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NO ACKNOWLEDGEMENT REQUIRED

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Florida Power CORPORATION

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FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

PLANT OPERATING MANUAL

EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-204B

OFF-SITE DOSE ASSESSMENT DURING RADIOLOGICAL EMERGENCIES (USER INSTRUCTIONS FOR RADDOSE-IV)

TABLE OF CONTENTS

1.0 PURPOSE

The RADDOSE-IV Computer model provides a method to evaluate the magnitude of a radiological release from CR-3, to track the plume, and to estimate offsite exposure. This procedure contains operating instructions for RADDOSE-IV and information to be used in developing program inputs.
[NOCS 00388,00389,01029,01062,01128,01582,01589,01592,05647
12210,13040,13140]

2.0 REFERENCES

2.1 Developmental References

2.1.1 RADDOSE-IV Operator's Manual

2.1.2 RADDOSE-IV Detailed Design Manual

2.1.3 RADDOSE-IV Verification & Validation Manual

2.1.4 CR-3 Radiological Emergency Response Plan (RERP)

2.1.5 EM-202, Duties of Emergency Coordinator

2.1.6 Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, EPA-400-R-92-001 Environmental Protection Agency (October, 1991).

2.1.7 Nuclear Regulatory Commission Response Technical Manual.

2.1.8 Final Safety and Analysis Report.

3.0 PERSONNEL INDOCTRINATION

NOTE

A safety assessment was performed for this procedure. A determination was made that this procedure is outside the scope of 10 CFR.50.59.

3.1 Definitions

3.1.1 **Advection Step** - ("time step" or "step") The entry of a set of meteorological and source term data into RADDOSE-IV and performance of calculations.

3.1.2 **Core Melt** - deformation of fuel pellet configuration due to excessive core temperature releasing large quantities of gaseous and particulate fission products.

3.1.3 **Depletion** - reduction of the concentration of the plume (i.e., deposition and dispersion).

3.1.4 **Deposition** - a means of puff depletion that deposits particulate radioactive material on the ground.

3.1.5 **Field** - the space provided on the monitor for one value on the meteorological and source term entry screens.

3.1.6 **Gas Gap Failure** - degradation of the protective cladding around the fuel pellets due to elevated core temperature releasing only gaseous activities contained in the space between pellet and the cladding.

3.1.7 **Sea breeze Effect** - a wind circulation system produced when the land temperature is higher than the ocean temperature causing a lower level wind direction from sea to land.

3.1.8 **Sigma-Theta** - The standard deviation of a set of wind range measurements. The Sigma-Theta meter automatically calculates and displays the standard deviation of wind range for the previous 15 minutes.

3.1.9 **Stability Class** - a lettering system from A to G to designate certain atmospheric conditions which affect the dispersion of the plume. Class A indicates rapid dispersion and class G indicates slow dispersion.

3.2 Responsibilities

3.2.1 The Emergency Coordinator (EC) is responsible for ensuring the Dose Assessment Team is aware of plant development related to offside dose projections.

3.2.2 The Dose Assessment team is responsible for the implementation of this procedure.

3.3 Limits & Precautions

3.3.1 Protective Action Guideline doses from the Environmental Protection Agency are 1 REM TEDE and 5 REM Thyroid at the site boundary (0.83 miles). EM-202 Enclosure 1 specifies conditions in which site boundary dose or dose rate may require declaration of a Site Area Emergency or General Emergency.

3.3.2 The RADDOSE-IV model has several switches (options) that may be set during program startup which affect the method the model uses to calculate doses. The calculation switches have been pre-set, but further details are available in the Operator's Manual, Section 2.3.1.

3.3.3 Detailed instructions, notes, and cautions are provided on various screens depending on input and parameters.

3.3.4 Doses calculated by RADDOSE-IV are approximately two times the doses calculated by the NRC's RASCAL model. To perform a reasonable comparison, inputs to both models must match as closely as possible (i.e., isotopic distribution, Ci/sec, meteorological data, exposure location, and exposure duration).

3.3.5 In a station blackout, the following instrumentation is available:

- _ RM-A1, RM-A2 meters and detectors powered, but not pumps.
- _ RM-Gs 1, 3, 5, 7, 9, 11, 25, 26, 27, 28, 29, 30.
- _ RM-Ls 2, 7.
- _ Primary Meteorological Tower local readouts only (at the tower).

3.3.6 Recorder AH-32-FIR Channel D indicates total Reactor Building stack flow and is the correct flow to use when using RM-A1 as the RADDOSE-IV release method. AH-294-FT measures Reactor Building purge flow rate only and does not include make up flow.

4.0 INSTRUCTIONS

4.1 Communications

4.1.1 Using the Dose Assessment Ringdown Telephone, ESTABLISH communications among the TSC and EOF Dose Assessment Teams (DATs) and the Dose Assessment Communicator in the Control Room monitoring radiological and meteorological data. [NOCS 00387]

4.1.1.1 LIFT the receiver of the Dose Assessment Ringdown telephone and the telephones at the other facility (TSC or EOF) and Control Room automatically ring.

4.1.2 IF the Dose Assessment Ringdown telephone is inoperable,
THEN REFER TO Enclosure 2 for instruction on establishing a conference call on the conventional telephone.

4.1.3 REQUEST the Dose Assessment Communicator in the Control Room SCAN the monitors and provide all abnormal readings (especially effluent monitors).

4.2 Program Startup

NOTE

RADDOSE IV is available on any computer with the standard desktop. The TSC and EOF dose assessment computers have an icon installed on the desktop. On other computers, the program is located at Start, Programs, Regulatory Affairs, CR3, RADDOSE IV, RADDOSE IV (HPIII printer).

4.2.1 IF the dose assessment computer fails,
THEN CONSIDER the following alternatives:

- o Use another computer with the standard desktop.
- o OBTAIN dose projection data from the other facility (TSC or EOF) as appropriate.
- o USE EM-204(A) as backup dose assessment.
- o INSTALL (by contacting IT personnel) RADDOSE-IV on another computer. REFER TO Enclosure 3 for program installation instructions.

4.2.2 LOG ON to computer using your OT number and password. (As of 4/2/01, the generic dose assessment logon ID is no longer valid).

4.2.3 START RADDOSE-IV by double clicking on the RADDOSE-IV icon on the desktop.

4.2.4 ACKNOWLEDGE Current Switch Settings (options for decay and depletion calculations, etc.).

4.2.5 From the Startup Menu, SELECT either:

- o Begin New Incident - This selection erases previously stored data and displays the Accident Definition Screen.

or

- o Continue Previous Incident - This selection recalls all entries and calculations for the previous incident and allows continuation.

4.2.6 IF previous incident data has been stored on a diskette(s),
THEN REFER TO Enclosure 6 for loading instructions.

4.3 Data Input

4.3.1 OBTAIN Meteorological data and radiological data from the Control Room or by using the plant computer. REFER TO Enclosure 4 for plant computer instructions. [NOCS 00387]

4.3.2 RECORD input data on Enclosure 5, Input Data Sheet for RADDOSE-IV if desirable.

4.3.3 Accident Scenario Definition Screen

ENTER the following information:

- o Trip/decay start date
- o Trip/decay start time
- o Release date
- o Release time
- o Time step (normally 30 minute increments)
- o Sea breeze effects (normally "ON")
- o Operator's initials

4.3.4 Meteorological Data Input Screen

4.3.4.1 USE the following priority when collecting wind speed, wind direction and outside air temperature:

1. 33' Primary Tower
2. 175' Primary Tower
3. 33' Alternate Tower (only source for Sigma-Theta, precipitation rate.

4.3.4.2 IF Sigma-Theta is not available,
THEN USE Delta T or the wind range to establish the stability class.
REFER to Enclosure 7, Alternate Methods for Determining Meteorological Data.

4.3.4.3 IF Control Room instrumentation is used to obtain meteorological data,
THEN ENSURE that values for wind speed, average wind direction, and wind range are determined using the average of the previous 15 minutes as displayed on the appropriate recorder.

4.3.4.4 From the Main Menu, SELECT "Enter/Edit Meteorological Data."

4.3.4.5 ENTER the following data (if not available from the plant computer or the Control Room, REFER TO Enclosure 7):

- o Wind speed (meters/second, 15-minute average)
- o Wind direction from (degrees, 15-minute average)
- o Sigma-Theta **or**
- o Delta T **or**
- o Stability class (entered directly, see Enclosure 7)
- o Outside air temperature (degrees F)
- o Precipitation rate (inches/15 minutes)

4.3.4.6 IF there has not been any recorded rainfall, THEN ENTER a "0" for "precipitation rate."

NOTE

This feature could be used to enter data for several steps at one time (e.g., from release start time to present time).

4.3.4.7 After all the meteorological data for the current step have been entered, ADD another step by PRESSING the [Insert] key if desirable.

4.3.4.8 PRESS the Down Arrow key and the Up Arrow key to move between the steps.

4.3.4.9 After all the meteorological data have been entered, PRESS the [F9] key to accept and continue.

4.3.5 Source Term Data Entry Screen

NOTE

Enclosure 1 provides reference source terms for dose assessment.

4.3.5.1 From the Main Menu, SELECT "Enter/Edit Source Term Data."

4.3.5.2 DETERMINE the appropriate Accident Type and proceed to the indicated section.

4.3.5.3 - Loss of Coolant Accident (LOCAN, LOCAG, LOCAC)
4.3.5.4 - Fuel Handling Accident (FHA)
4.3.5.5 - Waste Gas Decay Tank Rupture (WGDTR)
4.3.5.6 - Steam Generator Tube Rupture (SGTRN, SGTRG, SGTRC)

4.3.5.3 **Loss of Coolant Accident:**

NOTE

Offsite doses for LOCAN (no fuel damage) are not likely to exceed 1 REM TEDE or 5 REM Thyroid.

1. SELECT and ENTER the appropriate LOCA Accident Type based on the status of the core (REFER TO Enclosure 8):

   LOCAN - no fuel damage, normal RCS
   LOCAG - gas gap failure
   LOCAC - core melt

2. SELECT and ENTER one of the following Release Methods for Noble Gas (NG MTHD) and Iodine (I MTHD) based on the information available. REFER TO Enclosure 9 for more information on Release Methods:

   RMA1 - ENTER RM-A1 cpm (NG and/or I) and Reactor Building vent CFM from recorder AH-32-FIR Channel D. Use for LOCA inside the Reactor Building with a purge in progress.

   RMA2 - ENTER RM-A2 cpm (NG and/or I) and Auxiliary Building vent CFM. Use for LOCA inside the Auxiliary Building (e.g., Letdown leak, Spent Fuel Cooling leak) or LOCA inside the Reactor Building with leak into the Auxiliary Building (e.g., penetration failure).

   CONC - ENTER µCi/cc (NG and/or I) and release point CFM. Reactor Building concentrations may be obtained from RM-A6, PASS, RM-A1 Mid or High Range, grab samples, Enclosure 11 (RM-G29/30).
   Auxiliary Building concentrations may be obtained from RM-A2 Mid or High Range, RM-A3, RM-A4, RM-A7, RM-A8, PASS, grab samples.

   USE the Radiation Monitor Sensitivity Curve Log to convert RM-A readings to concentration.

   EFFL - ENTER isotopic µCi/cc (NG and I) and release point CFM. Obtain isotopic concentrations from PASS, analysis of grab sample.

   DRECT - ENTER calculated Ci/sec (NG and/or I).

   DEFLT - Program supplies default Ci/sec.

   RATIO - (For I only) Program calculates I Ci/sec based on NG Ci/sec. Use when the Iodine monitor is off-scale or unreliable (e.g., gas contamination).

3. GO TO Section 4.3.5.7.

4.3.5.4 **Fuel Handling Accident:**

1. ENTER FHA as the Accident Type.

2. SELECT and ENTER one of the following Release Methods for Noble Gas (NG MTHD) and Iodine (I MTHD) based on the information available. REFER TO Enclosure 9 for more information on Release Methods.

   RMA1 - ENTER RM-A1 cpm (NG and/or I) and Reactor Building vent CFM from recorder AH-32-FIR Channel D. Use for FHA inside the Reactor Building with a purge in progress.

   RMA2 - ENTER RM-A2 cpm (NG and/or I) and Auxiliary Building vent CFM. Use for FHA in the Auxiliary Building.

   CONC - ENTER μCi/cc (NG and/or I) and release point CFM. Reactor Building concentrations may be obtained from RM-A6, PASS, RM-A1 Mid or High Range, grab samples, Enclosure 11 (RM-G29/30).
   Auxiliary Building concentrations may be obtained from RM-A2 Mid or High Range, RM-A4, RM-A8, PASS, grab samples.

   USE the Radiation Monitor Sensitivity Curve Log to convert RM-A readings to concentration.

   EFFL - ENTER isotopic μCi/cc (NG and I) and release point CFM. Obtain isotopic concentrations from PASS, analysis of grab sample.

   DRECT - ENTER calculated Ci/sec (NG and/or I).

   DEFLT - Program supplies default Ci/sec.

3. GO TO Section 4.3.5.7.

4.3.5.5 **Waste Gas Decay Tank Rupture:**

NOTE
Offsite doses for a WGDTR are not likely to exceed 1 REM TEDE or 5 REM Thyroid.

1. ENTER WGDTR as the Accident Type.

2. SELECT and ENTER one of the following Release Methods for Noble Gas (NG MTHD) and Iodine (I MTHD) based on the information available. REFER TO Enclosure 9 for more information on Release Methods:

   RMA2 - ENTER RM-A2 cpm (NG and/or I) and Auxiliary Building vent CFM.

   CONC - ENTER µCi/cc (NG and/or I) and release point CFM Concentrations may be obtained from RM-A2 Mid or High Range, RM-A8, RM-A11, PASS, grab samples.

   USE the Radiation Monitor Sensitivity Curve Log to convert RM-A readings to concentration.

   EFFL - ENTER isotopic µCi/cc (NG and I) and release point CFM. Obtain isotopic concentrations from PASS, analysis of grab sample.

   DRECT - ENTER calculated Ci/sec (NG and/or I).

   DEFLT - Program supplies default Ci/sec.

3. GO TO Section 4.3.5.7.

4.3.5.6 **Steam Generator Tube Rupture:**

NOTE

Offsite doses for a SGTRN (no fuel damage) are not likely to exceed 1 REM TEDE or 5 REM Thyroid.

1. SELECT and ENTER the appropriate SGTR Accident Type based on the status of the core (REFER TO Enclosure 8):

   SGTRN - no fuel damage, normal RCS
   SGTRG - gas gap failure
   SGTRC - core melt

2. REFER TO Enclosure 10 for information on calculating source terms.

3. IF source term is derived from Enclosure 10,
   THEN SELECT and ENTER one of the following Release Methods for Noble Gas (NG MTHD) and Iodine (I MTHD) based on the information available.

   RMA2 - ENTER RM-A2 Noble Gas cpm and Auxiliary Building vent CFM. Use for Noble Gas when the affected generator is not isolated.

   DRECT - ENTER calculated Ci/sec (NG and/or I) from Enclosure 10.

   CONC - ENTER µCi/cc (NG and/or I) and release point CFM. Concentrations may be obtained from RM-A2 Mid or High Range, RM-A4, RM-A12, RM-G25/28, PASS, and grab samples.

   USE the Radiation Monitor Sensitivity Curve Log to convert radiation monitor readings to concentration.

4. If source term information was derived independent of Enclosure 10, the following Release Methods are also available. (REFER TO Enclosure 9 for more information on Release Methods.)

   CONC - ENTER µCi/cc (NG and/or I) and release point CFM. Concentrations may be obtained from RM-A2 Mid or High Range, RM-A4, RM-A12, RM-G25/28, PASS, and grab samples.

   USE the Radiation Monitor Sensitivity Curve Log to convert radiation monitor readings to concentration.

   EFFL - ENTER isotopic µCi/cc (NG and I) and release point CFM. Obtain isotopic concentrations from PASS, analysis of grab sample.

   DEFLT - Program supplies default Ci/sec.

4.3.5.7 IF multiple accidents or multiple release points for the same accident are to be entered, THEN REFER TO Enclosure 12 for specific instructions.

4.3.5.8 After all the source term data for the current step have been entered, ADD another step by PRESSING the [Insert] key and FOLLOWING instructions beginning at Section 4.3.5.2, if desirable.

4.3.5.9 IF more steps are added,
THEN PRESS the [Tab] key to move forward or the [Shift][Tab] keys to move backward.

4.3.5.10 After all source term data have been entered, PRESS the [F9] key to accept and continue.

4.3.5.11 From the Main Menu, SELECT "Perform Calculations" (not required on first step).

4.3.5.12 REVIEW the plume map and dose rates displayed after the calculations are complete and PRESS any key to continue.

4.3.5.13 To view or print results, SELECT "Output Menu" from the Main Menu.

4.3.5.14 To perform a forecast, REFER TO Section 4.4.5.

4.3.5.15 IF more steps have been entered,
AND it is desirable to complete all calculations before printing. THEN SELECT "Continue with Calculations" from the Main Menu.

4.3.5.16 After the plume map for each step is displayed, CONTINUE to SELECT "Continue with Calculations" until all steps have been calculated.

4.3.5.17 From the Main Menu, SELECT "Output Menu."

4.4 Data Output

4.4.1 Dose Rates at User-entered Locations

NOTE

Plume centerline dose rates are automatically calculated at 0.83, 2, 5, and 10 miles. Dose rates can be calculated at user-entered locations. Dose rates at user-enter locations will appear in the printed reports.

4.4.1.1 SELECT "Display PLUME CENTERLINE Dose Rates" from the Output Menu.

4.4.1.2 ENTER the Ring Distance in miles (distance from the plant) and the Direction in degrees (or "M" for plume centerline maximum).

4.4.1.3 PRESS [F9] to calculate.

4.4.1.4 REPEAT as necessary, PRESS [Esc] when finished.

4.4.2 Displayed Reports

4.4.2.1 To display maps or the tabular results of dose, dose rates, and/or deposition calculations, SELECT any of the "Display" options listed on the Output Menu.

4.4.3 Printed Reports

4.4.3.1 From the Output Menu, SELECT "Go to Report Menu."

NOTE

The Dose/Dose Rate Report, the Deposition Report, and the Complete Report contain detailed tabular results of calculations. In most cases, the "Summary Report" will be sufficient.

4.4.3.2 From the Report Menu, SELECT the "Summary Report" which includes the following:

- o Header Page
- o 10 mile Map
- o Maximum dose rates for 0.83, 2, 5, and 10 mile distances, dose rates at any user selected points, and dose rates and accumulated doses at special receptors.
- o A flag to consider Protective Action Recommendations (PARs), if needed.

4.4.3.3 REVIEW the following information on the Header Page:

- o Trip/decay start date and time
- o Release date and time
- o Projection number (step)
- o List of program switches (e.g., source decay, etc.)
- o Meteorological data including mixing height
- o Source term data
- o Release rates for Noble Gas, Iodine, and particulates
- o Cumulative release data
- o Isotope % abundance

4.4.3.4 After the printout is complete, SELECT "Output Menu" from the Report Options Menu.

NOTE

If data for one or more steps have been entered but not calculated, the program will automatically begin the next step calculation and display the plume map as in Section 4.3.5.12. If no more data have been entered, the cycle of data entry, calculation, and reporting starts again as in Section 4.3.4.

4.4.4 From the Output Menu, SELECT "Continue With Calculations."

4.4.5 Performing a Forecast

NOTE

After at least one step has been calculated, the Forecast option is available. This option can be used to project dose information and plume position two or more hours into the future based one set of meteorological and source term inputs. Doses will be calculated for the Forecast period only.

4.4.5.1 ENTER meteorological and source term inputs to be used for the forecast period as described in Sections 4.3.4 and 4.3.5.

4.4.5.2 From the Main Menu, SELECT "Performing a Forecast."

4.4.5.3 ENTER the forecast period in multiples of two hours (e.g., 2, 4, 6, 8 hours, etc.).

4.4.5.4 PRESS the [F9] key to accept and continue.

NOTE

On the 10 mile EPZ map displayed after a forecast calculation, the dose units are mREM accumulated during the forecast period NOT mR/hr. However, the printed report is in mR/hr.

4.4.5.5 DISPLAY or PRINT the forecast results just as with a real-time (normal) step if needed.

4.4.6 Before performing the next step after the forecast, REVIEW the meteorological and source term data and CORRECT as necessary as described in Sections 4.3.4 and 4.3.5.

4.4.7 Correcting and Recalculating a Step

4.4.7.1 COMPARE field measurements received from the Offsite Radiation Monitoring Team with calculated values (i.e., Noble Gas/Iodine ratios, doserates, dose, etc.) obtained from RADDOSE-IV.

4.4.7.2 IF calculated values seem inconsistent with field team data,
THEN REFER TO EM-219 section 4.5.

4.4.7.3 IF incorrect data are discovered for a previous step,
THEN REFER TO Enclosure 14 for correction/recalculation instructions.

4.5 Protective Actions Recommendation

4.5.1 IF dose projections equal or exceed 1 REM TEDE or 5 REM Thyroid at the site boundary (0.83 miles),
THEN NOTIFY the EC to CONSIDER public protective action recommendations.

4.6 Documentation

4.6.1 FORWARD All documentation created in the TSC to the Dose Assessment Coordinator for review as time permits.

4.6.2 TRANSMIT the documentation to Records Management under EM-204(B).

REFERENCE SOURCE TERMS FOR DOSE ASSESSMENT [NOCS 40771]

As a reference for dose assessment calculations, the following source terms are an indication of approximately 1 mR/hr DDE and 1 mR/hr Thyroid at the site boundary for LOCAN, FHA, WGDTR, SGTRN (release through Auxiliary Building vent). For SGTRN through pressure relief valves, refer to Enclosure 10, Page 3 of 3.

2.15E-1 Noble Gas Ci/sec ≈ 1 mR/hr DDE
1.50E-5 Iodine Ci/sec ≈ 1 mR/hr Thyroid

Met Data Assumptions:
Wind Speed = 1 m/sec
Wind Direction = 270°
Stability Class = E
Temperature = 80° F
Rain = 0 inches/15 min

RELEASES FROM THE AUXILIARY BUILDING
Assuming an Auxiliary Building Vent flow rate of 156,000 cfm, the following RM-A2 concentrations are required to yield the above source terms:

Noble Gas μCi/cc = 2.92E-3*
Iodine μCi/cc = 2.04E-7
Iodine μCi accumulating in 30 minutes at 1 cfm = 1.73E-1
I-131 μCi accumulating in 30 minutes at 1 cfm = 5.69E-2*

RELEASES FROM THE REACTOR BUILDING
Assuming a Reactor Building Vent flow rate of 45,000 cfm, the following RM-A1 concentrations are required to yield the above source terms:

Noble Gas μCi/cc = 1.01E-2*
Iodine μCi/cc = 7.06E-7
Iodine μCi accumulating in 30 minutes at 1 cfm = 6.00E-1
I-131 μCi accumulating in 30 minutes at 1 cfm = 1.97E-1*

Assuming a Reactor Building Design Basis Leakage flow rate of 6.1 cfm, the following Reactor Building atmosphere concentrations are required to yield the above source terms:

Noble Gas μCi/cc = 7.50E+1
Iodine μCi/cc = 5.21E-3

* Convert to cpm using the Radiation Monitor Sensitivity Curve Log.

CONFERENCE CALL INSTRUCTIONS

Communications should first be established between the Dose Assessment Communicator in the Control Room (providing met and rad monitor information) and the TSC Dose Assessment Team (DAT). Once the EOF DAT is established, it should be tied into the conference call as soon as possible. (A conference call can be initiated by any of the parties using the appropriate phone numbers.)

Dose assessment phone extensions are posted at the Dose Assessment Ringdown Phones in the Control Room, in the TSC, and EOF dose assessment rooms.

1. The Dose Assessment Communicator to the Control Room should establish communication with the TSC DAT.

2. Hookflash * (receive a stutter dial tone), then dial the EOF DAT extension.

3. Hookflash, and receive the feature dial tone.

4. Dial access code 4 to establish the conference.

5. If the extension at the EOF cannot be reached, hookflash again and communication with the TSC will be re-established.

*A hookflash is quickly depressing and releasing the connection button.

INSTALLING RADDOSE-IV

1.0 The program is contained on one 3 1/2" 1.4 MB diskette marked "FPC RADDOSE-IV, Version 2.0" stored in TSC procedure cabinet with EM-204(B) or in the EOF Dose Assessment Cabinet.

2.0 If Directory "RD4V2" already exists, go to 2.3.

2.1 Create a directory called "RD4V2" on drive C and make this the current directory. Type the following lines in the DOS Command Prompt window:

```
C:
CD\
MD\RD4V2
CD\RD4V2
```

2.2 If Directory "RD4V2" has just been created, go to 3.0.

2.3 If this directory already exists, delete all files by typing:

```
CD\RD4V2
DEL *.*
Y
```

3.0 Insert the RADDOSE-IV disk into drive A.

4.0 Run the installation program by typing "A:FPCINST."

5.0 Prompts are provided for the type printer to be used.

6.0 When installation is complete, a prompt will confirm the model is correctly installed.

7.0 There are additional data files on disk that must be copied manually. Leave disk inserted and type the following at the prompt:

```
COPY A:\DF\*.*
```

8.0 To start the program, type "FPC" at the DOS prompt.

DATA FROM THE PLANT COMPUTER [NOCS 40188]

This Enclosure contains four methods for obtaining data from the plant computer. Select the most appropriate method. Not all methods may be available. Data can also be obtained directly from the Control Room.

DYNAMIC DATA EXCHANGE SPREADSHEET - Live data from radiation monitors and meteorological instruments displayed in an Excel spreadsheet.

1. Double-click on the PICS icon.

2. Access Control Client box :
   a. In the "Choose a system" box, Select CR3 SPDS.
   b. In the User Name box, type either tsc or eof.
   c. In the Password box, type either tsc or eof.
   d. Click LogOn.

3. Minimize the PICS Access Control Client window.

4. In Windows Explorer, go to the c:\apps\Pics\RtdbDde directory and double- click on RtdbDde.exe file. When the hourglass disappears, go to the next step.

5. Start Excel.

6. Open the file c:\My Documents\Dde\RADMET.xls

7. Click Yes to update all linked information.

SPDS DISPLAYS – Live operational data, graphs, and selected radiation monitors.

1. Double-click on the PICS icon.

2. Access Control Client box :
   a. In the "Choose a system" box, Select CR3 SPDS.
   b. In the User Name box, type either tsc or eof.
   c. In the Password box, type either tsc or eof.
   d. Click LogOn.

3. In the PICS Access Control Client window, double-click on the SPDS Display icon.

4. When the SPDS graphic screen is displayed, press the "A" key to display the Alpha pages. Page 7 of 8 displays RM-G29/30, RM-A6, RM-L1, RM-A1 low-range, RM-A2 low-range, RM-A12, RM-Gs25-28, RM-L2, RM-L7, RM-G1, RM-A5.

PICS ARCHIVE RETRIEVAL – Data from any point recorded in the PICS Real Time Database downloaded per the user specifications of point selection, time selection, and time intervals.

1. Double-click on the PICS icon.

2. Access Control Client box :
   a. In the "Choose a system" box, Select CR3 SPDS.
   b. In the User Name box, type either tsc or eof.
   c. In the Password box, type either tsc or eof.
   d. Click LogOn.

3. In the PICS Access Control Client window, double-click on the Retrieval icon.

4. In the PDRSrtrv box, select File, New Retrieval.

5. On the Simple Retrieval Query Form:
   a. Enter start and stop times of desired data.
   b. Select Fixed Width Text.
   c. Enter file name and path for output file.
   d. Enter Snapshot interval (time between data points).
   e. Highlight point to read and click Select. Repeat as needed.
   f. Add point EVI-1 to the point selection list.
   g. Click Submit.

6. Start Excel.

7. Open the output file from 5.c above.

8. In the Text Import Wizard box:
   a. Select Fixed Width.
   b. Click Finish.

REDAS USE FOR DOSE ASSESSMENT

I. LOGGING ON THE NETWORK

Dose assessment team members log on using your OT number and password.

II. REDAS ACCESS & INITIAL SET-UP

1. From the Desktop menu, double click on the REDAS icon.
2. REDAS Network Accessor box is displayed, click on **OK.**
3. Select **Request**, then **Request Group.**
4. Verify that Standard Group, Sort By Name, and LOTUS(PRN) File Format have been selected.
5. Specify Start & End Dates & Times. To change parameters, click on the box, then enter dates/times. Specify at least one hour.

III. SELECTING REDAS GROUPS & DOWNLOADING

The order in which groups are selected is not important, however, all four dose assessment groups must be downloaded before importing the data into the Lotus spread sheet.

Group Names:

AA_ENG	Engineering Instruments
AA_MET	Meteorological Instruments
AA_RADAL	Air and Liquid Radiation Monitors
AA_RADG	General Area Radiation Monitors

1. Click on **AA_ENG.**
2. Verify Frequency is 15 minutes and Average box is checked.
3. Click on **OK.** All download parameters will be displayed in a "Group Confirmation" window. If data are correct, click on **Yes.** Otherwise, click on **No** to return to previous screen.
4. Downloading will start, and should take less than 1 minute. While downloading is taking place, the "Data Request Status" window will be active.
5. When downloading is complete, the "REDAS-NIS" window will be displayed.
6. Click on **OK** in the "REDAS-NIS" screen.
7. Select **Request**, then **Request Group.**
8. Click on **AA_MET.**
9. Verify Frequency is 15 minutes and Average box is checked.
10. Click on **OK** to accept download settings.
11. Verify settings in "Group Confirmation" window. Click on **Yes** to accept & begin download.
12. When downloading is complete, the "REDAS-NIS" window will be displayed.
13. Click on **OK** in the "REDAS-NIS" screen.
14. Select **Request**, then **Request Group.**
15. Click on **AA-RADAL.**
16. Verify Frequency is 15 minutes and Average box is checked.
17. Click on **OK** to accept download settings.
18. Verify settings in "Group Confirmation" window. Click on Yes to accept & begin download.
19. When downloading is complete, the "REDAS-NIS" window will be displayed.
20. Click on **OK** in the "REDAS-NIS" screen.
21. Select **Request**, then **Request Group.**
22. Click on **AA_RADG.**
23. Verify Frequency is 15 minutes and Average box is checked.
24. Click on **OK** to accept download settings.
25. Verify settings in "Group Confirmation" window. Click on **Yes** to accept & begin download.
26. When downloading is complete, the "REDAS-NIS" window will be displayed.
27. Click on **OK** in the "REDAS-NIS" screen.

IV USING LOTUS TO IMPORT REDAS DATA

The AA_DOSE.WK3 spreadsheet used for dose assessment contains three pages. Page 1 is reserved for documenting all macros; Page 2 is reserved for importation of downloaded data; Page 3 is used for tables (created by the Table macros).

1. Start Lotus 3.1.

2. Press the [/] key.

3. Select **File**, then **Retrieve**.

4. Select spreadsheet **AA_DOSE.WK3**.

   The Dose Assessment Main Menu choices will be listed horizontally at the top of the screen:

   IMPORT CLEAR Save_File RAD-Data MET-Data ENG-Data Quit

5. Select **IMPORT** option to import the four .prn files.

6. Select: **RAD-Data, MET-Data,** or **ENG-data**

   This will display a list of options:

   VIEW-GRAPHS PRINT-GRAPHS VIEW-TABLES PRINT-TABLES Quit

7. After one of these options is selected, a list of the graph or table macros is given.

   Quit will bring up the main menu.

8. The File_Save option is used to save the spreadsheet after data have been imported. **DO NOT SAVE THE SPREADSHEET AS AA_DOSE.WK3.**
   This will erase the original spreadsheet. The recommended names are DATA1.WK3, DATA2.WK3, etc.

NOTE

Esc from the Dose Assessment Main Menu will end the dose assessment macro. To return to the Dose Assessment Main Menu, press [Alt][F3], then [End], ensure \O is selected, then press [Enter].

V SWITCHING BETWEEN LOTUS AND REDAS

1. To switch from Lotus without closing the Lotus spreadsheet press [Alt][Tab]. If the REDAS window is not visible, press [Alt][Tab] until it appears.

2. To switch from REDAS, double click on the LOTUS icon at the bottom of the screen.

VI USING EXCEL TO IMPORT REDAS DATA

1. Start Excel.

2. Open the output file desired (normally c:\T123\Aa_eng.prn, Aa_met.prn, Aa_radal.prn, Aa_radg.prn).

3. Text Import Wizard Step 1 of 3:
In the Original Data Type, select Delimited then click Next.

4. Text Import Wizard Step 2 of 3:
In the Delimiters, select Comma then click Next.

5. Text Import Wizard Step 3 of 3:
In the Column data format, select General then click Finish.

METEOROLOGICAL INPUT SHEET FOR RADDOSE-IV

DATE/TIME OF TRIP:_____ DATE/TIME OF RELEASE:_____

Sources listed by priority

1. 33□ Primary Tower
2. 175□ Primary Tower
3. 33□ Alternate Tower
4. Other_____

METEOROLOGICAL DATA

ADVECTION STEP	DATE	DATA TIME	WIND SPEED METERS/SECOND	WIND DIRECTION DEGREES	Sigma Theta DEGREES or WIND RANGE DEGREES Or Delta T (Deg F)	STABILITY CLASS	AMBIENT TEMPERATURE DEGREES F	RAIN INCHES	SOURCE #1-5

RADIOLOGICAL DATA SHEET FOR RADDOSE-IV

ACCIDENT TYPES

LOCAN - Loss of Coolant Accident, Normal RCS
LOCAG - Loss of Coolant Accident, Gas Gap Failure
LOCAC - Loss of Coolant Accident, Core Melt
FHA - Fuel Handling Accident
SGTRN - Steam Generator Tube Rupture, Normal RCS
SGTRG - Steam Generator Tube Rupture, Gas Gap Failure
SGTRC - Steam Generator Tube Rupture, Core Melt
WGDTR - Waste Gas Decay Tank Rupture

RELEASE METHODS

RMA1 - RM-A1 Monitor (cpm)
RMA2 - RM-A2 Monitor (cpm)
CONC - Concentration/Flowrate (µCi/cc)
EFFL - Effluent Isotope Inventory (µCi/cc)
DRECT - Direct Input (Ci/sec)
DEFLT - Default Release Rate (Ci/sec)
RATIO - Iodine based on Noble Gas

SOURCE TERM DATA

ADVECTION STEP	DATE	DATA TIME	ACCIDENT TYPE	SCFM	NOBLE GAS METHOD	GAS MONITOR CPM	*GAS µCi/CC or Ci/sec*	IODINE METHOD	IODINE MONITOR CPM	IODINE µCi/cc or Ci/sec*	IODINE µCi

* If the Method is DRECT or DEFLT, enter Ci/sec in the Gas µCi/cc and/or the Iodine µCi/cc columns and mark the values with an *.

COPYING RADDOSE-IV DATA FILES

1.0 To copy an incident from the hard disk to formatted floppy diskettes, select "SAVE DATA TO DISK" from the startup menu. This may require several diskettes.

1.1 Insert a diskette in drive A when prompted. Label each diskette with the files it contains (e.g., MET and Source Data), so the files can be restored correctly to the hard disk later. Any files on the diskette will be overwritten.

2.0 To copy an incident from diskettes to the hard disk, type "RETRIEVE" from the C:\RD4V2\> prompt.

2.1 Insert the diskettes into drive A when prompted. Any files on the hard disk with the same name will be overwritten.

ALTERNATE METHODS FOR DETERMINING METEOROLOGICAL DATA

1. Wind direction, wind speed, and wind range can be estimated by observing cooling tower vapor, flags, fossil stack smoke, etc.

2. Stability class can be estimated using wind range if a wind direction recorder is available. Wind range is the difference (in degrees) between the highest and lowest wind direction tracing on the recorder for a 15 minute period. Use this difference and the following table to determine stability class. DO NOT ENTER WIND RANGE INTO THE SIGMA-THETA FIELD.

WIND RANGE DEGREES	STABILITY CLASS
≥135	A (disperses rapidly)
134 to 105	B
104 to 75	C
74 to 45	D
44 to 23	E
22 to 13	F
≤12	G (disperses slowly)

3. Enter the stability class into the CLS field of the Meteorological Data Input screen

4. Wind direction is determined by estimating the average value of the tracing for a 15 minute period.

5. Meteorological data may also be obtained from the following, however, non-local backup sources may not be representative.

   Primary Backup - FAA Flight Service Station in Gainesville, FL.
   Secondary Backup - Tampa Weather Service in Ruskin, FL.

SELECTION OF ACCIDENT TYPE

This enclosure lists four methods of selecting accident type based on the level of core damage. Each method has advantages and disadvantages. Use the most appropriate method (or combination) to predict the level of core damage.

BASED ON RM-G29 AND RM-G30:

This method can be performed quickly but requires a breach of the Reactor Coolant System and that the Reactor Building atmosphere be thoroughly mixed (which may take several hours).

Obtain RM-G29 and RM-G30 readings. Ignore spikes and estimate the sustained monitor reading. Use this value with the following data to determine accident type.

RM-G29/30 R/HR	ACCIDENT TYPE
<100	LOCAN
100 - 25000 WITH RB SPRAY	LOCAG
100 - 75000 WITHOUT RB SPRAY	LOCAG
>25000 WITH RB SPRAY	LOCAC
>75000 WITHOUT RB SPRAY	LOCAC

SELECTION OF ACCIDENT TYPE

BASED ON Xe-133 PERCENTAGE

This method requires a sample and analysis and cannot be quickly obtained.

The percent estimate is based on information in Section 14 of the FSAR and the NRC Response Technical Manual.

LOCAN: Xe-133 approximately 90% of total noble gases.
LOCAG, LOCAC: Xe-133 approximately 30% of total noble gases.

SELECTION OF ACCIDENT TYPE

BASED ON IODINE AND NOBLE GAS RATIOS:

The tables below list iodine and noble gas ratios that may be used to develop source terms when isotopic distribution data are not available. Sampling and analysis may be required so this method may not be quickly available. Ratio estimates are based on information in Section 14.0 of the FSAR and the NRC Response Technical Manual.

	NG/I	I/NG
LOCAN	241	4.14E-03
FHA	146	6.83E-03
WGDT	2000	5E-04
SGTRN	4320	2.31E-04

The following table lists ratios for LOCAG and LOCAC with RB Spray ON and RB Spray OFF. However, distinguishing between LOCAG and LOCAC using iodine and noble gas ratios will be difficult.

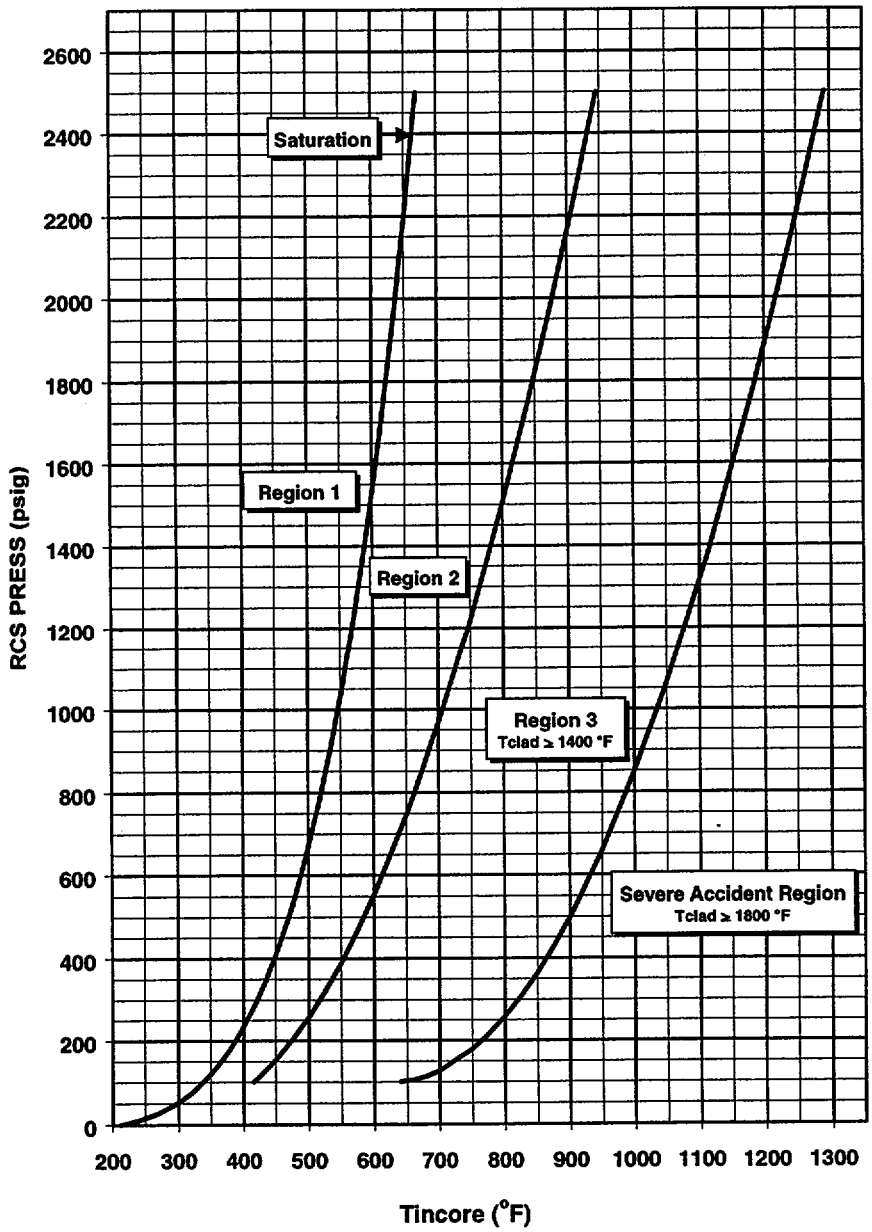
	RB SPRAY ON		RB SPRAY OFF	
	NG/I	I/NG	NG/I	I/NG
LOCAG	24	0.04	0.97	1.03
LOCAC	36	0.03	1.45	0.69

SELECTION OF ACCIDENT TYPE

BASED ON RCS PRESSURE AND TEMPERATURE:

This method can be performed quickly but will not indicate mechanically-induced core damage. The intersection of pressure from the Y axis and temperature from the X axis is the level of core damage. (Regions are from the Inadequate Core Cooling procedure used by Operations.)

Regions 1 and 2 indicate no fuel damage (normal RCS activity).
Region 3 indicates possible gas gap failure.
Severe Accident Region indicates possible core melt.



NOBLE GAS AND IODINE METHODS DESCRIPTIONS

1. RM-A1 or RM-A2 - Effluent monitor cpm/Flowrate

   The user must enter a specific RM-A1 monitor reading in cpm and a flow rate in SCFM in the Reactor Building vent or a specific RM-A2 monitor reading in cpm and a flow rate in SCFM in the Auxiliary Building vent. The release rate in Ci/sec is then calculated and displayed on the screen. It may be used for Noble Gas and/or Iodine. If the iodine filter has not been changed, the filter µCi for the previous step is subtracted from the current value. On the first step, the model assumes previous filter µCi is zero.

2. CONC - Concentration/Flowrate

   The user must enter µCi/cc from a grab sample or an estimated µCi/cc and a flowrate measurement or estimate (in SCFM) at the release point. It may be used for Noble Gas and/or Iodine. If this method is used for Iodine, the program asks if the concentration is I-131 only. If I-131 only, the program adds other Iodine isotopes in appropriate proportions. The release rate in Ci/sec is then calculated and displayed on the screen.

3. EFFL - Effluent Isotope Entry

   The Isotope Screen is displayed and the user must enter isotopic concentrations in µCi/cc from a grab sample or from the Post Accident Sampling System. Press the [Enter] key to input the concentration and to move to the next isotope. At least one noble gas and one iodine isotope must be entered. The release rate in Ci/sec is then calculated and displayed on the screen. Once a distribution has been entered, the program will retain it until a new distribution is entered or until the accident type is re-entered.

4. DRECT - Direct Input

   The user must enter a calculated release rate in Ci/sec for Noble Gas and/or Iodine.

5. DEFLT - Default

   The program enters the default value in Ci/sec for a particular accident type. It may be used for Noble Gas and/or Iodine. Default values should be used only as a last resort to calculate an upper limit dose rate. Protective Action Recommendations should not be based on a default calculation.

6. RATIO - Ratio of Noble Gas to Iodine (LOCA ONLY)

   NOTE
   This method is available for Iodine only with a LOCA accident type. For Iodine ratios in other accident types, see Enclosure 13.

   For Iodine only: The program calculates and enters the Iodine release rate in Ci/sec based on the Noble Gas to Iodine release rate ratio from the previous step. If RATIO is selected in the first step, default ratios are used. If an accident type change occurs between the steps, a correction factor is applied. Refer to Enclosure 13 for more information.

STEAM GENERATOR TUBE RUPTURE EVALUATION

Instructions: Determine whether the leaking OTSG is steaming to the condenser, steaming to the atmosphere, or isolated. Then refer to the appropriate section below and on the next page to develop source terms.
Background Information: Emergency Operating Procedures direct operators to continue to use both steam generators for RCS cooling until mode 5 is reached unless specific parameters are exceeded. These parameters are part of the Tube Rupture Alternate Control Criteria (TRACC) and involve RCS activity, BWST level, and OTSG level. If the condenser is available (vacuum established), steam will be directed there. Noble gases will be discharged from the condenser through the Auxiliary Building Ventilation and RM-A2. If the condenser is not available, steam will be discharged through the Atmospheric Dump Valves. Periodic steam releases through the Main Steam Safety Valves may occur immediately after a reactor trip.

I. LEAKING OTSG STEAMING TO THE CONDENSER

As long as condenser vacuum is established, Noble Gas releases from intermittent pressure reliefs to the atmosphere from the MSSVs/ADVs are not significant as at least 90% will be released through the condenser and Auxiliary Building Vent (RM-A2). Iodines and particulates will probably not be released through the condenser and Auxiliary Building Vent, but will be retained in the condenser and condensate demineralizers and released only when MSSVs/ADVs are open.

NOBLE GAS:

- Use RMA2 Release Method for RM-A2 low-range or CONC Release Method for mid or high-range.
- Enter RM-A2 low-range monitor cpm or mid or high-range µCi/cc and the Auxiliary Building Vent CFM.

IODINE:

- If there are Iodine channel indications, use RMA2 Release Method.
- Enter RM-A2 Iodine channel cpm and the Auxiliary Building Vent CFM.
- If the Iodine channel is off-scale, use the I/NG ratio in Enclosure 8 to calculate Ci/sec using the following equation and enter using the DRECT Release Method.
- Ci/sec = (NG Ci/sec) (I/NG ratio)
- If there are intermittent pressure reliefs to the atmosphere, use the following equation. The release rate is 10% of the primary-to-secondary Ci/sec for the duration the MSSVs/ADVs are open. (See information about computer points in section III on next page.) Curies from a short release are averaged over a 30-minute time step. For example, 1 Ci/sec for 30 seconds converts to 30 Ci over 30 minutes or 0.017 Ci/sec.
- Ci/sec = (___µCi/cc Total I in RCS) (___gpm P→S Leak Rate) (___minutes MSSVs/ADVs open) (2.1E-7)

II. LEAKING OTSG STEAMING TO THE ATMOSPHERE CONTINUOUSLY

NOBLE GAS:

- Use DRECT Release Method.
- Ci/sec = (___µCi/cc NG in RCS) (___gpm P→S Leak Rate) (6.3E-5)
- In the above equation, the release rate equals the primary-to-secondary Ci/sec.

IODINE:

- Use DRECT Release Method.
- Ci/sec = (___µCi/cc Total I in RCS) (___gpm P→S Leak Rate) (6.3E-5)
- In the above equation, the release rate equals the primary-to-secondary Ci/sec.

CONTINUED ON NEXT PAGE.

STEAM GENERATOR TUBE RUPTURE EVALUATION

III. LEAKING OTSG WAS STEAMING TO THE ATMOSPHERE BUT IS NOW ISOLATED

Use these equations if dose projections begin after the release was terminated (e.g., MSSVs open briefly after reactor trip or stuck open, but now repaired). Computer points W354, W355, RECL114, RECL115 track ADVs percent open. Downloading intervals of 1 minute or less over the period of the time step may be useful in determining minutes that the ADVs are open in the equations below.

NOBLE GAS:

- Use DRECT Release Method.
- Ci/sec = (___µCi/cc NG in RCS) (___gpm P→>S Leak Rate) (___minutes MSSVs/ADVs open) (2.1E-6)
- In the above equation, the release rate equals the primary-to-secondary Ci/sec for the duration the MSSVs/ADVs are open. Curies released are averaged over a 30 minute time step. For example, 30 Ci over 30 minutes converts to 0.017 Ci/sec.

IODINE:

- Use DRECT Release Method.
- Ci/sec = (___µCi/cc Total I in RCS) (___gpm P→S Leak Rate) (___minutes MSSVs/ADVs open) (2.1E-6)
- In the above equation, the release rate equals the primary-to-secondary Ci/sec for the duration the MSSVs/ADVs are open. Curies released are averaged over a 30 minute time step. For example, 30 Ci over 30 minutes converts to 0.017 Ci/sec.

ADDITIONAL INFORMATION

- RM-G26 and RM-G27 are N-16 monitors calibrated to read in gallons per day at 100% power.
- It is assumed that all noble gas activity leaking into the OTSG will be released via the AB stack (RM-A2), MSSVs/ADVs, or EFP-2.
- If core integrity is maintained, activity is based on the most recent RCS activity. RM-L1 may be used to scale this value as transients cause spikes in RCS activity.
- 1 gpm = 63 cc/s
- Maximum Leak Rate = 400 gpm (for one tube)
- Default Flow Rate through stuck open MSSV/ADV = 5900 cfm

DERIVATION OF CONSTANTS USED IN THE SOURCE TERM EQUATIONS

$$6.3E-5 = \left[\frac{1Ci}{1E6\mu Ci} \times \frac{3780\ cc}{1\ Gal} \times \frac{1\ min}{60\ sec}\right] \qquad 2.1E-7 = \left[\frac{Ci}{1E6\mu Ci} \times \frac{3780\ cc}{1\ Gal}\right] \div 1800\ sec \times 10\%$$

$$2.1E-6 = \left[\frac{1Ci}{1E6\mu Ci} \times \frac{3780\ cc}{1\ Gal}\right] \div 1800\ sec$$

Performed by: _____ Verified by: _____

REFERENCE DOSE RATES FOR A STEAM GENERATOR TUBE RUPTURE [NOCS 40771]

The following dose rates should be used as reference points. Projected dose rates for an actual SGTRN (no fuel damage) released through a stuck open MSSV/ADV should be similar assuming the other release conditions are similar. Note that the RCS coolant activities assumed are based on the Technical Specification limit. Typical coolant activity levels are approximately 100 times less than the assumed value. Offsite doses for a SGTRN should not exceed 1 REM TEDE or 5 REM Thyroid.

DOSE RATES AT 0.83 MILES

0.5 mR/hr - DDE
420 mR/hr - Thyroid (CDE):
20 mR/hr - TEDE

RELEASE CONDITIONS

Reactor Coolant Activity (Normal)

1.0 µCi/ml Total NG

1.0 µCi/ml Total Iodines

100 GPM primary-to-secondary leak rate

Leaking OTSG isolated

Noble Gas Ci/sec = 6.3E-3 *

Iodine Ci/sec = 6.3E-3 *

30 minute release through stuck open pressure relief valve.

Meteorological Conditions:

Wind Speed - 1 m/s (2.2 mph)

Stability Class - E (stable)

Rain - 0 inches/15 minutes

Temperature - 80°F

Wind Direction - 270° (from due West)

* Source Terms derived using equations in Section II of this Enclosure.

SOURCE TERM DETERMINATION FOR LOCA IN CONTAINMENT

Basing dose estimates on unconfirmed Design Basis Leakage is not recommended. If Containment Building pressure and radiation levels are elevated, field measurements should easily confirm a significant release. Consider monitoring the Intermediate Building roof vent, personnel and equipment hatches and downwind berm areas.

1. Obtain RM-G29 and RM-G30 readings. Ignore spikes and estimate the sustained monitor reading. Use this value with the following data to determine accident type (refer to Enclosure 8 for other methods of determining accident type).

RM-G29 & RM-G30 Reading (R/hr)	Accident Type
<100	LOCAN
100 - 75,000 (without RB Spray) 100 - 25,000 (with RB Spray)	LOCAG
> 75,000 (without RB Spray) > 25,000 (with RB Spray)	LOCAC

2. Determine the RB atmosphere concentration of Iodine or Noble Gas with the following relationship:

$$\mu Ci/cc = (RG\text{-}29 \text{ \& } 30 \text{ reading in R/hr}) / Factor$$

where "Factor" is taken from the following table.

	LOCAN		LOCAG		LOCAC	
	w/o Spray	w/ Spray	w/o Spray	w/ Spray	w/o Spray	w/ Spray
Noble Gas Factor	3	1	190	60	180	60
Iodine Factor	720	5700	180	1400	270	2100

3. Determine the flow rate using step 3a or 3b below.

   a. If the hole size and containment pressure are known, use the following formula to calculate flow rate in CFM:

$$\mathbf{CFM = 145 * \sqrt{PSIG} * HOLE\ SIZE\ (in\ square\ inches)}$$

   b. If Design Basis Leakage is indicated, select the flowrate based on RB pressure from the following table:

PSIG	5	10	15	20	25	30	35	40	45	50
CFM	1.9	2.7	3.3	3.9	4.3	4.7	5.1	5.4	5.8	6.1

4. Input the µCi/cc from step 2 above and the flow rate from step 3a or step 3b into RADDOSE-IV using the CONC Release Method.

Performed by: _____ Verified by: _____

INSTRUCTIONS FOR ENTERING MULTIPLE ACCIDENTS AND RELEASE POINTS

Source terms from three different release points (from one or more accidents) may be entered in each step. Multiple release points could be associated with the same accident (e.g., from RM-A2 and safety relief valves during SGTR) or multiple accidents could cause releases from different points (e.g., LOCA from Containment and WGDTR from RM-A2).

1.0 Entering Multiple Accidents

1.1 After all source term data on line 1 of the current step have been entered, press the down arrow key to move to line 2.

1.2 Press [F2] to access the Accident Menu.

1.3 Select another accident and press [ENTER].

1.4 Enter all source term data for the new accident.

1.5 If a release terminates, enter "NONE" in the Accident Type field.

1.6 Up to three different accidents may be entered in the current step. When all data are correct, press [F9].

2.0 Entering Multiple Release Points for the Same Accident

2.1 After all source term data on line 1 of the current step have been entered, press the down arrow key to move to line 2.

2.2 Press [F2] to access the Accident Menu.

2.3 To enter another release point, select the same accident type again and press [ENTER].

2.4 Enter all source term data for the new release point.

2.5 If a release terminates, enter "NONE" in the Accident Type field.

2.6 Up to three separate release points may be entered in the current step. When all data are correct, press [F9].

IODINE RATIO METHOD

This technique may be used to determine the total release rate of Iodines when the effluent monitor is off scale. (RADDOSE-IV can perform these calculations automatically using the Ratio Release Method discussed in Enclosure 9). Field team ratio may also be used.

The ratio approach which follows derives the current Iodine release rate from the previous step's Iodine to Noble Gas ratio and the current noble gas release rate. An additional factor (ATratio) is applied when the accident type changes from the previous step.

Accident Type Unchanged From Previous Step

$$\text{Iodine Ci/sec} = (\text{NG Ci/Sec})_{\text{current}} \times \left[\frac{\text{Iodine Ci/sec}}{\text{NG Ci/sec}}\right]_{\text{previous}}$$

Accident Type Changed From Previous Step

$$\text{Iodine Ci/sec} = (\text{NG Ci/Sec})_{\text{current}} \times \left[\frac{\text{Iodine Ci/sec}}{\text{NG Ci/sec}}\right]_{\text{previous}} \times (\text{ATratio})$$

Accident Type Change	ATratio RB Spray On	ATratio RB Spray Off
LOCA Normal to Gas Gap	10	250
LOCA Normal to Core Melt	7	167
Gas Gap to Core Melt	0.67	0.67

Use the DRECT method to enter Ci/sec into RADDOSE-IV.

Performed by: _____ Verified by: _____

INSTRUCTIONS FOR CORRECTING AND RECALCULATING A TIME STEP

To correct an error in a previous time step, it is necessary to return to both the meteorological data screen and the source term data screen. To recalculate the time step, perform the following:

1. From the Main Menu, select "Enter Meteorological Data," even if all data are correct.
2. If all meteorological data are correct, press [F9]. Go to 6 below.
3. Use the Up Arrow Key to return to the incorrect time step.
4. Use the Right and Left Arrow Keys to return to the incorrect data.
5. Re-enter the data, press [F9].
6. From the Main Menu, select "Enter Source Term Data," even if all source term data are correct.
7. If all source term data are correct, press [F9]. Go to number 11 below.
8. Use the [Shift][Tab] keys to return to the incorrect time step.
9. Use the Right and Left Arrow Keys and/or the Up and Down Arrow Keys to return to the incorrect data. (Use the Up and down Arrow Keys to access multiple accidents within the time step.)
10. Re-enter the data and press [F9].
11. RADDOSE-IV may have added a new time step to both the meteorological and source term data screens by copying the data from the last calculated time step. Ensure this new data are correct then press [F9]. If the data for the new time step are not available yet, it can be corrected when obtained.
12. From the Main Menu, select "Perform Calculations." The program will now recalculate the incorrect time step and display the plume map.
13. It is necessary to recalculate all time steps after the error. Reprint reports as necessary and continue to select "Perform Calculations" or "Continue with calculations" until program returns to the current time step.

PROCEDURE DEVELOPMENT AND REVISION RECORD

Procedure: EM0204B **New Rev:** 29 **PRR#:** 20309

Title: OFF-SITE DOSE ASSESSMENT DURING RADIOLOGICAL EMERGENCIES (USER INSTRUCTIONS FOR RADDOSE-IV)

MINOR CHANGES

If Minor Changes are included, check the applicable box(es) and provide a list of affected steps.
The following corrections are incorporated throughout:

- __ Sentence Structure
- __ Punctuation
- __ Capitalization
- __ Spelling
- __ Organizational Changes: position titles, department names, or telephone numbers
- __ Redundant words or phrases
- __ Abbreviations
- __ Obviously incorrect units of measure
- __ Inadvertently omitted symbols (#, %, etc.)
- __ Obvious step numbering discrepancies
- __ Format

The following corrections are incorporated in the step(s) indicated: "Throughout" is used in lieu of Step# if a specific change affects a large number of steps.

	Changing information that is obviously incorrect and referenced correctly elsewhere
	Misplaced decimals that are neither setpoint values nor tolerances
Enclosure 7 - Deleted reference to EM -206	**Reference to a procedure when an approved procedure has taken the place of another procedure**
	Fixing branching points when it is clear the branching steps were originally intended but were overlooked or incorrectly stated due to step number changes
	Adding clarifying information such as NOTES and CAUTIONS
	Adding words to clarify steps, NOTES, or CAUTIONS which clearly do not change the methodology or intent of the steps

PROCEDURE DEVELOPMENT AND REVISION RECORD

Procedure: EM0204B **New Rev:** 29 **PRR#:** 20309

Title: OFF-SITE DOSE ASSESSMENT DURING RADIOLOGICAL EMERGENCIES (USER INSTRUCTIONS FOR RADDOSE-IV)

NON-INTENT CHANGES

Changes are incorporated for the reasons provided. "Throughout" is used in lieu of Step # if a specific change affects a large number of steps. For new or cancelled procedures the reason is provided.

4.2 Note, 4.2.1, Enclosure 4	Added Logon instructions per PC 00-2890 and revised computer file access instructions resulting from the change to standard desktops on 4/2/01.
4.3.4.2, 4.3.4.5, Enclosure 5	Incorporated the use of delta T as a backup measure of stability class per PC 00-0608.
2.1.7, Enclosure 10	Eliminated the correction factor of 0.01 in the formulas in Attachment 10 and eliminated the Reference 2.1.7 which was the basis for the 0.01 factor. This is required per PC 01-0813 which explains why Reference 2.1.7 is non-conservative.

CHANGE OF INTENT, CANCELLATION, OR NEW PROCEDURE

Changes are incorporated for the reasons provided. "Throughout" is used in lieu of Step # if a specific change affects a large number of steps. For new or cancelled procedures the reason is provided.

None