Chapter 13

CONDUCT OF OPERATIONS

CHAPTER 13 : CONDUCT TO OPERATIONS

13 CONDUCT OF OPERATIONS

13.1 ORGANIZATIONAL STRUCTURE OF APPLICANT

13.1.1 COMPANY ORGANIZATION

This subsection describes the structure and qualifications of the Korea Hydro and Nuclear Power Company(KHNP)

13.1.1.1 Company functions, Responsibility, and Authorities

Korea Hydro & Nuclear Power Company(KHNP) has sole responsibility for operating the Ulchin Nuclear Power Plant, Unit 1&2(UCN 1&2). KHNP has a long history of building and operating conventional electric generating plants. In operating the proposed plants, KHNP will apply proven managerial techniques that have been successful in the past to ensure the highest operating standards. It is intent to operate these plants in such a manner that(1) they do not in any way endanger the health and safety of the public, (2) they are safe for the employees to operate, (3) they comply the applicable rules and regulations of the Republic of Korea Government, and (4) they efficiently provide a reliable supply of electric power to customers throughout Korea relying on the plant for service. The KHNP organization table is included in detail in the Regulation of KHNP. The home office of KHNP is in Gyeongju-si, Gyeongsangbuk-do.

13.1.1.2 KHNP's Inhouse Organization

The Power Generation Division, Technology & Engineering Division and Quality & Safety Division are responsible for operating and maintaining KHNP's nuclear power plants.
These divisions provide general supervision and technical management services for the nuclear power plant. The organization of these Divisions is shown in Figure 13.1-2.

The UCN 1&2 Plant will be staffed consistent with KHNP's policy for nuclear power plants. Support in the areas of operation, quality & safety, and engineering is provided by Power Generation Division, Technology & Engineering Division and Quality & Safety Division Staff. Consultation in some areas such as design improvements and computer programing is available from other KHNP departments.

Plant organization and responsibilities for normal plant operation are described in Sections 13.1.2 through 13.1.3. Plant organization and responsibilities during preoperational testing, startup, and initial operation are described in Chapter 14. All operations are performed by assigned plant employees.

13.1.1.3 Inter-relationships With Contractors and Suppliers

KHNP has total responsibility for the construction and operation of UCN 1&2. Planning, scheduling, and carrying out initial test and operation are under the direct control of KHNP.

Overseas Framatome & Alstom have been retained by KHNP to provide architectural and engineering services, including engineering, procurement, construction management, and technical direction and services for UCN 1&2. 263

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Framatome is responsible for supplying the nuclear steam supply system and Alsthom is responsible for supplying the turbine generator.

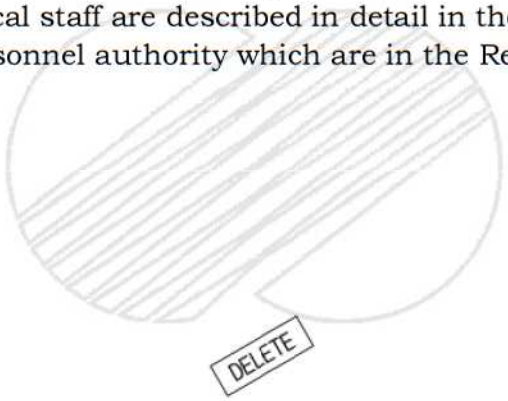
Detailed procedures will be prepared by KHNP from design information and procedures provided by Framatome and Alstom and manufacturers of equipment. The Results of initial tests and operation are fully documented and reviewed by KHNP personnel qualified by experience and training. 263

13.1.1.4. KHNP's Technical Staff

KHNP's organization responsibility for nuclear power business is a combination of Power Generation Division(Power Generation Department, Maintenance Management Department, Nuclear Fuel Office), Technology & Engineering Division(Technology Policy & Strategy Department, Plant Engineering & Management Department, Plant Strategy Project Office, Seismic Engineering Office), Quality & Safety Division(Quality Assurance Department, Safety Department, Emergency Management Office) and Project Division(Nuclear Power Construction Department, Construction Engineering Department, Backend Management & Decommissioning Department).
The Executive Vice President of each Division is responsible for nuclear generation, engineering, nuclear quality & safety and nuclear construction respectively.

13.1.1.4.1. Power Generation Division

The duties, responsibilities and authority of the Power Generation Division's key technical staff are described in detail in the staff organization and personnel authority which are in the Regulation of KHNP.



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13.1.1.4.2. Quality & Safety Division

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The duties, responsibilities and authority of the Quality & Safety Division's key technical staff are described in detail in the staff organization and personnel authority which are in the Regulation of KHNP.

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351 13.1.1.4.3 Technology & Engineering Division

The duties, responsibilities and authority of the Technology & Engineering Division's key technical staff are described in detail in the staff organization and personnel authority which are in the Regulation of KHNP.

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13.1.1.4.4 Quality Assurance Office (QAO)*

* Placed under the control of the Quality & Safety Division of KHNP
The duties, responsibilities and authority of the QAO's key technical staff are described in detail in the staff organization and personnel authority which are in the Regulation of KHNP.

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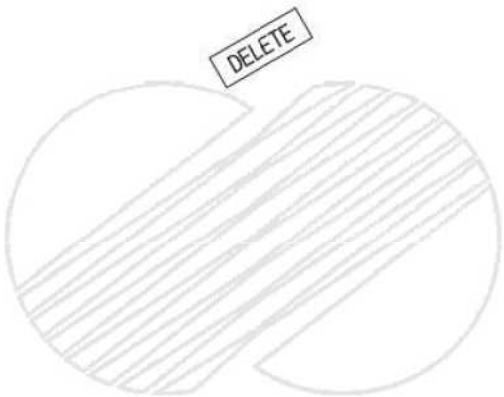

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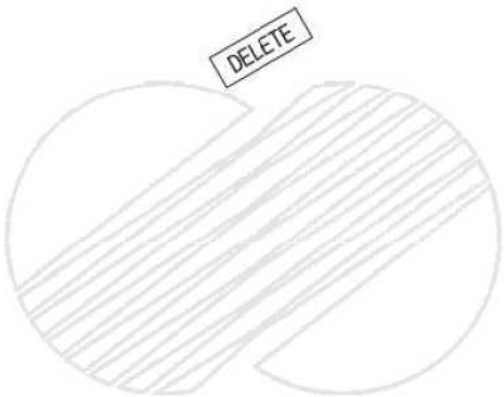

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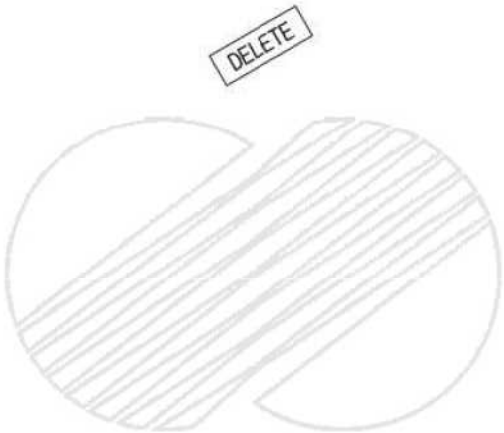

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13.1.2. OPERATING ORGANIZATION

13.1.2.1. Plant Organization

The Ulchin 1 & 2 organization, which will operate the plant, is shown is Figure 13.1-3. Plant personnel selection is such that education and work experience are consistent with levels of responsibility. 112

13.1.2.2. Personnel Functions, Responsibilities, and Authorities

During normal plant operations, the Director General is responsible for all plant activities. In the event of his absence, the responsibility is succeeded by the Operation Office Director, the Maintenance & Engineering Office Director, Safety & Engineering Support Team General Manager, Operation Management Team General Manager in order. 175 233 367

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During back shifts, weekends or holidays, the immediate responsibility falls upon the shift general manager followed by shift technical advisor. In addition, several persons are appointed as On-Call site Emergency Directors, These are the Director General, the Director, operation office and the General Manager, operation team. 175 233

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If an On-site emergency occurs, the shift general manager assumes the role of Site Emergency Director until relieved by an On-Call Site Emergency Director.

The function, responsibilities and authority of the plant personnel are described in detail in the staff organization and personnel authority which are in the Regulation of KHNP. 189

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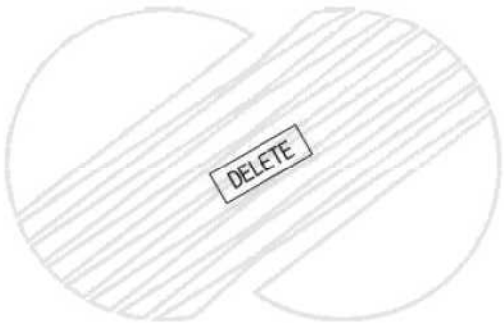

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13.1.2.3. Operating Shift Crew Composition

The unit will employ six operating shifts to allow for routine training vacation and sickness.

Each operating shift consists of :

1. One shift general manager for each unit
2. [Delete]
3. One shift technical advisor for each unit
4. [Delete]
5. Control room operators
6. Local auxiliary operators

The license requirements for operating personnel are discussed in Chapter 16.

13.1.3 QUALIFICATION REQUIREMENTS FOR NUCLEAR POWER PLANT PERSONNEL

13.1.3.1 Qualification Requirements

All nuclear power plant operating, technical, and maintenance support required to obtain and maintain KHNP's qualification requirements set forth according to :

1. KHNP's Nuclear Training Program "Chapter 7, Training and Licenses of personnel in the field of Nuclear Energy" (112 | 175)

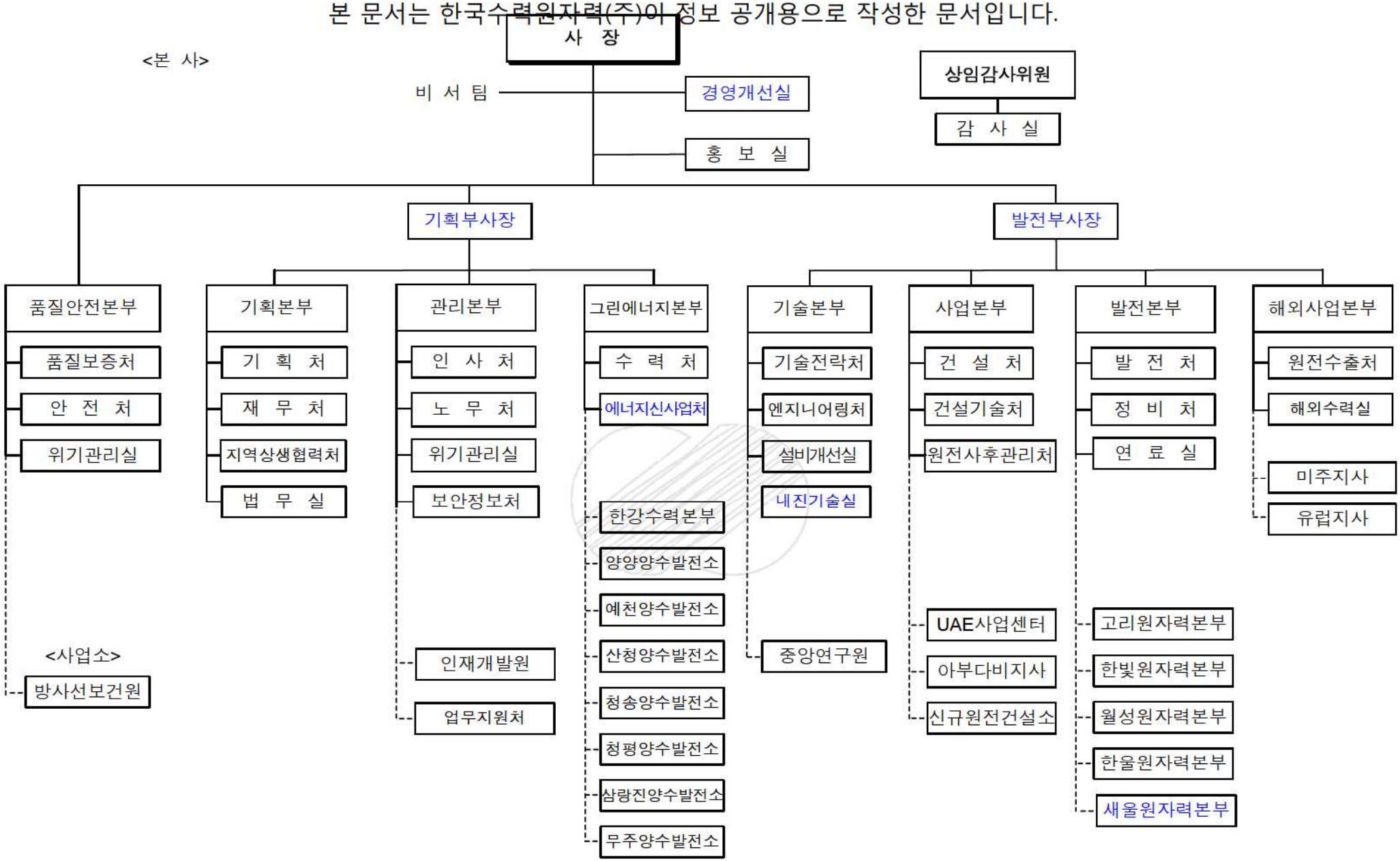
2. "Decree on Licenses of Nuclear Reactor Operators and Operation Supervisors (Presidential Decree No. 23759, enforced on December 1, 2012)" pursuant to Article 84 of Nuclear Safety Act of Republic of Korea. (279 | 270) (208 | 263)

3. ANSI/ANS-3.1 "Selection, Qualification, and Training of Personnel for Nuclear Power Plants. "

General Qualification Requirements

All those personnel except administration team personnel, clerks, repairmen, and technicians must have, as a minimum, a seven weeks training course covering the fundamental nuclear power plant technology, radiation protection, and security as well as a minimum of two months experience in power plant operation. Other personnel not mentioned above (such as personnel assigned to administrative team including plant guards, clerks, and repairmen) shall have one or two radiation ion and security by the plant training group. (175 | 233)

Technical personnel above assistant general manager must have training abroad in their respective areas. In addition, all personnel positioned higher than assistant general manager, and personnel assigned to positions in the training group, Engineering Affairs team, and QA team, except technicians and clerks, mush have a bachelor's degree in engineering or science, or its equivalent. Personnel assigned a position in the Operation team and Maintenance team(except general managers and all of the repairman and clerks) and all technicians must have a minimum of a high school diploma or equivalent.



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ULCHIN NUCLEAR UNIT 1 and 2

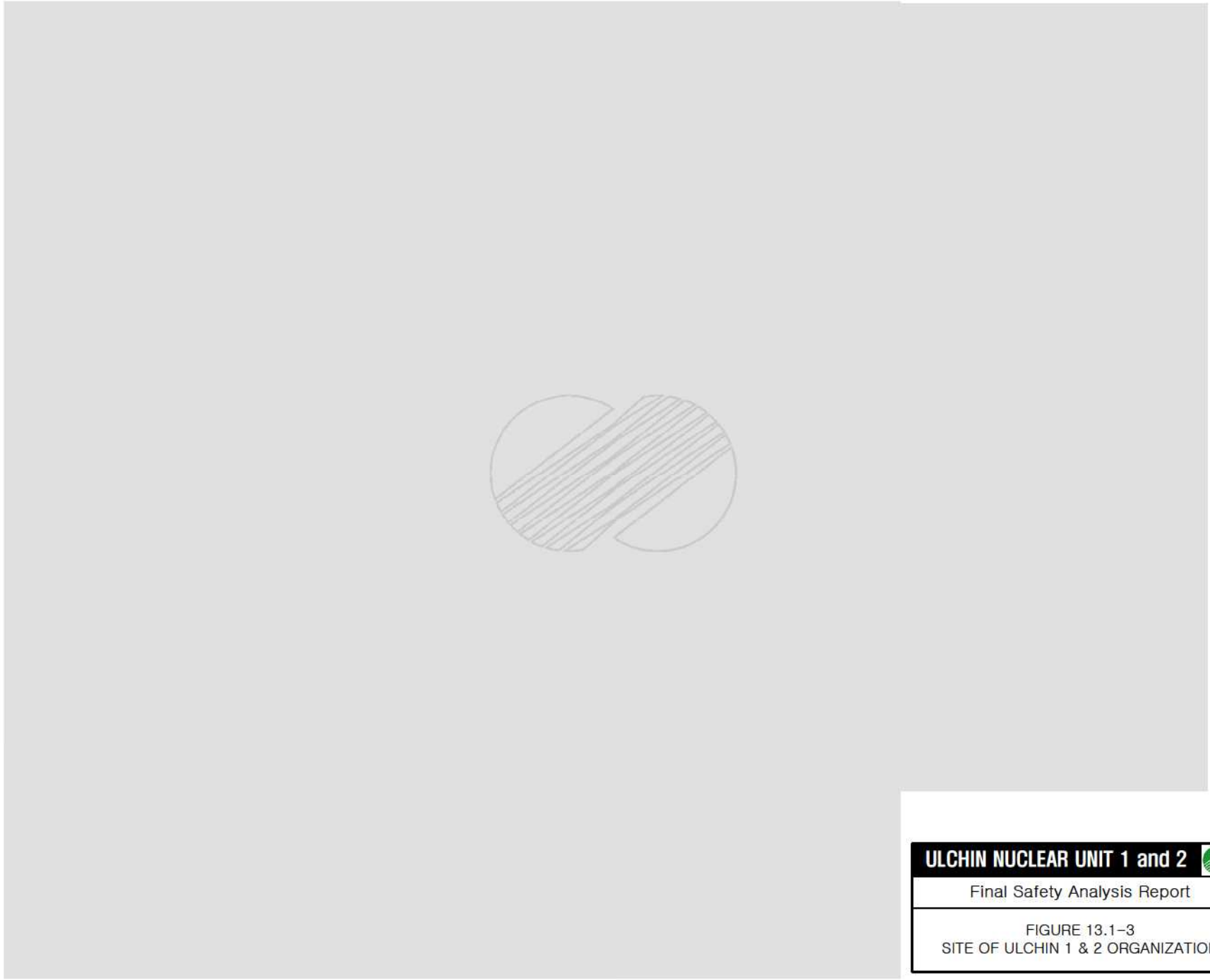
Final Safety Analysis Report

FIGURE 13.1-1
KOREA HYDRO & NUCLEAR POWER COMPANY
ORGANIZATION CHART

ULCHIN NUCLEAR UNIT 1 and 2

Final Safety Analysis Report

FIGURE 13.1-2
ORGANIZATION IN THE FIELD OF
THE NUCLEAR POWER



ULCHIN NUCLEAR UNIT 1 and 2

Final Safety Analysis Report

FIGURE 13.1-3
SITE OF ULCHIN 1 & 2 ORGANIZATION

13.2 TRAINING

13.2.1 Plant Staff Training Program

The training program is designed to provide plant personnel with requisite knowledge and skills, and enable them to practice safety improvements and plant efficiency. Individual training needs, contents, and levels are established by careful examination of the trainees experience, previous training, and job requirements. Responsibility for administration and evaluation of the training program planned or conducted by the KHNP's Nuclear Training Center rests with the Center's general manager.

Responsibility for administration and evaluation of the training program planned or conducted by the plant rests with the plant manager. In case the training program planned by KHNP's Nuclear Training Center is conducted at the plant, the Training Center's general manager can delegate responsibility for administration and evaluation of the training program to the plant manager for efficient progress.

Effectiveness of the training program is evaluated through analysis of the training courses, estimation of the training effects and the performance of employees in carrying out their assigned duties. 320

13.2.1.1 Program Description

The training program consists of Nuclear Recruits' Basic Training, Plant Personnel Duty Training, General Employee Training, Fire Protection Training, and Project Contract Training. Bellow is a description of the training program.

13.2.1.1.1 Nuclear Recruits' Basic Training

13.2.1.1.1.1 Basic Nuclear Training

The basic nuclear training program is and assembly training course for all nuclear recruits who work in a technical department. This program is divided into two courses.

A. Course I : Basic Nuclear Theory

113 This is a 8 week course that provides basic knowledge and nuclear theory related to the overalll power plant. Duration of the training course can be adjusted within 20 % according to the entry level of the recruits. The topical outline of the course is as follows :

a. Reactor theory and control
b. Thermal hydraulics engineering
c. Electronics / Instrumentation & Control in fundamentals
d. Chemistry in fundamentals
e. Radiation in fundamentals
f. Mechanics / Electricity in fundamentals

113

B. Course II : Basic Nuclear Systems

This is a 10 week course conducted to provide a knowledge of nuclear power plant systems, power plant design, and overall power plant operation after completion of the basic nuclear theory course. The training is be conducted by distinguishing common items from particular items of the nuclear power plant. The total duration of the training course can be adjusted by no more than 20%, according to the entry level of the recruits. The topical outline of the course is follows :

a. Reactor Equipment
b. Reactor Auxiliary Equipment
c. Reactor Safety Equipment
d. Turbine and Steam Generator Equipment
e. Generator and Auxiliary Equipment
f. Control and Protection Equipment
g. Plant Electrical System
h. Administration of Techniques

113

13.2.1.1.1.2 Onsite Familiarization Training

This training program is conducted at the KHNP's Headquarters or plant site for 16 weeks. It covers sections for which individual training is more effective than assembly training for nuclear recruit's assigned to onsite jobs. The total duration of the training course can be adjusted within a 20% range according to the entry level of the recruits. To improve training efficiency it may be divided and then conducted before, after, of during the assembly training of 13.2.1.1.1. The contents of the training course can be adjusted according to the entry level of the recruits and prearranged on site. The main contents of the training course are as follows :

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a. Organization and general administration in techniques
113 b. Understanding operation through cooperation with operator
c. Acquiring practical experience through the rotation of services among plant departments

13.2.1.1.2 Plant Personnel Duty Training

This training program is designed to provide operating, maintenance, and support personnel with the skills, knowledge, and abilities necessary to perform job assignments. The courses, contents, trainees, and duration of the training program are quite flexible according to the needs and emphasis of the plant. The contents of the training program are as follows :

13.2.1.1.2.1 Training for Main Control Board Operators

This training program is designed to provide practical knowledge for 8 weeks. Duration of the training course can be adjusted by no more than 2 weeks, considering the entry level of the
113 applicants. The topical outline of the course is as follows :

a. Reactor theory
b. Radiation management
c. Operation practice
d. Control room familiarization
e. Nuclear act
113 f. Fuel handling
g. Reactor operation and control
h. Reactor structure and design
i. Mitigating core damage
j. Administrative procedure

13.2.1.1.2.2 Electrical Maintenance Personnel Training

This training program on electrical maintenance is designed to provide theory and practical knowledge in general nuclear electricity and the main electric facilities for at least 1 week. The topical outline of the course is as follows :

113 a. Electricity in general
b. Electric facilities

13.2.1.1.2.3 Mechanical Maintenance Personnel Training

This training program is designed to provide theory and practical knowledge on general mechanics and main mechanical facilities for at least 1 week.
The topical outline of the course is as follows :

a. Mechanics in general
b. Mechanical facilities

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13.2.1.1.2.4 Instrumentation & Control Personnel Training

This training program is designed to provide theory and practical knowledge in instrumentation & control of general and main facilities for at least 1 week.
The topical outline of the course is as follows :

a. General instrumentation & control
b. Instrumentation & control facilities

113

13.2.1.1.2.5 Plant Computer Personnel Training

This training program is designed to provide special knowledge in the operation of computer hardware andsoftware as it is related to computer operation and maintenance. The program is designed to last for at least 1 week. The topical outline of the course is as follows :

a. Computer hardware
b. Computer software

113

13.2.1.1.2.6 Personnel Training in chemistry

This program for chemists is designed to provide general knowledge and practical analysis in chemistry for at least 1 week. The topical outline of the course is as follows :

a. General practice on chemistry
b. Analysis practice on chemistry
c. Primary water chemistry control
d. Secondary water chemistry control
e. Radio-Chemistry

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13.2.1.1.2.7 Radiation Control Personnel Training

This program is designed to provide theory and pratical knowledge in radiation control for at least 1 week. The topical outline of the course is as follows :

113
a. Health physics theory
b. Environmental radiation management
c. Radiation material management
d. Radiation emergency management

13.2.1.1.2.8 Incore management personnel Training

This program is designed to provide theory and practical knowledge in incore management for at least 1 week. The topical outline of the course is as follows :

113
a. Reactor theory
b. Nuclear design
c. Incore management

13.2.1.1.3 General Employee Training

All persons regularly employed by KHNP to work at nuclear power plants are instructed in the following areas at the KNTC and/or plant.

113
a. Radiological Health and Safety
b. Emergency Plan
c. Fire protection and Security
d. Quality Assurance

All persons having unescorted access to the plant areas must complete training curses in (1) elementary (2) radiation protection techniques for entering radiation work areas and controlled zones (3) pertinent sections of the site emergency plan. When persons who have not completed these training courses enter plant areas, they are escorted by an employee who has received the pertinent training.

13.2.1.1.4 Fire Protection Training

A. Fire brigade personnel must complete a training course covering the following topics :

a. Identification of fire hazards and associated fires types that occur in the plant.
b. Identification of areas where breathing apparatus is required, regardless of the size of the fire.
c. Familiarization with plant layout, including ingress and egress routes for each area.
d. Identification of the locations of installed and portable fire-fighting equipment in the plant.
e. Proper use of communication, lighting, ventilation, and emergency breathing equipment.
f. Proper use of available fire fighting equipment and correct methods of fire fighting for each type of fire.
g. Indoctrination in the fire protection plan which shall include fire brigade responsibilities.
h. Methods of fire fighting inside buildings and tunnels.
i. Design and maintenance of fire detection, suppression, and extinguishing system. 113
j. Fire protect techniques and procedures.
Refresher training will be scheduled by the plant manager.

B. Fire brigade drills
Fire brigade drills shall be performed in the plant to promote effective teamwork. Fire brigade drills shall be conducted using the following guidelines :

a. Drill scenarios shall be prepared to establish the objectives of each drill.
b. Each fire brigade shall be drilled at least quarterly.
c. Each drill shall be evaluated to determine how well the training objectives are met.
d. Drills shall include the following :
- Assessment of fire alarm effectiveness, time required to notify and assemble fire brigade, selection, replacement and use of equipment, and fire fighting strategies.

- Simulated use of fire fighting equipment required to cope with the situation and the type of fire selected for the drill.
- Assessment of brigade leader's direction of the effort.
- Assessment of each member's knowledge of fire fighting strategy, procedures, and use of equipment.

The plant manager shall be responsible for scheduling, conducting and documenting the fire brigade drills.

113 C. Instruction for all employees
Each plant employee shall receive instruction on the fire protection plan, and implementation instructions, evacuation routes from his normal place of duty, and procedures for reporting fires.

13.2.1.1.5 Project Contract Training

This program is designed to develop or enhance the skills, knowledge, and ability of personnel to perform job assignments. Implementation, courses, contents, and duration of the training program are flexible according to the con tract conditions of the project.

13.2.2 Retraining and Replacement Training

13.2.2.1 Licensed Operator Requalification Training

The training program for the licensed (senior) operators will meet the requirements of the Atomic Energy Laws. This training program sill keep the licensed (senior) operator familiar with plant design changes, and proficient in the execution of all procedures and the application of technical standards. This training consists of assembly of assembly training, on-the-job training, and operator evaluation.

13.2.2.1.1 Assembly Training

The training program is conducted for a continuous period that doesn't to exceed two years, and consists of a minimum of 50 hours of classroom training each year. Training is scheduled for designated groups, including main control room operators. These groups are relieved from regular duties for the training sessions. Each licensed (senior) operator in the main control room is assigned to a complete training course covering the following topics : 320

a. Theory and principles of reactor operation
b. General and specific plant operating characteristics
c. Plant instrumentation and control systems
d. Plant protection systems
e. Engineered safety systems
f. Normal, abnormal, and emergency operating procedures
g. Radiation control and safety
h. Technical specifications
i. Government regulations
j. Special subjects that are requested for the plant
k. Transient and accident analysis,
l. Mitigating core damage

13.2.2.1.2 On-The-Job Training

Each licensed operator manipulates the plant controls and each licensed senior operator manipulates the controls and directs the activities of individuals. These manipulations keep each licensed (senior) operator familiar with the knowledge and skills of reactivity control systems through at least 10 reactivity control manipulations in any combination of reactor start ups and reactor shut downs by using the control panel of the facility involved or by using a simulator for a continuous period not to exceed two years. Each licensed (senior) operator is cognizant of facility design changes, procedure changes, and facility license changes. Each licensed (senior) operator reviews the contents of all abnormal and emergency procedures on a regularly scheduled basis.

13.2.2.1.3 Evaluation

At the end of each training program, the licensed (senior) operators will participate in an annual examination and must receive a score of more than 70% in any category in which he is trained. A grade of less than 70% requires further study and reexamination on the same subject.

13.2.2.1.4 Responsibility

The general manager of the KHNP Nuclear Training Center is responsible for the collection and overall operation of the training program for the licensed (senior) operator. If a part or the whole of the training program is conducted at a plant location, the director and plant manager are responsible for assembly training, quizzes, and documentation for this part of the training program. The director and plant manager designate qualified individuals to be responsible for these duties. 208

13.2.2. 2 Refresher Training for Unlicensed Personnel

A refresher training program for unlicensed operators is conducted for a continuous period that doesn't exceed two years. and includes a minimum of 50 hours of assembly training each year. The training groups are relieved from regular duties for the training sessions according to the training plan. The subjects in the refresher program for unlicensed personnel are similar to that of the licensed operator program.

13.2.2.3 Replacement Training

It is the policy to promote qualified candidates to job vacancies. This policy is to be implemented for replacement personnel in the plant. The station staff, under the direction of the plant manager, will be responsible for the implementation of this on-the-job training program and will also maintain the proficiency of the replacement personnel.

13.2.3 Records

13.2.3.1 General Records

Records of employee qualifications, experience, and previous training are maintained in a standardized arrangement by the authorized department in line with the officially recognized data. The records are maintained in current and accurate status and are controlled according to their availability.

13. 2. 3. 2 Plant Records

Records of training history for plant personnel are maintained by the authorized department of the plant. These records are comprised of completed training courses and correspondence confirming whether training requirements have been met or not.

13. 2. 3. 3 Training Program Evaluations

Training programs conducted at the KHNP Nuclear Training Center and associated plants enhance the knowledge and skills required by each plant staff member, including the reactor operator. Efficiency of the training program is evaluated through analysis of the training courses, surveys of the training effects, and other numerous kinds of examinations taken after the training course, including written examinations. 208

13.3 EMERGENCY PLANNING

279 The Ulchin 1&2 Emergency plan is described in detail in "The Ulchin Nuclear Power Site Emergency Plan", submitted to NSSC as the separate document for the operating licence. 189

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13.4. REVIEW AND AUDIT

The quality assurance manual for the operation phase will be established by applying KEPIC QAP and ANSI/ANS 3.2 "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants, 1994 Edition" in accordance with Nuclear Safety Act(Article 21, 4), Rule of Technical Standards for Nuclear Facilities(Article 67), Criteria of Quality Assurance for Nuclear Facilities, and will be submitted with the application for the operating license.

The review and audit program consists of onsite review, independent review and audit in accordance with ANSI/ANS 3.2-1994.

13.4.1. Onsite review

The onsite review will be performed by the Plant Nuclear Safety Committee(PNSC) reviewing overall plant operation. The PNSC has the responsibility to review all plant administration, maintenance, and operation as related to safety and environmental aspects. A detailed description of the PNSC is provided in the technical specifications.

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The PNSC is composed of the plant manager, all senior plant technical supervisory personnel, and those department managers responsible for operation, maintenance, and technical activities of the unit. Collectively, they possess the type and degree of expertise required to properly review proposed changes to systems, procedures, and unplanned events that affect nuclear safety. The PNSC meets at least once every three month and maintains written minutes of each meeting.

The proposed changes considered by the PNSC involve routine operational matters which will not require a review by the KHNP Nuclear Review Board (KNRB). However, the minutes of the meetings and any significant proposed changes or tests should be submitted to the KNRB for approval.

13.4.2. Independent review

The KNRB provides an independent review of plant operating activities and details on the KNRB operation are described in the technical specifications. The KNRB is composed of experienced top-level KHNP officers and outside experts who have sufficient competence in a specialty related to plant operation and safety. This body will not have direct responsibility for routine plant operation but will exercise overall control and provide guidance for the safe and reliable operation of the plant.

Any potential hazard associated with plant operations shall be identified and the nuclear safety of all proposed changes shall be assured by the KNRB. Proposed changes or tests that involve changes in the technical specifications or which pose an unreviewed safety question are not carried out until authorized by the KNRB. The board meets at least once per calendar quarter during the initial year of unit operation following full loading and at least once per six months thereafter. Details of the activities and duties of the KNRB are described in KNRB operating procedure.

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13.4.3. Audit

A comprehensive system of planned and documented audits is conducted to verify compliance with all aspects of the administrative controls and quality assurance program. The audits shall be performed by the quality assurance organization in accordance with ANSI/ANS 3.2-1994 and with a frequency commensurate with their safety significance and encompass the following :

A. Conformance of facility operation to applicable license conditions and technical specifications.

B. Training and qualifications of the operating staff.

C. Results of actions taken to correct deficient items that affect nuclear safety.

D. Quality assurance program.

E. Facility emergency plan.

F. Facility security plan.

G. Fire protection program.

H. Implementation of inspection on the fire protection equipment and plan by external experts.

I. Radiological environmental monitoring plan.

J. Offsite dose calculation manual.

K. Process control program and implementing procedures for processing of radioactive wastes.

L. Items required by radioactive effluent controls program.

M. Any area considered appropriate by the KNRB. 344

The quality assurance division has the responsibility of auditing any activity or documentation affecting the quality of a safety-related item. Audits are performed by quality assurance engineers or other qualified persons designated by the quality assurance manager. These audits comply with the requirement for audit provided by ASME NQA-1 and KEPIC QAP, and are performed at the plant or at the contractor, vendor, or consultant source locations as required. The details of the audits is described in a separately published QA Manual.

Written reports of the audits are reviewed by the independent review committees and by appropriate members of management.

Appropriate and timely follow-up actions is taken to ensure the overall effectiveness of the audit and audit program.

13.5. PLANT PROCEDURES

All safety-related operations will be conducted using written and approved procedures. Procedures will be reviewed periodically and will be revised as necessary to ensure proper and safe operation of the plant. Operating personnel will be thoroughly trained to assure familiarity with the appropriate procedures.

13.5.1. Administrative procedures

13.5.1.1. Conformance with Regulatory Guide 1.33

Procedures will be prepared in accordance with ANSI N.18.7, Administrative Controls for Nuclear Power Plants. The applicable portions of Regulatory Guide 1.33, Quality Assurance program Requirements (operation), will be used for guidance.

13.5.1.2. Preparation of procedures

Cognizant plant division managers are responsible for initiating, preparing, and controlling plant procedures consistent with their responsibilities, and for ensuring that work is performed in accordance with the latest applicable documents. The procedures are reviewed and approved by the Plant Nuclear Safety Committee (PNSC). The plant superintendent promulgates all the procedures after the committee's approval.

13.5.1.3. Description of Administrative Procedures

A. Procedures for Shift Supervisors and Operators

These procedures are "Plant Operation Organization and Responsibility", and "Shift and Relief Turnover". They define the authority and responsibilities for reactor operators and senior reactor operators. These procedures also define the standards for operation and protection of the reactor and its related control equipment including the reactor control and protection system, rod control system and nuclear instrumentation system. 320

B. Special Procedures

These procedures shall be issued when written instructions are required to change the scope of a project or to provide procedures for completion. These procedures are reviewed by the PNSC and are self-cancelling when the job is completed.

C. Equipment Control Procedures

Equipment control procedures are written to provide control over the status of plant equipment, of purchased material, and of nonconforming material. Such procedures will include :

· Change of instrument setpoint
. Work authorization
· Control of purchased material, equipment and services
. Handling, storage and shipment of materials
· Nonconforming materials, parts, components or operations

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D. Control of Maintenance and Modification Procedures

Maintenance of safety-related equipment will be accomplished in accordance with written procedures. Such procedures will include :

· Work stop order
· Maintenance work control
· Gas cut and welding control
· Welding procedure verification control

Modification of equipment of safety-related systems is also accomplished in accordance with written procedures, such as "System Equipment Modification Control".

E. Master Surveillance Testing Schedule

The master surveillance testing schedule for safety-related systems will be established in accordance with the plant technical specification surveillance requirement (see Section 16.4.).

F. Log Book Usage and Control Procedures

These procedures describe the kinds of log books, the format of the log book entry, and will be covered in "Operating Log Books".

G. Temporary Procedures

These procedures are issued as required to provide detailed instruction for specific jobs that are of a specific duration and of a one-time-only nature. These procedures are reviewed and approved by the PNSC.

13.5.2. Operating and maintenance procedures

13.5.2.1. Control Room Operating Procedures

Operating procedures are prepared using the following format :

A. Purpose

Describes the objective to be accomplished.

B. Discussion

Provides a general description of the operation.

C. Prerequisites

Identifies the activities (tests, inspections, calibrations, valve lineup conditions, etc.) that must be completed prior to operation of the system, or plant.

D. Precautions

Lists the precautions to be observed or followed.

E. Limitations

Lists the limitations and parameters or conditions within which the plant or system must operate.

F. Procedures

Provides step-by-step procedures.

G. Appendices

Provides appendices when applicable.

Control room operating procedures are to be provided for the following categories :

A. General Plant Operation Procedures

These procedures describe how to bring the plant from cold shutdown or hot standby condition to power operations, then how to change load, and finally, how to bring the plant down to cold or hot standby conditions.

B. System Operating Procedures

These procedures describe the steps required to put the individual system into service, or take the system out of service. These procedures also instruct operators how to manipulate the system for several normal conditions as required.

C. Instrumentation Procedures

These procedures instruct the operators how to put the instrument into service and how to secure the instrument from service. These procedures also instruct the operators how to operate the instrument for different conditions.

D. System Abnormal Procedures

These procedures instruct operators how to respond for system abnormal conditions.

E. Alarm Procedures

The alarm procedures are classified according to their alarm window position index (panel, line, and row numbers). This allows operators to easily refer to the specific alarm procedure. As for alarm systems, they are designed to give visual (light) and audible (sound) alarms for each window. The visible alarms are classified into two categories : red trips and white alerts. Every visual alarm is initiated by a unique protective system and is accompanied by a high frequency buzz noise alarm to remind the operator to take action. When the alarm clears, the annunciator system acknowledges with a low frequency buzz.

F. Emergency Procedures

These procedures instruct the operators how to handle the plant in emergency situations such as :

. Earthquakes
. Typhoons
. Total loss of service air
. Total loss of instrument air
. Loss of feedwater
. Loss of coolant, etc.

G. Temporary Procedures

These procedures are required by the PNSC to provide detailed instructions for specific tests of operations of safety-related systems.

13.5.2.2. Other Procedures

Other procedures are provided for the following categories :

A. Plant Radiation Protection Procedures

These procedures are designed to limit and control radiation exposures and the spread of contamination, as well as to meet the requirements of USNRC 10 CFR 20 as modified by the ROK-AEB and the ALARA (as low as is reasonably achievable) philosophy. These procedures shall be followed by all plant personnel.

Procedures will include :

. Responsibility
. Radiation exposure limits
. Access control
. Protective clothing
. Personnel monitoring
. Radiological surveys and records
. Contaminated equipment control
. Radioactive shipments
. Radiation incidents - procedure and reporting
. Radioactive material handling

B. Emergency Preparedness Procedures

These procedures are provided to implement the provisions of the Emergency Plan (see Section 13.3.). They include organization, assignment of responsibilities, instructions to employees, procedures for emergencies, and the mobilization of offsite assistance when necessary. Procedures in this area are detailed in the Emergency Plan and shall be followed by all plant personnel.

C. Instrument Calibration and Test Procedures

These procedures provide detailed step-by-step methods for instrument calibration and tests, test intervals, and their acceptance criteria. These procedures include :

. Reactor protection instrument test and calibration
. Area radiation monitoring system calibration
. Process radiation monitoring system calibration
. Nuclear instrumentation monitoring system calibration
. Calibration of test instrumentation and devices

D. Chemical-Radiochemical Control Procedures

These procedures provide instructions on various chemical and radiochemical analysis and counting techniques. They also define the intervals for taking samples and apply to the work performed by chemical and radiation protection technicians. Procedures in this area include :

. Chemical analysis
. Calibration and operation of chemical instrumentation
. Radiochemical analysis procedures
. Calibration and operation or radiochemical instrumentation
. Chemical and radiochemical solutions
. Test forms
. Waste quality limits
. Chemical cleaning

E. Radioactive Waste Management Procedures

These procedures include :

. Solid waste handling and storage
. Radwaste release control
. Decontamination
. Counting room equipment control

F. Maintenance and Modification Procedures

These procedures provide detailed instructions for performing maintenance and modifications on safety-related systems or equipment.

G. Material Control Procedures

These procedures include :

. Material storage control
. Material receiving and distribution control
. Material purchasing specification control
. Material purchasing control
. Material identification control

H. Plant Security Procedures

Plant security procedures provide for implementation of the Security Plan (see Section 13.6.).

13.6. INDUSTRIAL SECURITY

The requirements of 10 CRF 73.55 and NRC Regulatory Guide 1.17,5.7, 5.12 and 5.44 serve as the basis for the KNU 9 & 10 Security System design. This section discusses in general how KNU 9 & 10 meets these requirements.

13.6.1. Personnel and plant design

The immediate plant boundary, including the intake and discharge canal, is enclosed by a chain link fence. At the main entrance to the plant, a security guard is assigned to control access to the plant. The fence structure surrounds the switchyard facility to isolate all substation equipment.

Controlled access to the power plant is through the main entrance gate which leads to the administration building. For normal authorized entry into the site, all personnel must pass through the main gate before proceeding to the administration building where appropriate radiation monitoring equipment can be secured when reporting for duty. Entry of personnel who are not part of the plant staff must be registered with the security guard. Each individual seeking permission to enter must be cleared under administrative procedures. All such individuals are directed to the main office where personnel monitoring equipment is issued, if necessary. Entry into the plant from the administration building is permitted under escort of company personnel only.

13.6.1.1. Built-in security

The KNU 9 & 10 site is in a remote location. It is unlikely that major civil disorders will occur at or near the plant area.

In the design and operation of the plant, care is taken to minimize the potential for industrial sabotage by the use of access control measures to prevent unauthorized persons from entering the protected areas. Should such persons succeed in entering the protected areas, special access control measures prevent them from entering vital equipment areas.

The built-in features and other physical security measures that protect against or limit the effects of possible sabotage efforts include.

1. A security barrier with an intrusion detection system around the perimeter of the plant, with gates that are kept closed and locked except during times of authorized use.

2. An isolated public visitor reception area located outside the protected area, away from the plant.

3. A perimeter patrol road inside the security barrier.

4. A well-lighted area to provide good observation of equipment areas under normal weather conditions and a non-glare-type protective lighting system for emergency use. The low-mounted protective lighting units are directed toward the perimeter fence and outside approaches.

5. A maximum number of exterior plant doors are kept locked or secured from inside when not in use.

6. A card-key access control system for external doors controls access to vital areas except where it is not feasible due to the door construction.

7. A force of trained, uniformed, and armed security personnel and policemen, used on a four-shift basis to police the property and provide access control.

8. Firefighting and other emergency equipment located throughout the plant and plant area to minimize the consequences of fires or explosions.

9. Engineered safeguards and protective systems that are provided to minimize the consequences of fires or explosions or to minimize the effects of postulated major equipment failures, natural disasters, and operator errors. These safeguards and protective systems will also serve to minimize the effects of industrial sabotage.

10. A controlled keying system for the doors not having Automatic Control Access Terminal (ACATS) to vital areas and vital equipment areas within the power block.

11. A complete procedure to control personnel exit and entry to areas equipped with keying system.

13.6.1.2. Personnel selection

KEPCO appoints, promotes, transfers, and retains employees on the basis of merit and efficiency. It is the policy of KEPCO to promote, whenever possible, present employees who have demonstrated competence, reliability, and stability, to vacant positions in preference to hiring persons from outside the organization. This is often accomplished by upgrading employees through internal training programs.

Selection for a position is supportable by records of education, training, and experience, and by records of evaluations which have been made regarding work performance, ability, and condition of health.

Each new KEPCO nuclear plant employee is given a national security agency check and written inquiries are routinely made to references, such as former employers, schools, and armed forces at the beginning of their employment.

13.6.2. Security plan

The physical plant security plan describes security measures used to minimize the potential for industrial sabotage including access control, surveillance of vital equipment, and plans for responding to security threats.

13.6.2.1. Access control

All personnel must show identification to the security guard on duty in the guard office prior to entering the site. Access to the site must be through the guard office, except for vehicle entry. KEPCO personnel must show their KEPCO photo identification card (only).

Visitors and drivers of vehicles must show their photo identification cards, issued by the government, or their KEPCO contractor's pass. Personnel without proper identification must have their identity verified prior to entering the site. Individuals without proper identification, who cannot be verified, are not allowed on site. These individuals may use the telephone in the guard office. All personnel must pass through the security card-key control system with an identification card, in the guard office, prior to entering and leaving the site. All personnel and vehicles are subject to an inspection of briefcases, bags, tool boxes, packages, etc. prior to entry and exit. 66

Personnel authorized to be on the reactor site are identified by badges. Badges are marked to clearly show the areas to which access is permitted. Plant operators are instructed to challenge all unidentified persons. In addition, plant operators are instructed to challenge plant employees who are not in their normal work areas.

Administrative control of all activities within the restricted area is the responsibility of the plant superintendent. Access to the restricted area is limited by a security fence with perimeter lighting and a controlled entrance gate. Entry to the restricted area is through this gate.

Entry to operating areas such as the control room within the restricted area is limited to those persons authorized for entry by qualified supervisory personnel.

Access to critical plant area is controlled by screening of visitors and use of identification badges.

The communications systems available to the security force for use in summoning assistance from the local police or military police includes independent telephone circuits and a two-way radio connection. At the start of each shift, telephone circuits are tested by the security force and the radio is tested by operating personnel.

All alarm systems are functionally tested for operability and reliability at least once a week

13.6.2.2. Control of personnel by categories

A list is maintained of all manufacturers' respresentatives, company employees, and others who require and are permitted access to plant property on a regular basis. These individuals are given appropriate badges as stated on the list. Other visitors are admitted to the plant property only after authorization from a member of the plant supervisory staff. Visitors are classified in categories as follows :

1. Sightseers and other occasional visitors.
2. Salesmen and visitors requiring admittance to the plant office only.
3. Manufacturer's service representatives, contractors, and their employees.
4. Company employees other than regular plant staff.

Category 1 visitors are issued a badge that indicates that they must be escorted. They are provided with an escort.

Category 2 visitors are issued a badges identifying them as being authorized to visit the office only and are directed to the office after receiving authorization from a member of the plant staff. Should it be necessary for them to visit other areas of the plant, they are provided with an escort. Anyone entering the controlled area must wear a radiation monitoring device.

Category 3 visitors who are visiting the plant for the first time are directed to the office. On subsequent visits, they may be issued appropriate identification and monitoring devices at the gate. If they have not received radiation protection training, they are required to have an escort at all times. If they have satisfied the health physics plant superintendent or his representative, they are issued monitoring devices and identification badges and do not require an escort. On subsequent visits, they may be issued appropriate badges and monitoring devices at the gate or reception ares. 320

Category 4 visitors identify themselves and, depending on their reason for visiting the plant and the extent radiation training, are treated in the same manner as Category 1 or 3 visitors.

13.6.2.3. Access control during emergencies

Upon hearing of an emergency, the public security personnel and policemen on duty at the access portal lock all doors to ensure controlled entry and exit. Visitors who are onsite are escorted to the access portal. Plant employees report to predesignated stations from which they are dispatched as needed to combat the emergency.

13.6.2.4. Surveillance of vital equipment

The unit operator continuously monitors the status of plant systems and equipment by means of annunciators, indicating lights, indicators, and recorders. New equipment or material is inspected on delivery. Operating logs and computer printout data are periodically examined for changes -in equipment performance. Most equipment is in continuous operation and any change is immediately detected by the operator. Standby and emergency equipment is periodically tested on a routine basis as required by the technical specifications. Assistant unit operators inspect equipment and spaces at least once each shift. In addition, the assistant shift supervisors, shift supervisors, and other supervisory personnel knowledgeable in plant conditions make frequent unscheduled inspection tours through the plant. The combination of these efforts provides reasonable assurance that unauthorized, physical changes in the status of components or equipment do not go undetected for long periods.

Key operating log sheets and selected recorder tracings are reviewed daily by the plant operations section. Abnormal changes observed are called to the attention of the plant superintendent and the appropriate supervisors for investigation and corrective action, if required. This operational audit serves to assure early detection of physical changes which would have a significant bearing on plant performance.

13.6.2.5. Potential security threats

A closed and continuing line of communication is maintained with the Kyeongsangbuk-Do Police. If an intruder does not immediately leave the area or attempts to breach the security fence, the Kyeongsangbuk-Do Police are immediately notified and their assistance is required to remove the intruder. There are two separate lines of communication available for notification. 320

All actual intrusion attempts or attempted acts of sabotage are reported to the ROK-AEB within 24 hours. 320

13.6.2.6. Administrative procedures

All intrusion attempts are investigated, and the intruder, placed under continuing surveillance, is advised that he is in a restricted area and should leave immediately. If the intruder does not comply, the Kyeongsangbuk-Do Police are notified as stated in Paragraph 13.6.2.5. 320

The following security-related records are maintained :

1. A visitors log.

2. Results of all tests, inspections, and maintenance performed on physical barriers and communication links.

3. A list of all intrusion attempts and action taken. 320

The security force's performance of their duties is audited regularly by the security supervisor. Results of the audits are kept on file in the administrative office of the KNU 9 & 10 plant.

13A.1. INTRODUCTION

This appendix includes emergency response planning data requested in Regulatory Guide 1.70, Revision 2. The most serious design basis accident is the loss-of-coolant accident (LOCA), which is described in Subsection 15.6-5. This appendix presents the results of the LOCA analysis in terms of time-distance-isodose curves and also presents projected population data, which may be useful in emergency planning.

13A.2. EMERGENCY PLANNING CURVES

Radiological consequences following a design basis loss of coolant accident are given in Subsection 15.6-5. The methodology used for the computation of whole body doses due to gamma radiation from submersion in the radioactive plume and dose to the thyroid due primarily to plume inhalation is presented in Appendix 15A. Two kinds of models are used, one called realistic model and one other called pessimistic model.

Time-distance isodose curves presented in Figures F-13A-1 and F-13A-2 correspond to an envelope of radiological consequences calculated using the pessimistic model and given in Subsection 15.6-5.

Thus the inhalation thyroid and whole body gamma isodose curves provide conservative estimates of doses which would be received by stationary individuals following a design basis loss of coolant accident.

13A.3. ESTIMATED REACTION AND RESPONSE TIMES

The time required to identify and characterize an accident is dependent on the severity of the accident. Remote monitoring capability (Section 7.5) with readout in the control room will provide necessary information to identify and classify an accident as well as initiate notifications and protective and corrective actions.

Chapter 12 discusses the radiation protection aspects of the plant ; Subsection 12.3.4 discusses the plant radiation system. In the event of a severe accident, it is estimated that it would take several minutes from receipt of the initial alarm to determine whether the potential for offsite radiological consequences requires protective action. The time required to predict inplant dose rates may require up to 10 minutes based upon the airborne radioactivity in the plant area. A preliminary offsite dose assessment would be obtained by using radiological source terms and meteorological conditions with either prepared overlay maps or similar techniques. The time to make this dose assessment may take up to 30 minutes. The preliminary assessment would be continuously updated and refined by manual field sampling and analyses as well as analyses performed in the plant environmental radiation laboratory.

An initial notification of offsite authorities will be instituted after the receipt of specific alarms and other indications that an evacuation may be required. This notification is estimated to be initiated a few minutes after the identification of the emergency situation, and it will allow the responsible agencies to begin marshalling the required information needed to institute their emergency procedures. After the preliminary dose assessment has been completed, subsequent contacts will be made conveying the results. This will then enable the agencies to either implement their emergency procedures or, as in the case of false alarms or minor accidents, to assess their reaction and return to their previous state of readiness.

Emergencies requiring local inplant area evacuation are announced over the public address system instructing those within the area to leave. The evacuation alarm (Subsection 9.5.2) is used only for unit, plant, and exclusion area evacuations. The alarm and/or announcements are made after receipt of radiation alarms in the control room or it is determined that an emergency condition exists. Personnel within the plant and the exclusion area would be alerted within 10 minutes of the determination that an emergency condition exists.

The time required for evacuation of personnel from the exclusion area is estimated to be between 30 minutes and 1 hour from the time of the identification of the emergency situation. Evacuation from the exclusion area will be accomplished by either company owned vehicles or private vehicles.

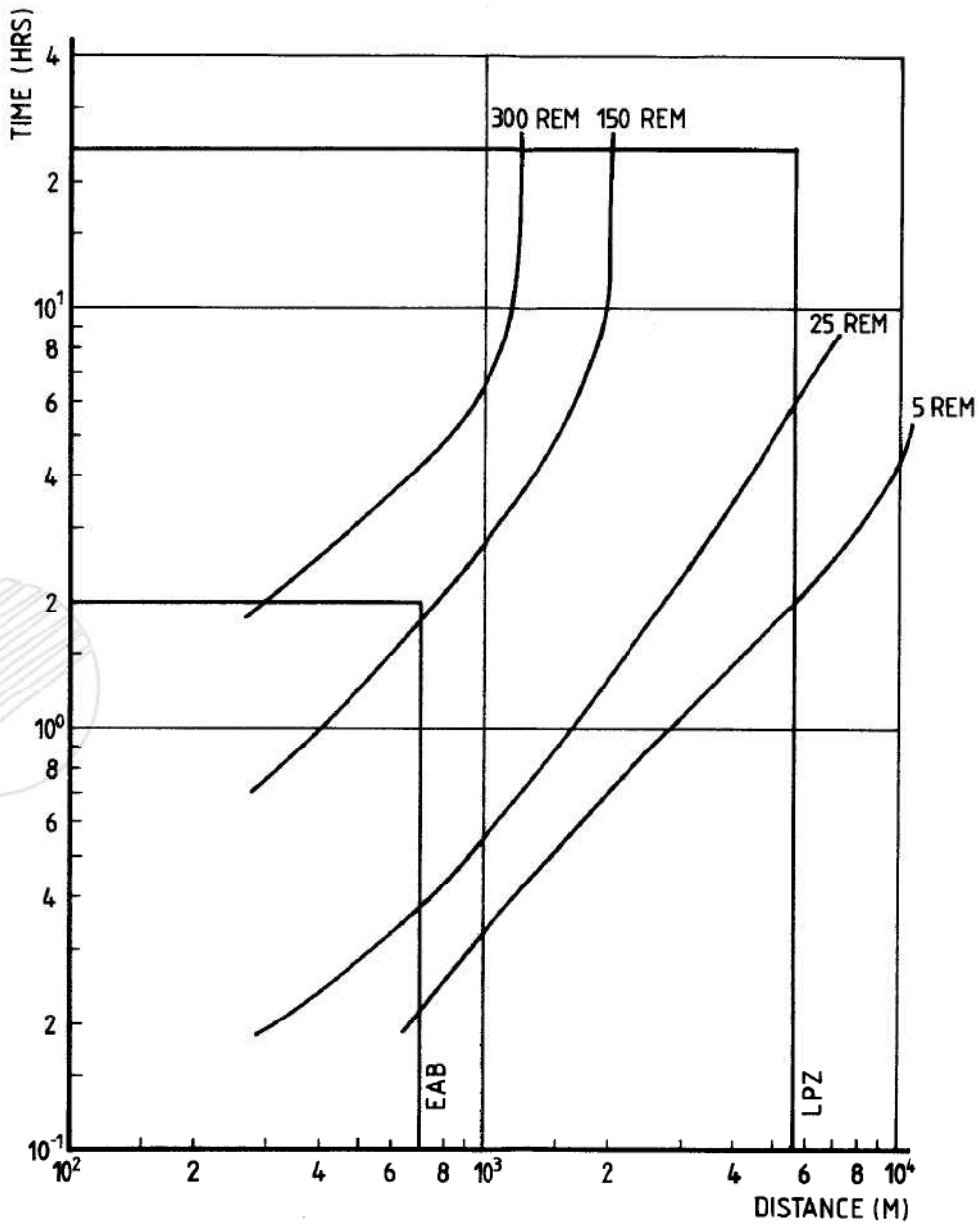
All roads within 5 miles of the plant are shown in Figure F-2.1-18. Figure F-2.1-11 is divided into 22.5° sectors and within a distance of 10 miles. The peak projected population within 10 miles is also shown as follows :

- projected 2028 resident population,

- projected transient 2028 peak day recreational population.

The data presented maximize the populations estimated to be within 10 miles of the site (See Section 2.1). The population within 22.5° sectors, for any wind direction can easily be determined by adding the population in the 10 potentially affected adjacent sectors.

1 The total resident population within the 16 kilometer radius is estimated to be 61,758 persons in the year 2028. The expected means for evacuating this population will be by private vehicles. Vehicles from province or local agencies may be used if needed. The estimated time to evacuate the people in the LPZ is 1 to 2 hours.



KOREA NUCLEAR UNITS 9 and 10

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FIGURE 13A-1

Thyroid dose evaluation curves