material and demonstrates to Company management proficiency in the application of good principles of radiation protection, industrial safety, and nuclear safety as related to the activities expected in his area of responsibility.

Health and Safety Supervisor

Bachelor of Science degree in a technical field; five (5) years' experience and demonstrated proficiency in the application of radiation safety principles; knowledgeable in fields related to radiation protection; and professional experience in assignments involving radiation protection at a supervisory level.

Nuclear Safety Officer and Second Party Reviewer

Bachelor of Science degree in science or engineering; and two (2) years' experience with nuclear criticality safety calculations similar to those associated with LRC activities or one (1) year experience with nuclear criticality safety calculations similar to those associated with LRC activities provided he has at least an additional two (2) years' experience in nuclear reactor physics calculations.

License Administrator

Bachelor of Science degree in science or engineering and three (3) years' experience in nuclear technology; or an Associate Degree in Science or nuclear technology and twelve (12) years' experience in nuclear technology.

Health Physics Engineer

Bachelor of Science degree which shall include at least 20 quarter-hours of health physics related course work or its equivalent in work experience.

Industrial Safety Officer

One (1) year's experience in radiation and industrial safety and be familiar with the codes and requirements of the Occupational Health and Safety Act and the National Fire Protection Association

C. Administrative Procedures

The LRC has developed an internal review system which ensures that activities at the site are conducted in a safe manner. The responsibilities for and organization of the system are summarized above under Section VI.A.

The LRC management has committed to assure that procedures important to plant operations are properly prepared and reviewed, are kept current and are followed by operating personnel.

The following procedures have been developed for initiation and review of a proposed addition or change to an area operating procedure:

1. Proposal. Project personnel submit the proposed procedure to the responsible facility supervisor.

2. Review. The facility supervisor forwards the submittal to the Supervisor, Health and Safety, and to the Nuclear Safety Officer for review and approval. He also submits it to the Industrial Safety Officer for review. The reviewers are independent of the operation under review. The Supervisor, Health and Safety, performs the radiation safety review; the Industrial Safety Officer, the industrial safety and fire protection review; and the Nuclear Safety Officer, the nuclear criticality safety review. The nuclear safety evaluations and calculations made by the Nuclear Safety Officer undergo an independent second party review by a qualified person. After review by the Industrial Safety Officer and review and approval by the Supervisor, Health and Safety, and by the Nuclear Safety Officer, it is reviewed by the Facility Supervisor (taking into account the recommendations of the Industrial Safety Officer) and approved by him.

A Radiation Work Permit (RWP) is required for any operation involving licensed material not covered by a written procedure. The RWPs are reviewed and updated quarterly.

3. Management Review. All operating procedures that have an effect on the use or handling of licensed material are approved by the Safety Review Committee.

4. Documentation. All reviews and approvals are documented. New and revised approved procedures are distributed in accordance with a document control system which assures that the manuals contain only the most currently approved procedures. They are reviewed annually to ensure that procedures are up to date and applicable. Area operating procedures are available in each operations area.

D. Audits and Inspections

A system of audits and inspections has been established by the LRC to help ensure that plant operations are conducted in accordance with regulations, established policies and written procedures. The nuclear criticality safety and radiation safety audits are performed by the Nuclear Safety Officer and the Health and Safety supervisor, respectively, on a monthly basis. The Safety Audit Subcommittee of the Safety Review Committee conducts audits three times a year. The FCUF staff has added a license condition to assure the audits per year by the Safety Audit Subcommittee be approximately equally spaced throughout the year. The use of personnel and organizations separate from the production organization and who do not have direct responsibility for the areas being audited helps ensure that audits are unbiased. Audits will be performed in accordance with a written review and audit plan and will be documented. These audits are frequently supplemented by routine inspections made by the Health Physics Engineer, the Industrial Safety Officer and the section managers. The auditing program is generally at least equivalent and in some specific areas (e.g., frequency of audits by the safety review committee) superior to that in operations at comparable research and development facilities. As in other licensed facilities, the program includes continuous daily informal auditing and more formal audits at monthly and three-times-a-year intervals, with written reporting to higher management levels and required follow-up of audit findings.

E. Personnel Training

New employees receive instruction by qualified experts on basic characteristics of radiation, radiation protection procedures, nuclear criticality safety, and emergency procedures. All employees also receive on-the-job training. The degree of training given depends on the extent of the employee's contact with hazardous materials.

The radiation safety training program is administered by the Supervisor, Health and Safety; the nuclear criticality safety program, by the Nuclear Safety Officer and the emergency plan training program, by the emergency officer. Records of training are maintained by those responsible for the identified program. Retraining in radiation and in nuclear criticality safety is performed annually. Retraining associated with the emergency plans varies from quarterly for the fire and rescue team to once in three years (American Red Cross Standard First Aid and Personal Safety Course) for onsite medical

support personnel, with members of the Emergency Control Organization being retrained annually. Records of the training sessions are documented. The effectiveness of the radiation and nuclear criticality safety training programs are evaluated by written examination and documented.

The FCUF staff has added a license condition to clarify the minimum qualifications of the designee who may perform the nuclear safety training in place of the Nuclear Safety Officer.

F. Records

In the conditions section of the license application, the licensee has committed to the maintenance of records of various required actions such as the records of criticality analyses, internal audits, ALARA findings, employee training, routine surveys, and instrument calibration.

VII. NUCLEAR CRITICALITY SAFETY

Introduction

The nuclear criticality control system at the LRC is based on:

1. Technical criteria using established policies, analytical methods, data, and safety margins.

2. Qualified nuclear criticality safety staff with specified responsibility and authority. The FCUF staff has added a license condition to clarify the minimum qualifications of personnel making the nuclear safety evaluations and the personnel making the independent reviews.

3. Administrative requirements for written operating procedures, review of nuclear safety analyses, audits of operations, posting of limits and training.

Technical Criteria

The technical criteria that the LRC uses to establish the nuclear criticality safety of a proposed, revised or new operation were provided in detail. The important criteria are as follows:

1. The basic policy is the double contingency policy, "Process designs should incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible." This policy accords with accepted practice throughout the U.S. nuclear industry and is endorsed by Regulatory Guide 3.4, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors."

2. Where geometry of the container is not controlling, double batching is always considered possible. The mass limit is no more than 0.45 of the minimum critical mass. Mass limits are tabulated in the license cordition section of the renewal application as a function of ^{235}U enrichment for uranium enriched fuels, for ^{233}U fuels, for mixtures of the two isotopes of

uranium with each other and with plutonium, and for plutonium in the absence of the other two isotopes. Mass limits have been based on data and calculations reported in the "Nuclear Safety Guide," TID-7016 (Rev 1), DP-1014, as well as on validated calculations by B&W using computer codes such as the Monte Carlo Keno Code.

3. Safe geometry limits are applied only to LWR fuel rods and the effective multiplication constant for water moderated and reflected assemblies is less than 0.95. The cross sectional area of an assembly of rods is no greater than that for a single LWR fuel assembly. In slab geometry, the maximum safe slab thickness is no more than 88% of the minimum critical. These margins and those given in Paragraph 2 above are comparable to those used in the Nuclear Safety Guide, TID-7016 (Rev. 1), and widely used throughout the nuclear industry.

4. The optimum (limiting case) conditions of water moderation credible for the system are assumed in setting limits.

5. Unit and geometry limits are all based on full water reflection.

6. The licensee spaces the process equipment and stored units to meet the following general criteria:

   a. The closest approach of one individually subcritical unit to another is limited by mechanical means or clearly delineated criticality zones.

   b. Each individually subcritical unit stored under water is isolated from the adjacent units by at least 12 inches of water.

   c. Minimum spacing between units and maximum number of units in storage spaces and between work stations are specified in the license conditions section.

   d. The FCUF staff has added a license condition to clarify the spacing requirements for irradiated fuel rods.

7. The licensee spaces the process equipment and stored units to meet the following conditions:

   a. The minimum edge-to-edge spacing between mass limiting units is 8 inches; the center-to-center spacing, 24 inches.

   b. The maximum system k_{eff} is 0.95 at the 95% confidence level.

Organization and Administrative Requirements

In addition to the requirements for qualified staff and established technical criteria, the LRC criticality safety requirements involve several administrative requirements:

1. The Nuclear Safety Officer reports directly to the Director of the LRC for his functions as Nuclear Safety Officer.

2. The Nuclear Safety Officer reviews and approves all area operating procedures for the safe handling of licensed material.

3. Periodic audits are performed to assure compliance with safety requirements.

   a. Monthly by the Nuclear Safety Officer

   b. Three times a year by the Safety Audit Subcommittee of the Safety Review Committee

4. Requirements for the posting of nuclear criticality safety limits.

5. Requirements for the training and retraining of operations personnel (see Section VI for additional details).

6. Maximum safe authorized fuel handling and storage limits and minimum spacing between units are license conditions.

Conclusions

The nuclear criticality safety review and our conclusion that the controls are acceptable are based on the following:

1. The license conditions section, as revised, improves clarity, corrects discrepancies, corrects the application of storage criteria for less than or equal to 4% enriched uranium, and ensures continued compliance with accepted practice. The basic policy underlying these conditions is in accordance with Regulatory Guide 3.4, "Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors."

2. The required record keeping system provides the necessary documentation that improves internal controls and provides review information to the IE personnel within NRC to corroborate licensee compliance.

3. The conformance of the technical criteria for nuclear criticality safety with established U.S. practice.

4. The validity of the nuclear criticality safety analysis made under the license, including the demonstration sections.

5. The history of safe plant operation with respect to nuclear criticality safety since the original license was issued.

VIII. RADIATION SAFETY

A. Radiation Safety Administration

The Supervisor, Health and Safety, reports to the Manager, Facilities, and is responsible for establishing and maintaining a radiation and industrial safety program to ensure the protection of plant employees and the public, and for auditing plant operations for compliance with the license and with radiological regulations. He has direct access to the Director of the Lynchburg Research Center (See Figure 4). His reporting position gives him the authority needed to discharge his duties and he is authorized to suspend any operation which he believes threatens the health and safety of the employees or the public. Also, the Supervisor, Health and Safety, must approve in writing all changes in area operating procedures. This approval procedure ensures proper health and safety review of all standard requirements affecting radiological safety.

In detail, the responsibilities of the radiation health and safety component include:

1. review and approval of health physics aspects of changes to operating procedures associated with the processing, handling or storage of SNM,

2. approval of Radiation Work Permits,

3. routine surveillance of operations, and

4. conducting training courses in health physics.

Overall objectives of the program are to ensure adequate containment of radioactive material and to reduce the levels of radiation exposure to the plant employees and the public to meet the ALARA goal.

The positions of Facility Supervisor, Supervisor of Health and Safety, and Health Physics Engineer are filled by individuals who must meet the minimum qualifications stated in Part VI of this report. These minimum technical qualifications assure that these individuals have an academic background, or equivalent, complete with special training in health physics and professional experience.

Two special features of radiation safety administration, radiation work permits and the ALARA Committee are described in detail below:

Radiation Work Permit (RWP)

For any operation or maintenance work involving work or entry into a system containing SNM, not already covered by an effective operating procedure or where there is a potential for release of contamination such that the airborne radioactivity concentration to which employees are exposed from the proposed operation is likely to exceed the limits specified in Appendix B, Table 1, of 10 CFR Part 20, or the potential external radiation exposure to which

employees are exposed is likely to exceed 100 mr in one work week, an RWP will be prepared and approved by a representative of Health and Safety and line supervision.

ALARA

The Safety Review Committee (SRC) serves as the Lynchburg Research Center ALARA (As Low As Reasonably Achievable) Committee, and is responsible for assuring implementation of the ALARA regulatory requirement pertaining to radiation workers. The Committee is specifically responsible for conducting periodic reviews and assessments of occupational radiation exposure (internal and external), radioactive material releases to unrestricted areas, and any related abnormal occurrences. The Committee meets four times each year and the findings and recommendations of the SRC on how to achieve the ALARA goal are reported directly to the Director of the LRC annually.

The activities of the ALARA Committee, the plant inspections for radiation protection, nuclear criticality safety, the employee training program, and the administrative procedures for review of pertinent changes by the health and safety organization demonstrate LRC's management commitment to comply with the ALARA concept.

B. Systems of Exposure Controls and Exposure Levels Experienced

External Exposure

External exposure in the LRC is evaluated and controlled on the basis of the data from film badges or TLDs which must be used as required by 10 CFR 20.202 (a) (i), as well as by beta-gamma dose rate surveys. The dosimeters are read and evaluated by Health and Safety on a monthly basis. Exposure trends are analyzed at least annually by the Supervisor of Health and Safety and the ALARA Committee to ensure that ALARA goals are being met. An administrative action level for occupational exposure of 300 mrem in a week is established by the LRC.

The external exposure data submitted by the LRC for the period from 1977 through 1978, as indicated by Table 1, show that average quarterly personnel external exposures are typically less than 28% of the allowable exposure, and no exposure is near the limit of 1.25 rem per quarter specified in 10 CFR 20.101.

Internal Exposure

Introduction

Radioactive material may enter the body by breathing contaminated air or by ingestion as a consequence of poor hygiene and failure to self monitor. Once in the body, the subsequent distribution and excretion of the radioactive material is a function of physical and chemical characteristics of the specific material. In the LRC plant, protection of the operating personnel from excessive internal exposure is provided by the use of:

Table 1

External Radiation Exposure Summary
B&W Lynchburg Research Center
Expressed As Percent of Limit (limit = 1.25 rem/Qtr)

Area	1977				1978			
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Hot Cell	24	16	20	20	40	28	24	17
Rad. Chem. Lab	<8	<8	<8	<8	<8	<8	<8	20
Health Physics	<8	<8	<8	<8	12	12	<8	<8
Plant Engineering	<8	<8	<8	<8	10	12	<8	<8
Reactor and Crit. Exp. Operation	<8	<8	<8	<8	<8	10	<8	<8
Irradiated Material Technology,	<8	<8	<8	<8	<8	<8	<8	<8
Nuclear Material Technology,	<8	<8	<8	<8	<8	<8	<8	<8
Nuclear Fuel Cycle (Alpha glove box)	<8	<8	<8	<8	<8	<8	<8	<8

1. A ventilation system designed to limit the concentration of radioactive materials in breathing air in plant working areas.

2. An air sampling and analysis program for monitoring the concentration of radioactivity in working areas to detect the presence of unsafe concentrations.

3. A bioassay program to monitor and detect any significant deposition of radioactive material in the body.

4. Protective clothing, shoes and gloves to minimize direct contact with the radioactive material.

5. Respiratory protective equipment to limit the inhalation of airborne radioactive material.

6. Surveys to detect the presence and extent of radioactive contamination.

7. Procedures, including action levels for investigation, control and decontamination of contaminated surfaces.

8. Arrangements for emergency evacuation of the buildings based on installed alarms, established procedures, personnel instruction and practice alerts.

Description of Room Air and Equipment Ventilation Systems

The ventilation system in the LRC is basically a once-through system. Outside air is brought into various plant areas through an air conditioning system. A 25,000 cfm fan provides exhaust ventilation for Building B areas, hoods, hot cells and glove boxes and the glove boxes in Building C. This exhaust is filtered through the double HEPA filters before it is discharged through the 150-foot stack. The stack fan is connected to an emergency backup power system for use in the event of an AC power failure. Room air in Building B, where the potential airborne concentration of radioactive material is negligible (such as counting room, machine shop and x-ray development room), is directly discharged to the roof.

The room air in Building C is filtered through the HEPA filters and discharged through a 15-foot stack.

In Building A, only sealed sources, fuel rods and elements are handled and materials that present a potential release hazard are not presently handled. The room air is filtered through the absolute filters prior to discharge through the roof.

The ventilation system at the LRC was designed and is maintained to limit the spread of airborne contamination by maintaining air pressure gradients so that air flow is directed from the working area into the process equipment, glove boxes and hoods.

Monitoring of Air Concentration Levels

The ventilation system at the LRC was designed and is operated to move air from areas of low contamination potential to areas of higher contamination potential. The concentration of radioactivity in the room air is monitored using fixed sampling heads mounted at work locations where the potential for airborne contamination exists. The filters from these samplers in the process areas are changed and counted daily. The proper location of the sampling head to provide representative air samples is evaluated at least once every year and whenever any licensed process or equipment changes are made. The action levels for airborne radioactivity in the plant are set so as to comply with 10 CFR 20.103 limits. The air quality in the plant is also maintained through tests and maintenance of the ventilation system and filters. For example, tests are performed at least monthly to determine that air flows are from uncontaminated areas to contaminated areas, HEPA filters are replaced when the differential pressure across the filter exceeds 4 inches of water and hood face velocities are maintained at a minimum of 100 linear feet per minute. The minimum frequencies for checking the pressure drop across the filters and the average face velocity into ventilated enclosures are weekly and monthly, respectively.

In Plant Airborne Activity Level

Data on the concentration of airborne radioactivity (both for Pu and U) provided by B&W for the past two years indicate an average of less than 1% of MPC with an occasional sample indicating 2 to 3% of MPC inside the facility. Average concentrations of airborne radioactivity for the past two years in various working areas are shown in the following table:

Table 2

Average Airborne Concentration Levels
in LRC, Expressed as % of MPC

Area	1977	1978
Building B		
Radiochemistry Laboratory	$\ll 1$	$\ll 1$
Hot Cell Control Room	≤ 1	$\ll 1$
Cask Handling Area	< 1	< 1
Building C		
Various Laboratories	$\ll 1$	≤ 1

The FCUF staff has added a condition that filters shall be counted weekly when air samples measure less than 10% MPC as specified in Appendix B, Table 1 of 10 CFR Part 20 to clarify the wording in the license application.

Program of Engineered Improvements

As can be seen in the preceding section, the concentration of airborne radioactivity in the various working areas has an average less than 1% of MPC. The averaged personnel external exposure in the hot cell area was increased from 0.25 rem in 1977 to 0.39 rem in 1978. The increase of this exposure is attributed to the increase in the level of licensed activities in the area rather than to a reduction in the application of the ALARA principle.

In 1978 the LRC started a program intended to reduce external exposures in the hot cell area. This was done by improving the method for transferring waste fuel into and out of the hot cell. By this new transfer method (transfer fuel in water versus in air), the external exposures have been reduced from 100 mr per transfer to less than 10 mr per transfer.

For further reduction of worker's internal deposition of radioactive material through inhalation, the LRC is planning to install a supplied air respiratory system for the work inside the hot cells. This new system will result in an increase in the protection factor when the wearer's internal exposure is estimated.

C. Bioassay Program

Internal exposure is evaluated and controlled by a bioassay program for both uranium and plutonium. The bioassay program for uranium is conducted in accordance with Regulatory Guide 8.11 ("Applications of Bioassay for Uranium"), while the bioassay program for Pu is a minimal program that is adequate for the limited possession of Pu at the LRC plant.

At the present time, no standard guides have been developed by the NRC for Pu bioassay. LRC's program for Pu bioassay, however, is equivalent to the program of other NRC licensees and is deemed adequate for the limited possession and form of Pu authorized by this license renewal.

The bioassay program proposed by LRC in the license application has been reviewed by the NRC Staff and is acceptable.

D. Use of Respiratory Protective Equipment

The conditions for use of respiratory protection equipment defined in Regulatory Guide 8.15 ("Acceptable Programs for Respiratory Protection") are required by 10 CFR 20.103 (c) and will apply to the revised license. The Office of Inspection and Enforcement inspected the licensee's program for use of respiratory protective equipment against Regulatory Guide 8.15. Except for an infraction concerning the selection of a respirator, the program was in compliance. The infraction was considered minor and remedial action has been taken by the licensee.

E. Control of Surface Contamination

The restricted areas of the B&W LRC plant are zoned to define areas as contamination areas, radiation areas, and high radiation areas. Each defined area is surveyed routinely for any undesirable surface contamination. The frequency of this survey and action levels for clean up are based on the use for which the areas are committed and on the potential hazard presented by the presence of surface contamination.

The specification for the control of surface contamination used by the LRC are within the range of levels used at other nuclear facilities with similar types of material and potential for contamination. They are summarized as follows:

Table 3

Guide to Surface Contamination Control Levels

Location	Action Level dpm/100 cm^2		Survey Frequency	
	Alpha	Beta	Alpha	Beta
Unirradiated, Unencapsulated Fuel Handling Area	5000	-	Weekly	-
Building A Laboratories	200	2000	Monthly	Monthly
Building B Counting Room	200	2000	Monthly	Monthly
Hot Cell Operations Area	200	2000	Monthly	Twice Monthly
Scanning Electron Microscopy Laboratory	200	2000	Monthly	Monthly
Exits from Controlled Areas	200	2000	Twice Weekly	Twice Weekly
Cask Handling Area	-	22000	-	Monthly
Radiochemistry Laboratory	-	22000	-	Twice Monthly

When contamination levels in any location exceed the specified action level, decontamination action is taken within 24 hours.

To ensure that sealed sources remain leak-tight, the FCUF staff has added Annexes A and B to the license conditions for "Leak Testing Sealed and Byproduct Material Sources" and "Leak Testing Sealed Plutonium Sources," respectively.

Although the licensee specifies a survey program for the controlled areas within the plant, none is specified for the clean areas inside the plant. Therefore, the FCUF staff has added a license condition that the LRC shall conduct area surveys routinely in clean (uncontrolled) areas inside the plant to ensure that radioactive material is confined to the controlled areas. The LRC shall conduct area surveys daily in lunchroom areas, cafeterias, snack bars and vending machine areas in the plant. If contamination is detected in any of these areas, corrective action shall be taken at once.

The FCUF staff has added a condition requiring the release of equipment and packages from the plant site or to uncontrolled areas onsite shall be in accordance with Annex C, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source or Special Nuclear Materials," which is an informal guide developed by NMSS staff.

F. Effluent Control

LRC is committed to a program to maintain release of radioactive materials to levels as low as reasonably achievable (ALARA). Important aspects of this program include:

* Establishment of action levels for radioactive concentrations in effluents so that any abnormal operation will be promptly corrected and ensure the radioactive concentration in the effluent is below the limits specified in 10 CFR Part 20.

* Safety Review Committee (ALARA Committee) will make a formal review of effluent data annually to look for trends and to determine if the concentration in effluents might be lowered under the concept of ALARA.

* Use of written procedures, reviewed and approved by Health and Safety, for processes that discharge radioactive material to the environs.

At the LRC potentially contaminated exhaust air is exhausted through at least one set of absolute filters and discharged through the stack, which is continuously monitored for particulate and gaseous activities. Data reported by the licensee show that airborne effluent released from the LRC is less than 1% of the MPC limit specified in 10 CFR Part 20. Therefore, the environmental impact of the facility operation is very small.

Liquid waste from each radioactive handling area is collected in tanks in an underground tank farm. The collected radioactive liquid waste is not released directly to the environment, but discharged to the liquid waste treatment plant of B&W's Naval Nuclear Fuel Division (NNFD) facility. The latter is operated under its own NRC SNM-42 license. The waste is discharged to the James River via the NNFD waste treatment plant in accordance with the 10 CFR Part 20 limits. Prior to discharging liquid waste to the NNFD, the solution is sampled. The liquid waste is not released to NNFD if the radioactivity in the liquid waste exceeds 25% of the MPC values specified in 10 CFR Part 20, Appendix B, Table I, Column 2 for restricted areas.

Effluent release from the LRC facility is and has been within all license conditions and regulatory requirements for discharge of radioactivity to unrestricted areas. A detailed description of the effluent release from the LRC and the impact resulting from the overall plant operation was published in the Environmental Impact Appraisal for the LRC dated January 1980.

G. Conclusion

Upon completion of the radiation safety review of the licensee's application and compliance history, the staff has concluded that the Babcock & Wilcox Company has the necessary technical staff at the Lynchburg Research Center to administer an effective radiological safety program. Conformance by B&W to their proposed conditions as well as to those developed by the FCUF staff should ensure a safe operation and the quick detection of unfavorable trends or effects by B&W or IE with prompt corrective action. The ongoing program of engineering improvements to reduce radiation levels has shown B&W's current commitment to the ALARA philosophy.

IX. ENVIRONMENTAL PROTECTION

The staff has analyzed the environmental impact of the continued operation of the LRC. Action levels and release limits for airborne effluents are established to maintain dose commitment to the nearest resident well below those allowable by EPA standards. In fact, the total airborne effluents from the B&W Commerical Nuclear Fuel Plant, Naval Nuclear Fuel Division (NNFD) and the LRC are maintained so that the dose commitment to the nearest resident is well below the current EPA standards. All potentially contaminated liquid wastes, after sampling, are released to the NNFD waste treatment facility. Liquid wastes released to the NNFD do not exceed 25% of the MPC values specified in 10 CFR Part 20, Appendix B, Table I, Column 2, for restricted areas.

The NNFD has established an environmental monitoring program which, in general, covers the entire 525-acre site occupied by all three B&W licensed facilities in Lynchburg. The cumulative impacts of the overall B&W site from the three facilities were assessed and the individual dose commitment to the nearest resident is well below the current EPA standard for fuel cycle facilities as specified in 40 CFR Part 190. It is concluded that no adverse environmental impact is anticipated from the routine operations.

X. EMERGENCY PLANS

The LRC has submitted emergency plans in accordance with Regulatory Guide 3.42 which meet the requirements of 10 CFR 70.22(i). The plans have been reviewed by the staff using the elements listed in Section IV of 10 CFR Part 50, Appendix E, to judge the adequacy of the plans. The staff finds the emergency planning for the LRC meets the requirements of 10 CFR 50, Appendix E, and provides a basis for an acceptable state of emergency preparedness (see Appendix 2). The FCUF staff has added a license condition to assure that the emergency requirements will not be degraded during the term of the license.

XI. FIRE SAFETY

A site visit was made to the LRC to review the facility fire safety program (see Appendix 3, Section A). The recommendations of the NRC Fire Protection Engineer were incorporated in the LRC renewal application (see Appendix 3, Section B). Therefore, the staff concludes the fire protection program at the LRC is adequate for the protection of personnel and the environment.

XII. PLANT DECOMMISSIONING

Conceptual Decommissioning Plan

The LRC has incorporated the decommissioning plan approved October 9, 1978, as Amendment No. 9 to the current license in a license condition section of the renewal application. The plan includes the following Performance Objective:

"The performance objective is to assure that the health and safety of the general public are protected by decontaminating the facilities to levels which do not exceed those specified in Table F-1 so as to enable release of the property for unrestricted use."

The levels referred to above (Table F-1 of the Decommissioning Plan) are the same as those in Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors," dated June 1974, and are similar to those in the NRC prepared Annex C to the License, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material," dated November 1976. Annex C, incorporated as a license condition, will be the controlling document and contains acceptable levels for release of facilities and equipment for unrestricted use.

The LRC Decommissioning Plan was reviewed by the staff and appears to be adequate in that the Performance Objective complies with the NRC Guidelines; the procedures proposed (together with the radiation control program associated with the license) are reasonable, acceptable to the staff, and should allow the Performance Objective to be attained. The estimated costs for decontamination appear to be realistic.

Financial Plan

B&W, by letters dated January 20, 1978, and March 13, 1978, described their plan for funding decommissioning costs for all their fuel plants (which includes the LRC).

B&W has stated that the Commission will be provided with assurance, on a continuing basis, of the ability of B&W to meet the costs of decommissioning all of its nuclear facilities regardless of when decommissioning occurs. This information will be in the form of annual Officers' Certificates required by existing Promissory Note Agreements and Annual Reports. In addition, B&W has committed to inform the Commission if its working capital should fall below the then-current estimated cost of decommissioning.

The staff has evaluated the B&W financial plan and finds that although it does not contain a financial surety arrangement that would guarantee decommissioning funds, it offers the assurance and commitment of a corporate official that adequate funds will be available when needed for decommissioning. With this commitment and considering the B&W resources to implement and finance the decommissioning plan, the staff finds that the cost of decontaminating the LRC facilities (1.7 million dollars) is a small fraction of the company's annual cash flow. Accordingly, the staff accepts the letters of commitment from corporate officials as adequate assurance that the facilities will be decontaminated at the end-of-plant life so they can be released for unrestricted use.

The B&W commitments for decommissioning and financial arrangements have been incorporated by the FCUF staff as a license condition to identify the decommissioning requirements at the end of plant life.

XIII. CONCLUSIONS

Upon completion of the staff review of the licensee's application and compliance history, the staff has concluded that the activities authorized by issuance of a renewed license to the Lynchburg Research Center, subject to the additional conditions developed by the FCUF staff, will not constitute an undue risk to the health and safety of the public. Further, the staff has determined that the application fulfills the requirements of 10 CFR 70.23(a).

The staff therefore recommends the LRC license be renewed in accordance with the statements, representations and conditions in the LRC application subject to the following additional conditions:

9. Authorized Use: For use in accordance with statements, representations and conditions contained in Appendix A of the licensee's application dated December 21, 1978, and supplements dated September 5, October 26, December 4, and December 20, 1979, and January 25, February 18, February 28, March 24, March 25 (2 supplements), April 8, May 9, May 20, May 30, and June 16, 1980.

10. Authorized Place of Use:

A. Licensed material shall be used at the licensee's Lynchburg Research Center in Buildings A, B, C and J and its addition, in the enclosure adjacent to Building J, at the Liquid Disposal Facility and in the underground storage area between Building B and the Liquid Waste Disposal Facility as described in the referenced application.

B. Sealed sources and radioactive tracers may be used as described in Appendix A, license condition section, of the licensee's supplement to the renewal application dated September 5, 1979.

11. Sealed sources shall be tested in accordance with the attached Annexes A and B for "Leak Testing Sealed Byproduct Material Sources" and "Leak Testing Sealed Plutonium Sources," respectively.

12. Release of equipment and packages from the plant site to unrestricted areas or to uncontrolled areas onsite shall be in accordance with the attached Annex C, dated November 1976.

13. The licensee shall maintain readiness to implement and shall follow the plans for coping with emergencies in accordance with the emergency plan submitted as Appendix C to the renewal application dated December 21, 1978, and its supplements dated September 5, October 26, and December 4, 1979. No changes to the plan shall be made which would decrease the effectiveness of the emergency plan without the prior approval of the Commission. Other changes to the emergency plan shall be promptly submitted, for information purposes, to the Region II Office of Inspection and Enforcement and to the Office of Nuclear Material Safety and Safeguards.

14. At the end of plant life the licensee shall decontaminate the facility and site in accordance with the general decommissioning plan submitted as Appendix F to the renewal application dated December 21, 1978, so that these facilities and grounds can be released for unrestricted use. The financial plan, to assure that funds will be available for decommissioning, submitted December 21, 1978, as part of Appendix F and supplement to Appendix F submitted September 5, 1979, are hereby incorporated as a condition of the license.

15. All appointments made by the Laboratory Director relating to the Safety Review Committee and its activities shall be in writing.

16. The three SAS audits of the LRC shall be of the safety-related activities and shall be made once every 4 months (plus or minus 2 weeks).

17. Airborne concentration of radioactivity in the working areas may be analyzed weekly when the measured concentration is less than 10% MPC as specified in Appendix B, Table 1, of 10 CFR Part 20.

18. The LRC shall conduct area surveys routinely in clean (uncontrolled) areas inside the plant to ensure that radioactive material is confined to the controlled areas. The LRC shall conduct area surveys daily in the lunchroom areas, cafeterias, snack bars and vending machine areas in the plant. If contamination is detected in any of these areas, corrective action shall be taken at once.

19. The Nuclear Safety Officer designee who may perform the nuclear safety training shall have the same minimum qualifications required for the Nuclear Safety Officer.

20. The person making the nuclear safety evaluation and the one performing the overchecks shall meet minimum qualifications required for the Nuclear Safety Officer.

21. Notwithstanding the spacing requirement in Part 2.d of Section A.9.5.7.5.2 for one position having a maximum of 75 rods to be spaced from any other fissile material by a minimum surface-to-surface separation of one foot, each such position shall have the specified minimum separation from any other position.

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APPENDIX 1

Allowable Shipping Cask Receipt

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Allowable Shipping Cask Receipt

The current license and the renewal application specified the receipt of material at the hot cell pool be limited to that arriving in the cask described in NRC Certificate of Compliance No. 6698. The safety analysis for the structural integrity of the pool was provided in the Wiley and Wilson, Inc., "Report of Operational and Structural Aspects of the Nuclear Fuel Transport Cask Handling System, Building B," dated July 29, 1975, submitted by the LRC as an enclosure to the Commission with a cover letter dated August 1, 1975 and in Appendix E of a Wiley and Wilson, Inc., "Supplement Clarifying Cask Receiving Pool Bottom Impact, Potential Through Cracking of Pool Slab, and Strength Characteristics of Epoxy Bonding Compound," dated July 22, 1975, submitted as an enclosure to the Commission with a cover letter dated August 22, 1975. Based on the above structural analysis, License Amendment No. 2 to the current license was issued on September 16, 1975, specifying the receipt of material at the containment pool be limited to that arriving in the cask described in NRC Certificate of Compliance No. 6698.

An LRC review of recent revisions to the cask (as described in the related Safety Analysis Report) indicated that water-tight integrity of the pool may be lost under the postulated accident conditions. Therefore, the LRC, by supplements dated March 24 and May 9, 1980, to its renewal application, has replaced the receipt of a specific cask at the hot cell pool with criteria to be used for the evaluation of the structural integrity of the pool in the event of an accidental drop of the loaded shipping container onto the impact slab. Consideration is given to impact limiting devices installed in the pool and on the cask. The criteria used to guarantee the structural integrity of the pool are consistent with those presented in the above referenced Wiley and Wilson, Inc., reports and previously accepted by the Commission. Therefore, the criteria for evaluating the structural integrity of the pool are adequate.

APPENDIX 2

Emergency Plan Review

LRC EMERGENCY PLAN REVIEW

A. Organization - Notification

The licensee has established an emergency organization for coping with incidents such as criticality, fire, explosion, toxic material release, radioactive spills, and personnel injury. The LRC Emergency Response Organization is headed by an emergency officer as emergency director appointed by the Laboratory Director. The latter may assume control of the emergency organization by informing the emergency officer of his desire to do so. The emergency director is aided by an emergency team of plant and staff members. Responsibility for specific activities such as conduct of operations, supervision of surveys, rescue operations, evacuation of personnel, training, drills and maintenance of the emergency procedures is assigned to specific positions in the organization. All emergency team leaders (e.g., evacuation officer, radiological safety officer, fire and rescue officer) report to the emergency officer who reports directly to the LRC Director. The emergency officer has the responsibility for initiating and coordinating all emergency operations.

Upon request, the LRC emergency organization is assisted by the Babcock & Wilcox Commercial Nuclear Fuel Plant (CNFP) and their Naval Nuclear Fuel Division (NNFD) who are located at the same site. In fact, the LRC emergency control organization has assigned responsibility for traffic control to the NNFD security force during an LRC emergency situation. If an emergency occurs after normal work hours, LRC employees have been instructed to notify the NNFD security shift supervisor using the emergency telephone system. The latter has been informed via LRC emergency procedures the action to be taken and whom to contact in the event of an emergency which occurs after normal working hours. Alternates are designated for key positions including that for the emergency officer, evacuation officer, radiological safety officer, fire and rescue officer and the nuclear criticality safety officer. The latter reports to the radiological safety officer.

Onsite personnel are notified of an emergency by the public address system, the evacuation alarm system and by telephone. Communication between the LRC, CNFP and NNFD is maintained by telephone and by portable radio. Offsite communication is maintained by telephone. The security force, NNFD, maintains radio communication with the Campbell County Sheriff's Department and the Virginia Police Department. During an emergency, communication between various elements of the emergency team is accomplished through the use of a megaphone and portable hand-held radios. During offshift hours, the NNFD security shift supervisor responds to calls on the emergency telephone number. He has been instructed via LRC emergency procedures on the action to take. The plan identifies local, State and Federal agencies that will provide support in the event of an emergency and the means of notifying the agencies. The responsibility for declaring and taking charge during an emergency is assigned for both normal and offshift hours.

B. Special Personnel

In addition to the LRC emergency organization personnel for handling emergencies, there are agreements in effect with the other two B&W facilities (CNFP and NNFD) on the site to provide additional technical support when deemed necessary by the emergency officer. These include the following services:

1. Health physics (CNFP and NNFD)
2. Security (NNFD)
3. First aid and decontamination assistance (CNFP and NNFD)
4. Ambulance service (NNFD)
5. Fire Brigade support (NNFD)
6. Communicate with off-site emergency organizations (NNFD)
7. Environmental sample collection assistance (CNFP)

C. Notification Criteria

The LRC emergency plan classifies incidents into five categories. The plan gives specific offsite release quantities and personnel exposure quantities for notification of the NRC and gives offsite personnel exposure quantities for notification of State authorities. However, procedures to cope with the category of General Emergency are not provided since the events in this category are judged not to be credible during the lifetime of the facilities. Examples of each type credible emergency and emergency response action for each are identified.

D. Outside Agencies

The procedures provide direction to the facility emergency organization to request participation of outside organizations and agencies whose services may be needed.

Agreements have been reached with the following organizations:

1. CNFP
2. NNFD
3. Concord Rescue Squad
4. Lynchburg General-Marshall Lodge Hospitals (primary)
5. Virginia Baptist Hospital (backup)

6. Concord Volunteer Fire Department

7. Department of Energy

The Commonwealth of Virginia Radiological Emergency Response Plan has established procedures for notification of the State Office of Emergency Services in the case of a radiological emergency that would affect offsite areas. State and local offices to be notified are the following:

1. Campbell County - Sheriff's Department

2. Virginia State Police

3. Virginia State Offices of Emergency Services

E. Maintenance of Organization and Procedures

The licensee will review and update the emergency procedures at least annually. A license condition shall be added to limit changes to the emergency plan without prior Commission approval to those that would not decrease its effectiveness. All written agreements are reviewed and updated every two years.

F. First Aid and Decontamination Facilities

In addition to identifying required onsite first aid, decontamination and personnel monitoring supplies and equipment, decontamination and first aid support are available onsite from both the CNFP and the NNFD. Transport of contaminated personnel is provided by the NNFD ambulance to local hospitals for further decontamination and/or treatment. The Concord Rescue Squad is available for emergency rescue and for first aid assistance. The rescue squad also provides backup ambulance services.

G. Offsite Treatment of Personnel

As noted in F, above, local hospitals are available for further decontamination and/or treatment of contaminated personnel. Detailed procedures have been developed for delivery of a patient to a specified location within the hospital, for preparing the patient for treatment and for subsequent treatment.

H. Personnel Training

The licensee has committed to maintain emergency preparedness through a continuing program in which LRC personnel receive training in the emergency procedures. The frequency of refresher training varies from quarterly for the fire and rescue team to annually for the emergency team and their alternates. In addition, onsite medical support personnel receive refresher training every three years to meet the certification requirements of the American Red Cross. Area fire departments receive an annual familiarization tour of the facility.

I. Practice Drills

Drills and exercises are conducted to test the adequacy of timing and content of implementing procedures and methods, to test emergency equipment and to ensure that emergency organization personnel are familiar with their duties. Two evacuation drills are held annually. Annual preplanned descriptions or simulations of accidents or similar events are detailed in a prepared scenario and are included in the evacuation drill. Annually an excerise is conducted that is coordinated with and participated in by offsite emergency support personnel to test, as a minimum, the communication links and notification procedures for early warning of the public.

J. Records

Records are maintained of all training, drills, and exercises. The documentation includes their evaluation and followup on corrective actions.

K. Reentry Criteria

The LRC plan includes the basic recovery criteria. The criteria are divided into the following categories:

1. Protection of health and property other than life saving situations.

2. Life saving actions.

No personnel are allowed to enter the affected plant areas unless authorized by the emergency officer. Prior to startup of operations after termination of an emergency, radiation levels will not exceed normal operating levels, as specified in the license conditions. Deficiencies identified in the investigation of the incident will be resolved prior to resumption of operations.

L. Conclusion

The emergency planning of the LRC meets the requirements of 10 CFR Part 50, Appendix E and provides a basis for an acceptable state of emergency preparedness. Issuance of an authorizing license condition to the LRC license is recommended subject to the requirement that the licensee makes no changes to the plan dated December 21, 1978, and its supplements dated September 5, October 26, and December 4, 1979, which would decrease the effectiveness of the plan without the prior approval of the Commission. Other changes to the Emergency Plan shall be promptly submitted, for information purposes, to Region II Office of Inspection and Enforcement and to the Office of Nuclear Material Safety and Safeguards.

APPENDIX 3

Fire Safety

A. Site Visit

B. LRC Action on NRC Recommendations

B. LRC Action on NRC Recommendations

1. The plutonium in the glove boxes shall be limited to a maximum of 660 g while the ducting in the exhaust system is PVC. The staff has concluded that a fire in the presence of 660 g plutonium would release a small fraction of the quarterly MPC hour limit to the plutonium laboratory.

2. The Industrial Safety Officer is responsible for the fire protection program at the LRC. He reports to the Health and Safety supervisor. The Industrial Safety Engineer maintains liaison with the B&W corporate Fire Protection Engineer for fire safety consultation.

3. The fire protection system and equipment provided throughout the LRC has been included in section 4.6.3 of the renewal application.

4. The Industrial Safety Officer provides expertise in fire protection to the facility supervisor and to the Safety Review Committee. The Safety Review Committee reviews procedures and projects for fire safety.

5. The B&W Corporate Fire Protection Engineer provides consulting services to the Industrial Safety Engineer.

6. The emergency plan includes the training and retraining given members of the fire and rescue team and offsite fire fighting support personnel.

Therefore, the staff concludes the fire protection program at the LRC is adequate for the protection of personnel and the environment.