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CLINTON POWER STATION

RADIATION PROTECTION MANUAL

ILLINOIS POWER COMPANY

For general guidance and policy only, and in no way supersedes station or Power Production Department procedures.

Prepared by: Vincent H. Browne
RadChem Technician

Submitted by: Leland C. Schneider
Supervisor-Radiation Protection

Reviewed by: Robert Haus
Supervisor-RadChem

Approved by: T F Plunkett 12/6/79
Plant Manager Date

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I. INTRODUCTION

A. Purpose

1. The primary purpose of the Clinton Power Station radiation protection program is to provide for the protection of plant personnel, the public, and the enviroment against unnecessary exposure to radiation and radioactive materials. This objective is best reached through training, administrative exposure control procedures, adequate work planning, and safe practices in all activities related to station operation.

2. This manual establishes standards and practices for control of exposure to radiation and radioactive materials. It is not the intent of this manual to give detailed procedures, but to provide a guide for accomplishing work involving radiation and to aid in indoctrination of new employees to the radiation protection program. Station procedures will provide the detailed instructions necessary to carry out the specific work objectives.

B. Responsibility

1. The primary responsibility for radiation protection lies with the individual and the immediate supervisor. Each individual is responsible for complying with all applicable radiological policies and practices and any willful violation will result in disciplinary action. Each supervisor is responsible to see that all station procedures related to radiological safety are complied with and all work involving radiation and radioactive material is performed safely. It is everyone's responsibility to notify Radiation Protection personnel immediately of any unusual incident involving radiation, change in procedure, or change in working conditions which could result in radiological conditions not previously evaluated by Radiation Protection personnel.

2. The Supervisor-Radiation Protection has overall responsibility for administering the radiation protection program.

C. Radiation Exposure Policy

It is the policy of Illinois Power Company to minimize personnel radiation exposure by maintaining exposures "as low as reasonably achievable" (ALARA). Administrative guides within 10CFR limits will be established to serve this end. They serve to control and minimize the individual's accumulated radiation exposure.

Initial restrictions set for a given job are self-imposed restrictions, consistent with the administrative guides. Necessary changes to these guides are required occasionally to accommodate changes in radiological conditions and plant status. Such changes in administrative guides are within the bounds set by regulatory agencies and in no way constitute a change in company policy.

D. Radiation Protection Training

1. Station Personnel

   All station personnel will receive initial training which includes, but is not limited to, basic radiation fundamentals, area posting and access control, personnel monitoring equipment, exposure limits, and radiological emergencies. Annual retraining, as specified by the Supervisor-Training should be performed so that the required proficiency is maintained in radiation protection policies and practices.

2. Radiation Protection Personnel

   Specialized training will be provided for personnel in order that they can provide effective radiation monitoring and provide technical guidance in radiation protection required by other station personnel.

3. Supervisory personnel are responsible to ensure that personnel under their supervision are familiar with current radiation protection policies and practices.

4. Special Training Programs

   a. Specialized training should be provided for off-site agencies or groups, visitors, and contractors. These programs will be tailored to the specific needs of the group concerned.

   b. Off-site agencies or groups who are expected to provide assistance in radiation emergencies should be indoctrinated sufficiently to assure they can provide effective assistance.

5. The Supervisor-Training is responsible for administering the training programs, including those for off-site agencies or groups. The Supervisor-Training will also be responsible for scheduling training and maintaining up-to-date records on training.

6. The Supervisor-Radiation Protection has the responsibility for review of the technical content of all radiological training programs.

II. RADIATION PROTECTION STANDARDS

Scope

This section prescribes the maximum permissible exposure to internal and external radiation as set forth in NRC regulations "Standards for Protection Against Radiation" (10CFR20) and regulations of the State of Illinois. Any future amendments to 10CFR20 will be incorporated into this section. The exposure limits and regulations prescribed in this manual will be applicable to all persons within the boundaries of the Clinton Power Station.

Responsibility

1. It is the responsibility of each individual to keep their radiation exposure "as low as reasonably achievable" consistent with their responsibilities. Each individual will ensure that their supervisor is informed of the amount of radiation received.

2. It is the responsibility of each supervisor to be cognizant of the current radiation exposure of each person under their direct supervision and, where possible, assign the individual work in such a manner as to limit each employee's total accumulated exposure.

3. It is the responsibility of Radiation Protection personnel to evaluate existing or potential station radiological conditions and to establish the radiation protection procedures, maintain records and inform supervisors of the exposure received by their respective personnel.

A. Units of Radiation Dose -

1. Dose Equivalents and Quality Factor (QF)*

Type of Radiation	QF
X-Ray, Beta, Gamma	1
Neutrons or High Energy Protons	10
Alpha and Heavy Particles	20

*The factor by which absorbed doses are multiplied to obtain a quantity that expresses - on a common scale for all ionizing radiations - the biological effectiveness of the absorbed dose.

2. Neutron Flux Dose Equivalents - The average permissible neutron fluxes corresponding to a dose of 300 mrem may be determined as follows based on a 40 hour work week:

Neutron Energy (Mev)	Neutron Flux (n/cm^2 per sec.)
Thermal	2010
Intermediate ($\sim$0.025 to $\sim$0.1)	240
Fast	51

B. Permissible Whole Body Exposure Limits (10CFR20)

1. The maximum permissible occupational radiation exposure for individuals 18 years of age or older will be limited to the following:

   a. The maximum quarterly exposure to the whole body: head and trunk; active blood forming organs; lens of the eyes; and gonads shall be limited to 1¼ rem.

   b. The maximum quarterly exposure to the skin of the whole body shall be limited to 7½ rem.

   c. The maximum quarterly exposure to the hands and forearms; feet and ankles shall be limited to 18 3/4 rem.

2. An individual may receive a dose to the whole body greater than that permitted in paragraph 1 of this section, provided:

   a. The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed 5(N-18) rem, where "N" equals the individuals age in years on their last birthday.

   b. If the licensee has determined the individual's accumulated occupational dose to the whole body on Form NRC-4 or equivalent, the applicable whole body exposure limit may be increased to 3 rem per quarter.

3. The licensee will permit individuals under 18 years of age into Station Radiological Areas only with permission of the Plant Manager and in strict adherence to the applicable sections in 10CFR20.104. Radiation Protection Supervision may permit the individual to receive a dose not to exceed 10% of the limits as specified in paragraph 1 of this section.

4. Since unborn children are more sensitive to ionizing radiation than adults, the National Council on Radiation Protection and Measurements has recommended that occupational exposure to the mother should not exceed 0.5 REM for the term of the pregnancy. The employer will reassign the employee within the station should it be necessary to reduce exposure of the mother to the above stated guideline. Female employees at CPS will receive instructions concerning prenatal radiation exposure.

C. Permissible Exposure Limits in Air (10CFR20)

1. No licensee shall possess, use, or transfer radioactive materials in such a manner as to permit an individual in a Controlled Station Radiological Area to inhale a quantity of radioactive material in any period of one calendar quarter greater than the quantity which would result from inhalation for 40 hours per week for 13 weeks at uniform concentrations of radioactive material in air specified in Appendix B, Table 1, Column 1, of 10CFR20.

2. When it is impractical to reduce airborne contamination levels below that specified in Appendix B, Table 1, Column 1 of 10CFR20, by process or other engineering controls, other precautionary practices such as increased surveillance, limitations of working time, or respiratory protective equipment shall be used to maintain intake of radioactive material by any individual within any period of seven consecutive days as far below that intake of radioactive material which would result from inhalation of such material for 40 hours at the uniform concentrations specified in Appendix B, Table 1, Column 1 as is reasonably achievable.

D. Administrative Dose Guides

1. In order to maintain the occupational exposure of personnel within limits established in 10CFR20, it is necessary to apply guidelines to the rate of dose accumulation over the period for which the limits are applicable.

   a. The weekly administrative dose guide (Monday through Sunday) established for this purpose is 300 mrem (0.300rem) to the whole body and critical organs. This administrative guide, however, does not relieve the individual or the supervisor from the responsibility to keep all radiation exposure "as low as reasonably achievable".

   b. Radiation Protection Supervision shall have the authority to increase the administrative dose guide of individuals to greater than 300 mrem/week, but not greater than 600 mrem/week.

   c. The Supervisor-Radiation Protection or designee shall have the authority to increase the administrative dose guide of the individual to greater than 600 mrem/week.

   d. In the event that an additional exposure authorization would allow an individual to exceed the quarterly administrative dose guide of 2000 mrem, the Plant Manager, or designee, shall evaluate the additional dose and the justification of why the dose guide should be extended and based upon the evaluation, approve or disapprove the request providing the conditions of II.B.2 are met.

E. Administrative Control of Internal Exposure

Exposure to airborne concentrations of radioactive material should be limited to 2 hours in any one day, or 10 hours in any seven consecutive days at the uniform maximum permissible concentration (MPC's) specified in Appendix B, Table 1, Column 1 of 10CFR20 (i.e., 2MPC hours per day, or 10MPC hours per week). If exposures above maximum permissible concentrations are necessary, the wearing of properly fitted respiratory protective equipment will be required or limitation of working times utilized.

F. Accumulation of Radiation Exposure

1. Occupational Exposure - Internal and external exposure may be combined to restrict the total dose to any individual.

2. Accumulated occupational dose to the whole body to date should be documented on Form NRC-4 or equivalent, when an individual is assigned to CPS to perform a specific task.

3. The licensee will maintain a record, Form NRC-5 or equivalent, showing the radiation exposure of each individual for whom personnel monitoring is required. The doses recorded on Form NRC-5 or equivalent, shall be for periods not to exceed one calendar quarter.

4. Internal radiation exposure will be maintained for any individual who has undergone bioassay to determine internal deposition of radionuclides.

G. Emergency/Accident Exposure

1. An emergency, as defined in this manual, is a set of unplanned events characterized by risks sufficient to require immediate action to avoid an abrupt or rapidly deteriorating situation. Although an emergency situation transcends the normal requirements of limiting exposure, there are suggested levels for exposure. It should be pointed out that every reasonable effort will be made to minimize exposure at all times.

2. Whole body exposure to radiation should be limited to 12 rem when emergency onsite actions are required to eliminate a source or potential source representating a hazard to the general public or to prevent a substantial loss in property.

NOTE

The allowed exposure of 12 rem is in situations when time permits some preparation prior to the exposure of individuals.

3. Whole body exposure to radiation should be limited to a once in a lifetime exposure of 25 rem for life-saving operations; such as a rescue or search for missing persons.

NOTE

The limitation referred to above corresponds to the once in a lifetime accidental or emergency dose for radiation workers which, according to the National Council for Radiation Protection, may be disregarded in the determination of their radiation exposure history. Rather, the 25 rem whole body value has been set forth in this procedure as a guide in evaluating the potential for exposure to radiation resulting from the accident or emergency.

4. Any exposure in excess of the quarterly limit (3 rem/qtr) should be authorized by the Plant Operations Manager (Shift Supervisor) and the senior Radiation Protection Supervision on site should time permit and is applicable during emergency situations only.

H. Overexposure

Individuals who receive exposure in excess of 10CFR20 limits prescribed, in the case of exposure to radiation or airborne radioactive material, shall be removed from further exposure during the remainder of the applicable period. A Condition Report will be utilized to document the incident.

III. RADIATION EXPOSURE CONTROL

Scope

This section covers the necessary regulations and radiation protection measures which apply to a Station Radiological Area. A Station Radiological Area (Figure A) is defined as an area within the boundaries of Clinton Power Station in which radioactive materials and radiation are present such that protective measures are required to ensure that limits expressed in 10CFR20 are not exceeded.

Access to the Station Radiological Areas shall be limited to those persons authorized entry by Plant Supervision and Radiation Protection personnel. The basic entry requirements are successful completion of Phase I of the CPS Orientation Program or an escort, the wearing of personnel monitoring equipment, and appropriate protective clothing by all individuals. Entry to and exit from Station Radiological Areas for individuals shall be through the designated access control points only.

Responsibility

It is the responsibility of the individual to obey the necessary procedures and radiation protection measures and when there are doubts as to the correctness of them or the safety of operation, report the circumstances to their supervisor.

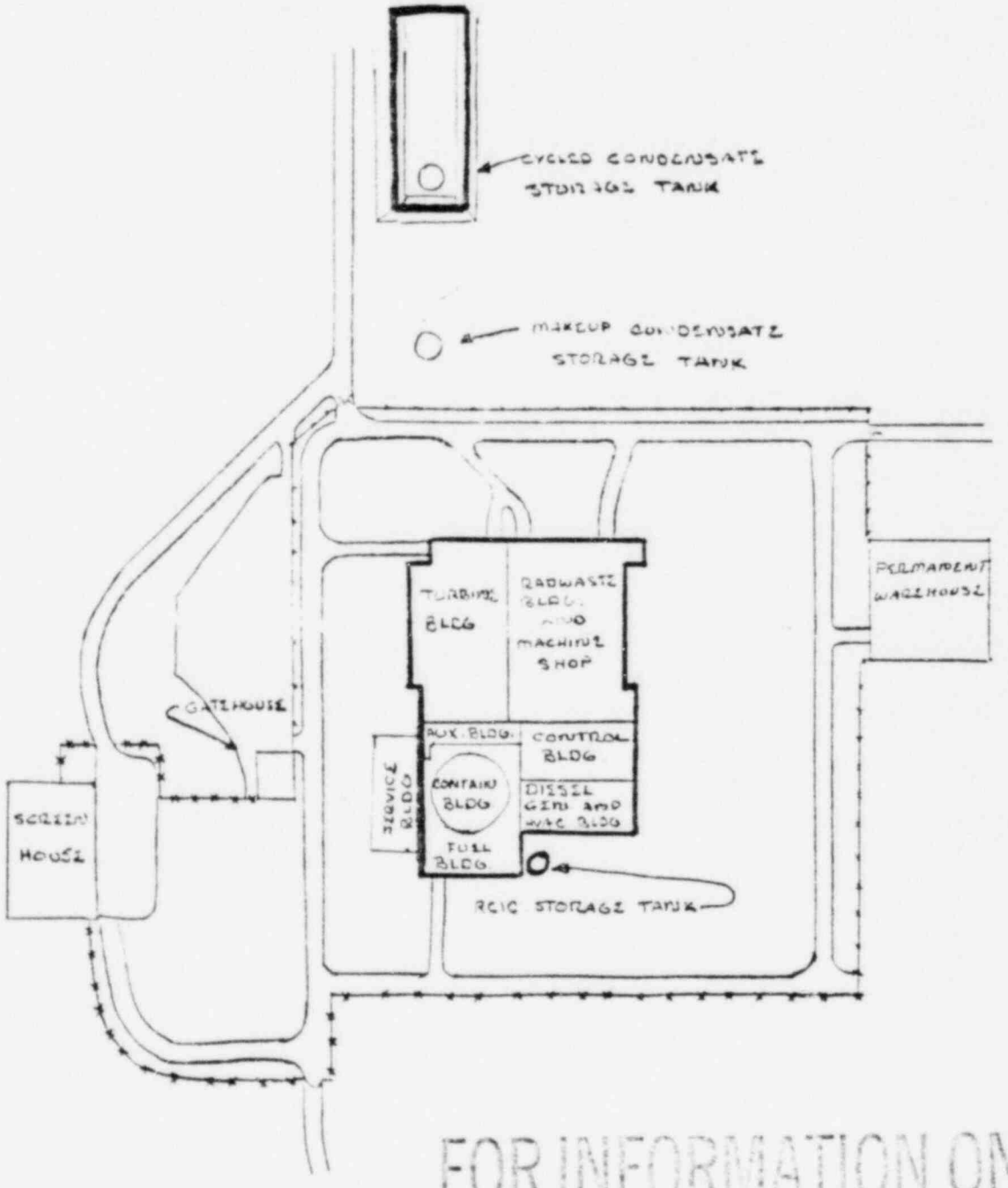
It is the responsibility of the supervisor to assure that all work in the Station Radiological Area is performed in accordance with approved procedures.

It is the responsibility of Radiation Protection personnel to evaluate radiological conditions in the Station Radiological Areas and recommend precautionary measures.

A. Definition of the Areas

1. Uncontrolled Area - An area where access is not controlled for purposes of protection of individuals from exposures to radiation or radioactive material. All areas outside the Station Radiological Area are normally classified Uncontrolled Areas.

Station Radiological Areas- inside heavy lined areas



2. Station Radiological Area (SRA) - An area where access is controlled for the purpose of protection of individuals from exposure to radiation and radioactive materials.

3. Controlled Station Radiological Areas - Areas within the SRA which require radiological controls beyond those specified for an SRA. Areas defined in paragraphs 4-9 are correctly termed as Controlled Station Radiological Areas.

4. Radiation Area - An area where an individual could receive a whole body dose in excess of 5 mrem in any one hour or 100 mrem in any 5 consecutive days.

5. High Radiation Area - An area where an individual could receive a whole body dose in excess of 100 mrem in any one hour.

6. Extreme High Radiation Area - An area where an individual could receive a whole body exposure equal to or greater than 1000 mrem in any one hour.

7. Radioactive Material Area - An area where licensed material is used or stored and which contains any radioactive material in an amount exceeding 10 times the quantity of such material specified in Appendix C of 10CFR20 (100 times the quantity for natural uranium or thorium).

8. Contamination Area - An area where removable surface contamination is in excess of 1000 dpm/100 cm^2 (β-γ) and/or 100 dpm/100 cm^2 (α).

9. Airborne Radioactivity Area - An area where airborne radioactivity exists in concentrations in excess of the limits in Appendix B, Table 1, Column 1, of 10CFR20.

B. Posting Requirements for Station Radiological Areas

1. Except as otherwise authorized by the Nuclear Regulatory Commission, signs prescribed by this section shall use conventional radiation caution colors, magenta on yellow background.

2. Access points to the Station Radiological Area shall be posted with a sign bearing the radiation caution symbol (three-bladed design using the color magenta on a yellow background) and the words (or equivalent):

"CAUTION

Station Radiological Area

Authorized Personnel Only"

3. Each Radiation Area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words (or equivalent):

"CAUTION
RADIATION AREA"

4. Each High Radiation Area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words (or equivalent):

"DANGER
HIGH RADIATION AREA"

5. Each Extreme High Radiation Area should be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

"DANGER
EXTREME HIGH RADIATION AREA"

6. Each Radioactive Material Area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words (or equivalent):

"CAUTION
RADIOACTIVE MATERIAL(S)"

7. Each Contamination Area shall have its boundaries clearly defined and conspicuously posted with a sign or signs bearing the radiation caution symbol and the words (or equivalent):

"CAUTION
CONTAMINATION AREA"

8. Each Airborne Radioactivity Area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words (or equivalent):

"CAUTION
AIRBORNE RADIOACTIVITY AREA"

C. Entry into High Radiation Areas

1. An individual or group of individuals requiring access to either High Radiation Areas or Extreme High Radiation Areas shall be provided with or accompanied by at least one of the following:

   a. A radiation monitoring device which continuously indicates the radiation dose rate in the area.

   b. A radiation monitoring device which continuously integrates the radiation dose rate in the area and which alarms when a preset integrated dose is received. Entry into such areas with this device may be made after the dose rate levels in the area have been established and personnel have been made knowledgeable of them.

   c. An individual granted unescorted access to the Station Radiological Area who is equipped with a radiation dose rate monitoring device. This individual shall be responsible for providing positive control over activities within the area and shall perform periodic radiation surveillance at the frequency specified in the Radiation Work Permit.

2. Each High Radiation Area shall be barricaded and provided with a plant key/lock series unique to High Radiation Areas only. These areas normally should be barricaded and locked with the exception of times when work is being performed in the area. Key control shall be maintained by Radiation Protection Supervision.

3. Each Extreme High Radiation Area shall be barricaded and locked or guarded. Each building which contains Extreme High Radiation Areas will receive a plant key/lock series which is unique to the Extreme High Radiation Areas in that building alone. Key control shall be maintained by Radiation Protection Supervision.

D. Tools, Material and Equipment

1. Tools, material and equipment will be unconditionally released outside the Station Radiological Area provided that the following conditions are met:

   a. A contamination survey has been performed by Radiation Protection personnel with removable contamination less than or equal to 1000 dpm/100 cm^2 beta-gamma, and less than or equal to 100 dpm/100 cm^2 alpha, when alpha contamination is known or suspected to exist.

   b. The fixed contamination level is less than or equal to 0.1 mrem/hour above background at 1 inch.

   c. A completed Unconditional Release Tag will be affixed or accompany any item released offsite which meets the requirements stated above.

2. A conditional release from the Station Radiological Area may be accomplished for items which do not meet the requirements as stated in Section 1 provided that they are properly packaged and labeled and the Supervisor-Radiation Protection's approval has been obtained.

3. Control of tools, material and equipment within the Station Radiological Area:

   a. Tools, material and equipment which exceed the limits of Section D.1.a should be readily identified as being contaminated by magenta paint, radiation tape or equivalent, tagged, and stored in controlled storage areas within the Station Radiological Area.

   b. Tools, material and equipment with loose surface contamination which are to be stored outside a Contamination Area, should be bagged or otherwise completely enclosed so as to prevent the spread of contamination, and properly tagged.

c. Tools, material and equipment in storage should have a completed Radioactive Material Tag attached such that the radiation and contamination levels are known to the individual handling the item.

4. Controlled Equipment - Equipment of a portable nature and of such design which makes decontamination impractical will be considered controlled equipment. Controlled equipment may have contamination up to 100,000 dpm/100 cm^2 beta-gamma and 100 dpm/100 cm^2 alpha, and may have beta-gamma radiation levels up to 10 mrem/hr at 1 inch. It may be used only in a Controlled Station Radiological Area by workers wearing protective clothing. Controlled equipment having radiation levels greater than 10 mrem/hr may be used when considering all factors involved, i.e., nature of equipment, frequency of use, and length of time it may be used, etc.

E. Protective Clothing

All personnel entering a Controlled Station Radiological Area are required to wear certain items of protective clothing. The items to be worn will depend on the duties of the individual and on existing plant conditions. The actual protective clothing to be worn will be delineated in the Radiation Work Permit. Protective clothing is not to be worn outside of the Station Radiological Area.

1. Use of Protective Clothing

The following procedure will be used by personnel required to wear full protective clothing in a Contamination Area:

a. Contamination Area Entry Procedure

1. From the clean protective clothing storage shelves, obtain at the minimum, protective clothing and other equipment as required by the Radiation Work Permit.

2. Remove all outer clothing, jewelry, etc. and store in storage areas which will be provided.

3. Personnel working in areas of high level contamination should tape shut all openings in protective clothing to prevent entry of contamination beneath the clothing.

b. Contamination Area Exit Procedure

1. Remove protective clothing in such a manner as to prevent contamination of the skin or articles of clothing underneath.

2. Place the articles of protective clothing in its respective container. Tape, disposable booties and other disposable items shall be placed in the radioactive waste container.

NOTE

Place the items removed in the respective container. This minimizes the time spent sorting material.

3. Monitor self and personal clothing with count rate meter immediately after leaving the Area.

NOTE

If contamination levels cause an alarm condition on the count rate meter (approx. 1000 dpm), notify Radiation Protection personnel immediately.

c. When working in contaminated areas, personnel should periodically check levels of contamination on protective clothing with a G. M. Survey Meter. If gross contamination is detected, i.e., radiation levels in excess of 10 mrem/hr at one inch, the protective clothing should be removed and clean protective clothing put on.

2. Laundered Protective Clothing

Laundered protective clothing will be surveyed for the following acceptable limits of contamination:

a. The fixed beta-gamma activity should not exceed a general reading of 5 mrem/hr. at one inch.

b. Clothing in excess of the above limits may be retained for limited use in highly contaminated areas or held for radioactive decay. This clothing will not be available for general use.

F. Radiation Work Permit

1. The Radiation Work Permit (RWP) is a control form which assures evaluation of radiological hazards involved with a specific work function or operation, and establishes appropriate radiological considerations prior to engaging in the work to be performed.

2. An RWP will be initiated for work or actions involving any or all of the following conditions (or which could result in any of the following conditions):

a. Entry into a high radiation area.

b. Airborne activity requiring the use of respiratory protective equipment.

c. Entry into an area where removable surface contamination exists above 1000 dpm/100cm^2 beta-gamma or 100 dpm/100cm^2 alpha, if alpha contamination is known or suspected to exist.

d. Maintenance or inspection of contaminated or radioactive equipment in excess of the following:

1. Removable surface contamination in excess of 1000 dpm/100cm^2 beta-gamma or 100 dpm/100cm^2 alpha, if alpha contamination is known or suspected to exist.

2. Radiation levels in excess of 100 mrem/hr or where an individual is likely to receive a whole body exposure of 100 mrem/wk in accordance with the following formula:

   (mrem/hr) X (hours/week repair time) $\geq$ 100 mrem/week.

e. Handling of certain licensed byproduct radioactive material as determined by the Supervisor-Radiation Protection.

f. Radioactive waste shipments.

g. Situations where exposure to neutron radiation is expected.

h. Other conditions as determined by Radiation Protection personnel.

3. Continuous Radiation Protection coverage may be substituted for an RWP in emergency situations or those requiring immediate access, but exposures will be documented upon completion of the job.

4. It will be the responsibility of the individual initiating the Radiation Work Permit to supply the following information:

   a. Date requested

   b. Maintenance Work Request (MWR) Number, if applicable

   c. Name of individual requesting the RWP

   d. Starting date/time

   e. Anticipated completion date/time

   f. Job description

   g. Location

   h. Name(s) and Social Security Number(s) of personnel.

5. Radiation Protection personnel will supply the following on the RWP:

   a. Perform radiological surveys as necessary and evaluate the conditions applicable to the work function. Enter the pertinent radiological survey measurements.

   b. Make a final determination for the need of the RWP.

   c. Enter the RWP number and the RWP expiration date/time.

   d. Mark the protective clothing and equipment required, any Special Instruction or Special Requirements and specify the Monitoring Required.

   e. Enter, as applicable, the stay time and/or exposure limit.

6. Approval of the RWP should be granted after all radiological and operational aspects have been reviewed. A member of the Radiation Protection Group, a member of the Radwaste Operations Group if the work is to be performed on Radwaste Systems, and the Shift Supervisor/Asst. Shift Supervisor signatures are required before approval to work under the RWP is granted.

7. Personnel performing work under an RWP should not deviate from the requirements and job description as stated on the RWP without authorization from Radiation Protection personnel.

8. In situations where an RWP needs an extension of expiration date/time or should radiological conditions change requiring changes in protective equipment, etc., a Radiation Work Permit Supplement will be initiated to document the changes. The RWP Supplement will be approved in the same manner as an RWP.

9. A department or group within a department may be issued an RWP for tasks which are considered routine or repetitive and is to be designated a Blanket RWP. The Blanket RWP allows the flexibility of longer duration and of being able to perform several tasks which would normally require several RWP's. It is prepared the same as the RWP with the exception that Radiation Protection Supervision and the cognizant department or group will write the Special Instructions to delineate what are considered routine or repetitive tasks.

10. The RWP will be terminated for any of the following reasons:

    a. Completion of job

    b. Cancellation of job

    c. Expiration of the RWP/RWP Supplement

11. Correlation of RWPs and ALARA

    By utilizing RWPs for specific tasks, the total exposure in man-rem for the job is documented. It can then be compared to the same job or similar jobs that are done at a later date. The evaluation can then be made to determine that the exposures are ALARA and whether or not the dose could be reduced by other means.

G. ALARA Program (As Low As Reasonably Achievable)

1. This program contains the Corporate Management's commitment to and establishes the authority and responsibility of Clinton Power Station to maintain radiation exposures ALARA.

2. Station Personnel

    a. Responsible to keep exposures as low as reasonably achievable including making recommendations to their supervisor.

    b. Insure that supervisory personnel are informed of their exposures so that proper planning may be effected.

c. Should remain knowledgeable of all radiological practices and adhere strictly to the conditions of the applicable RWP.

3. Implementation of ALARA

a. Assure effective measures are taken to provide procedures and practices by which specific goals and objectives of the ALARA program may be achieved.

b. Establish a radiation protection program for all station/utility personnel, contractors, and visitors which puts emphasis on the ALARA policy. Ensures that the resources, including personnel, facilities, instrumentation, and equipment are available to achieve an effective ALARA program.

c. Surveys of areas and review of related RWP's are to be conducted by Radiation Protection personnel. Radiation protection requirements will be clearly identified in written procedures and forwarded to the Supervisor-Radiation Protection for approval.

d. The Supervisor-Radiation Protection shall:

1. Schedule a review of the procedures with appropriate supervisory personnel, if necessary, to determine changes and to insure the ALARA requirements are being met. Training, job preparation and man-rem goals will be established as necessary.

2. Conduct an ALARA review of operational plant activities for the purpose of identifying the locations, operations, and conditions which have a potential for causing or have caused significant exposures.

3. Conduct at least biennial reviews of procedures, records, reports, etc., used to comply with the ALARA guidelines and the NRC regulatory requirements.

4. Submit to the Committee members the meeting agenda, status of "open" items, copy of ALARA Reviews generated since the last meeting, and publish meeting minutes.

e. Preparation of work area will be conducted with the intent to reduce radiation exposure whenever possible.

f. Training sessions for work crew and Radiation Protection personnel will be conducted as necessary to ensure personnel are familiar with all aspects of job.

g. Radiation Protection personnel will post requirements by issuing an RWP.

h. Adequate supervision should be provided to expedite and support the job.

i. After completion of job, exposures and procedure should be reviewed to determine if the ALARA concept was adhered to and successful.

4. ALARA Reviews

An ALARA Review will be initiated for any of the following conditions:

a. If the dose is either estimated or known from past experience to be greater than 10 man-rem for the particular job.

b. If the dose is greater than 10 man-rem per year for routine reoccurring jobs.

c. If new or modified plant facilities and/or equipment would cause a detrimental affect on existing radiation levels. The Supervisor-Radiation Protection will determine the need for an ALARA Review and assign a cognizant individual to complete the review.

5. ALARA Committee

The ALARA Committee is the on-site group designated to ensure the development and implementation of principles that will ensure that occupational exposures will be ALARA. The Committee is composed of the following personnel:

a. Plant Manager (Chairperson),

b. Assistant Plant Manager,

c. Supervisor-RadChem,

d. Supervisor-Radiation Protection, and

e. Member-at-Large (selected by Chairperson based on expertise required at the meeting).

H. Process Radiation Monitoring System (PRMS)

The PRMS detects, measures, indicates and records levels of radiation and airborne radioactivity to ensure that the dose received by individuals in a specific area are within permissible limits and/or guidelines. The PRMS consists of fixed or portable area radiation monitors, fixed or portable air monitors, and process radiation monitors. Should a predetermined radioactivity setpoint be exceeded, the PRMS provides for activation of local and remote alarm and in the case of process radiation monitors, it also may initiate proper controlling actions. The PRMS provides remote indication/alarm function in the Radiation Protection Office and in the Main Control Room.

IV. PERSONNEL MONITORING (PM)

Scope

All personnel subject to occupational radiation exposure, while within Clinton Power Station's Station Radiological Area, are required to have in their possession personnel monitoring devices issued by CPS capable of measuring the dose received from external sources of ionizing radiation.

Only PM equipment issued by Clinton Power Station will be utilized to determine accumulated whole body exposure for all personnel at CPS, but contractors may wear their own in addition. If erroneous exposure results are obtained using CPS PM equipment, an investigation should be initiated by Radiation Protection Supervision to determine the individual's exposure.

Responsibility

It is the responsibility of Radiation Protection personnel to establish and maintain the personnel monitoring program consistent with the requirements of 10CFR20.

It is the responsibility of the individual to wear the PM badge and self-reading dosimeter in the prescribed manner and ensure their safekeeping. The loss or damage of any PM device will require the immediate notification of Radiation Protection personnel.

A. Personnel Monitoring Equipment

1. Thermoluminescent Dosimetry (TLD)/Film Badge

   All personnel working within the Station Radiological Area of the plant will be issued beta-gamma sensitive TLD/Film Badge and will be required to wear such devices at all times while within the Station Radiological Area. A neutron sensitive TLD chip/film packet, in addition to the beta-gamma sensitive TLD chip/film packet should be issued to personnel whenever a significant neutron exposure is possible. Personnel to be issued TLD/Film Badge will pick them up either in the Radiation Protection Office or the TLD Reader Room.

2. Self Reading Dosimeters

A self-reading dosimeter will be issued, in addition to a TLD/Film Badge, to individuals who enter the Station Radiological Area as an indication of day to day exposure. Dosimeters should be read and recorded and rezeroed by Radiation Protection personnel when the readout approaches 3/4 scale. Any individual whose dosimeter is off scale shall report this immediately to Radiation Protection personnel.

B. Wearing of Personnel Monitoring Equipment

1. The TLD/Film Badge and self reading dosimeter are to be worn on the front trunk of the body, adjacent to each other and in a plainly visible position. It is required that each individual read their dosimeter periodically while in radiation areas. A dosimeter should be read, recorded and rezeroed prior to reaching 3/4 scale. In situations utilizing higher range dosimeters, the appropriate reading, recording and rezeroing requirements will be stipulated by Radiation Protection personnel. Precautions should be taken to prevent contamination of PM equipment while in Contamination Areas.

C. Special Personnel Monitoring and Personnel Monitoring Equipment

1. In situations where exposure to individuals is to be localized to a specific part of the body, the RWP will delineate where the PM equipment is to be worn.

2. Special or additional TLD's/Film Badges will be issued as deemed necessary by Radiation Protection personnel and as required by the Radiation Work Permit for any unusual exposure conditions.

D. Thermoluminescent Dosimetry/Film Badge Period

1. TLD/Film Badge will be processed at fixed intervals. The TLD/Film Badge should be processed immediately at any time an overexposure has occurred or is suspected.

E. Personnel Exposure Investigations

1. Technical Overexposure

a. When situations occur involving suspected or known exposure of personnel to ionizing radiation in excess of limits specified in Section II, Part B & C of this manual, the incident shall be promptly investigated and personnel exposures evaluated. This can require special bioassays, radiation surveys, air samples, and analysis of TLD/Film Badge exposure results.

b. An investigation shall be conducted in accordance with the CPS procedure covering Condition Reports and a written report shall be issued.

c. The report should include the following data.

1. Description of operation

2. Conditions under which the overexposure occurred.

3. Names of personnel involved together with previous exposure records.

4. Recommendations for corrective measures to prevent similar overexposures.

2. Self Reading Dosimeter Off-Scale, Lost TLD/Film Badge

a. When a situation occurs involving an off scale dosimeter or lost TLD/Film Badge, immediately leave the Controlled SRA and notify Radiation Protection so that personnel exposure can be evaluated by radiation surveys and TLD/Film Badge exposure results and a written report issued.

b. An investigation shall be conducted in accordance with the CPS procedure covering Condition Reports and a written report shall be issued.

c. The report should include the following data.

1. Reason for report

2. Conditions under which the off scale dosimeter or lost TLD/Film Badge occurred.

3. Names of personnel involved together with exposure record for the time frame involved.

4. Method utilized to determine exposure.

F. Visitors

1. Long term visitors, or those expected to receive a significant radiation exposure (> 312.5 mrem per quarter), will be issued a TLD/Film Badge and self reading dosimeter and will be monitored in the same manner as Clinton Power Station personnel.

2. Casual and short term visitors, those for whom exposures are expected to be insignificant (< 312.5 mrem per quarter) will be issued self reading dosimeters. The resultant radiation exposure indicated should be recorded on a log sheet maintained specifically for that purpose.

3. Radiation Protection personnel should be notified in advance, if possible, of any visitor(s) scheduled to enter the station so that the appropriate monitoring devices can be supplied and the visitor(s) can be instructed in their use.

G. Contractors

1. Contractor personnel, while performing work in station areas, will comply with personnel monitoring requirements established by Clinton Power Station. The contractor personnel will be issued TLD/Film Badges and self reading dosimeters as specified by Radiation Protection Supervision for the duration of the contracted work.

2. Handling and processing of TLD/Film Badge and self reading dosimeters will be the same as for station personnel.

V. CONTROL AND ACCOUNTABILITY OF RADIOACTIVE MATERIAL

Scope

It is the intention of this section to prescribe controls to assure compliance with applicable Federal and State Regulations regarding the transfer, possession and use of byproduct and special nuclear material.

Responsibility

It is the responsibility of cognizant supervision to notify Radiation Protection personnel of any impending shipment or receipt of radioactive material.

It is the responsibility of Radiation Protection Supervision to supervise the radiological preparation for shipment and receipt of all radioactive material arriving at or leaving Clinton Power Station.

A. Receipt of Radioactive Material

Upon receipt of any material, component, or equipment with a radiation warning label attached, Radiation Protection personnel will be promptly notified. A Radiation Protection representative will monitor the shipment and advise as to handling or storage.

B. Shipment of Radioactive Material

1. Prior to transfer or shipment of any material identified as, or suspected of being radioactive, Radiation Protection Supervision will be notified. A Radiation Protection representative will survey the material or equipment, advise as to packaging, labeling and shipment procedures. The shipment will be remonitored after packaging to insure compliance with all existing Federal and State Regulations covering such shipments.

2. An accurate account of all receipts and shipments will be maintained by Radiation Protection personnel.

C. Licensed Radioactive Material

1. Licensed radioactive material will be handled by or under the direct supervision of those individuals named in the appropriate NRC Material License. Radiation Protection personnel will assure compliance with provisions of applicable 10CFR's, and any conditions of the appropriate NRC Material License.

2. A complete inventory will be maintained by Radiation Protection personnel of all licensed radioactive sources on site. All such sources will be inventoried at intervals not to exceed one year.

3. Records will be kept of all receipt, transfer, disposal, leak test, and other information pertinent to licensed radioactive material.

4. Each sealed source containing radioactive material in excess of 100 microcuries of beta and/or gamma emitting material or 10 microcuries of alpha emitting material will be leak tested at intervals not to exceed six months to detect the presence of greater than 0.005 microcuries of gross activity. If the source exceeds this value, it will be removed from service and repaired or appropriately disposed of.

D. New Fuel Handling and Storage

1. Radiation Protection personnel shall be notifed and shall survey new fuel for radiation and contamination levels prior to or during unpacking and storage. RP will ensure that fuel is stored in a properly posted area for radioactive material.

2. The Technical Department is responsible for the coordination of the receipt and shipment of fuel and that the proper records are maintained.

E. Spent Fuel Shipments

Prior to shipment of spent fuel from the plant site, Radiation Protection personnel shall survey the transport for radiation and contamination levels and assure proper labeling. Records shall be maintained for each shipment of spent fuel assemblies.

VI. RADIOLOGICAL SURVEYS AND RECORDS

Scope

The radiation protection program will include radiological surveys for air activity, removable surface contamination and radiation levels. These surveys will be conducted at regular intervals and in specified areas.

Special surveys should be conducted to evaluate radiological conditions arising from situations not covered in any routine survey procedure.

An important function of Radiation Protection personnel is to maintain complete, meaningful and accurate records. Reports of conditions showing no radiation exposure and/or negative results are as important as the records of positive exposure conditions.

Responsibility

Radiation surveys will be conducted by Radiation Protection personnel or personnel whose assigned duties require the performance of radiation surveys.

Radiation Protection Supervision will review all surveys and recommend measures to be taken to control radiation exposure. The control measures may be physical and/or procedural. Physical measures implies the use of shielding, ventilation, respiratory protection and protective clothing. The procedural measures include access control, time limitations, and modifications of working procedures.

A. Radiological Surveys

1. Beta-gamma dose-rate, surface contamination, and airborne radioactivity surveys, as appropriate, will be conducted at regular intervals in areas as determined by the Supervisor-Radiation Protection.

2. All area dose rate surveys will be taken at waist level except for specified contact readings at points of interest. All area air samples should be of a representative volume and taken in the normal breathing zone. Survey personnel should also note, separately, the location of radiation levels significantly higher than the average or normal levels. When unusual conditions are encountered during a routine or special survey, these conditions shall be brought to the attention of Radiation Protection Supervision. Radiation Protection personnel will take appropriate action.

3. Personnel should note in writing any changes from the standard practices for conducting a survey to preclude the results being misinterpreted.

B. Records

Records and reports required to show compliance with Federal and State Regulations must be adequately maintained on permanent file. All information from routine and special radiological surveys will be recorded on appropriate survey forms. Radiation protection program records, whether considered primary, secondary or supporting records, should be filed and maintained for review as necessary.

VII. RADIOACTIVE WASTE DISPOSAL

Scope

The release of station radioactive effluents shall be subject to applicable regulations specified in 10CFR20, 50, and in Clinton Power Station Technical Specifications.

Responsibility

It will be the responsibility of the RadChem Department to analyze the radioactive content of all reactor plant effluents.

It is the responsibility of the RadChem Department to ensure that all radioactive waste discharges are in compliance with 10CFR20 and 10CFR50. Also, the RadChem Department will complete records of all radioactive waste releases to the environment and shipments for off-site disposal and assure they are properly maintained.

It is the responsibility of the Shift Supervisor to review the operational aspects of any release of radioactive effluents.

A. Solid Radioactive Waste

1. Solid radioactive waste containers, properly designated, are to be located at convenient points throughout the station. Each container should have a plastic liner to prevent the spread of contamination during transfer from the container.

NOTE

All personnel shall make an effort to place only radioactive waste or suspected radioactive waste in the radioactive waste containers.

2. The solid radioactive waste containers will be routinely monitored and emptied on a regular basis or when radiation levels necessitate.

3. Large solid waste articles shall be wrapped, sealed, painted or otherwise treated to further confine any remaining contamination before moving or storing as contaminated solid waste.

NOTE

These items should not be placed in compactable waste containers.

4. All solid radioactive waste will be processed and packaged in accordance with Department of Transportation and NRC regulations. The drummed radioactive waste will be held in the drum storage area until released for disposal.

B. Liquid Radioactive Waste

1. All liquid radioactive wastes will be stored and subsequently processed in the Liquid Radwaste System.

2. Prior to disposal of processed liquid radioactive waste, a sample will be obtained for analysis. An evaluation of the analysis will be made to ensure compliance with the limits and provisions set forth in 10CFR20 and Clinton Power Station Technical Specifications.

3. Each release will require the completion of a Discharge Permit.

C. Gaseous Radioactive Waste

1. All radioactive gaseous waste from the station stacks will be monitored prior to point of discharge.

2. The discharge of all radioactive gaseous waste will be in accordance with the limits and provisions of 10CFR20, 10CFR50 and Clinton Power Station Technical Specifications.

VIII. RADIATION INCIDENTS: GENERAL GUIDELINES AND REPORTING SEQUENCE

Scope

It is the intent of this section to describe the basic sequence of actions to be taken following a radiation incident in order to minimize the radiation exposure to station personnel and the general public. The exact actions to be taken shall be contained in the Emergency Plan Implementing Procedures.

This section discusses several types of credible radiation incidents. The actual conditions encountered after an incident may differ in some respects from those incidents upon which planning is based. Deviation from basic plans are to be expected and should be made as required to meet the actual need. Each situation must be separately evaluated as it occurs.

Responsibility

It is the responsibility of all station personnel to be familiar with emergency planning and procedures, so that in the event of an emergency, the individual can render effective assistance in controlling the emergency.

It is the responsibility of Radiation Protection personnel to maintain adequate supplies of emergency monitoring equipment and to routinely inspect and test all such equipment for proper operation.

A. Radioactive Spill

1. Spills Involving Minor Radiation Hazard to Personnel

a. Initial Action

1. Attempt to take action that the individual is qualified to take which will minimize the effects of the incident.

2. Notify all personnel not involved in the spill to vacate and/or stay clear of the area.

3. Confine the spill immediately, if possible.

   a. Liquid spill: Don protective gloves and shoecovers. Drop rags or absorbent paper on spill.

   b. Non-liquid spill: Don protective gloves and shoecovers. Dampen the spill, but do not spread.

4. Notify the Main Control Room (Shift Supervisor) of the location and type of spill.

b. Subsequent Action

1. Shift Supervisor and/or shift personnel will notify Radiation Protection personnel.

2. Permit only minimum number of persons necessary to deal with spill into area.

3. All persons involved in the spill will be monitored, the area will be decontaminated and work may be resumed after a survey is made and the area is approved for re-entry by Radiation Protection personnel.

2. Spills Involving Major Radiation Hazard to Personnel

a. Initial Action

1. Attempt to take action that the individual is qualified to take which will minimize the effects of the incident.

2. Notify all personnel not involved in the spill to vacate and/or stay clear of the area.

3 Immediately rinse off, if possible, radioactive material which may have splashed on exposed skin.

4. If spill is on clothing, discard protective clothing at once.

5. Vacate the area, remaining outside immediate area to prevent the spread of contamination.

6. Notify Main Control Room (Shift Supervisor) of the location and type of spill.

b. Subsequent Action

1. Shift Supervisor and/or shift personnel will notify Radiation Protection personnel.

2. Radiation Protection personnel will evaluate hazard and specify protective devices for re-entry.

3. All persons involved will be monitored, the area decontaminated, and work resumed after a survey is made and the area is approved for re-entry by Radiation Protection personnel.

B. Occurrence of Unsuspected High Radiation Levels

Upon detection of unsuspected or unusual high radiation levels, either by alarm on the radiation monitoring system or by routine surveillance, the following procedure shall be carried out.

1. Initial Action

a. Leave the area immediately and ensure that no other personnel are in the affected area.

b. Once clear of the radiation zone, secure or restrict access to the area.

c. Notify Main Control Room (Shift Supervisor).

2. Subsequent Action

a. Shift Supervisor and/or shift personnel will notify Radiation Protection personnel.

b. Radiation Protection personnel will institute a comprehensive dose rate survey to determine the radiation levels in the immediate area.

c. Check the self reading dosimeter readings of all personnel involved.

d. Place barricades and radiation warning signs as required.

e. Attempt to determine the cause of the high radiation levels.

f. Recommend the necessary steps to reduce the radiation levels to acceptable limits, if practicable.

C. Fires in the Station Radiological Area

1. Initial Action

a. Notify Main Control Room (Shift Supervisor) as to location and source of fire.

b. Evacuate personnel in a direction upwind of the fire.

c. Secure ventilation to area as directed by the Shift Supervisor.

d. Fight the fire.

2. Subsequent Action

a. Monitor Area and evaluate radiation hazard, if any.

b. Establish an access control point at location of emergency.

c. Following the emergency, personnel will be monitored, the area will be surveyed and work may be resumed after approval by Radiation Protection personnel.

D. Injuries to Personnel in the Station Radiological Area

1. Minor Injuries or Illness

a. Initial Action

1. Notify Main Control Room (Shift Supervisor) and the immediate supervisor.

b. Subsequent Action

1. Shift Supervisor and/or shift personnel will notify Radiation Protection personnel.

2. Check for contamination. If none exists, the patient is sent to the First Aid Room after removal of protective clothing.

3. If patient shows contamination, decontamination will be attempted in the Radiation Protection Decontamination Station by Radiation Protection personnel or medical personnel, if present, before patient is moved to the First Aid Room.

2. Major Injuries or Illness

NOTE: In cases of severe injury or illness, first aid shall take precedence over contamination control.

a. Initial Action

1. Notify Radiation Protection Office and Main Control Room (Shift Supervisor).

2. Determine extent of injury or illness, if possible, and perform emergency first aid.

3. Monitor area around patient for radiation. If dose rate is excessive, remove the patient immediately or provide temporary shielding to reduce exposure.

b. Subsequent Action

1. If the radiation levels are low and not considered hazardous, do not move the patient until approved by personnel knowledgeable in first aid.

E. Reporting

Management must be aware of adverse conditions in the station so that they may be evaluated and corrected as required. Many conditions which occur in the station may be of such significance that organizations external to the plant must be notified of the condition and what actions were taken to correct the situation. The CPS Condition Report shall be used as the information source for the preparation of subsequent reports required by various regulatory agencies via the Plant Manager.