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U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station OP1-17
Washington, DC 20555

**SUSQUEHANNA STEAM ELECTRIC STATION
REQUEST FOR ADDITIONAL INFORMATION (RAI) FOR
EMERGENCY PLAN (E-PLAN) REVISIONS
PLA-5567**

Docket Nos. 50-387
and 50-388

- Reference: 1) PLA-5511, B.L. Shriver (PPL) to USNRC Document Control Desk, "Proposed Emergency Plan Revision Requiring NRC Approval", dated September 6, 2002.*
- 2) Letter, NRC to B.L. Shriver (PPL), "Request for Additional Information (RAI) Susquehanna Steam Electric Station, Units 1 and 2 (SSES 1 & 2) - Emergency Plan (E-Plan) Revisions (TAC Nos. MB6300 and MB6301)", dated November 25, 2002.*

The purpose of this letter is to provide supplemental information necessary for the NRC staff to complete its review of the emergency plan revision proposed in Reference 1.

Attachment 1 to this letter contains responses to the NRC Request for Additional Information (Reference 2), and supplemental support documents referenced in the responses. Attachment 2 contains new pages for the Emergency Plan previously submitted (Reference 1).

Note to reviewers:

In the cover letter we will include a paragraph on implementation. This will be based on the results of a telecon with the NRC next week.

Sincerely,

B. L. Shriver

Attachments:

Attachment 1 – Response to the NRC's Request for Additional Information

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Attachment 2 – Updated pages to Proposed Revision to the Emergency
Plan

Attachment 3 – Dose Assessment Unit of Instruction

copy: NRC Region I
Mr. D. J. Allard, PA DEP
Mr. T. G. Colburn, NRC Sr. Project Manager
Mr. S. Hansell, NRC Sr. Resident Inspector
Mr. R. Janati, DEP/BRP

Attachment 1 to PLA-5567

**Response to NRC's
Request for Additional Information**

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Attachment 1 – Response to RAI

Susquehanna Emergency Action Level (EAL) Review Questions

NRC EAL Question 1

Have the EAL changes been reviewed and agreed to with State and local governmental authorities in accordance with Title 10 of the *Code of Federal Regulations*, (10 CFR), Part 50, Appendix E, Section IV.B., "Assessment Actions"?

PPL Response:

Yes, the EAL changes have been reviewed and agreed to by the Commonwealth of Pennsylvania (Pennsylvania Emergency Management Agency and Department of Environmental Protection - Bureau of Radiation Protection), the Luzerne County Emergency Management Agency and the Columbia County Department of Public Safety.

NRC EAL Question 2

What are the units and scale of the Vent Monitors used in EAL 15?

PPL Response:

Each of the five plant vents are monitored by an Eberline Model FAAM (Fixed Airborne Activity Monitor). The FAAM's analyze representative samples via isokinetic probes that are in compliance with ANSI 13.1-1969. Each FAAM has three noble gas detectors that provide overlapping ranges of 1×10^{-7} $\mu\text{Ci/cc}$ to 1×10^{-5} $\mu\text{Ci/cc}$ for Xe-133 gas.

The plant effluent noble gas data is continuously monitored and stored in solid state memory. The flow through the sample line is also measured and stored in solid state memory. The FAAM then calculates and stores activity per unit of volume. This information can be displayed upon request and is periodically printed out for record keeping purposes. This information is displayed and recorded on control room back panel OC630. This information is also displayed on OC677 in the TSC.

High activity alarms for all five vent stacks are annunciated on control room panel OC653. The microprocessor converts the monitor output to units of $\mu\text{Ci/min}$ based on the measured vent stack flow rates.

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NRC EAL Question 3

In the Site Area Emergency and General Emergency EAL 15 for Dose assessment the thyroid Combined Dose Estimate is identified as for a child instead of an adult. Is this intentional?

PPL Response:

While the EPA PAG guidance provides for the use of adult thyroid dose conversion factors, the Commonwealth of Pennsylvania requires the use of child thyroid CDE.

NRC EAL Question 4

Page 7-4 indicates that the dose program complies with EPA-400 and refers to the Code. Referencing EPA-400, Appendix B, it indicates that adult physiology is assumed. Is your dose assessment based on child or adult physiology and how does that impact the previous question?

PPL Response:

The accident dose assessments are based on the adult physiology per EPA-400, except for one case - that is, child thyroid dose conversion factors are used in calculating thyroid CDE. Calculations of TEDE are made using the (adult) dose factors provided in EPA-400. To capture this answer we added information to section 7.1.1.3 (replacement pages included in Attachment 2).

NRC EAL Question 5

Page 7-4 indicates that the dose calculation program is run from the Technical Support Center (TSC) and Emergency Operations Facility (EOF). What is used for dose assessment On-shift and where is it described in the E-plan?

PPL Response:

The Emergency Plan Section 7.1.1 states "The Emergency Director is responsible for initiating off-site dose calculation and assessment activities. These activities are performed by health physics trained personnel who report to the Operations Support Center (OSC) (or the Control Room for an Unusual Event)." The dose calculation methodology is described in E Plan Section 7.1.1.3. Section 7.1.1.3 goes on to note "the dose calculation program is a stand alone program running on PC's located in the TSC and EOF" In summary, the HP technicians report to the Emergency Director to determine if dose projections are necessary. If they are, they proceed up one flight of stairs to the TSC and perform those calculations. The TSC is located one floor above our Control Room.

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Susquehanna Staffing Questions

NRC Staffing Question 1

The staff requests clarification of the terms used in Section 6, "Organizational Control of Emergencies," of the proposed emergency plan contained in the letter dated September 6, 2002, to assist with understanding the process for augmenting on-shift staffing following the declaration of an Alert or above emergency classification. Example terms include: On page 6-2 of the proposed E-plan revision it is stated that "the [Operations Support Center] OSC and TSC are fully functional within 30 to 60 minutes." On the same page it is stated that "the TSC will be activated as soon as possible...". In the same sentence it is stated "... it is recognized that the activation time for the alternate TSC...". On page 6-3 it is stated that "The EOF is required to be activated following a Site Area Emergency or General Emergency classification and take over management of the emergency from the TSC...". On the same page it is stated that "Activation of the Emergency Operations Facility requires the minimum..."

- a. Provide E-plan references where the following terms are defined: "activated", "activation", "activation time", "take over management of the emergency", and "fully functional." The response should include a discussion of personnel response in sequence of response from when they are notified to report to their respective emergency response facility to the point when all personnel expected to perform emergency response functions are ready to perform their functions in their respective facility.
- b. Discuss the point from which "fully functional" time goal is measured.

PPL Response:

- a. "Fully functional" means that all minimum required staff as defined in Table 6.1 and the "shaded" positions in Figures 6.2 and 6.3 are present. "Activated", "activation" and "take over management of the emergency" all mean that the facility has sufficient staffing to perform required functions and the facility as taken over command and control of the emergency. The positions required to activate are specified with an * in Figures 6.2 and 6.3. The terms clarified above have been added to Section 1.0-Definitions (replacement pages included in Attachment 2).
- b. The goal is measured from the time of notification as described on page 6-2 Phase II for the TSC and from the time of event declaration as described on page 6-3 Phase III for the EOF. One of the first steps in the Control Room Communicator procedure is to activate NERO. This would occur within one to two minutes of event declaration.

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NRC Staffing Question 2

As part of the justification of extending the response times for augmentation personnel, provide documentation that describes the management expectation that personnel assigned emergency response functions are to respond to their respective emergency response locations as soon as possible without delay.

PPL Response:

The Emergency Response Organization expectations were communicated in a letter to all members on November 8, 2001. Included in these expectations is a requirement for on-call personnel to immediately report upon receiving an unscheduled 22222 pager activation (indicating a requirement to respond). These expectations are proceduralized in NDAP-QA-0014.

NRC Staffing Question 3

Discuss the training provided for the on-shift personnel who are designated to handle the offsite dose assessment function to compensate for the 30-minute Senior Health Physics Expertise position described in Table B-1 in NUREG-0654, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants."

PPL Response:

1. Emergency Plan Overview Training
2. Dose Calculator Training (annual retraining required, copy provided in attachment 3))
3. On-Site Radiation Monitoring Team Training (annual retraining required)
4. Contaminated Injury - Ambulance Training (annual retraining required)
5. Contaminated Injury - Hospital Training (annual retraining required)
6. In-Plant Team Management Training (annual retraining required)

NRC Staffing Question 4

Explain which on-shift personnel will perform the Radiation Protection functions of access control, health physics coverage, personnel monitoring and dosimetry issue. Table B-1 in NUREG-0654 notes that these functions may be performed by two on-shift personnel who may be assigned other functions.

PPL Response:

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Access control and dosimetry issue are performed automatically via the Radiation Protection module of our Nuclear Information Management System (NIMS). The two on-shift health physics technicians fulfill health physics coverage requirements.

NRC Staffing Question 5

Discuss shift operating crew performance related to handling emergency preparedness scenarios for 60 minutes without TSC and OSC assistance. In general terms, discuss any deficiencies related to emergency classification, required notifications, or protective action recommendations that may have been caused by or contributed by the lack of on-shift staffing.

PPL Response:

In reviewing past drill data as well as lessons learned from recent emergency plan activations, performance overall has been satisfactory. One area for improvement that was noted was communications with the NRC during the initial stages of an event. Accordingly we are proposing in this response to add a new position for this function. We will call this position "NRC Communicator" and structure it similar to the NRC Communicator function in the TSC. The qualification for the position of NRC Communicator is that the individual holds or has held a NRC license or STA certification at SSES or other BWR facility or has been certified at SSES or other BWR facility. In lieu of license or certification, the individual has sufficient BWR operating experience as determined by the Manager-Nuclear Operations to facilitate accurate communication with the NRC. Such individuals may be Reactor Engineers, Simulator instructors or individuals from the operations staff. In summary the individual must have sufficient understanding of Control Room operations that they can provide information concerning critical plant parameters, resources available to deal with the event, procedures in use, and priorities and actions minimize the consequences of the event.

NRC Staffing Question 6

Discuss the compensation provided for the repair and corrective actions tasks to be performed by the Mechanical Maintenance/Rad Waste Operator and the Electrical Maintenance Instrument and Control Technician as specified as 60-minute responders in Table B-1 or NUREG-0654.

PPL Response:

In our proposed revision to the Emergency Plan, we proposed the use of five non-licensed operators (NLOs). Two are used to fulfill the Fire Brigade responsibilities and three NLOs are used for safe shutdown and plant response. In this response, we are proposing the addition of another NLO. Having six NLOs provides sufficient flexibility

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such that corrective actions can be fulfilled by NLOs on-shift until additional support arrives. Such activities include racking breakers, changing fuses, manipulating valves, moving equipment, and starting equipment locally. This number of NLOs is the number in our current Emergency Plan. A footnote will be added to Table 6.1 to list the activities.

Note: In our response to questions 5 & 6 we have added two positions over that proposed in Reference 2. These additions increase the total number of on-shift individuals in our proposed Emergency Plan to 15. A revised Table 6.1 is included in Attachment 2.

NRC Staffing Question 7

At what emergency classification level are the Operational Support Center, Technical Support Center and Emergency Operations Facility activated?

PPL Response:

Operational Support Center and Technical Support Center are activated at the Alert. The Emergency Operations Facility is staffed at the Alert and activated at the Site Area Emergency.

NRC Staffing Question 8

Describe the notification and call-out processes for staffing the emergency response facilities.

PPL Response:

When an Alert classification is declared, the Control Room initiates pager activation via a single pushbutton in the control room. The pagers go off typically less than 1 minute after the button is pushed. On-call personnel respond immediately to their assigned facility. As a backup, the Control Room contacts Security who activates an automated call-out system. The system sends a second page. NERO personnel not on-call but fit for duty and at a location within the required response time, call in. The first person to call in for each position is expected to respond to their assigned facility. As a result more than one person for each position will respond to the pager activation. If no one calls in within 10 minutes for a given NERO position, then the system automatically calls the people assigned to the position (work phone, home phone, and/or their cell phone). After the facilities are fully functional, extra personnel will be released or retained to help as conditions dictate. If the emergency continues, additional personnel are scheduled for subsequent shifts via various administrative functions within the TSC, MOC, and EOF.

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In addition to the processes described above for NERO personnel, there are provisions to call out maintenance workers and health physics technicians as needed. Management personnel from these areas are on-call and these individuals respond as outlined above. These individuals arrange for call-out of additional personnel as needed.

Attachment 2 to PLA-5567

Updated Pages to

Proposed Revision to the Emergency Plan

1.0 DEFINITIONS

- 1.1 ACCIDENT - an unforeseen and unintentional event which may result in an emergency.
- 1.2 ACTIVATE - an emergency response facility has sufficient staffing to perform required functions and the facility has taken over command and control of the emergency. The positions required to activate the TSC and EOF are specified with an * in Figures 6.2 and 6.3. The terms "activated", "activation" and "take over management of the emergency" have the same definition.
- 1.3 ALERT - an Emergency Condition.
- 1.4 ANNUAL - occurring within calendar year starting January 1 and ending December 31.
- 1.5 ASSESSMENT ACTIONS - those actions taken during or after an incident to obtain and process information that is necessary to make decisions to implement specific emergency measures.
- 1.5 BIENNIAL EXERCISE - NRC/FEMA exercise performed on alternate years, to be completed within the calendar year scheduled.
- 1.6 BIWEEKLY - occurring on alternate weeks, with the 7-day week.
- 1.7 CDE - the Committed Dose Equivalent; dose to an organ due to an intake of radioactive material during the 50 year period following the intake.
- 1.8 COLUMBIA COUNTY DEPARTMENT OF PUBLIC SAFETY (CCDPS) - emergency response coordinating agency for Columbia County, responsible for implementing off-site action upon direct notification from Susquehanna SES or PEMA.
- 1.9 CONTROL ROOM - the location of the Control Panels from which the reactor and its auxiliary systems are controlled.
- 1.10 CORPORATE LEADERSHIP COUNCIL (CLC) - the PPL Management group which determines major policy commitments for the company. The CLC membership includes the President of the company and other senior executives.
- 1.11 CORRECTIVE ACTIONS - those emergency measures taken to ameliorate or terminate an emergency situation.
- 1.12 DEPARTMENT OF ENVIRONMENTAL PROTECTION/BUREAU OF RADIATION PROTECTION (DEP/BRP) - the State agency responsible to provide guidance and recommendations for specific off-site protective measures.

- 1.13 DOSE PROJECTION - a calculated estimate of the potential radiation dose to individuals at a given location, normally off-site, (determined from the quantity of radioactive material released and the appropriate meteorological transport and dispersion parameters).
- 1.14 DOSE RATE - the amount of radiation an individual can potentially receive per unit of time.
- 1.15 EFFECTIVE DOSE EQUIVALENT (EDE) - the sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues that are irradiated.
- 1.16 EMERGENCY ACTION LEVELS (EAL) - operational or radiological parameters which, when exceeded, require the implementation of portions of this plan. EALs for various emergency conditions are specified in Table 5.1.
- 1.17 EMERGENCY ACTIONS - those steps taken, as a result of exceeding an Emergency Action Level in the Emergency Plan, to ensure that the situation is assessed and that the proper corrective and/or protective actions are taken.
- 1.18 EMERGENCY ALERT SYSTEM (EAS) - radio and television broadcast system used by public emergency management officials to notify the public concerning protective actions to be taken in the event of natural disasters, radiological protective actions, and other information of immediate impact to the public. Formerly referred to as the Civil Defense Emergency Broadcast System.
- 1.19 EMERGENCY CONDITION - the characterization of several classes of emergency situations consisting of exclusive groupings including the entire spectrum of possible radiological emergency situations: The four classes of emergencies, listed in increasing severity, which PPL has incorporated into this Emergency Plan, are outlined in Section 5.0 of this plan.
- 1.20 EMERGENCY COORDINATORS - designated Susquehanna SES staff members responsible for coordinating specific emergency organization functions.
- 1.21 EMERGENCY DIRECTOR - the PPL individual responsible for direction of on-site activities during an emergency at the Susquehanna SES.
- 1.22 EMERGENCY MANAGERS - designated Susquehanna SES and General Office Personnel who are responsible for managing specific emergency organization functions.
- 1.23 EMERGENCY OPERATIONS CENTERS - designated State and county emergency management agency headquarters facilities, designed and equipped for the

purpose of exercising effective coordination and control over disaster operations carried out within their jurisdiction.

- 1.24 EMERGENCY OPERATIONS FACILITY - PPL Emergency Response Facility co-located with the Media Operation Center in Plains Township, Pennsylvania, to provide continuous coordination and evaluation of PPL activities during an emergency having or potentially having environmental consequences (Reference REFERENCES, Section 3.18).
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- 1.25 EMERGENCY PLAN BOUNDARY - same as the Exclusion Area, i.e., that area around Susquehanna SES within a radius of 1800 feet determined in accordance with 10CFR100.11. (See Figure 8.1.).
- 1.26 EMERGENCY PLAN IMPLEMENTING PROCEDURES - specific procedures defining in detail the action to be taken in the event of an emergency condition. The Emergency Plan Implementing Procedures will be separate from, but may incorporate and refer to, normal plant operating procedures and instructions and Emergency Plan Position Specific Procedures.
- 1.27 EMERGENCY PLANNING ZONE - there are two Emergency Planning Zones. The first is an area, approximately ten (10) miles in radius around the Susquehanna SES, for which emergency planning consideration of the plume exposure pathway has been given in order to ensure that prompt and effective actions can be taken to protect the public in the event of an accident. The second is an area approximately 50 miles in radius around the Susquehanna SES, for which emergency planning consideration of the ingestion exposure pathway has been given.
- 1.28 EMERGENCY PLAN POSITION SPECIFIC PROCEDURES - instructions describing how to perform tasks assigned to emergency positions. Each instruction includes an overview of the position's tasks, detailed instructions, and relevant material. Used together, these instructions are designed to implement the Emergency Plan during a declared emergency.
- 1.29 EXCLUSION AREA - that area around Susquehanna SES within a radius of 1,800 feet (see Figure 8.1) determined in accordance with 10CFR100.11.
- 1.30 FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - within the context of this plan, serves as the primary contact for requests for Federal assistance; lead coordinator all non-technical federal response.
- 1.31 FULLY FUNCTIONAL- all minimum required staff as defined in Table 6.1 and the "shaded" positions in Figures 6.2 and 6.3 are present.
- 1.31 GENERAL EMERGENCY - an Emergency Condition.

**Table 6.1
STATION EMERGENCY PLAN MINIMUM STAFFING REQUIREMENTS**

Major Functional Area	Major Tasks	Position Title or Expertise	On Shift	Capability for Additions	
				60 min	90 min
Plant Operations and Assessment of Operational Aspects		Shift Manager (SRO)	1	--	--
		Unit Supervisor (SRO)	1	--	--
		Plant Control Operators	3	--	--
		Non-Licensed Operators	4	--	--
Emergency Direction and Control (Emergency Director)		Emergency Director	1*	1	--
Notification/Communication	Notify licensee, State, Local, and Federal personnel & maintain communication	Communicators	1	2	1
		EOF Support Supervisor	--	--	1
		NRC communicator	1	--	--
Radiological Accident Assessment and Support of Operational Accident Assessment	Emergency Operations Facility (EOF) Director	Recovery Manager	--	--	1
	Radiation Protection & Dose Assessment	Radiation Protection Coordinator	--	1	--
		Dose Assessment Supervisor	--	--	1
		Rad Assessment Staff	--	1	2
	Offsite Surveys (Field Teams)	Survey Team Personnel	--	2#	2
	Onsite [out-of-plant (HP Tech)]	Survey Team Personnel	--	1	1
	Radiation Protection & Dose Assessment: a. Access Control b. HP coverage for repair, corrective actions, search and rescue, first aid, & firefighting c. Personnel Monitoring d. Dosimetry e. Dose Assessment f. In-Plant Surveys Chemistry/Radiochemistry	HP Technicians	2	3	3
Chemistry Technicians		1	1	--	

Note: The Capability for Additions column refers to reporting times. Reporting location may be the OSC, TSC, or EOF.

- # Rad monitoring team personnel (see Figure 6.3) – 2 are dispatched from the vicinity of the plant at 60 minutes.
- * Indicates the minimum number of individuals onshift with the capabilities of performing these functions. These individuals may also fulfill other responsibilities identified in this table.

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Table 6.1 (cont'd)

Major Functional Area	Major Tasks	Position Title or Expertise	On Shift	Capability for Additions	
				60 min	90 min
Plant System Engineering	Technical Support	Shift Technical Advisor	1	--	--
		Operations Coordinator	--	1	--
		Core/Thermal Hydraulics	--	1	--
		Electrical	--	1	--
		Mechanical	--	1	--
		Technical Support Coordinator	--	1	--
		Severe Accident Management Coordinator	--	1	--
Engineering Support Supervisor	--	--	--	1	
Repair and Corrective Actions	Management of Damage Control Teams	Damage Control Team Coordinator	--	1	--
		OSC Coordinator	--	1	--
	Communications with In-plant Teams	TSC Radio Communicator	--	1	--
	Repair and Corrective Actions (onshift requirements may be fulfilled by NLOs) **	Mechanical Maintenance/ Rad Waste Operator Electrical Maintenance/ Instrument and Control Technician	1* 1*	1	-- 1
Firefighting	--	--	Fire Brigade per Technical Requirements Manual	Local Support	
Rescue Operations and First Aid	--	--	2*	Local Support	
Site Access Control and Personnel Accountability	Security, firefighting communications, personnel accountability	Security Personnel	All per Security plan		
		Security Coordinator	--	1	--
			15	24	14
plus fire brigade and security plan required personnel					

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Note: The Capability for Additions column refers to reporting times. Reporting location may be the OSC, TSC, or EOF.

Rad monitoring team personnel (see Figure 6.3) – 2 are dispatched from the vicinity of the plant at 60 minutes.

* Indicates the minimum number of individuals onshift with the capabilities of performing these functions. These individuals may also fulfill other responsibilities identified in this table.

** Fulfilled by NLOs on-shift to provide initial damage control repair activities until additional support arrives. Such activities include racking breakers, changing fuses, manipulating valves, moving equipment, and starting equipment locally.

The tower measures wind speed, wind direction, and sigma theta at the 33-foot level. The tower also measures temperature and dew point temperature at a height of approximately 6.6 feet. The meteorological data collected from this tower is used only to support assessment and restoration efforts in the event there is an accidental release of radioactive material from SSES.

The meteorological systems are instrumented to provide continuous data to the control room and the Plant Integrated Computer System (PICSY) for utilization in the TSC and EOF. Data that enters PICSY is viewable through various display formats and is also transmitted to the NRC via ERDS. Digital dataloggers are present at all of the SSES meteorological towers. All data is stored locally and is available for acquisition by interrogation across telephone lines. Primary and backup tower strip chart recorders are located in the control room.

Site specific, meteorological information for emergency dose assessment purposes can be obtained by contacting either the SSES Contract Meteorologist or the National Weather Service Station using the phone numbers provided in the SSES Emergency Telephone Directory.

7.1.1.2 Health Physics Considerations

In the event of an unplanned radioactive release from either the reactor building vents, the turbine building vents, or the standby gas treatment vent; continuous gross noble gas readings are available from the vent monitors. Each monitor is also equipped with in-line iodine and particulate sampling capability. These in-line samples are periodically removed and analyzed in order to provide iodine and particulate release rate information.

The following Health Physics considerations are taken into account: selection of the accident type to closely approximate the isotopic mix and average gamma energies of the release occurring, radioactive decay from time of reactor shutdown, plume decay-in-transit and iodine and particulate depletion due to precipitation.

7.1.1.3 Dose Calculations for Airborne Releases

A dose calculation model is used to make current, site specific estimates and predictions of atmospheric effluent transport and diffusion during and immediately following an accidental airborne radioactivity release. The purpose of the prediction is to provide an input to the assessment of the consequences of accidental radioactive releases to the atmosphere and to aid in the implementation of emergency response decisions.

The dose calculation model used is a fast running, time-dependent, variable trajectory plume segment "B" model with the following capabilities:

NOTE: A class "B" model is a numerical model that represents the actual spatial and temporal variations of plume distribution.

- Computes atmospheric dispersion at the site based on atmospheric stability as a function of site specific terrain conditions with 15-minute upgrades of source term and meteorological conditions.
- Provides estimates of deposition and relative concentration of radioactivity within the plume exposure and ingestion EPZs for the duration of the release.
- Incorporated in the calculations is wet and dry deposition which enables dose estimates from three pathways - plume, ground shine, and ingestion.

The dose program complies with the "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," (EPA-400), adopting the dose calculation methodology in ICRP #26/30. The accident dose assessments are based on the adult physiology per EPA-400, except for one case - that is, child thyroid dose conversion factors are used in calculating thyroid CDE. Calculations of TEDE are made using the (adult) dose factors provided in EPA-400. The following calculational options are available:

- TEDE (Total Effective Dose Equivalent) integrated doses consisting of the sum of external doses from plume shine, 50 year committed effective dose equivalent from inhalation (CEDE), and 4 day ground shine doses.
- EDE and CDE dose rates for field team management.
- Fifty year thyroid committed dose (CDE), from inhalation of radioactive materials.
- Population dose (person rem) out to 50 miles.
- Summary print of projected doses for each of four projection times.
- Integrated ground dose for projected times specified by the user.

The dose calculation program is a stand alone program running on PCs located in the TSC and EOF.

7.1.1.4 Liquid Release Calculations

Estimates of downstream river water concentrations are made by employing effluent sample analysis or discharge monitor data, discharge flow rates and river elevation readings. The river elevation is used to estimate the travel time to the point of interest. The calculated degree of mixing, together with the discharge monitor data and the discharge flow rates are used to calculate downstream concentrations.