EMERGENCY PLAN IMPLEMENTING PROCEDURES

REVISION CONTROL SHEET

Revision No. 10

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1.0 PURPOSE

This procedure provides guidelines and criteria for recommending protective actions for radiological hazards for onsite personnel, emergency workers, and the population at risk.

2.0 APPLICABILITY:

This procedure shall be used by the Operations Shift Supervisor, Emergency Coordinator, Site Radiation Protection Coordinator and Health Physics personnel in making protective action recommendations or giving instructions; and used by emergency workers in general in limiting their own exposure levels while working in radiation areas.

3.0 RESPONSIBILITIES

3.1 Shift Supervising Engineer

- Make decisions to evacuate affected site locations in the event of a sudden radiological release
- Recommend protective action to offsite agencies for sudden and serious offsite radiological releases when neither the Emergency Coordinator or the Radiological and EOF Manager are available

3.2 Emergency Coordinator

- Recommend protective action to offsite agencies when appropriate for offsite radiological releases when the Radiological and EOF Manager is unavailable
- Authorize offsite radiological monitoring
- Authorize onsite personnel to receive emergency exposures in emergency situations

3.3 Site Radiation Protection Coordinator

- Supervise and control onsite radiological monitoring personnel exposure and determination of habitable work areas
- Consult with Emergency Coordinator to determine need for onsite personnel to receive emergency exposures in emergency situations

3.4 Onsite Personnel

- Monitor Self-reading dosimeters and minimize personal exposure

4.0 INSTRUCTIONS

4.1 Definitions

Attachment 1 provides definitions of technical terms used with the protective action guides.

4.2 Immediate Action Guidelines

Attachment 2 describes actions to be taken by IELP immediately upon identification of the emergency action level. The actions lited are those radiological protective actions from Table D-1 of the DAEC Emergency Plan. No offsite radiological releases requiring monitoring are expected for the Notification of Unusual Event class of emergency.

4.3 Protective Action Guidelines

Attachment 3 describes the recommended actions to be taken for projected whole body and thyroid exposures to the population at risk. Also described are recommended actions to be taken for projected airborne exposure dose rates over extended periods of time.

4.4 Federal Standards for Protection Against Radiation

Attachment 4 identifies 10CFR20 exposure limits and radiation protection requirements. DAEC administrative exposure limits, as described in Attachment 5, may be raised to the 10CFR20 limits by the site Radiation Protection Coordinator or the Emergency Coordinator as outlined in RPP 2.1.

4.5 DAEC Administrative Exposure Limits

Attachment 5 identifies administrative exposure limits at the DAEC.

4.6 Habitability Limits

Attachment 6 identifies the criteria for habitability of work areas.

4.7 High Exposure or Contamination of Personnel

a. If an individual has received exposure of 25 Rem or more, that individual shall be transported to Mercy Hospital for observation and treatment.

b. Any indication of contamination shall be treated in accordance with EPIP 4.2, "First Aid, Decontamination and Medical Support".

4.8 Emergency Exposure Limits

a. The Emergency Coordinator may approve the use of the limits specified in the DAEC Emergency Plan for Planned Whole Body Emergency Doses to Personnel - Attachment 7 - when deemed necessary under emergency conditions as referenced in the NCRP, Report 39.

5.0 REFERENCES

1. 10CFR20
2. FSAR, Section 12.0
3. RPP 2.1
4. Duane Arnold Energy Center Emergency Plan, Sections D and E
5. Emergency Plan Implementing Procedures

   EPIP 1.2

   EPIP 3.1

   EPIP 3.2

   EPIP 3.3

   EPIP 4.1

   EPIP 4.2

   EPIP 4.3
6. NCRP Report 39

6.0 ATTACHMENTS

1. Definitions
2. Immediate Action Guidelines
3. Protective Action Guidelines
4. Federal Standards for Protection Against Radiation
5. DAEC Administrative Exposure Limits
6. Habitability Limits
7. DAEC Emergency Plant Specified Limits for Planned Whole Body Emergency Doses to Personnel.

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PROTECTIVE ACTION GUIDES AND EXPOSURE LIMITS	

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REVIEWED BY: Herb Georgio — DATE: 8/30/82
ALARA Coordinator

REVIEWED BY: B R York — DATE: 9/16/82
Chairman, Operations Committee

APPROVED BY: D L Mineal — DATE: 9-22-82
Plant Superintendent - Nuclear

ATTACHMENT 1

DEFINITIONS

Airborne Radioactive Material	Any radioactive material dispersed in the air in the form of dusts, fumes, mists, vapors, or gases.
Calendar Quarter	Not less than 12 consecutive weeks nor more than 14 consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be such that no day is included in more than one calendar quarter or omitted from inclusion within a calendar quarter. IELP shall not change the method of determining calendar quarters except at the beginning of a calendar year.
Dose	As used in this procedure, the quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body. When this procedure specifies a dose during a period of time, the dose means the total quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body during such period of time.
High Radiation Area	Any area, accessible to personnel, in which there exists a radiation exposure rate in excess of 100 millirem/hour.
Personnel Monitoring Equipment	Devices designed to be worn or carried by an individual for the purpose of measuring the dose received (e.g., film badges, pocket chambers, pocket dosimeters, film rings, etc.).
Occupational Dose	Includes exposure of an individual to radiation (i) in a restricted area; or (ii) in the course of employment in which the individual's duties involved exposure to radiation, provided, that "occupational dose" shall not be deemed to include any exposure of an individual to radiation for the purpose of medical diagnosis or medical therapy of such individual.
RAD	As used in this procedure, is a measure of the dose of any ionizing radiation (usually associated with beta radiation) to body tissues in terms of the energy absorbed per unit mass of the tissue. One rad is the dose corresponding to the absorption of 100 ergs per gram of tissue. (One millirad (mrad) = 0.001 rad).

ATTACHMENT 1 (Con't)

DEFINITIONS

Radioactivity	For purposes of this procedure, radioactivity is measured in terms of disintegrations per unit time or in curies. One curie = 3.7×10^{10} disintegrations per second (dps). Commonly used submultiples of the curie are the millicurie and the microcurie: (1) One millicurie $(mCi)^1$ = 0.001 curie $(Ci)^1$ = 3.7×10^7 dps. (2) One microcurie $(uCi)^1$ = 0.000001 curie = 3.7×10^4 dps.
Radiation	Any or all of the following: alpha rays, beta rays, gamma rays, X-rays, neutrons, high-speed protons, and other atomic particles; but not sound or radio waves, or visible, infrared, or ultraviolet light.
Radiation Area	Any area, accessible to personnel, in which there exists a radiation exposure rate in excess of 2.5 millirem/hour.
REM	As used in this procedure, a measure of the dose of any ionizing radiation to body tissues in terms of its estimated biological effect relative to a dose of one roentgen (r) of X-rays. (One millirem (mrem) = 0.001 rem.)
Restricted Area	Any area access to which is controlled by IELP for purposes of protection of individual from exposure to radiation and radioactive materials. "Restricted area" shall not include any areas used as residental quarters, although a separate room or rooms in a residential building may be set apart as a restricted area. The DAEC restricted area is the site boundary.
Survey	An evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present.

ATTACHMENT 2

IMMEDIATE ACTION GUIDELINES

ALERT CLASS

Class Description

Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels. (Attachment 3)

Purpose

Purpose of offsite alert is to (1) assure that emergency personnel are readily available to respond if situation becomes more serious or to perform confirmatory radiation monitoring if required, and (2) provide offiste authorities current status information.

IELP ACTIONS

1. Promptly inform State and local authorities of alert status and reason for alert as soon as discovered.
2. Assess and respond
3. Dispatch on-site monitoring teams and associated communications.
4. Provide periodic meteorological assessments to offsite authorities and, if any releases are occuring, dose estimates for actual releases.
5. Provide periodic plant status updates to offsite authorities (at least every 15 minutes)

ATTACHMENT 2 (Continued)

IMMEDIATE ACTION GUIDELINES

SITE AREA EMERGENCY CLASS

Class Description

Events are in process or have occurred which involve actual or likely major failures of plant functions needed for protection of the public. Any releases not expected to exceed EPA Protective Action Guideline exposure levels except near site boundary.

Purpose

Purpose of the site area emergency delcaration is to (1) assure that response centers are manned, (2) assure that monitoring teams are dispatched. (3) assure that personnel required for evacuation of near-site areas are at duty stations if situation becomes more serious, (4) provide consultation with offsite authorities, and (5) provide updates for the public through offsite authorities.

IELP ACTIONS

1. Promptly inform State and local offsite authorities of site area emergency status and reason for emergency as soon as discovered.
2. Assess and respond.
3. Dispatch onsite and offsite monitoring teams and associated communications.
4. Provide meteorological and dose estimates to offsite authorities for actual releases via a dedicated individual or automated data transmission.
5. Provide release and dose projections based on available plant condition information and foreseeable contingencies.

ATTACHMENT 2 (Continued)

IMMEDIATE ACTION GUIDELINES

GENERAL EMERGENCY CLASS

Class Description

Events are in process or have occurred which involves actual or imminent substantial core degrdation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

Purpose

Purpose of the general emergency delcaration is to (1) initiate predetermined protective actions for the public, (2) provide continuous assessment of information from licensee and offsite organization measurements, (3) initiate additional measures as indicated by actual or potential releases, (4) provide consultation with offsite authorities and (5) provide updates for the public through offsite authorities.

IELP ACTIONS

1. Promptly inform State and local offsite authorities of general emergency status and reson for emergency as soon as discovered (Parallel notification of State/local)
2. Assess and respond
3. Dispatch onsite and offsite monitoring teams and associated communications.
4. Provide meteorological and dose estimates to offsite authorities for actual releases via a dedicated individual or automated data transmission.
5. Provide release and dose projections based on available plant condition information and foreseeable contingencies.

ATTACHMENT 3

PROTECTIVE ACTION GUIDELINES

Projected Exposure To An Individual In The Population	Recommended Actions
Whole body - less than 1 REM or Thyroid - less than 5 REM	1. No protective action required. 2. Issue an advisory to seek shelter and await further instructions or voluntarily evacuate. 3. Monitor environmental radiation levels.
Whole body - 1 to 5 REM or Thyroid - 5 to 25 REM	1. Seek shelter and await further instructions. 2. Consider evaucation, particularly for children and pregnant women. 3. Monitor environmental radiation levels. 4. Control access.
Whole Body - 5 REM and above or Thyroid - 25 REM and above	1. Conduct evacuation of populations in the predetermined area. 2. Monitor environmental radiation levels and adjust area for evacuation based on these levels. 3. Control access.

ATTACHMENT 4

10 CFR 20 STANDARDS FOR PROTECTION AGAINST RADIATION

A. Permissible Limits (Rems per Calendar Quarter)

1. Whole body, head and trunk, active blood-forming organs, lens of eyes, or gonads - 1.25 Rem.

2. Hands and forearms, feet and ankles - 18.75 Rem.

3. Skin of whole body - 7.5 Rem.

Exceptions to Whole Body limit above:

a. During any calendar quarter the dose to the whole body from radioactive material and other sources of radiation in IELP's possession shall not exceed 3 Rem; AND

b. The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed 5 (N-18) rems where "N" equals the individual's age in years at his last birthday; AND

c. IELP has determined the individual's accumulated occupational dose to the whole body on Form NRC-4, or on a clear and legible record containing all the information required in that form; and has otherwise complied with item d which follows.

d. Before permitting any individual in a restricted area to receive exposure to radiation in excess of the limits specified above, IELP shall: (1) Obtain a certificate on Form NRC-4, or on a clear and legible record containing all the information required in that form, signed by the individual showing each period of time after the individual attained the age of 18 in which the individual received an occupational dose of radiation; and (2) calculate on Form NRC-4 in accordance with the instructions appearing therein, or on a clear and legible record containing all information required in that form, the previously accumulated occupational dose received by the individual and the additional dose allowed for that individual under this attachment.

e. In the preparation of Form NRC-4, or a clear and legible record containing all the information required in that form, IELP shall make a reasonable effort to obtain reports of the individual's previously accumulated occupational dose. For each period for which IELP obtains such reports, the licensee shall use the dose shown in the report in preparing the form. In any case where IELP is unable to obtain reports of the individual's occupational dose for a previous complete calendar quarter, it shall be assumed that the individual has received the occupational dose specified in whichever of the following columns apply:

ATTACHMENT 4 (Continued)

10 CFR 20 STANDARDS FOR PROTECTION AGAINST RADIATION

Part of Body	Column 1 Assumed exposure in rems for calendar quarters prior to Jan. 1, 1961	Column 2 Assumed exposure in rems for calendar quarters beginning on or after Jan. 1, 1961
Whole body, gonads, active blood-forming organs, head and trunk lens of eye	3-3/4 Rem	1-1/4 Rem

IELP shall retain and preserve records used in preparing FormNRC-4 until the Commission authorizes their disposition. If calculation of the individual's accumulated occupational dose for all periods prior to January 1, 1961 yields a result higher than the applicable accumulated dose value for the individual as of that date, as specified in Items a, b, and c above, the excess may be disregarded.

B. Personnel Monitoring

IELP shall supply appropriate personnel monitoring equipment to, and shall require the use of such equipment by:

1. Each individual who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 25 percent of the applicable value specified in Part A of this Attachment.

2. Each individual under 18 years of age who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 5 percent of the applicable value specified in Part A of this Attachment.

3. Each individual who enters a high radiation area.

ATTACHMENT 4 (Continued)

10 CFR 20 STANDARDS FOR PROTECTION AGAINST RADIATION

C. Surveys

IELP shall make, or cause to be made, such surveys as may be necessary to comply with this Attchment or other exposure limits and protective actions established by IELP.

D. Signs

1. Radiation areas: Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION[1]
RADIATION AREA

2. High radiation areas: Each high radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION[1]
HIGH RADIATION AREA

3. Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the rdiation caution symbol and the words:

CAUTION[1]
AIRBORNE RADIOACTIVTY AREA

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1 or "DANGER" (used by DAEC)

ATTACHMENT 5

DAEC EXPOSURE LIMITS

A. External Exposure Limis (Rems per Calendar Quarter)

1. Whole Body; head, trunk, active blood-forming organs, lens of eyes, or gonads - 1.0 Rem

2. Hands and forearms; feet and ankles - 15.0 Rem

   NOTE: No individual will be allowed to exceed 10.0 Rem in a quarter unless the results of all TLD badges have been received.

3. Skin of Whole Body - 6.0 Rem

   NOTE: No individual will be allowed to exceed 5.0 Rem in a quarter unless the results of all TLD badges have been received.

4. No more than 300 mrem/day without approval from the Site Radiation Coordinator or Emergency Coordinator

5. Refer to RPP 2.1 for authorization up to 10CFR20 limits.

B. Internal Exposure Limits

Airborne Radioactivity:

1. 1.0×10^{-9} uCi/cc - particulate activity from unidentified sample analysis (gross beta-gamma)

2. 0.1 MPC - particulate activity from identified sample analysis (as determined, when necessary, in accordance with the foot notes of 10CFR20, Appendix B)

3. 0.1 MPC Radioiodines (Iodine 131-1.0×10^{-9} uCi/cc)

C. Protective Actions

1. Airborne Radioactivity above values listed in B above require that appropriate respirator equipment be used or time-keeping performed.

2. A limit of 10 MPC-hours during any calendar week shall not be exceeded without prior approval of the Site Radiation Protection Coordinator or Emergency Coordinator.

3. An MPC-hour log entry shall be made for any individual who exceeds two MPC-hours in any day or ten MPC-hours in any calendar week.

ATTACHMENT 6

HABITABILITY LIMITS

A. Background Activity

Occupancy Time	Permissable Exposure Rate
24 hours/day	6 mrem/hr.
12 hours/day	12 mrem/hr.
8 hours/day	19 mrem/hr.

Note: Exposure limits based upon 150 mrem/day. Longer occupancy times may be authorized by the Site Radiation Protection Coordinator as directed by the Emergency Coordinator. Refer to Attachment 5 for other considerations.

B. Airborn Activity

Activity Level	Habitability
1×10^{-9} uCi/cc (unidentified gross beta/gamma)	Safe

Refer to 10CFR20, Appendix B, Table I and RPP 8.1

Particulate activity greater than 50 times MPC	Full-face respirator (filter type)
Particulate activity greater than 10,000 times MPC or when airborne activity is in the form of a gas vapor	Self-contained breathing apparatus

C. Surface Contamination Activity

Activity Level	Action
1000 dpm/100 cm^2 (beta-gamma)	Shoe covers
250 dpm/100 cm^2 (alpha)	Show covers

Note: If contamination is above these limits, additional protective clothing or evacuation should be considered.

ATTACHMENT 6 (Continued)

HABITABILITY LIMITS

D. Posting of Radiation Area

1. Areas accessible to personnel with whole body exposure of 2.5 mrem to 100 mrem per hour shall be posted as "Radiation Area".

2. Areas accessible to personnel with whole body exposure in excess of 100 mrem per hour shall be posted as "High Radiation Area".

3. Areas accessible to pesonnel with airborne activity in excess of 25% of that specified in 10CFR20, Appendix B, Table I, Column 1, shall be barricaded (or roped off) and posted as "Airborne Radioactivity Area".

ATTACHMENT 7

DAEC EMERGENCY PLAN SPECIFIED LIMITS FOR PLANNED WHOLE BODY EMERGENCY DOSES TO PERSONNEL

A. Limits

The DAEC Emergency Plan specifies limits for planned whole body emergency doses to personnel as follows:

1. 12 Rem (12,000 mRem) for recovery of victims.
2. 25 Rem (25,000 mRem) to reduce hazard potential to acceptable leels.
3. 75 Rem (75,000 mRem) to save lives.

It is compatible with the risk concept to accept exposures leading to doses in excess of those permitted for routine occupational duties, when involved in a major accident. Saving of a life,measures to circumvent substantial exposures to population groups, or recovery of victims may all be sufficient cause for accepting above normal exposures. Dose limits cannot be specified but must be commensurate with the significance of the objectie and held to as low as is reasonably achievable. Some general guidance to follow:

- Rescue personnel should be volunteers or professional rescue personnel who volunteer by choice of employment.
- Rescue personnel should be boradly familiar with consequences of the exposure.
- Women capable of reproduction should not take part in these actions.
- Volunteers above the age of 45 should be selected.
- Internal exposure should be minimized by the use of the best available respiratory protection (positive pressure self-contained breathing apparatus) and contamination should be controlled by the use of protective clothing.
- Exposure under these conditions shall be limited to once in a lifetime.
- Persons receiving exposures as indicated should avoid procreation for a few months.
- Medical follow-up should be considered depending on the magnitude of the exposure.

ATTACHMENT 7 (Continued)

DAEC EMERGENCY PLAN SPECIFIED LIMITS FOR PLANNED WHOLE BODY EMERGENCY DOSES TO PERSONNEL

4. Extremity exposure limits in emergencies are 150 Rem (150,000 mRem). The 150 Rem additional would result in a total of 225 Rem (75 Rem received with whole body exposure.)

5. Exposure limits in excess of those permitted in 10CFR20.101 should be authorized only as a last resort. This authorization can only be made by the Emergency Coordinator (Plant Superintendent - Nuclear or his alternate). The Site Radiation Protection Coordinator (Radiation Protection Supervisor or his alternate) may authorize exposure limits in excess of DAEC administrative limits in an emergency but not to exceed 10CFR20.101 limits. If this becomes necessary the normal process of requesting increased exposure limits need not be followed but emergency records shall indicate that higher limits were authorized, who authorized the higher limits, and who authorized the higher permissible exposure.

One of the most important pathways for personnel exposure during an emergency is via inhalation of either gasses or particulates and whole body exposure to the plume. Released gasses will be either radioactive noble gasses, organic iodines, inorganic iodines or volatile inorganic materials. The PAG for thyroid doses due to inahlation from a passing plume is:

Population at Risk	Projected Thyroid Dose Rem
General Population	5
Emergency Workers	125