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PPL EMERGENCY PERSONNEL DOSE ASSESSMENT AND PROTECTIVE ACTION RECOMMENDATION (PAR) GUIDE

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NOTE: **EMERGENCY EXPOSURE EXTENSION REQUEST FORM** and **POTASSIUM IODIDE TRACKING FORM** can be found in the TAB Listing at the front of the procedure.

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1.0 Limits for **EMERGENCY** doses.

- 1.1 An **EMERGENCY DOSE AUTHORIZATION** (see **EMERGENCY EXPOSURE EXTENSIONS**) may be granted in order to protect facilities, and or equipment to substantially limit the escape of radioactive effluents or control fires. The maximum planned doses are:
 - 1.1.1 Whole body (TEDE)⁽¹⁾ dose shall not exceed 10 Rem.
 - 1.1.2 Dose to any organ (CDE)⁽²⁾, including the skin and extremity (SDE)⁽³⁾, shall not exceed 100 Rem.
 - 1.1.3 Dose to the lens of the eye shall not exceed 30 Rem (LDE)⁽⁴⁾.
- 1.2 An **EMERGENCY** dose authorization may be granted for life-saving actions or protection of large populations. The maximum doses are:
 - 1.2.1 Planned whole body (TEDE)⁽¹⁾ doses shall not exceed 25 Rem.
 - 1.2.2 Planned dose to any organ (CDE)⁽²⁾, including skin and extremity doses, shall not exceed 250 Rem.
 - 1.2.3 Dose to the lens of the eye shall not exceed 75 Rem (LDE)⁽⁴⁾
- 1.3 **RARE** situations may occur in which a dose **GREATER THAN** those specified in **SECTION 1.2** above for emergency dose would be unavoidable to carry out a lifesaving operation or to avoid extensive exposure of large populations. It is not possible to prejudge the risk that one should be allowed to take to save lives of others, therefore no upper limit has been established.

(1) The sum of the Effective Dose Equivalent resulting from the exposure to external sources and the committed effective Dose Equivalent incurred from all significant inhalation pathways during the early phase.

(2) The Committed Dose Equivalent to the thyroid from radioiodine.

(3) Shallow Dose Equivalent.

(4) Lens Dose Equivalent.

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2.0 For any **EMERGENCY EXPOSURE OR ACCIDENTAL OVEREXPOSURE**, the assessment actions in step 2 of the **EMERGENCY EXPOSURE EXTENSIONS** must be performed.

3.0 PROTECTIVE ACTIONS

3.1 Potassium Iodide

3.1.1 For emergency workers entering areas where a committed dose equivalent, (CDE)⁽²⁾, to the thyroid from radioiodine could be 25 Rem or greater, the **Consulting Radiological Physician** should provide input concerning the administration and cessation of KI intake. (See Emergency Telephone Directory for telephone number.)

3.1.2 For thyroid exposures that are strongly expected to exceed 25 Rem, (CDE)⁽²⁾, KI doses of 130 mg (100 mg - iodine) per day should be administered.

Unless the **EMERGENCY DIRECTOR** or **RECOVERY MANAGER** instructs personnel to do otherwise, the KI tablets should generally be taken as soon as possible after thyroid exposure exceeding 25 Rem (CDE)⁽²⁾ is projected.

NOTE: Stable Iodine (KI) is most effective when administered immediately prior to exposure to radioiodine. Significant blockage of the thyroid dose can be provided by administration within one or two hours after uptake of radioiodine.

3.1.3 Onsite issuance of KI for iodine prophylaxis requires the approval of the **EMERGENCY DIRECTOR**. Issuance to EOF and FIELD EMERGENCY MONITORING/SAMPLING TEAM personnel requires the approval of the **RECOVERY MANAGER** when the EOF has relieved the TSC of emergency management activities. The **EMERGENCY DIRECTOR** will approve issuance prior to that time. These approvals must be documented on the **POTASSIUM IODIDE (KI) TRACKING FORM**.

⁽²⁾ The Committed Dose Equivalent to the thyroid from radioiodine.

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3.1.4 For an injured and/or contaminated worker sent to a hospital for treatment, the patient will be under the care of the attending physician. As such, plant procedures no longer apply and KI issuance will be at the discretion of the attending physician. The physician can rely on a senior Health Physics Technician Level II or Health Physics Management to provide the in-plant radiological data on which to base their decision.

- 3.2 Protective measures should be implemented for EOF personnel at the direction of the **DOSE ASSESSMENT SUPERVISOR**.
- 3.3 Exposures to members of local offsite support groups, (ambulance workers, fire fighters) shall not exceed 500 mrem (TEDE)⁽¹⁾ for the performance of support duties on the site of the Susquehanna SES.

4.0 **EMERGENCY EXPOSURE NOTIFICATIONS AND A HEALTH CONSEQUENCE INVESTIGATION** must be conducted for any emergency exposure as outlined in step 6 of the Emergency Exposure Extensions.

⁽¹⁾ The sum of the Effective Dose Equivalent resulting from the exposure to external sources and the committed effective Dose Equivalent incurred from all significant inhalation pathways during the early phase.

EMERGENCY EXPOSURE EXTENSIONS

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1. Fill out the attached **EMERGENCY EXPOSURE EXTENSION REQUEST** Form.
2. Review the following factors:
 - Rescue personnel should be volunteers or professional rescuers.
 - Other considerations being equal (e.g., skill, potential need for person on another mission) personnel above the age of 45 are preferred.
 - Rescue personnel should be familiar and briefed with the consequences of exposure.
 - Women capable of reproduction should not take part in an effort requiring EMERGENCY exposure.
 - Use of personnel with high lifetime cumulative exposure should be discouraged.
 - All reasonable measures must be taken to control contamination and internal exposure.
 - Exposure under these conditions shall be limited to once in a lifetime.
 - For exposures greater than 25 Rem whole body (TEDE), the persons undertaking any emergency operation in which the dose will exceed 25 Rem to the whole body (TEDE) should do so only on a voluntary basis and with full awareness of the risks involved, including the numerical levels of dose at which acute effects of radiation will be incurred and numerical estimates of the risk of delayed effects. See the following two tables for general information concerning Health Effects & Cancer Risks.

EMERGENCY EXPOSURE EXTENSIONS

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Health Effects Associated with Whole Body Absorbed Doses Received Within a Few Hours^(a)

Whole Body Absorbed Dose (rad)	Early Fatalities ^(b) (percent)	Whole Body Absorbed Dose (rad)	Prodromal Effects ^(c) (percent affected)
140	5	50	2
200	15	100	15
300	50	150	50
400	85	200	85
460	95	250	98

- (a) Risks will be lower for protracted exposure periods.
- (b) Supportive medical treatment may increase the dose at which these frequencies occur by approximately 50 percent.
- (c) Symptoms (nausea, vomiting) which occur within a few hours after exposure to large doses of radiation and which usually precede more serious health effects.

Approximate Cancer Risk to Average Individuals from 25 Rem Effective Dose Equivalent Delivered Promptly

Age at Exposure (years)	Approximate Risk of Premature Death (deaths per 1,000 persons exposed)	Average Years of Life Lost if Premature Death Occurs (years)
20 to 30	9.1	24
30 to 40	7.2	19
40 to 50	5.3	15
50 to 60	3.5	11

3. Review the **HEALTH PHYSICS AND ALARA CONSIDERATIONS DURING EMERGENCIES** which is attached.
4. Obtain appropriate approval signatures as outlined in the table below.

EXTENSION		APPROVAL	ACTIONS
FROM mrem (TEDE)	TO mrem (TEDE)		
4000	<25000	ED and RPC/RM and DASU	ALARA REVIEW AND APPLY EMERGENCY EXPOSURE CONSIDERATIONS
>25000		ED and RPC/RM and DASU	ALL OF ABOVE AND BRIEFING ON RISKS

EMERGENCY EXPOSURE EXTENSIONS

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5. If the Emergency Dose Extension is for greater than 4 Rem (TEDE), have the volunteer sign the **EMERGENCY EXPOSURE REQUEST** Form acknowledging that they are a volunteer and are fully aware of the radiological risks of acute and delayed effects.
6. Upon completion of the activity requiring the Emergency Exposure perform the following:
 - Collect, process, and evaluate personnel dosimetry devices when technically appropriate.
 - Investigate the circumstances of all emergency exposures and confirm the dose received.
 - Notify the NRC of emergency exposure as follows:

Immediate notification of the NRC is required for:

 - a. Exposure of the whole body of greater than 25 Rem (TEDE); or
 - b. Exposure of the skin of the whole body of greater than 150 Rem (SDE); or
 - c. Exposure of the extremities of greater than 375 Rem (SDE).

Notification of the NRC **within 24 hours** is required for:

 - a. Exposure of the whole body of greater than 5 Rem (TEDE); or
 - b. Exposure of the skin of the whole body of greater than 30 Rem (SDE); or
 - c. Exposure of the extremities of greater than 75 Rem (SDE).
 - Assess the health consequences of all emergency exposures. Consult with a physician to determine the need for and extent of physical and biochemical examinations.
 - Whole body greater than 25 Rem (TEDE) should result in an examination of the exposed person by a physician.
 - If internal exposure is suspected, quantitative measurements should be made immediately. Bioassays are required based on the following:
 - Nasal smear or facial contamination greater than 1,000 cpm above background.
 - Greater than 4 DAC-HRS in a day or less, or 20 DAC-HRS in a week or less.

HEALTH PHYSICS AND ALARA CONSIDERATIONS DURING EMERGENCIES

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1.0 Evaluate radiological conditions.

1.1 Obtain detailed survey data to ascertain:

- 1.1.1 Beta-Gamma radiation levels
- 1.1.2 Need for neutron measurements
- 1.1.3 Contamination levels and protective clothing requirements
- 1.1.4 Airborne radioactive materials
- 1.1.5 Variability of conditions over space and time

1.2 Evaluate personnel status.

- 1.2.1 Determine available dose under normal administrative dose objectives.
- 1.2.2 If essential, obtain approval from **RADIATION PROTECTION COORDINATOR/EMERGENCY DIRECTOR** for persons expected to exceed administrative objectives.
- 1.2.3 Follow criteria in PPL Emergency Personnel Dose Assessment and Protective Action Recommendation Guide when emergency exposures are deemed appropriate by **EMERGENCY DIRECTOR**.
- 1.2.4 Assess individual's history of exposure to airborne materials.
- 1.2.5 Assess individual's skills in relation to proposed task.
- 1.2.6 Assess individual's lifetime exposure history.

HEALTH PHYSICS AND ALARA CONSIDERATIONS DURING EMERGENCIES

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1.3 Determine proper type and placement of dosimeters.

1.3.1 Evaluate need for additional whole body dosimeters.

NOTE: For emergency exposures above 4 rem, the placement of several dosimeters on an individual is recommended to determine spatial distribution of dose to the individual.

1.3.2 Evaluate need and placement of extremity dosimeters.

1.3.3 Evaluate need for additional dosimetry devices such as high range self-reading dosimeters, electronic dosimeters, and neutron dosimeters.

1.3.4 Evaluate need for time keeping.

1.4 Determine proper respirator equipment required to perform task.

NOTE: For tasks expected to last more than several hours, consider need for relief of team members.

1.5 Review the following ALARA items:

NOTE: The detail and scope of ALARA reviews are to be commensurate with the magnitude of doses expected, numbers of people involved, and urgency of required task.

1.5.1 Consider the trend of exposures vs. the importance of the task:

a. Important and critical task with rising exposure rates will require the dispatch of teams as quickly as possible to reduce exposures.

b. Unimportant or less critical task could be delayed until exposure rates begin to trend downward.

HEALTH PHYSICS AND ALARA CONSIDERATIONS DURING EMERGENCIES

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- 1.5.2 When time permits the following should be included in the ALARA review:
- a. Consider the use of remote handling devices or other special tools.
 - b. Consider the use of portable shielding.
 - c. Consider the need for mock-ups or other practice exercises.
 - d. Assess the number of people required to assure all have essential productive roles.
 - e. Consider the magnitude of doses received by team members in transit to work location.