FPL

MAY 2 2 2001

L-2001-124
10 CFR 50.54(q)
10 CFR 50 Appendix E

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Emergency Plan Implementing Procedure Revision

The following document has been revised:

0-EPIP-20126, Offsite Dose Calculations

The implementation date was April 26, 2001. Pursuant to the requirements of 10 CFR 50.54(q) and 10 CFR 50 Appendix E, one copy of the revised document is enclosed. A summary of changes to the document is attached. FPL has determined that the changes described do not result in a decrease in the effectiveness of the Emergency Plan.

Very truly yours,

R. J. Hovey
Vice President
Turkey Point Plant

CLM

Attachment, enclosures

cc: Regional Administrator, Region II, USNRC (2 copies)
Senior Resident Inspector, USNRC, Turkey Point Plant (w/o enclosure)

A045
A009

SUMMMARY OF CHANGES

0-EPIP-20126, Offsite Dose Calculations

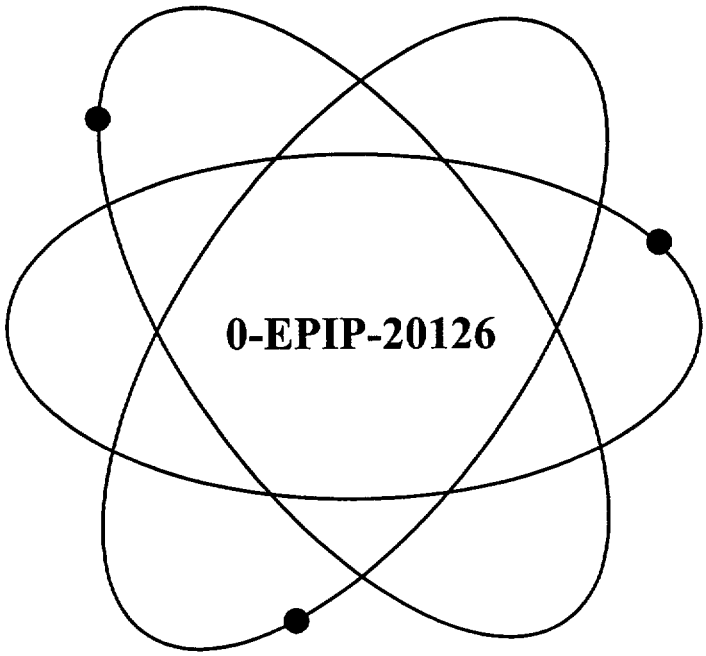
Changes to this procedure were due to a great number of minor errors that were introduced during the procedure conversion by word processing. In addition, there were minor enhancements made for clarification.

Specific Changes

1. Pages 17, 18, 29, 43, 45, 47, 48, 51, 52, 54, 55, 56, 57, 58, 59, and 60 had typos, due to the word processing conversion.
2. Page 17, corrected containment exhaust fan to the appropriate value of 35,000 scfm. Added information about the CHRRMS (Containment High Range Radiation Monitoring System) for completeness.
3. Page 20, change made to align procedure to LAN-based rather than stand-alone.
4. Page 24, step added to begin print function.
5. Page 31, Meteorological Data Worksheet, replaced with a better copy.
6. Page 33-42, clarified the correct calculation time. Calculations are based on sample time and not when one actually begins to do them.
7. Page 47, added reactor trip date and time, because they are needed to complete form. A note was added to remind dose assessor to consult Attachment 4 for additional adjustments to the values in the worksheet. Added step 13 to remind dose assessor to check if the data of this worksheet should be used elsewhere.
8. Page 55, added new step to direct dose assessor to the new SGTR worksheet.
9. Page 60, clarified the use of the date and time of sample.

Florida Power & Light Company

Turkey Point Nuclear Plant



Title:

Off-site Dose Calculations

Safety Related Procedure	
Responsible Department:	Emergency Preparedness
Revision Approval Date:	3/26/01
Periodic Review Due:	5/1/03

***RTSs** 97-1404P, 99-0286, 00-0212, 00-0741*

W97:JR/ev/ev/ev

LIST OF EFFECTIVE PAGES

Page	Revision Date	Page	Revision Date
1	03/26/01	32	06/01/00
2	03/26/01	33	03/26/01
3	03/26/01	34	03/26/01
4	03/26/01	35	03/26/01
5	06/01/00	36	03/26/01
6	06/01/00	37	03/26/01
7	06/01/00	38	03/26/01
8	06/01/00	39	03/26/01
9	06/01/00	40	03/26/01
10	06/01/00	41	03/26/01
11	06/01/00	42	03/26/01
12	06/01/00	43	03/26/01
13	06/01/00	44	03/26/01
14	06/01/00	45	03/26/01
15	06/01/00	46	03/26/01
16	06/01/00	47	03/26/01
17	03/26/01	48	03/26/01
18	03/26/01	49	03/26/01
19	06/01/00	50	03/26/01
20	03/26/01	51	03/26/01
21	06/01/00	52	03/26/01
22	06/01/00	53	03/26/01
23	06/01/00	54	03/26/01
24	03/26/01	55	03/26/01
25	03/26/01	56	03/26/01
26	06/01/00	57	03/26/01
27	06/01/00	58	03/26/01
28	06/01/00	59	03/26/01
29	03/26/01	60	03/26/01
30	06/01/00	61	03/26/01
31	03/26/01	62	03/26/01
		63	03/26/01

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

1.0 PURPOSE

1.1 This procedure provides a method for estimating Emergency Off-site Doses to support Protective Action Recommendation (PAR) formulation.

1.2 This procedure provides a method for reporting Reportable Quantities (RQ) of radionuclides releases pursuant to 40 CFR 302 and 40 CFR 355.

2.0 REFERENCES/RECORDS REQUIRED/COMMITMENT DOCUMENTS

2.1 References

2.1.1 Plant Procedures

1. 0-ADM-115, Notification of Plant Events
2. 0-EPIP-20101, Duties of Emergency Coordinator
3. 0-NCAP-104, Primary to Secondary Leak Detection

2.1.2 Regulatory Guides

1. 10 CFR 20, Appendix B
2. 40 CFR 302, Reportable Quantity Adjustment - Radionuclides
3. 40 CFR 355, Emergency Planning and Notification

2.1.3 Miscellaneous Documents (i.e., PC/Ms, Correspondence)

1. Turkey Point Plant Radiological Emergency Plan
2. Turkey Point Units 3 and 4 Off-site Dose Calculation Manual
   a. Section 2.0, Table 2.2-1
   b. Section 3.0, Tables 3.1-1, 3.2-1
3. Class A, Emergency Off-site Dose Calculation System User's Manual
4. EPA-520, Rev 6/79

2.1.3 (Cont'd)

5. NRC Response Technical Manual, RTM-91
6. JPE-PTPO-85-74, Containment Break Calculations
7. JPE-LR-87-033, Steam Generator Tube Rupture - FSAR Model - PTN 3 and 4
8. PTN-ENG-SENS-97-088, Revision 1, Engineering Evaluation Related to Pre-planned Alternative Monitoring for the Containment High Range Radiation Monitors
9. PSL-BFJM-93-032, Revision 0, Method to Estimate Post-Accident Containment Release

2.2 Records Required

2.2.1 Records of meteorological conditions used to calculate dose rates and doses shall be kept on the attached worksheets or forms containing similar information.

2.2.2 A copy of the completed Dose Calculation Worksheet, or computer generated forms conveying similar information, shall be given to the Emergency Coordinator, and shall contain:

1. Meteorological conditions (wind speed, wind direction, and affected sectors).
2. Emergency Off-site Doses at 1, 2, 5 and 10 miles, including sectors affected.
3. Default values or actual measurements that were used for dose estimates.

2.2.3 Completed copies of the below listed item(s) constitute Quality Assurance Records and shall be transmitted to QA Records for retention in accordance with Quality Assurance Records Program requirements:

1. A form similar to Attachment 2 or computer generated forms conveying similar information.

2.3 Commitment Documents

2.3.1 None

3.0 RESPONSIBILITIES

3.1 The Emergency Coordinator is responsible for directing the performance of emergency off-site dose calculations during an emergency which involves a release of radioactivity to the environment.

3.2 The HP/Chemistry Department representatives are responsible for performing the following:

3.2.1 Calculations in accordance with this procedure.

3.2.2 Ensuring that the Emergency Coordinator receives the most current dose calculations as soon as possible after request of emergency off-site dose information.

3.2.3 Performance of Reportable Quantity (RQ) calculations, as necessary.

3.2.4 Notifying the Chemistry Supervisor or designee as soon as practical for verification of release data. Notification to the Emergency Coordinator will not be delayed because of notification process with the Chemistry Supervisor.

3.2.5 Ensuring that the initial EOF Responders are updated with copies (e.g., facsimile) of dose calculations. The dose calculation summary sheet, if using the computer method, contains the minimum information needed by the initial EOF Responders. Attachment 2 contains the minimum information needed if using the manual calculation method.

4.0 DEFINITIONS

4.1 Core Overheating/Melting - Severe core damage, beyond gap failure, typically indicated by:

4.1.1 The core being uncovered, by coolant, for 30 minutes or more.

4.1.2 CHRRM reading 1.3 E+4 R/hr or more.

NOTE

The 700°F core exit thermocouple value used in other procedures signifies the starting point for potential core melting. The value used in this procedure signifies that the core is in an overheat condition, melting is imminent and the release may include particulates, (e.g., Bariums, Cesiums, Strontiums, etc.).

4.1.3 Valid Core Exit Thermocouple reading(s) in excess of 1700°F.

4.2 Deep Dose Equivalent (DDE) - Applies to External Whole Body Exposure and is the dose equivalent at a tissue depth of 1cm. The computerized version of this procedure also estimates a plume immersion dose (DDE), which is a best estimate of an in-plume survey meter reading.

4.3 Emergency Off-site Doses - The Total Dose (TEDE) and Thyroid Dose (CDE), calculated as either rates of exposure to the dose commitment or the total dose committed from the release.

4.4 Release - During any declared emergency, any effluent monitor increase of approximately ten times, or one decade above pre-transient values, or Health Physics detected airborne radioactivity levels in excess of 25 percent DAC outside of plant buildings due to failure of equipment directly associated with the declared plant emergency.

4.5 Thyroid Dose (CDE) - The Committed Dose Equivalent to an adult thyroid from inhaling the radioiodine in the plume.

4.6 Total Dose (TEDE) - The Total Effective Dose Equivalent, the sum of the doses to the whole body from immersion in a plume containing radioactive material, the CEDE from inhaling the plume, and an assumed four days of exposure to plume deposition (fallout).

5.0 PROCEDURE

CAUTIONS

- ***Doses determined in this procedure will be given to the Emergency Coordinator, who will evaluate doses and plant conditions with criteria listed in 0-EPIP-20101, Duties of Emergency Coordinator.***
- ***Dose Projections should be made on a best estimate basis by projecting the duration of the release, if possible. If no reasonable duration of release can be projected, the default value listed in Part D of Attachment 3 should be used.***
- ***Releases greater than Off-site Dose Calculation Manual limits or Reportable Quantities shall require reports or notifications to the NRC even if no off-site action is required. Ensure reports are performed as required by 0-ADM-115, Notification of Plant Events.***
- ***The following steps apply to the use of this procedure for the performance of a manual calculation. As soon as possible, the computerized Emergency Off-site Dose Calculation Method should be used for dose calculations. The instructions for using the computer program, which parallels this procedure, are in Enclosure 2.***

5.1 Discussion

5.1.1 During any emergency involving release of radioactivity to the environment, the Emergency Plan requires Emergency Off-site Doses be calculated for areas up to 10 miles from the plant. This information will be used in making Protective Action Recommendations and will be an input to the State of Florida Division of Emergency Management (DEM) in determining what off-site protective actions should be taken. When the Technical Support Center or the Emergency Operations Facility are operational, the function of dose calculation will be shifted to one of these locations.

5.1.2 The Chemistry Department Representative should use the computer dose calculation model in the Technical Support Center, when time and manpower resources are available, along with this procedure for estimating Emergency Offsite Doses when releases of radioactivity occur during an emergency. The computer model closely parallels this procedure. The instructions for using the computer program, which parallels this procedure, are in Enclosure 2. Additional instructions for use of the computer are located in the Emergency Off-site Dose Calculation User's Manual located in the Health Physics/Chemistry Area of the TSC and the EOF.

5.1.3 ERDADS may be used to display effluent monitor and meteorological data required by this procedure and the computerized Emergency Off-site Dose Calculation Method.

5.1.4 The various meteorological data processing methods deal with sea-breeze. Sea-breeze is a coastal phenomena where an artificial ceiling may exist. Our methods assume that this ceiling acts as a limit to vertical mixing; that is, the plume is below the ceiling. This leads to a slightly higher concentration for a given stability class. The computer program will state **Sea-breeze: Yes** when the procedure states **No impact**. The computer model is stating that sea-breeze may exist although there is no impact; the ceiling is too high to affect the vertical mixing within 10 miles of the plant.

5.1.5 The various release rate determination methods in the procedure and computer program require asking the Emergency Coordinator if the core is overheating or melting (typical indications listed in the definitions section). The purpose of the question is to determine:

1. if there is a core damage sequence in progress, or

2. if the damage has gone beyond gap failure?

IF there is overheating or melting in progress, THEN the off-site TEDE dose multiplier is increased to 4.4 to reflect the additional dose from the presence of particulates in the plume.

5.1.6 Pursuant to 40 CFR 302, Radionuclides are designated as a hazardous substance, which if released, other than federally permitted, (within Technical Specification limits) in a quantity equal to or greater than the revised Reportable Quantities (RQ) Table, requires notification to various Agencies.

5.2 Meteorological Conditions Determination

5.2.1 Complete applicable worksheets in Attachment 1. The three methods listed are in preferential order. Use the next method, in order to supplement any missing data. Indicate the method used on the selected worksheet in Attachment 2.

CAUTIONS

- ***All Met Tower Data for Wind Speed, Wind Direction, Delta Temperature, and Sigma-Theta are averaged over 15 minutes by the instrumentation for display on the strip charts and ERDADS.***
- ***Meteorological Wind Speed, Wind Direction, Delta Temperature, and Sigma-Theta values should vary with time, i.e., Chart Recorders in the Control Room should not be straight lining. Investigate data that is unchanging.***

1. Plant Meteorology Towers - Data from the primary and backup met towers is evaluated by following the instructions of Attachment 1, Part A. Use primary Met Tower data, with backup Met Tower data being used to supplement any primary Met Tower data.

NOTE

Meteorological data from the NWS is not required to be averaged.

2. National Weather Service (NWS) - Meteorological observations taken at the NWS are evaluated by following the instructions on Attachment 1, Part B.

3. Default Values - Daytime and nighttime default values are listed in Attachment 1, Part C.

5.3 Dose Calculation Worksheets

5.3.1 Select the appropriate Dose Calculation Worksheet from Attachment 2. The worksheets, numbered 1 through 10, are tied to the Stability Class and Sea-breeze impact. The class and impact are noted on the first row of the worksheet.

5.4 Release Rate Determination

5.4.1 Perform Release Rate Calculations using Worksheets in Attachments 3 through 6 as appropriate. Indicate the method used on the selected dose calculation worksheet.

NOTES

- *Although grab sampling is the primary method, it is unlikely that results will be available in the early phases of an emergency situation. Dose assessment cannot be held up waiting grab sample results, therefore, the Effluent Monitor method should be used in the initial dose assessment. Grab Sampling should be performed as soon as possible.*
- *If the accident is a Loss of Coolant Accident (LOCA), a release estimate using the CHRRM Data Worksheet should be added to the release rates determined by Grab Sampling or Effluent Monitor Readings to account for the potential of unmonitored leakage, for example, through penetrations.*

1. Grab Sample - Grab Sample results are evaluated by following the instructions on Attachment 3, Part A.

NOTES

- *Effluent Monitor Data should be used when Grab Sample Data is not available or if there is insufficient time to perform Method 1, as in the early phases of an emergency situation.*
- *Since it will be difficult to analyze grab samples quickly, Effluent Monitor Data should be computed throughout the release and related to Grab Sample Data. This will permit a continuous release rate estimate even when grab sample data is unavailable. Iodine release rate factors may be modified if two or more grab samples indicate that the factors should be modified.*

2. Effluent Monitors - Effluent Monitor readings are evaluated by following the instructions on Attachment 3, Part B. SPING-4 data should be used in preference to associated PRMS data.

5.4.1 (Cont'd)

NOTE

The CHRRM monitor should be used in addition to Methods 1 or 2, if a loss of coolant accident (LOCA) has occurred. For example, if the CHRRM reading is high but the plant vent monitor reading is approximately normal, this probably indicates that containment isolation is preventing a release from containment to the plant vent. However, the FSAR design leak rate from containment should still be taken into consideration, as leakage from other penetrations may not register on effluent monitors.

3. Containment High Range Radiation Monitor (CHRRM) -CHRRM readings are evaluated by following the instructions on Attachment 3, Part C.

4. Default Values - default noble gas and iodine release rates are listed in Attachment 3, Part D, for the following accidents:

   a. Loss of Coolant (LOCA)

   b. Steam Generator Tube Rupture (SGTR)

   c. Spent Fuel Handling

5. Attachment 4 provides methods to adjust or replace the LOCA default release rates based on known plant parameters. Guidance is provided for coping with containment failure releases, either rapid depressurization or estimated penetration size failure.

6. Attachment 5 provides methods to adjust the steam generator tube rupture default release rates based on known plant parameters. Guidance is also provided for estimating a release rate using survey meter readings of the Main Steam Line.

7. Attachment 6 provides a method, using factors in this procedure, to estimate a release rate from field team centerline survey meter readings.

5.5 Dose Rates and Projected Doses

NOTE

Contact Chemistry Supervisor or designee as soon as practical to verify release data after giving a copy of the dose calculation worksheet to the Emergency Coordinator. Do not delay notifications to the Emergency Coordinator.

5.5.1 Dose rates and projected doses are calculated by following the instructions on Attachment 2 selected at Subsection 5.3.

5.6 Computerized Emergency Off-site Dose Calculation Method

5.6.1 The computerized Emergency Off-site Dose Calculation Method should be used for dose calculations, (in preference to manual method). See Enclosure 2 for instructions on use of computer program.

5.7 Evaluating EPA Reportability

NOTE

Attachment 7 contains forms to assist in this activity.

5.7.1 Determine if the following condition has occurred during the Radioactive release:

NOTE

A Nuclear Incident means any occurrence of bodily injury, sickness, disease, death, loss of or damage to property or loss of use of property (Off-site Evacuation) resulting from the radioactive, toxic, explosive, or other hazardous properties of source, special nuclear or byproduct material.

1. Dose exceeds any applicable Technical Specification, or section of the Off-site Dose Calculation Manual (ODCM) **AND** the release is not exempt under a nuclear incident.

5.7.2 If the condition in Substep 5.7.1.1 is not met, proceed to Subsection 5.8.

5.7.3 Using Radionuclide Reportable Quantities (RQs) listed in Appendix B to 40 CFR 302.4, determine if a RQ limit has been exceeded using the following criteria.

1. If the identity and quantity (in curies) of each Radionuclide in a mixture or solution is known, the ratio between the quantity released and the RQ for the Radionuclide must be determined for each Radionuclide. An RQ is reached if the sum of the ratios of the Radionuclides is equal to or greater than one. [Grab Sample method only]

2. If the identity of each Radionuclide in a released mixture or solution is known, but the quantity of one or more of the radionuclides is unknown, a RQ is reached if the total quantity (in curies) of the mixture or solution released is equal to or greater than the lowest RQ of any Radionuclide in the mixture or solution. (Methods other than Grab Sample]

3. If the identity of one or more of the Radionuclides in a released mixture or solution is unknown, a RQ is reached if the total quantity (in curies) released is either equal to or greater than one curie or the lowest RQ of any known individual Radionuclide in the mixture or solution, whichever is lower. [Methods other than Grab Sample]

5.7.4 If the release exceeds the permissible RQ limits, complete Attachment 7 accordingly.

5.7.5 Request the Chemistry Supervisor, or designee to notify the agencies listed in Attachment 7, of the release.

1. Provide each agency with the information required in Attachment 7.

2. Record Date/Time and name of person contacted for each agency.

5.7.6 This event shall be reportable to the NRC. Ensure notifications and reports required by 0-ADM-115, Notification of Plant Events, are made.

5.8 Continue Monitoring and Evaluation of Releases

NOTE

Significant wind direction changes (into new sector) or wind speed changes should be brought to the attention of the Emergency Coordinator for evaluation.

5.8.1 The Emergency Coordinator or designee shall monitor release rates and meteorological conditions.

5.8.2 If using the Manual Method (e.g., worksheets), dose rate estimates should be updated once every hour unless:

1. Monitor reading increases by two or more times,

OR

2. Stability class changes.

If the above conditions occur, then dose calculations should be re-evaluated.

5.8.3 If using the computerized version, dose calculation forecasts (to obtain projected dose PARs) should be performed every 15 or 30 minutes, depending on the selected Advection Step.

5.8.4 Comparisons between field monitoring results and plume calculations should be performed and the results of the comparisons may be used to modify the input data for the manual or computerized dose calculations.

5.8.5 Dose Calculation activities will remain in effect until the Emergency Coordinator designates otherwise.

END OF TEXT

ENCLOSURE 1
(Page 1 of 3)

SYSTEM PARAMETERS AND CONVERSION FACTORS

The following system parameters and conversion factors are provided for use in emergency response activities. Some values may be **approximated** in that the values have been rounded to the nearest tenth of an order of magnitude; for example, 1.2 E+04 rather than 12,345:

System Volumes

Containment 4.4 E+10 cc
Spent Fuel Pit: 60,000 ft^3 (1.7 E+9 cc) Level Indicator: 650 gal/in 40 ft=312,000 gal
Accumulators 6545 gal each
RCS 70,000 gal
Steam Generators secondary 40,000 gal max 20,000 gal operating, primary 6921 gal max
Pressurizer 9725 gal max 5835 gal operating
RWST 320,000 gal
VCT 748 gal liquid and 200 ft^3 gas
CCW 35,000 gal
Gas Decay Tank 525 ft^3
Containment Sump 629,326 gal max 10 gal/in 0-32 in 1376 gal/in 32-489 in

System Flows

Steam Dump @ 1100 psi 28 lbm/sec Each ADV = 1.3 E+4 cc/sec
Aux Feed Flow 800 gpm each
Standby Feedwater 1350 gpm
Containment Exhaust 35,000 scfm/unit (1.65 E+7 cc/sec)
Spent Fuel Pit Exhaust 20,000 scfm (9.44 E+6 cc/sec)
RCP 88,500 gpm per pump
Air ejector 30 scfm (1.42 E+4 cc/sec)
Instrument Air Bleed U-3 20 scfm (9440 cc/sec) U-4 25 scfm (11800 cc/sec)
Safety Injection 375 gpm
Charging Pump 77 gpm each

Process Radiation Monitoring System

Monitor	Description	Units	Range Min - Max	Typical Routine Reading	Typical response factor (uCi/cc/cpm)
R-11	Containment Particulate	µCi/cc	1.0E-09 - 1.0E-06	1.0E-08	7.36E-12
R-12	Containment Gas	µCi/cc	1.0E-06 - 1.0E-03	1.0E-05	3.48E-08
R-14	Plant Vent Gas	cpm	0-300,000	500	5.0E-09
R-15	Air Ejector Gas	cpm	0-300,000	400	2.5E-08
R-17	CCW	cpm	0-250,000	750	2.0E-07
R-18	Liquid Rad Waste	cpm	0-250,000	5000	2.0E-08
R-19	S/G Blowdown	cpm	0-250,000	750	5.0E-09
R-20	Letdown	mr/hr	0.1 - 10,000	100	----------
DAM-1	Main Steam	µCi/cc	1.0E+00 - 1.0E+05	1.0E-01	----------
SPINGs					
Ch-5	Low Range Noble Gas	µCi/cc	1.0E-07 - 6.0E-02	5.0E-07	----------
Ch-7	Mid Range Noble Gas	µCi/cc	2.5E-02 - 4.0E+02	1.0E-04	----------
Ch-9	High Range Noble Gas	µCi/cc	1.0E+00 - 1.0E+05	1.0E-01	----------
CHRRM	Containment High Range Radiation Monitor	R/hr	1.0E+00-1.0E+08	1.0E+00	----------

ENCLOSURE 1
(Page 2 of 3)

SYSTEM PARAMETERS AND CONVERSION FACTORS

The Core:

≈ 8.7 E 7 Curies I-131 DEQ (assume 15% in the gap for estimating purposes)
≈ 3.5 E 8 Curies of 'core mix'(gross) noble gas

For LOCA

25% of total core iodine inventory is assumed to be available for release.
100% of total core gas inventory is assumed to be available for release.
Design base leak rate is 1273 cc/sec. (0.25% per day)
Dose at the site boundary for a LOCA is 93 Rem thyroid and 3.1 Rem whole body.

For Steam Generator Tube Rupture

Isolation of steam generators should occur within 30 minutes.
102,700 lbs of RCS will leak into the steam generator.
55,000 lbs of steam will be discharged into the atmosphere.
With 1% defective fuel:
Approximately 11,196 Ci of noble gas is released
Approximately 7.6 Ci of I-131 DEQ is released
Dose at the site boundary <1.0 Rem thyroid, <0.1 Rem whole body

Primary to Secondary Leak Rate

$$\text{Leak Rate (gallons/hour)} = \frac{\text{S/G } \mu\text{Ci/ml}}{\text{RCS } \mu\text{Ci/ml}} \times \frac{\text{Blowdown (lbm/hr)}}{8.33 \text{ (lbm/gallon)}}$$

Ci/sec = (Leak Rate, gph)*(3785 ml/gal)*(2.78 E-04 hr/sec)*(RCS µCi/ml)*(1.0 E-6 Ci/µCi)

Conversion Factors

1 gallon = 8.33 lbm (@STP)=3785 ml $1\ ft^3 = 28317\ cm^3$

$1\ lb/ft^3 \times 0.0160 = g/cm^3$ 1CFM x 472 = cc/sec

1 lbm/hr steam x 0.126 = ml/sec condensed liquid

1 lb x 454 = grams

1 mph x 0.447 = meter/sec 1 meter/sec x 2.23 = miles per hour

1 mph ÷ 1.15 = knot knot x 1.15 = mph 1 mile = 1609 meters

1 µCi/cc equilibrium noble gas = 3.6 E+5 mrem/hr (DDE) immersion dose rate

1 µCi/cc Iodine-131 (or mix as DEQ) = 1.3 E+9 mrem/hr (CDE) Adult Thyroid from inhalation

X/Q (FSAR default) = 1.5 E-4 $sec/meter^3$ (class F, 4.5 mph)

ENCLOSURE 1
(Page 3 of 3)

SYSTEM PARAMETERS AND CONVERSION FACTORS

Use this method **IF** there is not radiological data (e.g., CHRRM, containment grab sample, etc.,) **AND** the accident has progressed past gap failure **AND** the containment has undergone catastrophic failure (e.g., know there should be pressure and there is none).

Note that the following method provides DOSES, not release rates. Doses based on stability class D and 4 mph wind speed.

REACTOR ACCIDENT CONSEQUENCE OVERVIEW
Containment Leakage

Core Condition	Containment Status	Mitigating System Status (*)	Acute Dose (rem) 1 Hour Release @ 1 mile (**) WB	THY
MELT Release From Core 4500°F	Early Total Failure (< 1hr)	No Mitigation	1000+	10^5+
		Mitigated	250	10^4
	Late Total Failure (2-12hr)		250	10^4
	Major Leakage (100% / day)		10	10^3
	Design Leakage		10^{-2}	1
Gap Release From Core 1500°F	Early Total Failure (< 1hr)	No Mitigation	50	10^4
		Mitigated	10	10^3
	Late Total Failure (2-12hr)		5	10^3
	Major Leakage (100% / day)		10^{-1}	10
	Design Leakage		10^{-4}	10^{-2}

* Sprays, filters
** 1 hour cloud immersion and inhalation plus 3 hours of **ground shine**

BASIS: NRC's Response Technical Manual RTM-91 Vol. 1, Rev. 1, pg C-2

ENCLOSURE 2
(Page 1 of 6)

OFF-SITE DOSE CALCULATIONS - COMPUTER METHOD

1.0 Discussion

1.1 The computer based Class A Dose Calculation Program utilizes inputs and processes similar to the manual procedure. However, the refinements available in the computer based process allow for a wider range of input information and mathematical complexity than available in the manual method. This procedure provides guidance for using the computer based process to derive calculated off-site doses in a manner similar to that discussed for the manual calculation. Personnel having expertise in dose calculation methodology may utilize this expertise in combination with the advanced methods available through the screen driven menus to modify and refine these basic calculations.

NOTE: If the EOF and TSC are manned and operational, dose assessment personnel at these locations should coordinate their efforts in order to calculate the most accurate available off site dose assessment.

A. Computer Startup

1. Energize the uninterruptible power supply to the computer, to prevent data loss if a power interruption occurs.
2. Ensure that the floppy disk drive is empty.
3. **IF** turned off, **THEN** turn on the display monitor, the printer, the computer and the print buffer if attached.
4. Acquire the Class-A User's Manual while computer is starting up.

NOTE

Log-off when computer is no longer required.

5. Log on to the computer.
   a. Log into the LAN by entering your SLID and password.
   b. Double click on the icon **FPL Class A** to launch Off-Site Dose Calculation software.

ENCLOSURE 2
(Page 2 of 6)

OFF-SITE DOSE CALCULATIONS - COMPUTER METHOD

B. Pre-Use QC Check

1. **IF** time and manpower permit, **THEN** a pre-use verification check using input data from the User's Manual should be performed prior to conducting dose calculations.

2. **WHEN** the pre-use check is completed, **THEN** exit to the Main Menu, **AND** proceed to Step 3 of Conducting Calculations, below.

C. Conducting Calculations

1. **WHEN** the plant site menu is displayed, **THEN** depress the Function Key (i.e., F3-Unit 3 or F4-Unit 4) to select the affected Turkey Point Plant Unit.

2. **WHEN** the program asks, **Is this an exercise [Y/N]?, THEN** answer appropriately and depress the **ENTER** key.

3. **WHEN** the Main Menu is displayed, **THEN** select the F1 Function Key to start calculations.

4. **WHEN** prompted by the program, **Warning - Start calculations will destroy previous dose values. OK [Y/N]?, THEN** depress **Y** and the **ENTER** key to reinitialize the data files.

NOTES

1. *Thirty minute advection steps are normally used except for fuel handing accidents, for which 15 minutes advection time steps should be used.*

2. *Once advection time is selected, it should not be changed while running the program to prevent generating errors.*

5. **SELECT** from the screen functions displayed on the General Accident Information Worksheet to edit the type of accident, reactor trip time, release start time, and advection step in the format shown on the screen by depressing the corresponding Function Keys, F1, F2, F3, or F4 respectively, then depress **ENTER** after each new entry.

6. **WHEN** the correct accident type, reactor trip time, release start time, and the advection time step have been entered, **THEN** depress the F5 Function Key to accept the inputs.

ENCLOSURE 2
(Page 3 of 6)

OFF-SITE DOSE CALCULATIONS - COMPUTER METHOD

7. **WHEN** the Input Menu is displayed, **THEN** depress the F1 Function Key to bring up the Meteorological Data menu.

8. **WHEN** the Meteorological Data Summary Menu is displayed, **SELECT** the data sheet corresponding to the source of the data [i.e., Site Tower [ERDADS, chart recorder), Airport (NOAA, NWS), Default].

CAUTION

When determining the atmospheric stability class, the Class A computer program will select the most recently entered indicator (Delta-T or Sigma-Theta) of stability. Since Delta-T is the preferred indicator, ensure that Delta-T data is entered last when available.

9. **ENTER** the meteorological data gathered in the format shown using the displayed Function Keys, THEN depress the **ENTER** key after each new entry.

10. **WHEN** all necessary meteorological data has been entered, **THEN** depress the appropriate Function Key to ACCEPT the data and go to the Meteorological Data Summary Menu.

11. Review the entered meteorological data, Depress the F5 Function Key to accept the data and then return to the Input Menu.

12. **WHEN** the Input Menu is displayed, **THEN** depress the F2 Function Key to bring up the Source Term Data menu.

NOTE

If editing is required, edit the information in accordance with the displayed instructions.

13. **IF** the accident type is a LOCA or SGTR, **THEN** respond appropriately to the question about the Core Damage Situation.

14. **IF** the accident type is a LOCA, **THEN** respond appropriately to the question about the Iodine Removal System Status.

15. **WHEN** the Source Term Summary Menu is displayed, **THEN** select the data sheet corresponding to the source of the data (i.e., Grab Sampling, Effluent Monitors, CHRRM, Default).

ENCLOSURE 2
(Page 4 of 6)

OFF-SITE DOSE CALCULATIONS - COMPUTER METHOD

16. **ENTER** the source term data gathered in the format shown using the displayed Function Keys, **THEN** depress the **ENTER** key after each new entry.

17. **WHEN** the input of source term information has been completed, **THEN** depress the appropriate Function Key to ACCEPT the data and return to the Source Term Summary Menu.

18. **IF** the entered source term data is acceptable, **THEN** depress the F7 function key and return to the INPUT menu, **OR** go to Step 15 to re-enter the data.

19. **IF** a final check of data accuracy is needed, **THEN** depress the F3 Function Key to review a summary of the meteorological and source term data. Depress the F1 Function Key to print or the F2 Function Key to exit.

20. **IF** the meteorological or source term data needs to be revised, **THEN** go to Step 7 or Step 12 above, respectively.

21. **DEPRESS** the F4 Function Key at the screen prompt, **Proceed with calculations [Y/N]?, AND** answer Y, **THEN** depress the **ENTER** key to begin calculations.

22. **WHEN** the Output Menu is displayed, **THEN** depress the F3 Function Key to select **Print Reports**.

23. **WHEN** the Printed Report Menu is displayed, **THEN** depress the displayed Function Keys to select the desired reports.

CAUTION

Ensure that the printer and print buffer, if used, are on line and ready for use prior to proceeding with the printing task. If either device is not ready for use, the computer will exit the dose calculation program.

24. **DEPRESS** lower case **x** to escape from the task or any other key to begin printing.

25. **WHEN** the Output Menu is displayed, **THEN** depress the F6 Function Key to select the Run Mode Menu.

26. **WHEN** the Run Mode Menu is displayed, **THEN** depress the F1 Function Key to select the Actual Calculation Mode and perform the next advection step (cumulative dose calculation) **OR** depress the F2 Function Key to select the Forecast Calculation Mode.

ENCLOSURE 2
(Page 5 of 6)

OFF-SITE DOSE CALCULATIONS - COMPUTER METHOD

NOTES

1. *Forecast periods are typically 2 hours.*
2. *Forecasted doses assume release rates and meteorological conditions remain constant during the forecasting period chosen.*
3. *Consider the reasonableness of assuming constant meteorological conditions and release rates for forecasting periods exceeding 2 hours.*

27. Edit the forecast period as desired using the displayed instructions.

28. **WHEN** the forecast period has been accepted, the Input Menu: Forecast Calculation mode will be displayed, **THEN** Depress the displayed Function Keys to review and/or edit the inputs as necessary.

29. When all inputs are acceptable, **THEN** depress the F4 Function Key to perform calculations, at the screen prompt, **Proceed with calculations [Y/N]?, AND** answer **Y**, and depress the **ENTER** key to begin calculations.

30. **WHEN** the Output Menu - Forecast Calculations mode is displayed, **THEN** depress the F3 Function Key to select **Print Reports**.

31. **WHEN** the Printed Report Menu is displayed, **THEN** depress the displayed Function Keys to select the desired reports.

CAUTION

Ensure that the printer and print buffer, if used, are on line and ready.

32 DEPRESS lower case x to escape from the task or any other key to begin printing.

NOTES

1. *The Emergency Coordinator should be provided with a printout of actual calculated doses, Protective Action Recommendations (PARs), and as requested, forecasted doses.*
2. *The Emergency Coordinator should be updated every 30 minutes during periods of actual or potential off-site release.*

33. **WHEN** the reports have been printed, **THEN** return to the Run Mode Menu to update information and repeat the dose calculation process as needed due to release rate or meteorological changes.

ENCLOSURE 2
(Page 6 of 6)

OFF-SITE DOSE CALCULATIONS - COMPUTER METHOD

34. **DEPRESS** the F1 Function Key for the Actual Calculation Mode **OR** the F2 Function Key for the Forecast Calculation Mode **OR** the F3 Function Key to return to the Main Menu and quit.

35. **REVIEW** the Summary of Met and Source Data displays for all subsequent calculations even if the inputs do not change so that they can be reviewed and accepted. Also ensure that the Noble Gas Reduction Factor is reset to its proper value.

ATTACHMENT 1
(Page 1 of 7)

METEOROLOGICAL DATA WORKSHEET

Part A - MET Tower Worksheet

1. Date and Time of observations:_____/_____/_____ , _____

2. If using ERDADS, press the purple **RAD** key on the ERDADS keyboard. For a terminal outside the Control Room, to change from one unit to the other, type PUP (space) UNIT# (where # is either 3 or 4) and press EXEC (execute).

3. Copy the observations into the following table:

Desired Data	Source of the Met Data		Value	Unit
	Primary	Backup		
Wind Speed	10m Tower	So Dade (60m) Tower		mph
Wind (from) Direction	10m Tower	So Dade (60m) Tower		degrees
Primary Stability Class Indicator	So Dade (60m) Tower Delta-T, ΔT	////////////////		deg F / 50 meters
Alternate Stability Class Indicator	////////////////////	10m Tower Sigma-Theta		degrees
Ambient Air Temperature	ERDADS	Airport		degrees F

4. Using the Wind (from) Direction, circle the Affected Sectors in the table:

NOTE: If the wind direction is directly on the edge of two sectors (e.g., 11°, 33°, 56°, etc.), an additional sector should be added to the protective action recommendations. For example, if the wind direction is from 78°, then the affected sectors for PARs should be L, M, N, and P.

Wind From	Affected Sectors	Wind From	Affected Sectors	Wind From	Affected Sectors
348 - 11	H J K	123 - 146	P Q R	258 - 281	D E F
11 - 33	J K L	146 - 168	Q R A	281 - 303	E F G
33 - 56	K L M	168 - 191	R A B	303 - 326	F G H
56 - 78	L M N	191 - 213	A B C	326 - 348	G H J
78 - 101	M N P	213 - 236	B C D	**Note**:	
101 - 123	N P Q	236 - 258	C D E	there is no sector **I** and **O**	

ATTACHMENT 1
(Page 2 of 7)

METEOROLOGICAL DATA WORKSHEET

Part A - Met Tower Worksheet

5. Using the Stability Class Indicator, determine and circle the Stability Class:

If using Delta-T, ΔT	If using Sigma-Theta, $\sigma\theta$	Stability Class
$\Delta T \leq -1.7$	$\sigma\theta \geq 22.5$	A
$-1.7 < \Delta T \leq -1.5$	$22.5 > \sigma\theta \geq 17.5$	B
$-1.5 < \Delta T \leq -1.4$	$17.5 > \sigma\theta \geq 12.5$	C
$-1.4 < \Delta T \leq -0.5$	$12.5 > \sigma\theta \geq 7.5$	D
$-0.5 < \Delta T \leq +1.4$	$7.5 > \sigma\theta \geq 3.8$	E
$+1.4 < \Delta T \leq +3.6$	$3.8 > \sigma\theta \geq 2.1$	F
$+3.6 < \Delta T$	$2.1 > \sigma\theta$	G

6. Evaluate Seabreeze Impact, if any of the following four is No, then Impact is NO.

CIRCLE IMPACT: YES NO

a. Stability Class is A, B, or C

b. Time of day is 6 a.m. to 7 p.m.

c. Wind is from: ≥ 20 degrees to ≤ 220 degrees.

d. Observed Air Temperature is above (i.e., warmer than) value in table (default is YES)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
66	68	73	77	80	84	86	85	84	80	74	69

7. Select the Dose Calculation Worksheet (Attachment 2).

If Stability Class Is	And Seabreeze Impact Is	Then Use Worksheet #	If Stability Is	And Seabreeze Is	Then Use #
A	YES	1	C	NO	6
A	NO	2	D	N/A	7
B	YES	3	E	N/A	8
B	NO	4	F	N/A	9
C	YES	5	G	N/A	10

8. Copy information to Attachment 2:
   a. **WIND DIRECTION, AFFECTED SECTORS** and **METHOD** to Line A.
   b. **WIND SPEED** to Lines 2 and 9.
   c. Place a check in the blank to the left of Met Tower on Line A.
9. This worksheet is completed, proceed to release rate determination, Attachment 3.

ATTACHMENT 1
(Page 3 of 7)

METEOROLOGICAL DATA WORKSHEET

Part B - NWS Worksheet

In the event data is unavailable from the meteorological strip chart recorder or ERDADS, use the following procedure:

1. GATHER DATA

   A. Date:_____ Time:_____ of observations

   B. Phone National Weather Services, using the commercial phone **AND** ask to be connected to lead forecaster. Commercial phone numbers are available in the Emergency Response Directory.

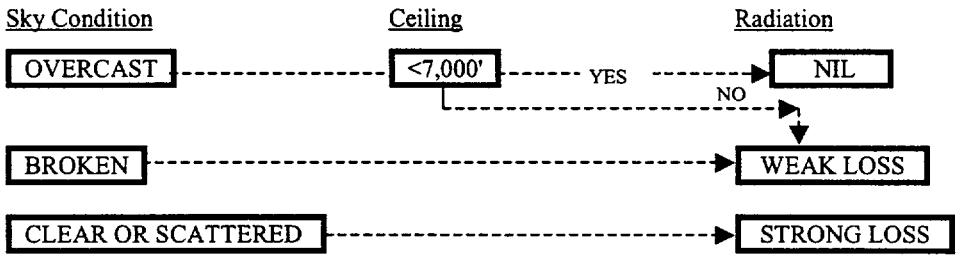
   C. Copy Current weather conditions as follows:

   Temperature:..... _____°F
   WIND DIRECTION:..... _____Degrees
   WIND SPEED:..... _____(MPH)
   Sky Condition: Clear or
   Scattered: ..... _____
   Broken: ..... _____
   Overcast: ..... _____
   IF Broken or overcast,
   THEN copy ceiling height: ..... _____Ft.

2. **IF** DAYTIME (1 hour after sunrise to 1 hour before sunset), **THEN** go to Step 4 (next page).

3. NIGHTTIME CALCULATIONS

   A. Determine Solar Radiation Characteristics:



   B. Circle Stability Category (D through G)

Solar Radiation	Wind Speed (mph) Less than 5	5, 6	7	8	9, 10	11	12 and above
Nil	D	D	D	D	D	D	D
Weak Loss	F	E	E	D	D	D	D
Strong Loss	G	F	F	E	E	E	D

   C. Seabreeze Impact = No

   D. Go to Step 5

ATTACHMENT 1
(Page 4 of 7)
METEOROLOGICAL DATA WORKSHEET

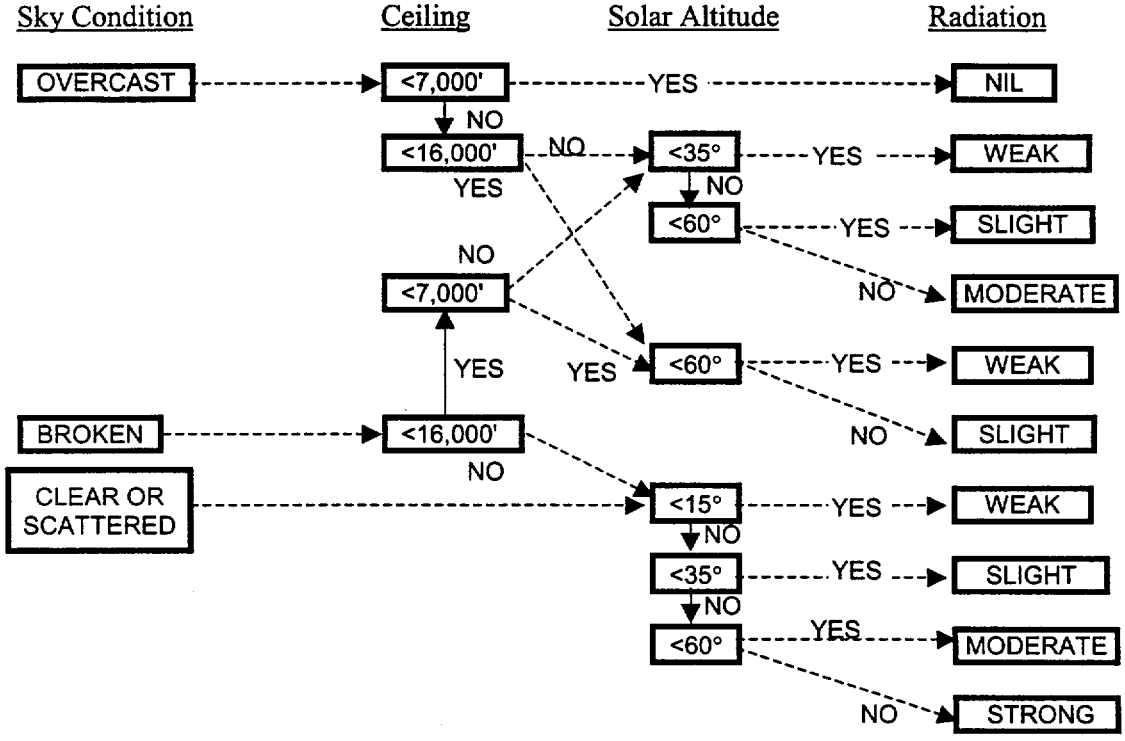
Part B - NWS Worksheet

4. DAYTIME CALCULATIONS:

A. Determine solar altitude (angle of sun above horizon) using Figure A-1 of this Attachment.

Circle Solar Altitude = <15 15 to <35 35 to <60 ≥60

B. Determine Solar Radiation Characteristics: (Place check mark next to appropriate box in radiation column)



C. Circle Stability Category (A through D)

Solar Radiation	Wind Speed (mph) 0,1	2,4	5,6	7	8	9,10	11	12	>12
Strong	A	A	A	B	B	B	C	C	C
Moderate	A	B	B	B	B	C	C	C	D
Slight	B	B	C	C	C	C	D	D	D
Weak	C	C	D	D	D	D	D	D	D
Nil	D	D	D	D	D	D	D	D	D

D. **IF** stability class is A, B, or C **AND** wind direction is from 20 degrees through east to 220 degrees, **THEN** seabreeze impact = Y, otherwise impact = N.

ATTACHMENT 1
(Page 5 of 7)

METEOROLOGICAL DATA WORKSHEET

Part B - NWS Worksheet

5. Using the Wind (from) Direction, circle the **AFFECTED SECTORS** in the table:

   NOTE: If the wind direction is directly on the edge of two sectors (e.g., 11°, 33°, 56°, etc.), an additional sector should be added to the protective action recommendations. For example, if the wind direction is from 78°, then the affected sectors for PARs should be L, M. N, and P.

Wind From	Affected Sectors	Wind From	Affected Sectors	Wind From	Affected Sectors
348 - 11	H J K	123 - 146	P Q R	258 - 281	D E F
11 - 33	J K L	146 - 168	Q R A	281 - 303	E F G
33 - 56	K L M	168 - 191	R A B	303 - 326	F G H
56 - 78	L M N	191 - 213	A B C	326 - 348	G H J
78 - 101	M N P	213 - 236	B C D	**Note**:	
101 - 123	N P Q	236 - 258	C D E	there is no sector **I** or **O**	

6. Select the Dose Calculation Worksheet (Attachment 2).

If Stability Class Is	And Seabreeze Impact Is	Then Use Worksheet #	If Stability Is	And Seabreeze Is	Then Use #
A	YES	1	C	NO	6
A	NO	2	D	N/A	7
B	YES	3	E	N/A	8
B	NO	4	F	N/A	9
C	YES	5	G	N/A	10

7. Copy information to Attachment 2.

   a. **WIND DIRECTION, AFFECTED SECTORS** and **METHOD** to Line A.

   b. **WIND SPEED** to Lines 2 and 9.

   c. Place a check in the blank to the left of NWS on Line A.

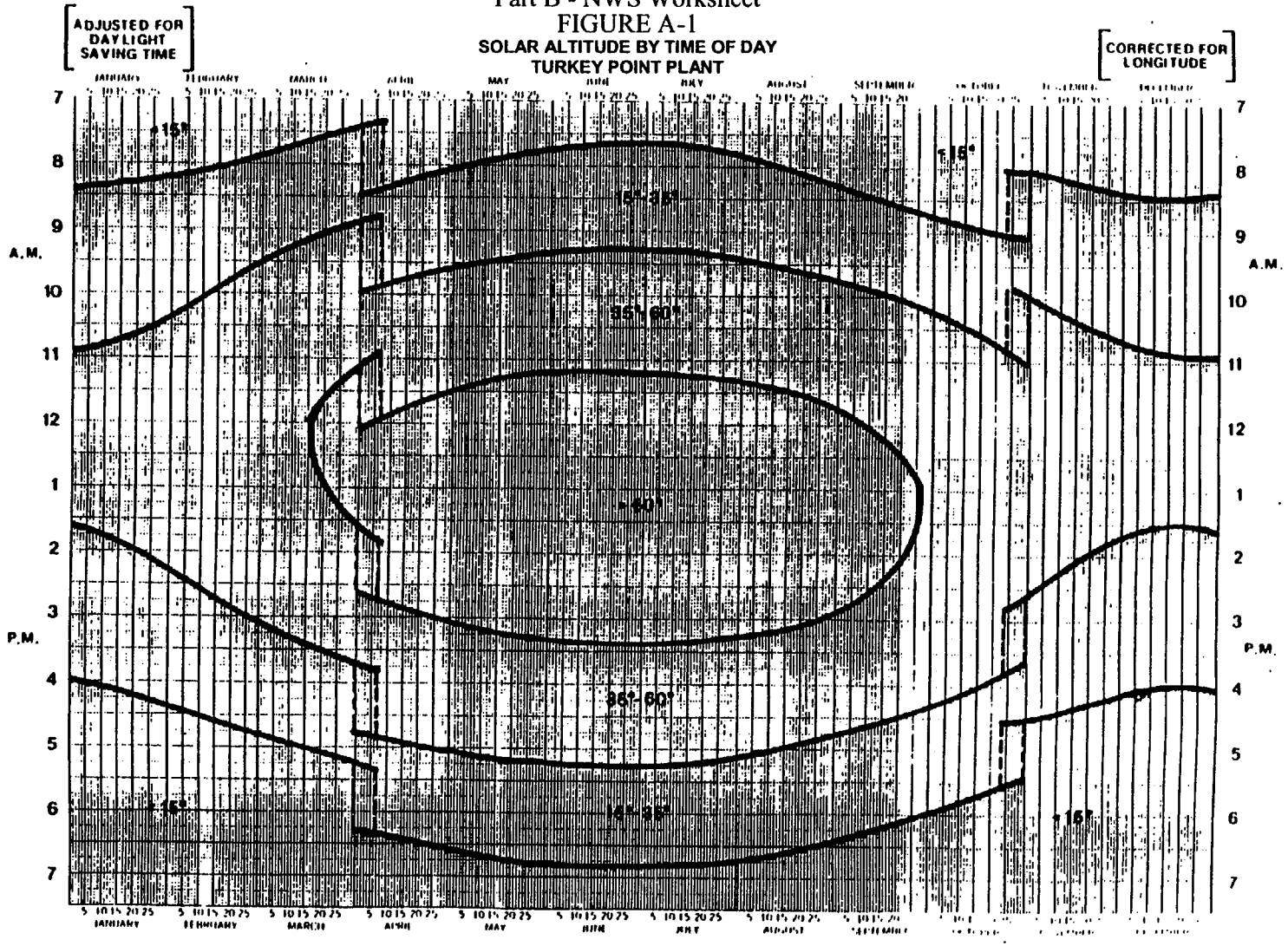
8. This worksheet is completed, proceed to release rate determination, Attachment 3.

ATTACHMENT 1
(Page 6 of 7)
METEOROLOGICAL DATA WORKSHEET

Part B - NWS Worksheet

FIGURE A-1

SOLAR ALTITUDE BY TIME OF DAY
TURKEY POINT PLANT



W97:JR/ev/ev/ev

ATTACHMENT 1
(Page 7 of 7)

METEOROLOGICAL DATA WORKSHEET

Part C - Default Met Worksheet

NOTE: This method is to be used only if Site Tower and National Weather Service Data is not available.

1. **WIND DIRECTION** may be based on local observations or other suitable methods of estimation. If Wind Direction is available, determine Affected Sectors, using the table below.

   IF WIND DIRECTION DATA IS NOT AVAILABLE, THEN **AFFECTED SECTORS** IS ALL (SECTORS)

   Observed Wind Direction_____, Affected Sectors_____ at Date_____Time_____

   NOTE: If the wind direction is directly on the edge of two sectors (e.g., 11°, 33°, 56°, etc.), an additional sector should be added to the protective action recommendations. For example, if the wind direction is from 78°, then the affected sectors for PARs should be L, M, N, and P.

Wind From	Affected Sectors	Wind From	Affected Sectors	Wind From	Affected Sectors
348 - 11	H J K	123 - 146	P Q R	258 - 281	D E F
11 - 33	J K L	146 - 168	Q R A	281 - 303	E F G
33 - 56	K L M	168 - 191	R A B	303 - 326	F G H
56 - 78	L M N	191 - 213	A B C	326 - 348	G H J
78 - 101	M N P	213 - 236	B C D	**Note**:	
101 - 123	N P Q	236 - 258	C D E	there is no sector **I** or **O**	

2. **IF** Daytime Hours (1 hour after sunrise and 1 hour before sunset) **THEN**:

   Select DOSE CALCULATION WORKSHEET 8, (Stability Class E, Seabreeze Impact = N/A)

   Check DEFAULT method in Line A

   Wind Speed = 5 mph in line 2 and 9

   Copy Affected Sectors, from Step 1, to Line A

   Use of this method is complete, proceed to release rate determination, Attachment 3

3. **IF** Not Daytime Hours **THEN**:

   Select DOSE CALCULATION WORKSHEET 9, (Stability Class F, Seabreeze Impact = N/A)

   Check DEFAULT method in Line A

   Wind Speed = 5 mph in line 2 and 9

   Copy Affected Sectors, from Step 1, to Line A

   Use of this method is complete, proceed to release rate determination, Attachment 3

ATTACHMENT 2
(Page 1 of 10)
DOSE CALCULATION WORKSHEETS

WORKSHEET 1 **STABILITY CLASS = A** **SEABREEZE IMPACT = YES** **UNIT** _____

A. Met Summary: Wind Direction (from)_____ Affected Sectors_____
Check method used: _____ Met Tower _____ NWS _____ Default

B. Release Rate determined by: _____ Grab _____ Effluent Mon _____ Default
_____ CHRRM _____ Attachment

Date and time of release data: _____/_____

Follow the instructions to calculate doses @						Use Code *
Line	Instructions for THYROID DOSES	1 mile	2 miles	5 miles	10 miles	
1	Enter the **Iodine Release Rate**, Ci/sec					SNF
2	Enter the **Wind Speed**, mph					SNF
3	Divide Line 1 by Line 2					
4	Iodine Dose Factors	2.2 E+ 4	8.1 E+3	2.2 E+3	7.8 E+2	
5	Multiply Line 3 by Line 4 to obtain **THYROID DOSE (CDE)** RATE, mrem/hr					SNF
6	Enter **Duration** of release, hours					SNF
7	Multiply Line 5 by Line 6 to obtain **THYROID DOSE (CDE),** mrem					PAR
* **SNF** (State Notification Form); **PAR** (Protective Action Recommendation Worksheet)						
Line	Instructions for TOTAL WHOLE BODY DOSES	1 mile	2 miles	5 miles	10 miles	
8	Enter **Noble Gas Release Rate**, Ci/sec					SNF
9	Enter the **Wind Speed**, from Line 2 above					
10	Divide Line 8 by Line 9					
11	Enter the Particulate Factor (**PF**)					
12	Multiply Line 10 by Line 11					
13	Noble Gas Dose Factors	6.1	2.3	0.64	0.22	
14	Multiply Line 12 by Line 13					
15	Enter (Line 5 multiplied by 0.04)					
16	Add Line 14 and Line 15 to obtain **TOTAL DOSE (TEDE) RATE**, mrem/hr					SNF
17	Enter **Duration** of release, hours					
18	Multiply Line 16 by Line 17 to obtain **TOTAL DOSE (TEDE),** mrem					PAR
19	Forward this worksheet (or a copy) to the Emergency Coordinator {RM if done in EOF}					
20	Dose Calculations completed; continue monitoring releases and assessing doses.					

ATTACHMENT 2
(Page 2 of 10)
DOSE CALCULATION WORKSHEETS

WORKSHEET 2 **STABILITY CLASS = A** **SEABREEZE IMPACT = NO** **UNIT** _____

A. Met Summary: Wind Direction (from)_____ Affected Sectors_____
Check method used: _____ Met Tower _____ NWS _____ Default

B. Release Rate determined by: _____ Grab _____ Effluent Mon _____ Default
_____ CHRRM _____ Attachment

Date and time of release data: _____/_____

Follow the instructions to calculate doses @						Use Code *
Line	Instructions for THYROID DOSES	1 mile	2 miles	5 miles	10 miles	
1	Enter the **Iodine Release Rate**, Ci/sec					SNF
2	Enter the **Wind Speed**, mph					SNF
3	Divide Line 1 by Line 2					
4	Iodine Dose Factors	3.6 E+3	1.8 E+3	7.7 E+2	3.9 E+2	
5	Multiply Line 3 by Line 4 to obtain **THYROID DOSE (CDE) RATE**, mrem/hr					SNF
6	Enter **Duration** of release, hours					SNF
7	Multiply Line 5 by Line 6 to obtain **THYROID DOSE (CDE)**, mrem					PAR
* **SNF** (State Notification Form); **PAR** (Protective Action Recommendation Worksheet)						
Line	Instructions for TOTAL WHOLE BODY DOSES	1 mile	2 miles	5 miles	10 miles	
8	Enter **Noble Gas Release Rate**, Ci/sec					SNF
9	Enter the **Wind Speed**, from Line 2 above					
10	Divide Line 8 by Line 9					
11	Enter the Particulate Factor (**PF**)					
12	Multiply Line 10 by Line 11					
13	Noble Gas Dose Factors	1.0	0.5	0.22	0.11	
14	Multiply Line 12 by Line 13					
15	Enter (Line 5 multiplied by 0.04)					
16	Add Line 14 and Line 15 to obtain **TOTAL DOSE (TEDE) RATE,** mrem/hr					SNF
17	Enter **Duration** of release, hours					
18	Multiply Line 16 by Line 17 to obtain **TOTAL DOSE (TEDE)** mrem					PAR
19	Forward this worksheet (or a copy) to the Emergency Coordinator {RM if done in EOF}					
20	Dose Calculations completed; continue monitoring releases and assessing doses.					

ATTACHMENT 2
(Page 3 of 10)
DOSE CALCULATION WORKSHEETS

WORKSHEET 3 **STABILITY CLASS = B** **SEABREEZE IMPACT = YES** **UNIT** _____

A. Met Summary: Wind Direction (from)_____ Affected Sectors_____
Check method used: _____ Met Tower _____ NWS _____ Default

B. Release Rate determined by: _____ Grab _____ Effluent Mon _____ Default
_____ CHRRM _____ Attachment

Date and time of release data: _____/_____

Follow the instructions to calculate doses @						Use Code *
Line	Instructions for THYROID DOSES	1 mile	2 miles	5 miles	10 miles	
1	Enter the **Iodine Release Rate**, Ci/sec					SNF
2	Enter the **Wind Speed**, mph					SNF
3	Divide Line 1 by Line 2					
4	Iodine Dose Factors	3.0 E+4	1.1 E+4	3.0 E+3	1.1 E+3	
5	Multiply Line 3 by Line 4 to obtain **THYROID DOSE (CDE) RATE**, mrem/hr					SNF
6	Enter **Duration** of release, hours					SNF
7	Multiply Line 5 by Line 6 to obtain **THYROID DOSE (CDE)**, mrem					PAR
* **SNF** (State Notification Form); **PAR** (Protective Action Recommendation Worksheet)						
Line	Instructions for TOTAL WHOLE BODY DOSES	1 mile	2 miles	5 miles	10 miles	
8	Enter **Noble Gas Release Rate**, Ci/sec					SNF
9	Enter the **Wind Speed**, from Line 2 above					
10	Divide Line 8 by Line 9					
11	Enter the Particulate Factor (**PF**)					
12	Multiply Line 10 by Line 11					
13	Noble Gas Dose Factors	8.3	2.9	0.84	0.30	
14	Multiply Line 12 by Line 13					
15	Enter (Line 5 multiplied by 0.04)					
16	Add Line 14 and Line 15 to obtain **TOTAL DOSE (TEDE) RATE**, mrem/hr					SNF
17	Enter **Duration** of release, hours					
18	Multiply Line 16 by Line 17 to obtain **TOTAL DOSE (TEDE)**, mrem					PAR
19	Forward this worksheet (or a copy) to the Emergency Coordinator {RM if done in EOF}					
20	Dose Calculations completed; continue monitoring releases and assessing doses.					

ATTACHMENT 2
(Page 4 of 10)
DOSE CALCULATION WORKSHEETS

WORKSHEET 4 **STABILITY CLASS = B** **SEABREEZE IMPACT = NO** **UNIT** _____

A. Met Summary: Wind Direction (from)_____ Affected Sectors_____
Check method used: _____ Met Tower _____ NWS _____ Default

B. Release Rate determined by: _____ Grab _____ Effluent Mon _____ Default
_____ CHRRM _____ Attachment

Date and time of release data: _____/_____

Follow the instructions to calculate doses @						Use Code *
Line	Instructions for THYROID DOSES	1 mile	2 miles	5 miles	10 miles	
1	Enter the **Iodine Release Rate**, Ci/sec					SNF
2	Enter the **Wind Speed**, mph					SNF
3	Divide Line 1 by Line 2					
4	Iodine Dose Factors	2.3 E+4	5.9 E+3	1.1 E+3	5.7 E+2	
5	Multiply Line 3 by Line 4 to obtain **THYROID DOSE (CDE) RATE**, mrem/hr					SNF
6	Enter **Duration** of release, hours					SNF
7	Multiply Line 5 by Line 6 to obtain **THYROID DOSE (CDE)**, mrem					PAR
* **SNF** (State Notification Form); **PAR** (Protective Action Recommendation Worksheet)						
Line	Instructions for TOTAL WHOLE BODY DOSES	1 mile	2 miles	5 miles	10 miles	
8	Enter **Noble Gas Release Rate**, Ci/sec					SNF
9	Enter the **Wind Speed**, from Line 2 above					
10	Divide Line 8 by Line 9					
11	Enter the Particulate Factor (**PF**)					
12	Multiply Line 10 by Line 11					
13	Noble Gas Dose Factors	6.4	1.6	0.31	0.15	
14	Multiply Line 12 by Line 13					
15	Enter (Line 5 multiplied by 0.04)					
16	Add Line 14 and Line 15 to obtain **TOTAL DOSE (TEDE) RATE**, mrem/hr					SNF
17	Enter **Duration** of release, hours					
18	Multiply Line 16 by Line 17 to obtain **TOTAL DOSE (TEDE)**, mrem					PAR
19	Forward this worksheet (or a copy) to the Emergency Coordinator {RM if done in EOF}					
20	Dose Calculations completed; continue monitoring releases and assessing doses.					

ATTACHMENT 2
(Page 5 of 10)
DOSE CALCULATION WORKSHEETS

WORKSHEET 5 **STABILITY CLASS = C** **SEABREEZE IMPACT = YES** **UNIT** _____

A. Met Summary: Wind Direction (from)_____ Affected Sectors_____
Check method used: _____ Met Tower _____ NWS _____ Default

B. Release Rate determined by: _____ Grab _____ Effluent Mon _____ Default
_____ CHRRM _____ Attachment

Date and time of release data: _____/_____

Follow the instructions to calculate doses @						Use Code *
Line	Instructions for THYROID DOSES	1 mile	2 miles	5 miles	10 miles	
1	Enter the **Iodine Release Rate**, Ci/sec					SNF
2	Enter the **Wind Speed**, mph					SNF
3	Divide Line 1 by Line 2					
4	Iodine Dose Factors	5.9 E+4	1.7 E+4	3.7 E+3	1.5 E+3	
5	Multiply Line 3 by Line 4 to obtain **THYROID DOSE (CDE) RATE**, mrem/hr					SNF
6	Enter **Duration** of release, hours					SNF
7	Multiply Line 5 by Line 6 to obtain **THYROID DOSE (CDE)**, mrem					PAR
* **SNF** (State Notification Form); **PAR** (Protective Action Recommendation Worksheet)						
Line	Instructions for TOTAL WHOLE BODY DOSES	1 mile	2 miles	5 miles	10 miles	
8	Enter **Noble Gas Release Rate**, Ci/sec					SNF
9	Enter the **Wind Speed**, from Line 2 above					
10	Divide Line 8 by Line 9					
11	Enter the Particulate Factor (**PF**)					
12	Multiply Line 10 by Line 11					
13	Noble Gas Dose Factors	16.0	4.6	1.1	0.42	
14	Multiply Line 12 by Line 13					
15	Enter (Line 5 multiplied by 0.04)					
16	Add Line 14 and Line 15 to obtain **TOTAL DOSE (TEDE) RATE**, mrem/hr					SNF
17	Enter **Duration** of release, hours					
18	Multiply Line 16 by Line 17 to obtain **TOTAL DOSE (TEDE)**, mrem					PAR
19	Forward this worksheet (or a copy) to the Emergency Coordinator {RM if done in EOF}					
20	Dose Calculations completed; continue monitoring releases and assessing doses.					

ATTACHMENT 2
(Page 6 of 10)
DOSE CALCULATION WORKSHEETS

WORKSHEET 6 **STABILITY CLASS = C** **SEABREEZE IMPACT = NO** **UNIT** _____

A. Met Summary: Wind Direction (from)_____ Affected Sectors_____
Check method used: _____ Met Tower _____ NWS _____ Default

B. Release Rate determined by: _____ Grab _____ Effluent Mon _____ Default
_____ CHRRM _____ Attachment

Date and time of release data: _____/_____

Follow the instructions to calculate doses @						Use Code *
Line	Instructions for THYROID DOSES	1 mile	2 miles	5 miles	10 miles	
1	Enter the **Iodine Release Rate**, Ci/sec					SNF
2	Enter the **Wind Speed**, mph					SNF
3	Divide Line 1 by Line 2					
4	Iodine Dose Factors	5.9 E+ 4	1.7 E+4	3.1 E+3	9.1 E+2	
5	Multiply Line 3 by Line 4 to obtain **THYROID DOSE (CDE) RATE**, mrem/hr					SNF
6	Enter **Duration** of release, hours					SNF
7	Multiply Line 5 by Line 6 to obtain **THYROID DOSE (CDE)**, mrem					PAR
* **SNF** (State Notification Form); **PAR** (Protective Action Recommendation Worksheet)						
Line	Instructions for TOTAL WHOLE BODY DOSES	1 mile	2 miles	5 miles	10 miles	
8	Enter **Noble Gas Release Rate**, Ci/sec					SNF
9	Enter the **Wind Speed**, from Line 2 above					
10	Divide Line 8 by Line 9					
11	Enter the Particulate Factor (**PF**)					
12	Multiply Line 10 by Line 11					
13	Noble Gas Dose Factors	16.0	4.6	0.88	0.26	
14	Multiply Line 12 by Line 13					
15	Enter (Line 5 multiplied by 0.04)					
16	Add Line 14 and Line 15 to obtain **TOTAL DOSE (TEDE) RATE**, mrem/hr					SNF
17	Enter **Duration** of release, hours					
18	Multiply Line 16 by Line 17 to obtain **TOTAL DOSE (TEDE)**, mrem					PAR
19	Forward this worksheet (or a copy) to the Emergency Coordinator {RM if done in EOF}					
20	Dose Calculations completed; continue monitoring releases and assessing doses.					

ATTACHMENT 2
(Page 7 of 10)
DOSE CALCULATION WORKSHEETS

WORKSHEET 7 **STABILITY CLASS = D** **SEABREEZE IMPACT = N/A** **UNIT** _____

A. Met Summary: Wind Direction (from)_____ Affected Sectors_____
Check method used: _____ Met Tower _____ NWS _____ Default

B. Release Rate determined by: _____ Grab _____ Effluent Mon _____ Default
_____ CHRRM _____ Attachment

Date and time of release data: _____/_____

Follow the instructions to calculate doses @						Use Code *
Line	Instructions for THYROID DOSES	1 mile	2 miles	5 miles	10 miles	
1	Enter the **Iodine Release Rate**, Ci/sec					SNF
2	Enter the **Wind Speed**, mph					SNF
3	Divide Line 1 by Line 2					
4	Iodine Dose Factors	1.6 E+5	5.9 E+4	1.6 E+4	5.7 E+3	
5	Multiply Line 3 by Line 4 to obtain **THYROID DOSE (CDE) RATE**, mrem/hr					SNF
6	Enter **Duration** of release, hours					SNF
7	Multiply Line 5 by Line 6 to obtain **THYROID DOSE (CDE)**, mrem					PAR
* **SNF** (State Notification Form); **PAR** (Protective Action Recommendation Worksheet)						
Line	Instructions for TOTAL WHOLE BODY DOSES	1 mile	2 miles	5 miles	10 miles	
8	Enter **Noble Gas Release Rate**, Ci/sec					SNF
9	Enter the **Wind Speed**, from Line 2 above					
10	Divide Line 8 by Line 9					
11	Enter the Particulate Factor (**PF**)					
12	Multiply Line 10 by Line 11					
13	Noble Gas Dose Factors	44.0	17.0	4.4	1.6	
14	Multiply Line 12 by Line 13					
15	Enter (Line 5 multiplied by 0.04)					
16	Add Line 14 and Line 15 to obtain **TOTAL DOSE (TEDE) RATE**, mrem/hr					SNF
17	Enter **Duration** of release, hours					
18	Multiply Line 16 by Line 17 to obtain **TOTAL DOSE (TEDE)**, mrem					PAR
19	Forward this worksheet (or a copy) to the Emergency Coordinator {RM if done in EOF}					
20	Dose Calculations completed; continue monitoring releases and assessing doses.					

ATTACHMENT 2
(Page 8 of 10)
DOSE CALCULATION WORKSHEETS

WORKSHEET 8 **STABILITY CLASS = E** **SEABREEZE IMPACT = N/A** **UNIT** _____

A. Met Summary: Wind Direction (from)_____ Affected Sectors_____
Check method used: _____ Met Tower _____ NWS _____ Default

B. Release Rate determined by: _____ Grab _____ Effluent Mon _____ Default
_____ CHRRM _____ Attachment

Date and time of release data: _____/_____

Follow the instructions to calculate doses @						Use Code *
Line	Instructions for THYROID DOSES	1 mile	2 miles	5 miles	10 miles	
1	Enter the **Iodine Release Rate**, Ci/sec					SNF
2	Enter the **Wind Speed**, mph					SNF
3	Divide Line 1 by Line 2					
4	Iodine Dose Factors	2.9 E+5	1.2 E+5	3.6 E+4	1.5 E+4	
5	Multiply Line 3 by Line 4 to obtain **THYROID DOSE (CDE) RATE**, mrem/hr					SNF
6	Enter **Duration** of release, hours					SNF
7	Multiply Line 5 by Line 6 to obtain **THYROID DOSE (CDE)**, mrem					PAR
* **SNF** (State Notification Form); **PAR** (Protective Action Recommendation Worksheet)						
Line	Instructions for TOTAL WHOLE BODY DOSES	1 mile	2 miles	5 miles	10 miles	
8	Enter **Noble Gas Release Rate**, Ci/sec					SNF
9	Enter the **Wind Speed**, from Line 2 above					
10	Divide Line 8 by Line 9					
11	Enter the Particulate Factor (**PF**)					
12	Multiply Line 10 by Line 11					
13	Noble Gas Dose Factors	81.0	33.0	10.0	4.0	
14	Multiply Line 12 by Line 13					
15	Enter (Line 5 multiplied by 0.04)					
16	Add Line 14 and Line 15 to obtain **TOTAL DOSE (TEDE) RATE**, mrem/hr					SNF
17	Enter **Duration** of release, hours					
18	Multiply Line 16 by Line 17 to obtain **TOTAL DOSE (TEDE)**, mrem					PAR
19	Forward this worksheet (or a copy) to the Emergency Coordinator {RM if done in EOF}					
20	Dose Calculations completed; continue monitoring releases and assessing doses.					

ATTACHMENT 2
(Page 9 of 10)
DOSE CALCULATION WORKSHEETS

WORKSHEET 9 **STABILITY CLASS = F** **SEABREEZE IMPACT = N/A** **UNIT** _____

A. Met Summary: Wind Direction (from)_____ Affected Sectors_____
Check method used: _____ Met Tower _____ NWS _____ Default

B. Release Rate determined by: _____ Grab _____ Effluent Mon _____ Default
_____ CHRRM _____ Attachment

Date and time of release data: _____/_____

Follow the instructions to calculate doses @						Use Code *
Line	Instructions for THYROID DOSES	1 mile	2 miles	5 miles	10 miles	
1	Enter the **Iodine Release Rate**, Ci/sec					SNF
2	Enter the **Wind Speed**, mph					SNF
3	Divide Line 1 by Line 2					
4	Iodine Dose Factors	5.2 E+5	2.3 E+5	7.7 E+4	3.6 E+4	
5	Multiply Line 3 by Line 4 to obtain **THYROID DOSE (CDE) RATE**, mrem/hr					SNF
6	Enter **Duration** of release, hours					SNF
7	Multiply Line 5 by Line 6 to obtain **THYROID DOSE (CDE)**, mrem					PAR
* **SNF** (State Notification Form); **PAR** (Protective Action Recommendation Worksheet)						
Line	Instructions for TOTAL WHOLE BODY DOSES	1 mile	2 miles	5 miles	10 miles	
8	Enter **Noble Gas Release Rate**, Ci/sec					SNF
9	Enter the **Wind Speed**, from Line 2 above					
10	Divide Line 8 by Line 9					
11	Enter the Particulate Factor (**PF**)					
12	Multiply Line 10 by Line 11					
13	Noble Gas Dose Factors	1.5 E+2	6.6 E+1	2.2 E+1	9.5 E 0	
14	Multiply Line 12 by Line 13					
15	Enter (Line 5 multiplied by 0.04)					
16	Add Line 14 and Line 15 to obtain **TOTAL DOSE (TEDE) RATE**, mrem/hr					SNF
17	Enter **Duration** of release, hours					
18	Multiply Line 16 by Line 17 to obtain **TOTAL DOSE (TEDE)**, mrem					PAR
19	Forward this worksheet (or a copy) to the Emergency Coordinator {RM if done in EOF}					
20	Dose Calculations completed; continue monitoring releases and assessing doses.					

ATTACHMENT 2
(Page 10 of 10)
DOSE CALCULATION WORKSHEETS

WORKSHEET 10 **STABILITY CLASS = G** **SEABREEZE IMPACT = N/A** **UNIT** _____

A. Met Summary: Wind Direction (from)_____ Affected Sectors_____
Check method used: _____ Met Tower _____ NWS _____ Default

B. Release Rate determined by: _____ Grab _____ Effluent Mon _____ Default
_____ CHRRM _____ Attachment

Date and time of release data: _____/_____

Follow the instructions to calculate doses @						Use Code *
Line	Instructions for THYROID DOSES	1 mile	2 miles	5 miles	10 miles	
1	Enter the **Iodine Release Rate**, Ci/sec					SNF
2	Enter the **Wind Speed**, mph					SNF
3	Divide Line 1 by Line 2					
4	Iodine Dose Factors	9.1 E+5	4.6 E+5	1.7 E+5	7.7 E+4	
5	Multiply Line 3 by Line 4 to obtain **THYROID DOSE (CDE) RATE**, mrem/hr					SNF
6	Enter **Duration** of release, hours					SNF
7	Multiply Line 5 by Line 6 to obtain **THYROID DOSE (CDE)**, mrem					PAR
* **SNF** (State Notification Form); **PAR** (Protective Action Recommendation Worksheet)						
Line	Instructions for TOTAL WHOLE BODY DOSES	1 mile	2 miles	5 miles	10 miles	
8	Enter **Noble Gas Release Rate**, Ci/sec					SNF
9	Enter the **Wind Speed**, from Line 2 above					
10	Divide Line 8 by Line 9					
11	Enter the Particulate Factor (**PF**)					
12	Multiply Line 10 by Line 11					
13	Noble Gas Dose Factors	2.4 E+2	1.2 E+2	4.8 E+1	2.2 E+1	
14	Multiply Line 12 by Line 13					
15	Enter (Line 5 multiplied by 0.04)					
16	Add Line 14 and Line 15 to obtain **TOTAL DOSE (TEDE) RATE**, mrem/hr					SNF
17	Enter **Duration** of release, hours					
18	Multiply Line 16 by Line 17 to obtain **TOTAL DOSE (TEDE)**, mrem					PAR
19	Forward this worksheet (or a copy) to the Emergency Coordinator {RM if done in EOF}					
20	Dose Calculations completed; continue monitoring releases and assessing doses.					

ATTACHMENT 3
(Page 1 of 7)

RADIOACTIVE RELEASE WORKSHEET

Part A - Grab Sample Data Worksheet

1. Date: _____ and Time _____ of Data, Unit _____

2. Ask the Emergency Coordinator for the following:

   a. Accident Type: _____
   b. Potential Duration of Release (if unknown, use default):_____ hours
   c. Is the core overheating/melting? (circle): **YES** **NO**

3. **IF** the core is overheating or melting, **THEN** Particulate Factor (PF) = 4.4, else PF = 1.0; enter **PF** _____

4. Enter the Gross Noble Gas and Iodine-131 DEQ, in µCi/cc for the affected/sampled pathways, into the table below:

   a. **IF** Iodine results are not available, **THEN** calculate as shown below, using the Iodine Release Rate Factor, found on Page 2 of 6.
   Noble Gas Conc X IRRF = Iodine Conc
   _____NG(µCi/cc) X _____IRRF = _____Iodine (µCi/cc)

5. Determine pathway flow in cc/sec for plant vent and steam lines (if affected).

   a. For Plant Vent; calculate as shown below:
   Plant vent channel 10 flowrate (cfm) x 472 = plant vent flowrate (cc/sec)
   _____PV Chl 10 X 472 = _____PV (cc/sec)
   IF Plant Vent Sping Ch. 10 data is not available, **THEN** use the Plant Vent Fan Configuration Table on Page 2 of 6.
   b. For Main Steam Lines, refer to Page 2 of 6.

6. Calculate Release Rates:

Pathway	Type	µCi/cc x	Flow cc/sec x µCi to Ci =		Release Rate, Ci/sec Noble Gas	Iodine
Plant Vent	Noble Gas			1 E -6		//////////////
	Iodines				//////////////	
Main Steam Lines	Noble Gas			1 E -6		//////////////
	Iodines				//////////////	
Cond Air Ejector	Noble Gas		1.42E 4	1 E -6		//////////////
	Iodines				//////////////	
U-3 Fuel Pool Vent	Noble Gas		9.43E 6	1 E -6		//////////////
	Iodines				//////////////	

7. Calculate Site Release Rate:

a. Total the Release Rates using this Worksheet		
b. Enter other Release Rates (e.g., CHRRM/Other Unit)		
c. Add to obtain Site Release Rate		

8. Enter the Site Release Rates in Attachment 2.

   a. Place a check in the blank to the left of Grab in Line B to indicate this method.
   b. Enter the Noble Gas Release Rate into Line 8.
   c. Enter the Iodine Release Rate into Line 1.
   d. Enter the Duration (if 2 affected units, use longest) into Line 6 and Line 17.
   e. Enter the **PF** (Particulate Factor) (if 2 affected units, use largest) into Line 11.

9. This worksheet is done, follow the instructions on Attachment 2.

ATTACHMENT 3
(Page 2 of 7)

RADIOACTIVE RELEASE WORKSHEET

Part A - Grab Sample Data Worksheet

Iodine Release Rate Factors (IRRF)

Plant Condition	IRRF
LOCA and Emergency Containment Filter(s) in use	0.011
LOCA and Emergency Containment Filter(s) not in use	0.063
Fuel Handling	0.001
Steam Generator Tube Rupture	6.8E-4
Waste Gas Decay Tank or VCT release	1E - 06

Plant Vent Exhaust Fan Configuration Table

CONTAINMENT PURGE	AUXILIARY BUILDING	SPENT FUEL PIT	RADWASTE BUILDING	LAUNDRY SYSTEM	PLANT VENT FLOW cc/sec
0	0	1	2	1	1.45 E+7
0	1	1	2	1	3.82 E+7
0	2	1	2	1	4.31 E+7
1	1	1	2	1	4.74 E+7
1	2	1	2	1	5.07 E+7
2	1	1	2	1	5.66 E+7
2	2	1	2	1	5.99 E+7

Main Steam Line Flow

I) Atmospheric Dump Valves (1 per line): Each 1.33 E+4 cc/sec
II) Each S/G safety relief valve (four per steam line): 1.1 E+5 cc/sec each
III) Exhaust from Each Aux Feed Pump: 3.4 E+3 cc/sec each
IV) **IF** time and data permits, **THEN** average the flow as shown below, **ELSE** assume a constant flow rate.

Main Steam Line Flow Averaging Method				
Pathway cc/sec	X	Amount of OPEN time, sec or min Averaging Period: 1800 sec or 30 min	=	Average cc/sec
_____ cc/sec	x	_____	=	_____cc/sec

ATTACHMENT 3
(Page 3 of 7)

RADIOACTIVE RELEASE WORKSHEET

Part B - Effluent Monitor Data Worksheet

1. Date: _____ and Time _____ of Data, Unit _____

2. Ask the Emergency Coordinator for the following:

   a. Accident Type: _____
   b. Potential Duration of Release (if unknown, use default):_____ hours
   c. Is the core overheating/melting? (circle): **YES** **NO**

3. **IF** the core is overheating or melting, **THEN** Particulate Factor (PF) = 4.4, else PF = 1.0; enter **PF** _____

4. Enter the monitor readings for the affected pathways in the table of Step 7:

   a. SPING-4 reading (already averaged) preferred over R-14, R-15.
   b. **IF** using R-14, R-15, **THEN** estimate the four chart points over prior 15 minutes.
   c. **IF** using DAM-1 (already averaged), **THEN** multiply the reading by the number of S/Gs feeding monitor:
      DAM-1 µCi/cc_____ x _____ S/Gs being monitored = _____
      (DAM-1 value for Step 7)

5. Determine pathway flow in cc/sec for plant vent and steam lines (if affected).

   a. For Plant Vent; calculate as shown below:
      Plant vent channel 10 flowrate (cfm) x 472 = plant vent flowrate (cc/sec)
      _____PV Chl 10 X 472 = _____PV (cc/sec)
      IF Plant Vent Sping Ch. 10 data is not available, **THEN** use the Plant Vent Fan Configuration Table on Page 4 of 6.
   b. For Main Steam Lines, refer to Page 4 of 6.

6. Enter the Iodine Release Rate Factor (IRRF) in to the table below, Factors listed on Page 4 of 6.

7. Calculate Release Rates:

Pathway		Monitor Reading	x Cal x	Flow cc/sec x	µCi to Ci =	Noble Gas Rel. Rate	x IRRF =	Iodine Rel. Rate
Plant Vent	R-14		5 E-9		1 E -6			
	SPING		1.0		1 E -6			
Main Steam	DAM-1		1.0		1 E -6			
Cond Air Ejector	R-15		2.47E-8	1.42E 4	1 E -6			
	SPING		1.0	1.42E 4	1 E -6			
#3 SFP Vent	SPING		1.0	9.43E 6	1 E -6			

8. Calculate Site Release Rate:

a. Total the Release Rates using this Worksheet		//////	
b. Enter other Release Rates (e.g., CHRRM/Other Unit)		//////	
c. Add to obtain Site Release Rate		//////	

9. Enter the Site Release Rates in Attachment 2.
   a. Place a check on the blank to the left of **Effluent Mon** in Line B to indicate this method.
   b. Enter the Noble Gas Release Rate into Line 8.
   c. Enter the Iodine Release Rate into Line 1.
   d. Enter the Duration (if 2 affected units, use longest) into Line 6 and Line 17.
   e. Enter the **PF** (Particulate Factor) (if 2 affected units, use largest) into Line 11.
10. This worksheet is done, follow the instructions on Attachment 2.

ATTACHMENT 3
(Page 4 of 7)

RADIOACTIVE RELEASE WORKSHEET

Part B - Effluent Monitor Data Worksheet

Iodine Release Rate Factors (IRRF)

Plant Condition	IRRF
LOCA and Emergency Containment Filter(s) in use	0.011
LOCA and Emergency Containment Filter(s) not in use	0.063
Fuel Handling	0.001
Steam Generator Tube Rupture	6.8E-4
Waste Gas Decay Tank or VCT release	1E - 06

Plant Vent Exhaust Fan Configuration Table

CONTAINMENT PURGE	AUXILIARY BUILDING	SPENT FUEL PIT	RADWASTE BUILDING	LAUNDRY SYSTEM	PLANT VENT FLOW cc/sec
0	0	1	2	1	1.45 E+7
0	1	1	2	1	3.82 E+7
0	2	1	2	1	4.31 E+7
1	1	1	2	1	4.74 E+7
1	2	1	2	1	5.07 E+7
2	1	1	2	1	5.66 E+7
2	2	1	2	1	5.99 E+7

Main Steam Line Flow

I) Atmospheric Dump Valves (1 per line): Each 1.33 E+4 cc/sec
II) Each S/G safety relief valve (four per steam line): 1.1 E+5 cc/sec each
III) Exhaust from Each Aux Feed Pump: 3.4 E+3 cc/sec each
IV) **IF** time and data permits, **THEN** average the flow as shown below, **ELSE** assume a constant flow rate.

Main Steam Line Flow Averaging Method				
Pathway cc/sec	X	Amount of OPEN time, sec or min Averaging Period: 1800 sec or 30 min	=	Average cc/sec
_____ cc/sec	x	_____	=	_____cc/sec

ATTACHMENT 3
(Page 5 of 7)

RADIOACTIVE RELEASE WORKSHEET

Part C - Containment High Range Radiation Monitor (CHRRM) Data Worksheet

(If both units are using this method, then complete one worksheet for each unit)

1. Date and time of data:_____/_____ Reactor Trip Date and Time_____/_____

2. Ask the Emergency Coordinator for the following:

   a. Is the core overheating/melting? (circle): **YES** **NO**

   b. Potential Duration of Release (if unknown, use default):_____hours

3. **IF** the core is overheating or melting, THEN Particulate Factor (PF) = 4.4, else PF = 1.0; enter PF _____

4. Obtain: Highest CHRRM reading:_____R/hr, Elapsed time (ET) since Reactor Trip:_____hours

5. **IF** using the pre-planned CHRRM alternate, estimate the CHRRM value:

   Alternate _____R/hr x 1.3E+4 =_____estimated CHRRM

6. Using the Elapsed Time, select the Conversion Factor (CF), from the table below, for use in Step 7.

Elapsed Time, Hr	Conversion Factor	Elapsed Time, Hr	Conversion Factor
ET = 0	1.6 E-6	2.0 < ET ≤ 4.0	9.0 E-6
0 < ET ≤ 0.5	2.2 E-6	4.0 < ET ≤ 8.0	1.8 E-5
0.5 < ET ≤ 1.0	3.2 E-6	8.0 < ET	4.8 E-5
1.0 <ET ≤ 2.0	5.0 E-6		

7. CHRRM _____R/hr X CF_____=_____(CFA) [1] for use in Steps 9 and 11.

8. Determine Noble Gas Reduction Factor (NGRF), from Table; NGRF=_____, for use in Step 9.

ET	NGRF	ET	NGRF	ET	NGRF	ET	NGRF
0	1.0	>4 to ≤5	0.44	>9 to ≤10	0.26	>14 to ≤15	0.16
>0 to ≤1	0.90	>5 to ≤6	0.39	>10 to ≤11	0.23	>15 to ≤16	0.14
>1 to ≤2	0.70	>6 to ≤7	0.35	>11 to ≤12	0.21	>16 to ≤17	0.14
>2 to ≤3	0.6	>7 to ≤8	0.32	>12 to ≤13	0.19	>17 to ≤18	0.14
>3 to ≤4	0.5	>8 to ≤9	0.28	>13 to ≤14	0.18	>18	0.13

9. Calculate:_____(CFA) X _____(NGRF) X **10.2** Ci/sec=_____Noble Gas Release Rate, Ci/sec.

ATTACHMENT 3
(Page 6 of 7)

RADIOACTIVE RELEASE WORKSHEET

Part C - Containment High Range Radiation Monitor (CHRRM) Data Worksheet (Cont'd)

10. **IF** the Emergency Containment Filter(s) IS in use, **THEN** (ICV) [2] = 0.11; if NOT in use, then (ICV) [2] = 0.63.

11. Calculate:_____(CFA) X _____ (ICV) =_____Iodine Release Rate, Ci/sec.

12. Calculate Site Release Rate, Ci/sec:

NOTE

Determine if Attachment 4 should be used to adjust results obtained from this worksheet.

	Noble Gas	Iodine
a. Enter the Release Rates determined from this Worksheet		
b. **IF** the other unit is AFFECTED, **THEN** enter its release rates		
c. Add 12.a and 12.b to obtain Site Release Rates		

13. If necessary, move noble gas and iodine release rate results to Attachment 3, Page 1, Line 7b **OR** Attachment 3, Page 3, Line 8b and continue with the instructions on those worksheets. If those worksheets were not used, continue with Step 14 below.

14. Enter the Site Release Rates in Attachment 2.

    a. Place a check in the blank to the left of **CHRRM** in Line B to indicate this method.
    b. Enter the Noble Gas Release Rate into Line 8.
    c. Enter the Iodine Release Rate into Line 1.
    d. Enter the Duration (if two affected units, use longest) into Line 6.
    e. Enter the **PF** (Particulate Factor) (if two affected units, use largest) into Line 11.

15. This worksheet is done, follow the instructions on Attachment 2.

Footnotes:

(1) CFA = Core Fraction Airborne; decimal fraction of total inventory assumed to be in the containment atmosphere.

(2) ICV = Iodine Conversion Value: A factor that includes containment default leak rate to determine the iodine release rate.

ATTACHMENT 3
(Page 7 of 7)

RADIOACTIVE RELEASE WORKSHEET

Part D - Default Values for Radioactive Releases

1. Default data is listed by accident type.

   a. For the accident type and plant conditions, select the default data.

   b. Copy the default data to the selected worksheet in Attachment 2.

      I. Iodine Release Rate to Line 1

      II. Noble Gas Release Rate to Line 8

      III. Particulate Factor (PF) to Line 11

   c. Place a check in the blank to the left of default on Line B on the selected worksheet in Attachment 2.

2. This worksheet is done, follow the instructions on the selected worksheet in Attachment 2.

LOSS OF COOLANT ACCIDENT (LOCA)

Compare hours after reactor trip to table below; see Attachment 4 for methods to adjust these values based on known plant conditions.

Hours post-trip	Duration	Iodine Ci/sec	Noble Ci/sec	PF
0 to 2	2 hours	0.11	10.2	4.4
>2 to 8	2 hours	0.06	5.4	4.4
more than 8	2 hours	0.02	1.6	4.4

STEAM GENERATOR TUBE RUPTURE (SGTR)

Use the listed values until the affected generator is isolated; see Attachment 5 for methods to adjust the values based on known plant conditions.

Duration	Iodine Ci/sec	Noble Gas Ci/sec	PF
1/2 hour	0.0042	6.2	1.0

FUEL HANDLING

Multiply the below listed release rates by the number of known/estimated damaged fuel bundles:

Duration	Iodine Ci/sec	Noble Gas Ci/sec	PF
1/4 hour	0.0047	17.0	1.0

ATTACHMENT 4
(Page 1 of 5)

LOCA RELEASE RATE DETERMINATIONS WORKSHEET

Provides methods to adjust or replace the LOCA default release rates based on known plant parameters. Guidance is provided for coping with containment failure releases, either rapid depressurization or estimated penetration size failure.

NOTE

The following methods are provided for guidance. Conditions may warrant an approach different than shown; use the factors presented here and elsewhere in this procedure, as necessary, to estimate releases. Document the calculations in the applicable facilities logbook.

It must be understood that the methodology provided in Attachment 4 includes conservative assumptions, and is intended to provide a means to estimate an upper bound to the release, not an exact release rate.

This Attachment has three methods (LOCA-1 to LOCA-3), select the one that most closely matches the conditions listed below:

IF the CHRRM is operational **AND** containment integrity is not good **AND** an equivalent penetration diameter (0.25 to 2 inches) leak has been postulated, **THEN** a release rate can be estimated using the CHRRM method and LOCA-1.

NOTE

The next two methods are in response to a rapid decrease in containment pressure or rapid decrease in the CHRRM reading that was determined, by Operations or Engineering, not due to changes in equipment operation (e.g., additional containment sprays, coolers, etc.).

IF the CHRRM is operational **AND** containment pressure appears to have rapidly (~30 min.) fallen **AND** the CHRRM reading also fell during the same period as the pressure fall, **THEN** a release rate can be estimated using LOCA-2.

IF the CHRRM is operational **AND** containment pressure appears to have rapidly (~30 min.) fallen **AND** the CHRRM reading was either constant or increased during the same period as the pressure fall **AND** the **percent (%) mass lost** can be estimated, **THEN** a release rate can be estimated using LOCA-3.

ATTACHMENT 4
(Page 2 of 5)

LOCA RELEASE RATE DETERMINATIONS WORKSHEET

Method LOCA-1

Use this method **IF** the CHRRM is operational **AND** containment integrity is not good **AND** an equivalent penetration diameter leak has been postulated.

METHOD: DATE:_____, and TIME of data:_____, Unit:_____

1. Determine the release rates using the CHRRM worksheet, copy the noble gas and iodine release rates to line 4a and 4b, respectively.

2. Enter the equivalent penetration diameter:_____inches
and the containment pressure: _____**PSIG**

3. From the table below, find and enter the release multiplier on line 4a and 4b.

Pen. dia. (inches)	Containment Pressure (if psig is between values, use next highest)			
	5 psig	10 psig	25 psig	50 psig
0.25	5.5	8	14	23
0.50	16	23	46	75
0.75	36	50	83	140
1.00	57	92	150	250
1.25	100	150	250	400
1.50	160	225	375	600
1.75	225	300	500	825
2.00	275	400	650	1000

4. Calculate Estimated Release Rate:

(CHRRM method) (multiplier) (Estimated Release Rates)

a. Noble Gas_____ Ci/sec x _____ = _____Noble Gas, Ci/sec

b. Iodine_____ Ci/sec x _____ = _____ Iodine, Ci/sec

5. Enter the Estimated Release Rates into the previously selected Dose Calculation Worksheet (enter **LOCA-1** next to **Attachment** as method), or enter release rates as **Direct** entry if using the computer, to estimate Off-site doses.

Basis: **Multipliers** are a ratio of the flow rates from engineering letter JPEPTPO-85-74, Figure XIII A, to the design basis flow (0.25%/day of 1.5E6 ft^3 ->1229 cc/sec)

ATTACHMENT 4
(Page 3 of 5)

LOCA RELEASE RATE DETERMINATIONS WORKSHEET

Method LOCA - 2

Use this method **IF** the CHRRM is operational **AND** containment pressure appears to have rapidly (~30 min.) fallen **AND** the CHRRM reading also fell during the same period as the pressure fall.

NOTES

- *A CHRRM drop of about 3 percent per hour may be due to radiological decay.*
- *The CHRRM may drop by as much as 10 percent very quickly if containment spray is actuated, due to Iodine washout.*

METHOD:

1. Date and time of data: _____/ _____, Unit _____

2. Calculate Delta-CHRRM:

   Start CHRRM _____ – End CHRRM _____= _____ Delta-CHRRM, R/hr

3. Calculate Duration:

   a. Clock Time End _____ – Clock Time Start _____ = _____ Delta-Clock (hours and/or minutes)

   b. Convert Delta-Clock to Delta-Seconds: _____ Δ sec

4. Estimate Curies Lost:

   Delta-CHRRM _____R/hr x 565 Ci N.G. per R/hr = _____ Noble Gas Curies Lost

5. Estimate Noble Gas Release Rate (loss rate):

   Noble Gas Curies lost _____ ÷ _____ Δ sec = _____ Noble Gas Ci/sec

6. Estimate the Iodine Release Rate (IRRF = Iodine Release Rate Factor, see Page 2 of Attachment-3):

   N.G. Ci/sec _____ x _____ (IRRF) = _____ Iodine Ci/sec

7. Enter the Estimated Release Rates into the previously selected Dose Calculation Worksheet (enter **LOCA-2** next to **Attachment** as method), or enter release rates as **Direct** entry if using the computer, to estimate Off-site doses.

Basis: Assumes CHRRM responding only to noble gas
Assumes rate of curies from core << curies lost through leak
6.25 E+5 R/hr = 100% core inventory noble gas ($1+C_{T=0}$, CF from 21026 CHRRM method)
3.53 E+8 curies = 100% core inventory noble gas (PTN UFSAR)
565 = 3.53 E+8 Ci ÷ 6.26 E+5 R/hr

ATTACHMENT 4
(Page 4 of 5)

LOCA RELEASE RATE DETERMINATIONS WORKSHEET

Method LOCA - 3

Use this method **IF** the CHRRM is operational **AND** containment pressure appears to have rapidly (~30 min.) fallen **AND** the CHRRM reading was either constant or increased during the same period as the pressure fall **AND** the percent mass lost can be estimated.

NOTE

The percent mass lost is estimated on Page 5 of Attachment 4.

METHOD:

1. Date and time of data:_____/_____

2. Calculate average CHRRM reading (if CHRRM was constant, enter reading as Avg.)

   (Start CHRRM _____ + End CHRRM _____) ÷ 2 = _____ Avg CHRRM, R/hr

3. Estimate Noble Gas Curies in the containment:

   Avg CHRRM R/hr _____ x 565 Ci N.G. per R/hr =_____ Noble Gas Curies in ctmt

4. Calculate Duration:

   a. Clock Time End _____ –Clock Time Start _____=_____ Delta-Clock (hours and/or minutes)

   b. Convert Delta-Clock to Delta-Seconds: _____ Δsec

5. Estimate Curies Lost:

   N.G. Curies in ctmt _____ x _____ % mass lost ÷ 100 = _____ Noble Gas Curies Lost

6. Estimate Noble Gas Release Rate (loss rate):

   Noble Gas Curies lost _____ ÷ _____ Δ sec = _____ Noble Gas Ci/sec

7. Estimate the Iodine Release Rate (IRRF = Iodine Release Rate Factor, see Page 2 of Attachment 3):

   N.G. Ci/sec _____ x _____ (IRRF) = _____ Iodine Ci/sec

8. Enter the Estimated Release Rates into the previously selected Dose Calculation Worksheet (enter **LOCA-3** next to **Attachment** as method), or enter release rates as **Direct** entry if using the computer, to estimate Off-site doses.

Basis: Assumes rate of curies from core ≈ curies lost through leak (constant CHRRM), or assumes rate of curies from core >curies lost through leak (increasing CHRRM), and same remaining assumptions as in LOCA-2.

ATTACHMENT 4
(Page 5 of 5)

LOCA RELEASE RATE DETERMINATIONS WORKSHEET

ESTIMATE OF CONTAINMENT % **MASS LOST**

1. Purpose

   The purpose of this calculation is to provide a method to estimate containment % mass release to the environment during a post-LOCA containment depressurization transient (containment **burp**).

2. Discussion

   A. The dose assessment group can use the containment mass release data to estimate the radiation release to the environment, using this attachment, provided the containment radiological conditions are known.

   B. The containment depressurization event should be large (greater than 5.0 psi change), over a short period of time, since the methodology does not accurately credit the effect of containment heat removal systems.

3. Acquire the following data:

NOTES

- *The **time span** for data observation should be the same as used for the calculation on Attachment 4, Method LOCA-3.*
- *Density is mass per unit volume and is symbolized by the unit rho (ρ)*

   A. Containment Pressure **just** before blowdown transient: _____ psig {Pstart}

   B. Containment Temperature **just** before blowdown transient: _____ deg F {Tstart}

   C. Containment Pressure **just** after blowdown transient: _____ psig {Pend}

   D. Containment Temperature **just** after blowdown transient: _____ deg F {Tend}

4. Estimate Initial Containment Atmosphere Density (ρinit):

$$\frac{144 \times (14.7 + \_\_\_\_\_\ \text{Pstart})}{53.3 \times (460 + \_\_\_\_\_\ \text{Tstart})} = \_\_\_\_\_\ \rho\text{init}$$

5. Estimate End Containment Atmosphere Density (ρend):

$$\frac{144 \times (14.7 + \_\_\_\_\_\ \text{Pend})}{53.3 \times (460 + \_\_\_\_\_\ \text{Tend})} = \_\_\_\_\_\ \rho\text{end}$$

6. Estimate % Mass Lost:

$$\left(1 \text{ Minus } \left(\frac{\_\_\_\_\_\ \rho\text{end}}{\_\_\_\_\_\ \rho\text{init}}\right)\right) \times 100 = \_\_\_\_\_\ \%\text{ mass lost}$$

ATTACHMENT 5
(Page 1 of 5)

STEAM GENERATOR TUBE RUPTURE WORKSHEET

SGTR Release Rate Determinations

Use this method to either estimate release rates or modify the Default release rates for a Steam Generator Tube Rupture Accident.

The default release rate is based on:

1. Complete break of one tube at the tube sheet, which is under water; that is the S/G is NOT considered uncovered (level > 6% NR)
2. 553 gpm primary to secondary leak rate (average over 30 minute accident period).
3. 1 percent failed fuel.

   and

4. 100 percent of the noble gas in the RCS discharged to the steam generator is released to the atmosphere.
5. 1 percent of the iodine in the RCS discharged to the steam generator is released to the atmosphere.

NOTE

The following methods are provided for guidance. Conditions may warrant an approach different than shown; use the factors presented here and elsewhere in this procedure, as necessary, to estimate releases. Document the calculations.

IF any, or all, of the first three default basis are known to be different than stated above, **THEN** adjust the default release rate by using method SGTR-1.

IF RCS grab sample results, and 1° - 2° leak rate are known, **THEN** estimate the release rate using method SGTR-2.

IF secondary concentrations and steaming rates are known, **THEN** estimate the release rate using method SGTR-3.

IF gamma survey meter contact readings of the main steam line are known, **THEN** estimate the release rate using method SGTR-4.

Basis for Attachment 5:

553 gpm leak rate in SGTR-1 = ((1.03E+5 lbm (FSAR) / 46.3 lbm/ft3) * 7.48 gal/ft3) / 30 min
p-mod = partition factor modifier, Westinghouse Study on effect of rupture site not covered by water indicates about a 4.6 times higher iodine release rate.
6.3E-5 = 1E-6 Ci/µCi x 3785 cc/gal /60 sec/min
0.126 = (lbm/hr x 453.6 gram/lbm) / (1 gram/cc liquid * 3600 sec/hr)
addn'l ref: UFSAR analysis and JPE-LR 87-033 (ref Substep 2.1.3.7)

ATTACHMENT 5
(Page 2 of 5)

STEAM GENERATOR TUBE RUPTURE WORKSHEET

Method SGTR-1

INSTRUCTIONS:

1. VERIFY AND RECORD INFORMATION:

   a. Date:_____ and Time: _____ of data, for Unit:_____

   b. Duration of Release per EC _____ hours (SGTR default = 0.5 hours; PF = 1.0)

   c. Percent of failed fuel: _____ [Default is 1%]

   d. Primary leak data, get both if possible:

      Number of failed tubes _____ [Default is 1]
      Leak Rate _____ [Default is 553 gpm]

   e. Affected S/G narrow range level _____%

2. Determine primary leak rate **flow modifier**

   a. Estimated pri - sec leakrate if available (gpm) _____ DIVIDED BY 553 = _____

   b. **Flow mod** is the larger of Number of Failed Tubes or value calculated in Step 2a

3. For Iodine only, **IF** S/G level <6% NR, **THEN** p-mod = 5, **ELSE** p-mod = 1 (circle one)

4. Adjust the default release rates:

	Default Ci/sec	x flow mod x	% failed fuel x	p-mod	=	Release rate Ci/sec
Noble Gas	6.2			1		
Iodine	4.2 E-3					

5. **IF** performing manual calculations following this procedure, **THEN** enter the release rate estimated from this method into the dose calculation process.

   a. On the applicable worksheet in Attachment 2, Step B (Release rate determined by:) enter SGTR-1 on the line for Attachment.

6. If performing calculations using the computer program, use the Direct Entry source term option.

ATTACHMENT 5
(Page 3 of 5)

STEAM GENERATOR TUBE RUPTURE WORKSHEET

Method SGTR-2

Use this method if RCS grab sample results and 1° - 2° leak rate are known

INSTRUCTIONS:

1. VERIFY AND RECORD INFORMATION:

   a. Date:_____ and Time: _____ of data, for Unit:_____

   b. Duration of Release per EC _____ hours (SGTR default = 0.5 hours; PF = 1.0)

   c. RCS Gross Noble Gas Activity: _____ µCi/cc

   d. RCS I-131 DEQ activity: µCi/cc

   e. Affected S/G narrow range level _____%

2. PERFORM CALCULATIONS

   ONLY FOR IODINE: **IF** S/G level < 6% NR, **THEN** p-mod = 5, **ELSE** p-mod =1

	RCS activity µCi/cc	x	1° - 2° flow gpm	x	partition	x	p-mod	x	unit conversion	=	Release rate Ci/sec
Noble Gas					1		1		6.3 E-5		
Iodine					0.01				6.3 E-5		

3. **IF** performing manual calculations following this procedure, **THEN** enter the release rate estimated from this method into the dose calculation process.

   a. On the applicable worksheet in Attachment 2, Step B (Release rate determined by:) enter SGTR-2 on the line for Attachment.

4. If performing calculations using the computer program, use the Direct Entry source term option.

ATTACHMENT 5
(Page 4 of 5)

STEAM GENERATOR TUBE RUPTURE WORKSHEET

Method SGTR-3

Use this method if secondary concentrations and steaming rates are known

1. VERIFY AND RECORD INFORMATION:

   a. Date:_____ and Time: _____ of data, for Unit:_____

   b. Duration of Release per EC _____ hours (SGTR default = 0.5 hours; PF = 1.0)

   c. Secondary Steaming Rate: _____ , _____ (units; e.g., lbm/hr)

   d. Secondary Gross Noble Gas Activity: _____µCi/cc liquid sample, for use in Step 4

   e. Secondary I-131 DEQ activity: _____ µCi/cc liquid sample, for use in Step 4

   f. Affected S/G narrow range level _____%

2. Convert Steaming Rate to cc/sec liquid equivalent release rate

   IF in lbm/hr: _____lb/hr x 0.126 =_____ cc (liquid)/sec

   IF in lbm/sec:_____lb/sec x 454 =_____ cc (liquid)/sec

   IF in volumetric units (e.g., Ft^3/time, **THEN** get Engineering to calculate liquid rates)

3. For Iodine only, **IF** S/G level <6% NR, **THEN** p-mod = 5, **ELSE** p-mod =1
   (circle selected p-mod)

4. Estimate the release rates:

	Sec activity µCi/cc	x Steaming Rate, cc/sec	x p-mod	x partition	x µCi to= Ci	Estimated Release Rates, Ci/sec
Noble Gas			1	1	1 E-6	
Iodine				0.01	1 E-6	

5. **IF** performing manual calculations following this procedure, **THEN** enter the release rate estimated from this method into the dose calculation process.

   a. On the applicable worksheet in Attachment 2, Step B (Release rate determined by:) enter SGTR-3 on the line for Attachment.

6. If performing calculations using the computer program, use the Direct Entry source term option.

ATTACHMENT 5
(Page 5 of 5)

STEAM GENERATOR TUBE RUPTURE WORKSHEET

Method SGTR-4

Use this method if gamma survey meter contact readings of the main steam line are known

1. VERIFY AND RECORD INFORMATION:

   a. Date:_____ and Time: _____ of data, for Unit:_____

   Ask Emergency Coordinator

   b. Duration of Release_____ hours (Default = 0.5)

   c. Is the core over heating or melting:_____ (Yes or NO)

   IF the core IS NOT overheating or melting, **THEN** MF = 2.4 E-2 AND PF = 1

   IF the core IS overheating or melting, **THEN** MF = 2.1 E-3 AND PF = 4.4

2. Enter the main Steam Line Survey Meter Reading: _____mr/hr

3. Enter the MF determined in Step 1.c _____ Noble Gas µCi/cc per mr/hr

4. Multiply line 2 and 3, place result here → _____ Noble Gas µCi/cc

5. Enter the Steam Line Flow Rate, see Values below _____ cc/sec

6. Multiply lines 4 and 5, _____ Noble Gas µCi/sec

7. Multiply line 6 by 1E-6, to estimate the _____ Noble Gas Ci/sec

8. Multiply line 7 by 6.8E-4 to estimate the _____ Iodine Ci/sec

9. **IF** performing manual calculations following this procedure, **THEN** enter the release rate estimated from this method into the dose calculation process.

   a. On the applicable worksheet in Attachment 2, Step B (Release Rate determined by:) enter SGTR-4 on the line for Attachment.

10. If performing calculations using the computer program, use Direct Entry source term option

Main Steam Line Flow Rate Values

I. Atmospheric Dump Valves (3): EACH 1.33 E+4 cc/sec, 4.0 E+4 IF all three
II EACH S/G safety relief valve (4 per steam line): 1.1 E+5 cc/sec each
III Exhaust from EACH Aux Feed Pump: 3.4 E+3 cc/sec
IV **IF** time and data permits, **THEN** average the flow as shown in Attachment 3

ATTACHMENT 6
(Page 1 of 2)

FIELD TEAM MEASUREMENTS ASSESSMENT

This attachment provides methods to estimate a release rate from field team survey meter measurements and provides guidance on comparing field measurements to dose projections.

RELEASE RATE ESTIMATION

1. Date _____ and time _____ of data:

NOTE

Survey meter Gamma (CLOSED WINDOW) results must be from plume centerline; that is, the maximum value from a lateral transverse of the plume.

2. IF the survey meter measurement was at 1 mile value, THEN go to Step 4.

3. Estimate the 1 mile value:

   Estimated 1 mile value = Survey meter results x (downwind distance, miles)^{Z}

   Where the exponent Z = 2 for Stability Class A, B
   1.5 for Stability Class C, D
   1.0 for Stability Class E, F, G

   (_____) mr/hr x (_____ miles)$^{(\text{——}Z)}$ = _____ Estimated 1 mile mr/hr
   meter results downwind distance

4. Select the Dose Calculation Worksheet (DCW) for the met conditions at time of sampling.

   a. Use Wind Speed in Miles Per Hour, mph

   b. Copy from Line 13, the 1 mile Noble Gas Dose Factor (NGDF) for use in Step 5.

5. Estimate Noble Gas Release Rate (the Dose Calculation Worksheet in reverse):

   (_____mr/hr / _____) x _____ mph = _____ NG Ci/sec
   estimate 1 mile divide NGDF wind speed

6. Estimate Iodine Release Rate (IRRF = Iodine Release Rate Factor, see Page 2 of Attachment 3):

NOTE

A similar process to that used to determine noble gas Ci/sec may be used to estimate an Iodine release rate. Substitute field estimated Thyroid Dose Rate in Step 3, substitute the Iodine Dose Factor (Dose Calc Worksheet line 4 value) for the NGDF in Step 5.

   _____ x _____ = _____ Iodine 131 DEQ Ci/sec
   NG Ci/sec (IRRF)

7. Utilize the current meteorological conditions and appropriate Dose Calculation Worksheets (enter **6** next to Attachment as method), or enter release rates as Direct if using the computer, to estimate Off-site Doses from this attachment.

ATTACHMENT 6
(Page 2 of 2)

FIELD TEAM MEASUREMENTS ASSESSMENT

Comparing Field Measurements to Dose Projections

NOTES

- ***Reasonable comparison** between Field Measurements and Dose Calculations is if the two are within an order of magnitude. Too many assumptions preclude better precision.*
- *A survey team measurements **off centerline** will yield a low estimated release rate. The Field Monitoring Coordinator (EOF) has a method for estimating centerline values for these situations.*

Survey Meter DDE Readings

The computerized dose calculation program estimates the **survey meter reading** DDE and for the pre-designated sampling locations (refer to Field Survey Map for descriptions of the locations). This Survey Meter Estimate is sum of immersion in plume of noble Gas, and plume shine from iodine and particulates. The noble gasses are the majority of the exposure source. The program adjusts for gap versus core mix of noble gasses in response to the Core Damage Situation question.

The manual method does not calculate a DDE from immersion in noble gas. Referring to a Dose Calculation Worksheet apropos to the met conditions, a value could be estimated by multiplying the value calculated on line 10 by the Dose Factors listed on line 13. These Dose Factors are based on a core mix of noble gasses, and include the X/Q for the prevailing meteorological conditions.

Thyroid CDE

Thyroid dose projections, both procedure and computer, are based on a release of I-131 DEQ Ci/sec. The field teams measure I-131 in the plume; their procedure has a time dependent factor to account for the dose from the other iodines. The factor starts at about 1.4 and decays to 1 over about 24 hours.

Dividing projected thyroid dose rate, mr/hr, by 1.3E + 9 will estimate the Iodine 131 DEQ concentration μCi/cc.

Time of Sample v. Time of Release

Time of field measurement minus (downwind distance, miles / wind speed, mph) will yield the time of the release rate estimated.

The computerized calculations use a time window 15 or 30 minutes long. Select the latest printout that has a Release Observation Time before the time estimated above.

Estimating Dose Rates or Concentrations at Other Distances (e.g., 1, 2, 5, 10 miles)

Estimated Value @ Dist x = Measured value times $(DWD/Dist\ x)^z$

Where: DWD = Measurement downwind distance, miles
Dist x = other distance, miles
Z = exponent based on stability class

(ref EPA-520, Rev. 6/79, Page 5.10)

ATTACHMENT 7
(Page 1 of 2)

REPORTABLE QUANTITY (RQ) RADIOACTIVE RELEASE DATA SHEET

Brief description of the event: _____

_____

_____

_____

Estimate of Quantity of Substance Released to environment:

Isotopes released; Quantity and RQ Limit:

Nuclide	Curies	RQ Limit	Nuclide	Curies	RQ Limit
Cs-134	_____	1.0	I-133	_____	0.1
Cs-137	_____	1.0	Xe-133	_____	1000
Co-58	_____	10.0	Xe-135	_____	100
Co-60	_____	10.0	_____	_____	_____
I-131	_____	0.01	_____	_____	_____

Time and Duration of release:

Start Date/Time: _____/_____ Stop Date/Time: _____/_____

Medium released to:

Liquid: a) Discharge Canal (Lake Warren):_____

b) Ground:

Airborne Gaseous: a) Wind Speed: _____MPH

b) Wind Direction (from): _____degree

c) Downwind Sector:_____

Any known or anticipated Acute or Chronic Health Risks (check one):

_____YES _____NO _____Unable to provide information

Any advice regarding medical attention necessary for exposed individual:

_____

_____

_____

ATTACHMENT 7
(Page 2 of 2)

REPORTABLE QUANTITY (RQ) RADIOACTIVE RELEASE DATA SHEET

Any precautions to take as result of release:

_____

_____

_____

Names and telephone number of personnel to be contacted for further information:

Name: _____ Plant No. _____ Beeper No. _____

_____ _____ _____

_____ _____ _____

NOTE

See ERD for associated phone numbers.

Notifications made to:

a. Nuclear Plant Supervisor

1) Date/Time:_____/_____

2) Name of person given information:_____

b. National Response Center

1) Date/Time:_____/_____

2) Name of person given information:_____

c. State Emergency Response Commission

1) Date/Time:_____/_____

2) Name of person given information:_____

d. Local Emergency Response Planning Committee (Community Emergency Coordinator)

1) Date/Time:_____/_____

2) Name of person given information:_____

Completed by:

Name (Print/Initials):_____/_____

Date/Time:_____/_____

FINAL PAGE