

July 14, 2003

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555-0001

Subject: Duke Energy Corporation  
Catawba Nuclear Station Units 1 and 2  
Docket Nos. 50-413 and 50-414  
Emergency Plan Implementing Procedures

Please find enclosed for NRC Staff use and review the following  
Emergency Plan Implementing Procedures:

HP/0/B/1009/026, On-Shift Offsite Dose Projections (Rev. 005)

SH/0/B/2005/001, Emergency Response Offsite Dose Projections  
(Rev. 002)

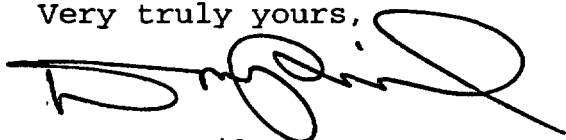
Procedure SH/0/B/2005/001 has a restricted change that will be  
made into a permanent revision within 30-60 days.

These revisions are being submitted in accordance with 10CFR  
50.54(q) and do not decrease the effectiveness of the Emergency  
Plan Implementing Procedures or the Emergency Plan.

By copy of this letter, two copies of the above documents are  
being provided to the NRC, Region II.

If there are any questions, please call Tom Beadle at 803-831-  
4027.

Very truly yours,



D. M. Jamil

Attachments

A045

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xc (w/attachments):

L. A. Reyes  
U.S. Nuclear Regulatory Commission  
Regional Administrator, Region II  
Atlanta Federal Center  
61 Forsyth St., SW, Suite 23T85  
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(w/o attachments):

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NRR Senior Project Manager  
U.S. Nuclear Regulatory Commission  
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U.S. Nuclear Regulatory Commission  
Catawba Nuclear Site

**DUKE POWER COMPANY  
CATAWBA NUCLEAR STATION  
EMERGENCY PLAN IMPLEMENTING PROCEDURES INDEX**

**VOLUME I**

<b>PROCEDURE</b>	<b>TITLE</b>
RP/0/A/5000/001	Classification of Emergency (Rev. 015)
RP/0/A/5000/002	Notification of Unusual Event (Rev. 036)
RP/0/A/5000/003	Alert (Rev. 039)
RP/0/A/5000/004	Site Area Emergency (Rev. 041)
RP/0/A/5000/005	General Emergency (Rev. 041)
RP/0/A/5000/006	Deleted
RP/0/A/5000/006 A	Notifications to States and Counties from the Control Room (Rev. 015)
RP/0/A/5000/006 B	Notifications to States and Counties from the Technical Support Center (Rev. 015)
RP/0/A/5000/006 C	Deleted
RP/0/A/5000/007	Natural Disaster and Earthquake (Rev. 021)
RP/0/A/5000/008	Deleted
RP/0/B/5000/008	Spill Response (Rev. 021)
RP/0/A/5000/009	Collision/Explosion (Rev. 007)
RP/0/A/5000/010	Conducting A Site Assembly or Preparing the Site for an Evacuation (Rev. 016)
RP/0/A/5000/11	Deleted
RP/0/B/5000/12	Deleted
RP/0/B/5000/013	NRC Notification Requirements (Rev. 029)
RP/0/B/5000/14	Deleted
RP/0/A/5000/015	Core Damage Assessment (Rev. 005)
RP/0/B/5000/016	Deleted
RP/0/B/5000/17	Deleted

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**VOLUME I**

<b>PROCEDURE</b>	<b>TITLE</b>
RP/0/A/5000/018	Emergency Worker Dose Extension (1/15/96)
RP/0/B/5000/019	Deleted
RP/0/A/5000/020	Technical Support Center (TSC) Activation Procedure (Rev. 017)
RP/0/A/5000/021	Deleted
RP/0/B/5000/022	Evacuation Coordinator Procedure (Rev. 004)
RP/0/B/5000/023	Deleted
RP/0/A/5000/024	OSC Activation Procedure (Rev. 011)
RP/0/B/5000/025	Recovery and Reentry Procedure (Rev. 003)
RP/0/B/5000/026	Site Response to Security Events (Rev. 005)
RP/0/B/5000/028	Communications and Community Relations EnergyQuest Emergency Response Plan (Rev. 001)

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**VOLUME II**

<b>PROCEDURE</b>	<b>TITLE</b>
HP/0/B/1000/006	Emergency Equipment Functional Check and Inventory (Rev. 055)
HP/0/B/1009/001	Radiation Protection Recovery Plan (Rev. 008)
HP/0/B/1009/003	Radiation Protection Response Following a Primary to Secondary Leak (Rev. 008)
HP/0/B/1009/004	Environmental Monitoring for Emergency Conditions Within the Ten-Mile Radius of CNS (Rev. 028)
HP/0/B/1009/005	Personnel/Vehicle Monitoring for Emergency Conditions (Rev. 016)
HP/0/B/1009/006	Alternative Method for Determining Dose Rate Within the Reactor Building (Rev. 008)
HP/0/B/1009/007	In-Plant Particulate and Iodine Monitoring Under Accident Conditions (Rev. 019)
HP/0/B/1009/008	Contamination Control of Injured Individuals (Rev. 015)
HP/0/B/1009/009	Guidelines for Accident and Emergency Response (Rev. 039)
HP/0/B/1009/014	Radiation Protection Actions Following an Uncontrolled Release of Radioactive Material (Rev. 008)
HP/0/B/1009/016	Distribution of Potassium Iodide Tablets in the Event of a Radioiodine Release (Rev. 011)
HP/0/B/1009/017	Deleted
HP/1/B/1009/017	Deleted
HP/2/B/1009/017	Deleted
HP/0/B/1009/018	Deleted
HP/0/B/1009/019	Emergency Radio System Operation, Maintenance and Communication (Rev. 010)
HP/0/B/1009/024	Implementing Procedure for Estimating Food Chain Doses Under Post-Accident Conditions (Rev. 002)

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CATAWBA NUCLEAR STATION  
EMERGENCY PLAN IMPLEMENTING PROCEDURES INDEX**

**VOLUME II**

<b>PROCEDURE</b>	<b>TITLE</b>
HP/0/B/1009/025	Deleted
HP/0/B/1009/026	On-Shift Offsite Dose Projections (Rev. 005)
SH/0/B/2005/001	Emergency Response Offsite Dose Projections (Rev. 002) (Restricted Change)
SH/0/B/2005/002	Protocol for the Field Monitoring Coordinator During Emergency Conditions (Rev. 002)
OP/0/A/6200/021	Deleted
SR/0/B/2000/001	Standard Procedure for Public Affairs Response to the Emergency Operations Facility (Rev. 004)
SR/0/B/2000/002	Standard Procedure for EOF Services (Rev. 002)
SR/0/B/2000/003	Activation of the Emergency Operations Facility (Rev. 009)
SR/0/B/2000/004	Notification to States and Counties from the Emergency Operations Facility (Rev. 005)

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Duke Power Company  
PROCEDURE PROCESS RECORD

(1) ID No. HP/0/B/1009/026Revision No. 005

## PREPARATION

- (2) Station Catawba Nuclear Station
- (3) Procedure Title On-Shift Offsite Dose Projections
- (4) Prepared By W. D. [Signature] Date 7-10-03
- (5) Requires NSD 228 Applicability Determination? If Applicability Determination is required, attach NSD 228 documentation.  
☒ Yes (New procedure or revision with major changes)  
☐ No (Revision with minor changes)  
☐ No (To incorporate previously approved changes)
- (6) Reviewed By Brian Chundrick (QR) Date 7/10/2003  
 Cross-Disciplinary Review By Gary L. Mitchell (QR) NA NA Date 7-10-2003  
 Reactivity Mgmt. Review By NA (QR) NA BE Date 7/10/2003  
 Mgmt. Involvement Review By NA (Ops. Supt.) NA BE Date 7/10/2003
- (7) Additional Reviews  
 Reviewed By \_\_\_\_\_ Date \_\_\_\_\_  
 Reviewed By \_\_\_\_\_ Date \_\_\_\_\_
- (8) Temporary Approval (if necessary)  
 By \_\_\_\_\_ (OSM/QR) Date \_\_\_\_\_  
 By \_\_\_\_\_ (QR) Date \_\_\_\_\_
- (9) Approved By Lamorne [Signature] Date 7-10-03

## PERFORMANCE (Compare with control copy every 14 calendar days while work is being performed.)

- (10) Compared with Control Copy \_\_\_\_\_ Date \_\_\_\_\_  
 Compared with Control Copy \_\_\_\_\_ Date \_\_\_\_\_  
 Compared with Control Copy \_\_\_\_\_ Date \_\_\_\_\_
- (11) Date(s) Performed \_\_\_\_\_  
 Work Order Number (WO#) \_\_\_\_\_

## COMPLETION

- (12) Procedure Completion Verification:  
☐ Yes ☐ NA Check lists and/or blanks initialed, signed, dated, or filled in NA, as appropriate?  
☐ Yes ☐ NA Required enclosures attached?  
☐ Yes ☐ NA Data sheets attached, completed, dated, and signed?  
☐ Yes ☐ NA Charts, graphs, etc. attached, dated, identified, and marked?  
☐ Yes ☐ NA Procedure requirements met?
- Verified By \_\_\_\_\_ Date \_\_\_\_\_
- (13) Procedure Completion Approved \_\_\_\_\_ Date \_\_\_\_\_
- (14) Remarks (Attach additional pages, if necessary)

**Duke Power Company  
Catawba Nuclear Station**

**On-Shift Offsite Dose Projections**

**Reference Use**

**Procedure No.**

**HP/0/B/1009/026**

**Revision No.**

**005**

**Electronic Reference No.**

**CP00945J**



## **On-Shift Offsite Dose Projections**

### **1. Purpose**

The purpose of this procedure is to provide on-shift Radiation Protection (RP) personnel instruction for using the Raddose 5 Dose Assessment Software (DAS) computer program to project downwind offsite dose to the public and provide guidance for completing offsite dose sections on an Emergency Notification.

### **2. References**

- 2.1 RP/0/A/5000/001 Classification Of Emergency
- 2.2 EPA 400-R-92-001 Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
- 2.3 Earth Tech RADDPOSE 5 Operator's Manual
- 2.4 PIP # C-03-03436 - Unit Vent Flow Computer Point Not Indicating Properly

### **3. Limits and Precautions**

None

### **4. Procedure**

#### **4.1 Procedure use**

- 4.1.1 Obtain a Working Copy of this procedure.
- 4.1.2 Use this procedure during emergency conditions, including exercises and drills.
  - Perform dose assessment when Operations Shift Manager (OSM) or On-Shift Emergency Coordinator notifies RP to perform this procedure due to declaration of a site Emergency Action Level (EAL) classification.
  - Perform on-shift dose assessment prior to availability of Emergency Response Organization (ERO) dose assessor in the Technical Support Center (TSC) or Emergency Operations Facility (EOF).

- NOTE:**
- This procedure may be performed in sectional parts to evaluate and assess offsite dose from gaseous radioactive releases that may occur.
  - This procedure describes information for using Raddose 5 (Earth Tech Raddose 5 Operator's Manual) in an abridged form where steps are performed for a single offsite dose projection. IF multiple offsite dose projections are required, reports can be obtained by repeating procedure steps.

- CAUTION:**
- Catawba Engineering has determined that the Unit Vent Flow Monitor may not indicate properly for flow rates  $< 9.75E+4 \text{ ft}^3/\text{min}$  (PIP # C-03-03436).
  - Until this problem is fully resolved, Raddose-5 Automatic Version will NOT function properly (PIP # C-03-03436).

4.1.3 Go to Section 4.3 (DO NOT USE SECTION 4.2).

#### 4.2 Raddose-5 Automatic Version

- 4.2.1 Obtain information from Unit OSM as to Accident Type, Reactor Status, Release Information and current Emergency Classification per Enclosure 5.1 (Catawba Release Pathway Evaluation).
- 4.2.2 Select "RADDLOSE" icon.
- Select appropriate unit icon for CNS.
- 4.2.3 Select Mode of Operation as "Automatic".
- 4.2.4 IF data is NOT available OR Automatic Mode does not continue, perform any or all of the following:
- Close current application window
  - Select "Cancel" on current application window
  - Exit Raddose-5
  - Go to step 4.3.1.
- 4.2.5 Select "Drill Mode" or "Accident Mode" as appropriate for the situation.

**NOTE:** IF the reactor did NOT trip and shutdown is in progress, THEN current date and time is the same as "Reactor Trip Date" and "Reactor Trip Time". IF start of offsite release is NOT known, THEN current date and time is the same as "Release Date" and "Release Time".

- 4.2.6 Input "Reactor Trip Date/Release Date" and "Reactor Trip Time/Release Time" per Enclosure 5.1.
- 4.2.7 Enter operator's initials.
- 4.2.8 IF all data input is correct, select "Accept".
- 4.2.9 IF any data requires correction, select "Cancel".
  - Select "Begin New Incident"
  - Select "Yes" to "This erases all previous data..." question.
  - Go to Step 4.2.6.
- 4.2.10 Select appropriate Accident Type for use with Automatic Mode.
  - LOCA
  - SG Tube Rupture
- 4.2.11 Select "Enter/Edit Meteorological Data" button.
- 4.2.12 IF all data automatically input via OILS PI (SDS), select "Accept".
- 4.2.13 IF all data is NOT automatically input via OILS PI (SDS), select "Cancel".
  - Select "Go to Start-Up Menu".
  - Select "Exit Raddose V".
  - Go to Step 4.3.3.
- 4.2.14 Select "Enter/Edit Source Term Data" (automatically populating fields from PI data server).
- 4.2.15 IF all data is automatically input via OILS PI (SDS), select "Accept".

- 4.2.16 **IF** all data is **NOT** automatically input via OILS PI (SDS), select "Cancel".
- Select "Go to Start-Up Menu".
  - Select "Exit Raddose V".
  - Go to Step 4.3.3.
- 4.2.17 Select "Emergency Classification".
- 4.2.18 Select appropriate current classification.
- 4.2.19 Select "Continue".
- 4.2.20 Select "Start Auto Mode w/ Auto Reports"
- 4.2.21 **IF** you want to continue, select "Yes".
- 4.2.22 **IF** you want to return to previous screen, select "No".

<p><b>NOTE:</b> Raddose-5 ("Automatic Mode Status Screen") will immediately generate a dose assessment report for the first step. The program will automatically wait 15 minutes and generate a report for the second and subsequent steps.</p>
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- 4.2.23 Create at least one copy of each dose assessment report for filing.
- 4.2.24 Provide data from Enclosure 5.5 (Emergency Notification), page 2 and 3 to OSM via the Emergency Notification Form, page 1.
- Continue production of offsite dose projections as OSM requests.
- 4.2.25 **IF** OSM requests additional Raddose-5 offsite dose projections, continue with Automatic Mode.
- Evaluate any increasing or adverse trends on additional dose projections.
- 4.2.26 **IF** no further on-shift dose assessment is required, select "Quit Automatic Mode".
- Select "Yes" to "Are you sure you want to exit Automatic operating mode?"
  - Exit Raddose-V per Section 4.4.

4.2.27 **IF** notified by Unit OSM that Accident Type has changed, select "Quit Automatic Mode".

- Select "Yes" to "Are you sure you want to exit Automatic operating mode?"
- Select "Go to Start-Up Menu".
- Select "Begin New Incident".
- Select "Yes" in box with "This erases all previous data".
- Go to step 4.2.6.

**4.3 Raddose-5 Manual Data Collection**

4.3.1 Use Enclosure 5.1 (Catawba Release Pathway Evaluation) for recording initial information about current site conditions.

- Obtain affected unit and reactor status information from Operations Shift Manager or designee.

4.3.2 Use Operator Aided Computer (OAC) Satellite Display System (SDS) to obtain information about site meteorological and radiological conditions.

4.3.3 **IF** additional information is necessary, use the following enclosures:

- Enclosure 5.2 (Catawba Meteorology for Manual Inputs) for meteorological data
- Enclosure 5.3 (Catawba Unit Vent Data for Manual Inputs) for release through a unit vent
- Enclosure 5.4 (Catawba Steam Release Data for Manual Inputs) for steam generator tube rupture or steam line release.

4.3.4 Select "RADDLOSE" icon.

- Select icon for affected unit at CNS.

<b>NOTE:</b> This section of the procedure is for "Normal Mode" operation of Raddose.
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4.3.5 Select "Normal".

4.3.6 Select "Drill Mode" or "Accident Mode", as appropriate to ERO response.

4.3.7 Select "Manual" at next prompt to manually enter all data.

- A. Select "Begin New Incident".
- B. Click "YES" at pop up box prompt, "This erases all previous data."
- C. Use information from Enclosure 5.1 at "Accident Scenario Definition menu" to enter the following:

**NOTE:** IF the reactor did NOT trip and shutdown is in progress, THEN current date and time is the same as "Reactor Trip Date" and "Reactor Trip Time". IF start of offsite release is NOT known, THEN current date and time is the same as "Release Date" and "Release Time".

- Reactor trip date
  - Reactor trip time
  - Release date
  - Release time
  - Raddose 5 operator's initials
- D. Ensure all data is correct.
- IF any data is incorrect, select field with mouse to enter correct data.

**NOTE:** IF "Cancel" is selected to exit screen, no data will be saved.

- E. Select "Accept" to progress to "Main Menu"; or select "Cancel" to exit screen.

4.3.8 At "Main Menu" select "Enter/Edit Meteorological Data".

- Select "OK" on "No Automatic meteorological data available. Enter data manually".

A. Enter the following meteorological data:

- Wind speed
- Wind direction
- Mixing height - (computer generated value)
- Delta temperature
- Air temperature
- Precipitation

B. Ensure all data is correct.

- IF any data is incorrect, select field with mouse to enter correct data.

**NOTE:** IF "Cancel" is selected to exit screen, no data will be saved.

C. Select "Accept" to return to "Main Menu" or select "Cancel" to exit screen.

4.3.9 At "Main Menu" select "Enter/Edit Source Term Data".

- Click "OK" on "No Automatic monitor data is available. Enter data manually".

**NOTE:** "Accident Type" is option selected by user for each time step path based on accident for affected Unit 1 or Unit 2.

4.3.10 Under "Accident Type", click on "None" field to select LOCA or SGTR.

4.3.11 IF LOCA is selected, use information from Enclosure 5.1 for affected Unit Vent release Path 1.

A. For "NG Method", click on field to select EMF.

B. Select Unit Vent EMF36L.

**NOTE:** A pop-up box "Unit Vent Release Pathway Data" will be displayed and the user must select conditions for Unit Vent filter status using information obtained from Operations.

C. Select "Filter Status" on "Unit Vent Release Pathway Data" screen.

- D. Select "Ice Condenser" status.
- E. Select "Hold-Up Time" status.
- F. Select "Spray Status".
- G. Select "OK".
- H. Enter EMF monitor reading.

**NOTE:** IF Unit Vent Flow Monitor is inoperable OR Unit Vent Flow Rate indication is  $< 1.00\text{E}+5 \text{ ft}^3/\text{min}$ ,  $1.90\text{E}+5 \text{ ft}^3/\text{min}$  shall be used for Unit Vent "Flow Rate" (PIP # C-03-03436).

- I. Enter Unit Vent "Flow Rate".
- J. Repeat steps 4.3.11 A. through 4.3.11 I. for the unaffected Unit Vent release Path 2.
- K. IF appropriate, enter accident type and required data for additional release path within the same time step.
- L. IF any data is incorrect, select field with mouse to enter correct data.

**NOTE:** IF "Cancel" is selected to exit screen, no data will be saved.

- M. Select "Accept" to return program to "Main Menu" or "Cancel" to exit screen.

4.3.12 IF SGTR is selected, use information from Enclosure 5.1 for affected Unit release Path 1:

- A. For "NG Method", click on field to select EMF.
- B. Select Unit Vent EMF36L.

**NOTE:** A pop-up box "Steam Line Release Pathway Data" is displayed where the user must choose conditions for Steam Generator release being Partitioned or Not-Partitioned; using information obtained from Operations.

- C. Select "Partitioned" or "Not Partitioned", and then "OK".
- D. Enter EMF "Monitor Reading".
- E. Enter release flow rate.



- F. Repeat steps 4.3.12 A. through 4.3.12 E for the unaffected Unit Vent release Path 2.
- G. For "NG Method", Path 3 for affected Unit, select affected Steam Generator EMF.
- H. Select "Partitioned" or "Not Partitioned", and then "OK".
- I. Enter EMF "Monitor Reading".
- J. Enter release flow rate.
- K. IF appropriate, enter accident type and required data for additional release path within the same time step.
- L. IF any data is incorrect, select field with mouse to enter correct data.

**NOTE:** IF "Cancel" is selected to exit screen, no data will be saved.

- M. Select "Accept" to return program to "Main Menu" or "Cancel" to exit screen.
- 4.3.13 Select "Emergency Classification".
- 4.3.14 Select appropriate Classification.
- 4.3.15 Select "Accept".
- 4.3.16 Select "Continue".
- 4.3.17 Select "Perform Calculations" at "Main Menu".

**NOTE:** The program displays a pop-up box "Please wait...calculating Step # - Loop over Puffs - number of puffs = "; and calculates the offsite dose for the current time step. The final output is a Real-Time Mode display of the plume path with Maximum Dose Rates (mrem/hr) on 10-Mile Emergency Planning Zone (EPZ) map.

- A. Select "Continue" on 10-Mile EPZ Map to go to "Output Menu".

**NOTE:** A pop-up box is presented "Please wait, writing spreadsheet data file" where final display is the Real-Time Mode Output Menu.

- B. Select "Continue Calculations" to return to "Main Menu".
- C. At "Main Menu" select "Perform Forecast".

**NOTE:** A pop-up box is presented "Please wait, writing spreadsheet data file" where final display is the Real-Time Mode Output Menu.

D. Select "Continue Calculations" to return to "Main Menu".

E. At "Main Menu" select "Perform Forecast".

**NOTE:** The program displays a Forecast Mode dialogue box where the user must select options for current conditions that the program uses for Line #10 and #13 on Enclosure 5.5. (Emergency Notification).

F. Select one of the following for "Emergency Release Status":

- None
- Potential
- Is Occurring
- Has Occurred

G. Ensure "New" is selected for "Status of Projected Offsite Dose".

H. Click on Forecast Period (hours) box to enter release duration.

- IF release duration is unknown, enter default time of one (1) hour.
- Ensure data selections are correct.

I. Select "OK" to proceed.

J. Select "OK" at pop-up box; "Note: Forecast will use meteorological and source term data from Step #. Continue?"

**NOTE:** A pop-up box with "Forecast for Period ending in # hours -Number Puffs =" is displayed while the program calculates offsite dose. Final screen display is plume path on 10-Mile EPZ map with dose results in mrem.

K. Select "Continue" at EPZ plume map to proceed to "Output Menu"

L. Select "No" at pop-up box "Do you want to save PAZs identified in Forecast Mode for evacuation?"

**NOTE:** The program displays pop-up box "Please wait, writing data spreadsheet file" and then returns to the Output Menu in the Forecast Mode.

M. Select "Go to Report Menu" at "Output Menu".

**NOTE:** User can select printing options when the program displays a pop-up box for computer print Setup parameters. The program has option for number of copies to print and user can make selection to change desktop computer settings for printers.

N. Obtain the following Raddose-5 reports by selecting individual menu options:

**NOTE:** User must select "OK", "Cancel" or "Setup" following each report option "pop up box".

- "Print Green Form + Summary Form"
- "Print Summary Form", for additional summary reports

O. Select "Return to Output Menu" to exit "Report Options Menu".

P. At the "Output Menu" in Forecast Mode select "Return to Main Menu".

Q. Select "OK" at pop-up box "You just completed a Forecast. Remember to check the meteorological and source term data for current information."

R. Go to Step 4.3.8 to continue report generation as required from "Main Menu" screen.

#### 4.4 Exit Raddose-V

4.4.1 IF at "Output Menu" select "Return to Main Menu".

4.4.2 IF at "Main Menu" select "Go to Start-Up Menu".

4.4.3 Select "Exit Raddose-V" at "Start-up Menu".

#### 4.5 Turnover

4.5.1 Provide all pertinent dose assessment documents to TSC Dose Assessors after TSC Emergency Response Organization (ERO) is activated.

#### **4.6 Record retention**

##### **4.6.1 Retain the following:**

- Reports generated during event
- Working Copy of procedure
- Other miscellaneous logs and notes

#### **5. Enclosures**

- 5.1 Catawba Release Pathway Evaluation
- 5.2 Catawba Meteorology for Manual Inputs
- 5.3 Catawba Unit Vent Data for Manual Inputs
- 5.4 Catawba Steam Release Data for Manual Inputs
- 5.5 Emergency Notification

**Enclosure 5.1**  
**Catawba Release Pathway Evaluation**

**HP/0/B/1009/026**  
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Obtain  
information  
from  
Operations for  
affected Unit  
and record data  
for Raddose-5  
INITIAL  
DATA  
ENTRY:  
(Automatic &  
Manual)

Circle selected  
options

Automatic: Affected Unit? U-1 or U-2

Accident Type? LOCA or SG Tube Rupture SGTR

Emergency Classification? NOUE Alert SAE GE

Did Reactor trip? Yes No      Date/Time of Reactor Trip? (\_\_\_\_/\_\_\_\_:\_\_\_\_)  
Mo yy/ hr: mn

IF the Reactor did NOT trip and shutdown is in progress, THEN current date and time is the same  
as "Reactor Trip Date" and "Reactor Trip Time". (\_\_\_\_/\_\_\_\_:\_\_\_\_)  
Mo yy/ hr: mn

IF Operations does not know or provide a release time, then use current date & time.  
(\_\_\_\_/\_\_\_\_:\_\_\_\_)  
Mo yy/ hr: mn

=====

Manual: Affected Unit? U-1 or U-2

Accident Type? LOCA or SG Tube Rupture SGTR

Emergency Classification? NOUE Alert SAE GE

Did Reactor trip? Yes No      Date/Time of Reactor Trip? (\_\_\_\_/\_\_\_\_:\_\_\_\_)  
Mo dd yy hr: mn

IF the Reactor did NOT trip and shutdown is in progress, THEN current date and time is the same  
as "Reactor Trip Date" and "Reactor Trip Time". (\_\_\_\_/\_\_\_\_:\_\_\_\_)  
Mo yy/ hr: mn

IF Operations does not know or provide a release time, then use current date & time.  
(\_\_\_\_/\_\_\_\_:\_\_\_\_)  
Mo dd yy hr: mn

Is affected Unit Vent release filtered by Unit Vent VE/VA filter fans? ON OFF  
Ice Condenser Status?: "No Recirculation" "Recirculation" or "No Ice"  
Hold-Up?: "<=24 Hours" or "> 24 Hours"  
Spray Status?: ON OFF

Is unaffected Unit Vent release filtered by Unit Vent VE/VA filter fans? ON OFF  
Ice Condenser Status?: "No Recirculation" "Recirculation" or "No Ice"  
Hold-Up?: "<=24 Hours" or "> 24 Hours"  
Spray Status?: ON OFF

IF a SGTR release, what is the affected steam generator? (A B C D) for steam line  
EMF (\_\_\_\_)

IF a SGTR release occurred, is the affected S/G isolated? Yes No

Are affected S/G secondary side "U" tubes covered with water AND is release  
Partitioned? Yes No

Is steam from affected steam generators currently being released? Yes No

**Enclosure 5.1**  
**Catawba Release Pathway Evaluation**

**HP/0/B/1009/026**  
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<b>Release Duration</b> <b>(Manual ONLY)</b> <b>Circle selected options</b>	Can radioactive release (steam or vent) pathway be isolated? Yes    No    Unknown What is the estimated stop time for the release? _____  (If release stop time is unknown, use default of 1hr.)																																																													
Obtain from OAC SDS (Encl. 5.2); <b>(Manual ONLY)</b>	wind speed        (        ) in mph – lower tower measurement preferred wind direction    (        ) in degrees from North – upper tower measurement  Mixing height    ( XXXXX ) in meters - calculated by program; Temperature D/T (        ) D/T in C° Air Temperature   (        ) in C° Precipitation      (        ) inches per quarter hour																																																													
Obtain EMF Monitor Reading and Vent or Steam release flow rate from OAC SDS (Encl. 5.3 & 5.4); <b>(Manual ONLY)</b>  <b>Circle selected options</b>	<b>STEP 1 :</b>  Accident Type: LOCA  <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 30%; text-align: center; border-bottom: 1px solid black;">Unit 1 Vent</th> <th style="width: 10%; text-align: center; border-bottom: 1px solid black;">AND</th> <th style="width: 30%; text-align: center; border-bottom: 1px solid black;">Unit 2 Vent</th> </tr> </thead> <tbody> <tr> <td>NG Method</td> <td style="text-align: center;">( EMF36L-UV1L )</td> <td></td> <td style="text-align: center;">( EMF36L-UV2L )</td> </tr> <tr> <td>Filter Status</td> <td style="text-align: center;">( On   Off )</td> <td></td> <td style="text-align: center;">( On   Off )</td> </tr> <tr> <td>Monitor Reading</td> <td style="text-align: center;">(        ) cpm</td> <td></td> <td style="text-align: center;">(        ) cpm</td> </tr> <tr> <td>Vent Flow Rate</td> <td style="text-align: center;">(        ) cfm</td> <td></td> <td style="text-align: center;">(        ) cfm</td> </tr> </tbody> </table> <hr style="border: 1px double black;"/> Accident Type: SGTR  <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 30%; text-align: center; border-bottom: 1px solid black;">Unit 1 Vent</th> <th style="width: 10%; text-align: center; border-bottom: 1px solid black;">AND</th> <th style="width: 30%; text-align: center; border-bottom: 1px solid black;">Unit 2 Vent</th> </tr> </thead> <tbody> <tr> <td>NG Method</td> <td style="text-align: center;">( EMF36L-UV1L )</td> <td></td> <td style="text-align: center;">( EMF36L-UV2L )</td> </tr> <tr> <td>Filter Status</td> <td style="text-align: center;">( On   Off )</td> <td></td> <td style="text-align: center;">( On   Off )</td> </tr> <tr> <td>Monitor Reading</td> <td style="text-align: center;">(        ) cpm</td> <td></td> <td style="text-align: center;">(        ) cpm</td> </tr> <tr> <td>Vent Flow Rate</td> <td style="text-align: center;">(        ) cfm</td> <td></td> <td style="text-align: center;">(        ) cfm</td> </tr> </tbody> </table> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 45%;"></th> <th style="width: 10%; text-align: center; border-bottom: 1px solid black;">OR</th> <th style="width: 45%;"></th> </tr> </thead> <tbody> <tr> <td style="text-align: center; border-bottom: 1px solid black;">Unit 1</td> <td></td> <td style="text-align: center; border-bottom: 1px solid black;">Unit 2</td> </tr> <tr> <td>Affected S/G ( A, B, C, D )</td> <td></td> <td>Affected S/G ( A, B, C, D )</td> </tr> <tr> <td>NG Method(EMF) (        )</td> <td></td> <td>NG Method(EMF) (        )</td> </tr> <tr> <td>Partitioned ( Yes   No )</td> <td></td> <td>Partitioned ( Yes   No )</td> </tr> <tr> <td>Monitor Reading(mR/hr) (        )</td> <td></td> <td>Monitor Reading(mR/hr) (        )</td> </tr> <tr> <td>Steam Rel. (lbm/15 min) (        )</td> <td></td> <td>Steam Rel. (lbm/15 min) (        )</td> </tr> </tbody> </table>		Unit 1 Vent	AND	Unit 2 Vent	NG Method	( EMF36L-UV1L )		( EMF36L-UV2L )	Filter Status	( On   Off )		( On   Off )	Monitor Reading	(        ) cpm		(        ) cpm	Vent Flow Rate	(        ) cfm		(        ) cfm		Unit 1 Vent	AND	Unit 2 Vent	NG Method	( EMF36L-UV1L )		( EMF36L-UV2L )	Filter Status	( On   Off )		( On   Off )	Monitor Reading	(        ) cpm		(        ) cpm	Vent Flow Rate	(        ) cfm		(        ) cfm		OR		Unit 1		Unit 2	Affected S/G ( A, B, C, D )		Affected S/G ( A, B, C, D )	NG Method(EMF) (        )		NG Method(EMF) (        )	Partitioned ( Yes   No )		Partitioned ( Yes   No )	Monitor Reading(mR/hr) (        )		Monitor Reading(mR/hr) (        )	Steam Rel. (lbm/15 min) (        )		Steam Rel. (lbm/15 min) (        )
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**Enclosure 5.1**  
**Catawba Release Pathway Evaluation**

**HP/0/B/1009/026**  
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- NOTE:**
- Use consistent Accident Type (LOCA or SGTR) for each Raddose 5 release path, for each fifteen minute time step.
  - Change the Accident Type only when reactor plant status indicates conditions that are degrading to a different type of accident.

1. Use Loss Of Coolant Accident (LOCA) Accident Type for assessment method for either Unit Vent(s) release path(s).
  - LOCA - Loss of coolant (normal coolant) - leaks released into containment with fission products normally found in coolant and release pathway is through either Unit Vent
  - After a valid increase or Trip 2 alarm on a Unit Vent radiation monitor select a vent EMF monitor
  - Unit 1 or Unit 2 Vent EMF36 (low range in counts per minute)
2. Use S/G Tube Rupture (SGTR) Accident Type for primary to secondary system tube leak with relief valve open or steam line break and/or noble gas release through Unit Vent.
  - SGTR - Steam generator tube rupture (normal coolant) - steam generator release accidents with fission products normally found in coolant where release pathway is any main steam line and/or power operated relief valve open
  - After a monitor increase or valid Trip 2 alarm on any steam line radiation monitor select affected steam line and EMF radiation monitor
  - Unit 1 EMF26 EMF27 EMF28 EMF29 (Steamline A, B, C, D) with reading in mR/hr
  - Unit 2 EMF10 EMF11 EMF12 EMF13 (Steamline A, B, C, D) with reading in mR/hr

**Enclosure 5.2**  
**Catawba Meteorology for Manual Inputs**

**HP/0/B/1009/026**  
**Page 1 of 2**

1. Access CNS Meteorological Tower data using OAC Satellite Display System (SDS) by entering GD ERORD5 (meteorological and EMF data), or GD EROENV (15 minute average data).

**NOTE:** Table below shall be used to record appropriate RADDOSE information.

Step Number	Step Time	Wind Speed in (mph) (lower preferred)	Wind Direction From 0°=N (upper preferred)	Mixing Height	D/T Temp. $\Delta T$ in C°	Stability Class	Air Temp. in C°	Precipitation (inches in last 15 minutes)
Computer generated	Computer generated			Computer generated		Computer generated		

- Use lower tower wind speed (WS) in miles per hour
  - Use upper tower wind direction; in degrees from North where (N) = 0°
  - Use upper tower wind speed (WS) if lower tower wind speed is not available
  - Use lower tower wind direction if upper tower wind direction is not available
2. **IF** CNS Meteorological Tower data is not available request meteorological information from Operations or obtain meteorological information by calling McGuire Nuclear Station Control Room (8-875-4262, 4263 or 4138).
    - **IF** CNS meteorological tower temperature gradient D/T is unknown use the following default based on time of day, for stability classification, and complete the table below.
      - A. Between 1000 - 1600 hours; assume  $\Delta T = -0.3$  and Stability Class D
      - B. Between 1600 - 1000 hours; assume  $\Delta T = +1.3$  and Stability Class F
  3. Obtain fifteen minute average meteorological data for Raddose-5.
    - Record information on Enclosure 5.1
    - Complete Enclosure 5.2 as necessary

Temperature Gradient $\Delta T^\circ$ in (C°)	Stability Class
$\Delta T^\circ \leq -0.97$	A extremely unstable
$\Delta T -0.97 < \Delta T \leq -0.87$	B moderately stable
$\Delta T -0.87 < \Delta T \leq -0.76$	C slightly unstable
$\Delta T -0.76 < \Delta T \leq -0.25$	D neutral
$\Delta T -0.25 < \Delta T \leq +0.76$	E slightly stable
$\Delta T +0.76 < \Delta T \leq +2.04$	F moderately stable
$\Delta T +2.04 < \Delta T$	G extremely stable



**Enclosure 5.2**  
**Catawba Meteorology for Manual Inputs**

**HP/0/B/1009/026**  
**Page 2 of 2**

**4. Enter data in the Raddose-5 program.**

- Use MNS wind and temperature meteorological data if live time data is unavailable
- Use CNS default time of day D/T if data is unavailable
- wind speed in miles per hour (mph)
- wind direction; where wind direction is from North ( $N = 0^{\circ}$ )
- delta temperature gradient in degrees centigrade ( $\Delta T = C^{\circ}$ ); where meteorological tower temperature is recorded for the low level sensor (10m) with delta-temperature ( $\Delta T$ ) as the difference in the reading between the low and high sensor (60m)
- meteorological stability class is computer generated
- mean mixing height (in meters) is computer calculated using  $\Delta T$
- air temperature is in degrees centigrade (Temperature in  $C^{\circ}$ )
- precipitation occurring (inches per fifteen minute period)

**5. Obtain most current meteorological conditions for Raddose-5.**

- Obtain most current wind direction and wind speed to determine downwind Protective Action Zones (PAZs)

**Enclosure 5.3**  
**Catawba Unit Vent Data for Manual Inputs**

**HP/0/B/1009/026**  
**Page 1 of 2**

1. Determine type of accident, source term release pathway, and EMF noble gas monitor method; (e.g., normal reactor coolant activity, with reactor coolant leak inside containment, LOCA, with radioactive gas leakage to Annulus through Unit Vent, with all filters intact and vent radiation monitor EMF36L).
2. Access OAC Satellite Display Systems (SDS) by entering **GD ERORD5** (meteorological and EMF data), or **GD EROEMF15** (15 minute EMF average data), or **GD EROEMF** (live time EMF display).
  - **IF** necessary, use top menu bar item **GRAPHICS**; select Ventilation and scroll to **VENTMENU**; and use **OK** to open the display.

**NOTE:** 1. **IF** Unit Vent Flow Monitor is inoperable **OR** Unit Vent Flow Rate indication is  $< 1.00\text{E}+5 \text{ ft}^3/\text{min}$ ,  $1.90\text{E}+5 \text{ ft}^3/\text{min}$  shall be used for Unit Vent "Flow Rate" (PIP # C-03-03436).

2. Table below shall be used to record appropriate RADDOSE information.

Step Number	Step Time	Path	Accident Type LOCA or SGTR	Vent Flow Rate in $\text{ft}^3/\text{min}$	NG Method EMF Monitor	Monitor Reading in cpm or mR/hr	NG Release Rate Ci/sec	I/P Method	Iodine Release Rate Ci/sec	Part Release Rate Ci/sec
Computer generated	Computer generated	Computer generated					Computer generated	Computer generated	Computer generated	Computer generated

- Record information on Enclosure 5.1
  - Complete Enclosure 5.3 as necessary
  - Enter data in the Raddose-5 program
3. Select LOCA accident type for affected unit vent release pathway:
    - LOCA - Loss of Coolant Accident (normal coolant)
  4. Select affected Unit Vent Noble Gas method.
    - UV1L - Unit Vent 1 EMF-36L      UV2L - Unit Vent 2 EMF-36L

Other monitors available, but not specified for use in procedure:

    - UV1H - Unit Vent 1 EMF-36H      UV2H - Unit Vent 2 EMF-36H
    - UV1HH - Unit Vent 1 EMF-54      UV2HH - Unit Vent 2 EMF-54
    - Use on-scale EMF readings when vent EMF sample pump is not tripped or EMF package is not isolated; resulting from loss of power and/or EMF54 reading  $> 5 \text{ R/hr}$
    - Evaluate (e.g., Auxiliary Building release) and select EMF radiation monitor for each unit vent.

Enclosure 5.3  
Catawba Unit Vent Data for Manual Inputs

HP/0/B/1009/026  
Page 2 of 2

5. Select unit vent filtration reduction factors: Vent Filters On or Off, Ice Condenser Status - No Recirculation, Recirculation or No Ice, Hold Up time - " $\leq$  24 Hours or  $>$  24 Hours and Spray Status - On or Off.
6. Use RADDose 5 to calculate source term - vent release in Ci/sec.
  - Ci/sec is calculated by isotope spectrum based on accident type and time after reactor shutdown.
$$RR = EMF \times CF \times AJ \times FR \times (1E-6 \text{ Ci}/\mu\text{Ci} \times 1/60 \text{ min/sec} \times 28320 \text{ ml/ft}^3)$$
Where:
$$RR = \text{release rate activity in Ci/sec}$$
$$EMF = \text{Use EMF36L counts per minute (cpm), if reading } \leq 1E+7 \text{ cpm and vent sample pump is not tripped (UV1L, UV2L)}$$
$$EMF = \text{Use EMF36H cpm reading if EMF36L is offscale and EMF36H } \leq 1E+6 \text{ cpm and sample pump is not tripped (UV1H, UV2H)}$$
$$EMF = \text{Use EMF54 (R/hr) reading if EMF36L and EMF36H are offscale, and/or vent EMF sample pump is tripped (UV1HH, UV2HH)}$$
$$CF = \text{Unit Vent radiation monitor Noble Gas Correlation Factor}$$
$$AJ = \text{Adjustment Factors for Noble Gas, Iodines and Particulates for accident types}$$
$$FR = \text{Unit Vent Flow Rate in ft}^3 \text{ per minute; maximum vent flow } \leq 1.90E+5 \text{ ft}^3/\text{min}$$
7. IF release duration time is not known use a default time of (1) hour for Raddose 5 (Forecast mode) dose projection.
  - DO NOT save forecasted dose to PAZs

# Enclosure 5.4

## Catawba Steam Release Data for Manual Inputs

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1. Determine type of accident; source term release pathway and EMF NG gas monitor method; (e.g., steam generator (S/G) tube rupture, with normal reactor coolant activity, with steam line Power Operated Release Valve (PORV) open and steamline EMF radiation monitor).
2. Access OAC Satellite Display Systems (SDS) display typing **GD ERORD5** (meteorological and EMF data), or **EROEMF15** (15 minute EMF average data), or **GD EROEMF** (live time EMFdisplay), or **GD EROSECND** (live time display of secondary system data)
  - **IF** necessary, to view steam release information type **GD EROSECND**; use lower left SDS screen arrows  $\uparrow\downarrow$  to view affected steam line release information.

**NOTE:** Table below shall be used to record appropriate RADDOSE information.

Step Number	Step Time	Path	Accident Type	Steam Flow in last 15 minutes	NG Method Steamline EMF Monitor	EMF Monitor Reading in mR/hr	NG Release Rate Ci/sec	I/P Method	Iodine Release Rate Ci/sec	Part Release Rate Ci/sec
Computer generated	Computer generated	Computer generated	SGTR				Computer generated	Computer generated	computer generated	Computer generated

- Record information on Enclosure 5.1
  - Complete Enclosure 5.4 as necessary
  - Enter data in the Raddose-5 program
3. Select Steam Generator Tube Rupture (SGTR) accident type for affected steamline release pathway:
    - a. Select affected Steamline Noble Gas method
      - Unit 1 - EMF26 EMF27 EMF28 EMF29 (Steamline A, B, C, D reading in mR/hr)
      - Unit 2 - EMF10 EMF11 EMF12 EMF13 (Steamline A, B, C, D reading in mR/hr)

Enclosure 5.4  
Catawba Steam Release Data for Manual  
Inputs

HP/0/B/1009/026  
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**NOTE:** IF a steam generator is not overfilled with primary water and reading is determined to be within gage level indicator a partitioning effect for dose reduction for radio-iodine and particulates can be selected in Raddose-5.

b. Select S/G release reduction method:

- WHEN Unit 1 S/G tube break is below secondary side water level measured >0% Narrow Range water level indicator OR > 55% Wide Range water level select Partitioned.
- IF Unit 1 S/G water level CAN NOT be determined OR is ≤0% Narrow Range water level indicator OR ≤ 55% Wide Range water level OR the break is above the secondary side water level where reactor coolant is released by steam release directly to offsite environment, select Not Partitioned.
- WHEN Unit 2 S/G tube break is below secondary side water level measured >5% Narrow Range water level indicator OR > 45% Wide Range water level select Partitioned.
- IF Unit 2 S/G water level CAN NOT be determined OR is ≤5% Narrow Range water level indicator OR ≤ 45% Wide Range water level OR the break is above the secondary side water level where reactor coolant is released by steam release directly to offsite environment, select Not Partitioned.

4. Use Raddose-V to calculate source term - steam release in Ci/sec.

- Ci/sec calculated by isotope spectrum based on accident type and time after reactor shutdown

$$RR = EMF \times CF \times AJ \times LR \times (0.41 \text{ ft}^3 / \text{lbm} \times 28320 \text{ ml/ft}^3 \times 1\text{E-6 Ci/}\mu\text{Ci} \times 1/3600 \text{ hr/s})$$

Where:

RR = release rate activity in Ci/sec

EMF = radiation monitor reading in mR/hr (normally a 15 minute average reading)

CF = steam line radiation monitor Correlation Factor

AJ = Adjustment Factor (unit-less) based on accident type

LR = Steam release rate from safety valve in pounds mass of steam released through each valve during valve open period (lbm/15 min.), where; default release rate = 5.235E4 lbm/ 15 min.

5. IF release duration time is not known use default time of (1) hour for Raddose 5 (Forecast mode) dose projection.

- DO NOT save forecasted dose to PAZs

Enclosure 5.5  
Emergency Notification

HP/0/B/1009/026  
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1. Emergency Notification Form (example):

**EMERGENCY NOTIFICATION**

1. ☒ THIS IS A DRILL ☐ ACTUAL EMERGENCY ☐ INITIAL ☐ FOLLOW-UP MESSAGE NUMBER \_\_\_\_\_

2. SITE: Catawba UNIT:    REPORTED BY: \_\_\_\_\_

3. TRANSMITTAL TIME/DATE:    /    /    CONFIRMATION PHONE NUMBER: \_\_\_\_\_  
(Eastern) mm/dd/yy

4. AUTHENTICATION (If Required): \_\_\_\_\_  
(Number) (Codeword)

5. EMERGENCY CLASSIFICATION:  
☒ NOTIFICATION OF UNUSUAL EVENT ☐ ALERT ☐ SITE AREA EMERGENCY ☐ GENERAL EMERGENCY

6. ☒ Emergency Declaration At: ☐ Termination At: TIME/DATE:    /    /    (If B, go to Item 16)  
(Eastern) mm dd yy

7. EMERGENCY DESCRIPTIONS/REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8. PLANT CONDITION: ☒ IMPROVING ☐ STABLE ☐ DEGRADING

9. REACTOR STATUS: ☒ SHUTDOWN: TIME/DATE:    /    /    ☐ \_\_\_\_\_% POWER  
(Eastern) mm dd yy

10. EMERGENCY RELEASE(S):  
☒ NONE (Go to Item 14) ☐ POTENTIAL (Go to Item 14) ☐ IS OCCURRING ☐ HAS OCCURRED

\*\*11. TYPE OF RELEASE: ☐ ELEVATED ☒ GROUND LEVEL  
☒ AIRBORNE: STARTED: 00:00 STOPPED:    /    /     
Time (Eastern) Date Time (Eastern) Date  
☐ LIQUID: STARTED:    /    /    STOPPED:    /    /     
Time (Eastern) Date Time (Eastern) Date

\*\*12. RELEASE MAGNITUDE: ☒ Curies Per Sec ☐ Curies NORMAL OPERATING LIMITS: ☒ BELOW ☐ ABOVE  
☒ NOBLE GASES 0.00E+00 ☐ IODINES 0.00E+00  
☐ PARTICULATES 0.00E+00 ☐ OTHER \_\_\_\_\_

\*\*13. ESTIMATE OF PROJECTED OFFSITE DOSE: ☐ NEW ☐ UNCHANGED PROJECTION TIME: \_\_\_\_\_  
(Eastern)

	TEDE mrem	Thyroid CDE mrem	ESTIMATED DURATION: <u>  </u> HRS.
SITE BOUNDARY	0.00E+00	0.00E+00	
2 MILES	0.00E+00	0.00E+00	
5 MILES	0.00E+00	0.00E+00	
10 MILES	0.00E+00	0.00E+00	

\*\*14. METEOROLOGICAL DATA: ☒ WIND DIRECTION (from)    deg ☐ SPEED (mph)     
☐ STABILITY CLASS    ☐ PRECIPITATION (type)    in/15 min

15. RECOMMENDED PROTECTIVE ACTIONS:  
☒ NO RECOMMENDED PROTECTIVE ACTIONS  
☐ EVACUATE  
☐ SHELTER IN-PLACE  
☐ OTHER \_\_\_\_\_

16. APPROVED BY: \_\_\_\_\_ TIME/DATE:    /    /     
(Name) (Title) (Eastern) mm dd yy

\* If Items 8-14 have not changed, only items 1-7 and 15-16 are required to be completed

\*\* Information may not be available on initial notification

**Enclosure 5.5**  
**Emergency Notification**

**HP0/B/1009/026**  
**Page 2 of 6**

**2. Dose Assessment Forecast Report ("Green Sheet") (example):**

**Catawba Nuclear Station Unit No 1 Dose Assessment**  
**RADDOSE-V Version 3.0c**  
**Copyright 2002 Earth Tech**

Current Date: 02/04/2003  
Current Time: 09:27  
Operator: CVW

Step #: 1  
Step Date: 02/04/2003  
Step Time: 09:26

**\*\*\* FORECAST FOR 1 HOUR \*\*\***

**ACCIDENT DESCRIPTION:** General Emergency has NOT been declared  
Reactor Shutdown: 02/04/2003 0911 hrs  
Accident Time: 02/04/2003 0911 hrs

**PATHWAY 1**  
Accident Type: LOCA  
Noble Gas Method: UVIL (EMF36L)  
VentCF = 1.69E-08  
Flow Rate: 1.30E+05 ft<sup>3</sup>/min  
Monitor Reading: 2.14E+01 cpm (P)

**RELEASE RATES:**  
Noble Gas Release Rate (Ci/sec): 2.21E-05 Ci/s Below Normal Operating Limits  
Iodine Release Rate (Ci/sec): 1.63E-09 Ci/s  
Particulate Release Rate (Ci/sec): 2.50E-11 Ci/s

**ACTUAL, FORECAST AND TOTAL (Forecast + Integrated) DOSES:**

Distance (miles)	TEDE (mrem)			Thyroid CDE (mrem)		
	Actual	Forecast	Total	Actual	Forecast	Total
0.50	5.82E-05	2.33E-04	2.91E-04	1.44E-04	5.77E-04	7.22E-04
1.00	0.00E+00	1.39E-04	1.39E-04	0.00E+00	2.29E-04	2.29E-04
2.00	0.00E+00	3.96E-05	3.96E-05	0.00E+00	5.26E-05	5.26E-05
5.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**METEOROLOGICAL DATA:**

Wind Speed: 2.5 mph (P)  
Wind Direction: From 186.02 deg To 6.02 deg  
Stability Class: G (P)

**RECOMMENDED PROTECTIVE ACTIONS:: Based on Radiological Conditions**

Evacuate : None  
Shelter : None

**TOTAL (Forecast + Integrated) DOSES FROM 02/04/2003 09:11 TO 10:26:**

Distance (miles)	Current Dose Rates (mrem/hr)		Dose (mrem)		X/Q (sec/m3)
	TEDE	Thyroid CDE	TEDE	Thyroid CDE	
0.50	2.33E-04	5.77E-04	2.91E-04	7.22E-04	6.48E-04
1.00	1.39E-04	2.29E-04	1.39E-04	2.29E-04	3.37E-04
2.00	7.92E-05	1.06E-04	3.96E-05	5.26E-05	1.55E-04
5.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**DOSE CONVERSION FACTORS:**

mrem \*m<sup>3</sup>/Ci\*hr  
TEDE: 2.07E+07  
Plume EDE: 6.56E+04  
Ground EDE: 7.55E+06  
CDE Thyroid: 4.18E+08  
Inhalation: 1.31E+07

**EMERGENCY CLASS:**

	Total Effective Dose Equivalent	Adult Thyroid
Site Area Emergency :	No < 100 mrem	No < 500 mrem
General Emergency :	No < 1000 mrem	No < 5000 mrem

**Enclosure 5.5**  
**Emergency Notification**

**HP/0/B/1009/026**  
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**2. Dose Assessment Forecast Report ("Green Sheet"):**

PAG Dose Limits:	1 rem	5 rem
PAG Exceeded at Site Boundary?	No	No
PAG Distances (miles):	N/A	N/A

**MONITOR CORRECTION FACTORS:**

	Pathway 1
Time Since Trip (Hrs)	0.00
Ice Condenser	No Recirc
Sprays	On
Hold-Up Time	<=24 hrs
Cont Leak Rate Method	-----
Cont Leak Type	
Cont Pressure	-----
Cont Leak Rate	-----
Cont Bypass Fraction	-----
Filters	Yes
SG Partitioned	-----
Pool Scrubbing	-----
Field Measurement	-----
Distance	-----
Direction	-----
Fuel Assembly Age (Days)	-----



Enclosure 5.5  
Emergency Notification

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3. Provide Control Room personnel completing an Emergency Notification Form the following information using Raddose-5 data from Dose Assessment Forecast Report ("Green Sheet").

- NOTE:** Line # 5 - Emergency Action Level (EAL) classification is determined by OSM using RP/0/A/5000/001 (Classification Of Emergency) if offsite dose exceeds Selected Licensee Commitment (SLC) limits.
- Unusual Event - if gaseous or liquid radiological effluents exceed SLC limits
  - Alert - is based on EMF readings that exceed SLC limits
  - Site Area Emergency - is classified if site boundary dose rate exceeds Forecasted TEDE dose  $\geq 100$  mrem; and/or Forecasted CDE Thyroid dose  $\geq 500$  mrem
  - General Emergency - is classified if site boundary dose rate exceeds Forecasted TEDE dose  $\geq 1$  rem; and/or Forecasted CDE Thyroid dose  $\geq 5$  rem

Line # 10 - Emergency Release(s); use the following guidelines:

- A. None - no release of radioactivity generated by the event and no release expected.
- B. Potential Release - radioactivity generated during an event that has potential to be released but is not currently being released.
  - Discretionary option for the Emergency Coordinator or the EOF Director.
- C. Is Occurring - radioactivity generated during an event that is currently being released through any defined accident pathway, using any of the following indicators:
  - Either containment particulate, gaseous, iodine monitor readings indicate an increase in activity,

OR

Containment monitor readings indicate greater than 1.5 R/hr

AND

Either containment pressure is greater than 0.3 psig,

OR

An actual containment breach is known to exist.

**Enclosure 5.5**  
**Emergency Notification**

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- Unit vent particulate, gaseous, iodine monitor readings indicate an increase in activity.
- Condenser air ejector exhaust monitor or other alternate means indicate Steam Generator tube leakage.
- Confirmed activity in the environment reported by Field Monitor Team(s).
- Knowledge of the event and the impact on systems operation and resultant release paths.

D. Has Occurred - any radioactivity generated during an event that has been released previous to ERO activation that may require offsite agency notification.

Line # 11 - Type of Release

- Ground Level release and Airborne release with start time and stop time; if known.

Line # 12 - Release Magnitude in Curies per second (Ci/sec) released (from "RELEASE RATES:" on Dose Assessment Report)

- A. Indicate Normal Operating Limits: above or below site boundary limits; where Technical Specification site boundary dose rate limit is; < 0.05 mrem/hr and Child Thyroid Dose rate limit is < 0.17 mrem/hr; using the following guidelines:
- Release Below Normal Operating Limits is radioactivity released at any time during an event and/or radioactivity that may have been previously released that is not above site boundary normal operating limits.
  - Release Above Normal Operating Limits is any radioactivity released during the event and/or any radioactivity previously released that is above normal site boundary operating limits.
- B. Quantity of each form of radioactive material released:
- Noble Gases
  - Iodines
  - Particulates

Enclosure 5.5  
Emergency Notification

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**Line # 13 - Estimate of Projected Offsite Dose (from "ACTUAL, FORECAST AND TOTAL (Forecast + Integrated) DOSES:" on Dose Assessment Report)**

- A. New - used for initial forecast and when forecasted dose results are calculated for Emergency Notification
- B. Unchanged - used when forecasted dose results are exactly the same as a previously issued Emergency Notification (for On-Shift Projections "New" is only selection).
- C. Projection Time - is "Step Time" from Dose Assessment Report
- D. Estimated Duration - is duration of release in hours; (On -Shift dose assessment projection time using "Automatic Mode" defaults to one hour. In "Manual" if release time is known to be > 1 hour, input time in hours.)
- E. TEDE - projected offsite dose in mrem at; Site Boundary, 2 miles, 5 miles and 10 miles
- F. CDE - projected offsite dose in mrem at; Site Boundary, 2 miles, 5 miles and 10 miles

**Line # 14 - Meteorological data**

- A. Wind Direction - in degrees from North; where N = 0°
- B. Wind speed - in miles per hour (mph)
- C. Stability Class - (A,B,C,D,E,F or G)
- D. Precipitation - (type; e.g., rain, sleet, snow) inches in the last fifteen minutes

**Line # 15 - Recommended Protective Actions (from "RECOMMENDED PROTECTIVE ACTIONS: Based on Radiological Conditions" on Dose Assessment Report)**

- A. No Recommended Protective Actions - recommended if EPZ projected dose for PAZs is < 1 rem TEDE or < 5 rem Adult Thyroid CDE.
- B. Evacuate - recommended for affected PAZs if the projected dose is ≥ 1 rem TEDE or ≥ 5 rem Adult Thyroid CDE; and recommend Shelter in Place for all other PAZs.

# APPENDIX F. 703. PROCEDURE CHANGE PROCESS RECORD

(R04-03)

Duke Power Company

## PROCEDURE CHANGE PROCESS RECORD

- (1) ID No. SH/0/B/2005/001

Revision No. 002 Change No. B  
Permanent/Restricted to Catawba
- (2) Station: Catawba Nuclear Station
- (3) Procedure Title: Emergency Response Offsite Dose Projections
- (4) Section(s) of Procedure Affected: \_\_\_\_\_
- (5) Requires NSD 228 Applicability Determination? If Applicability Determination is required, attach NSD 228 documentation.  
☒ Yes (Major procedure change)  
☐ No (Minor procedure change)
- (6) Description of Change: *(Attach additional pages, if necessary.)*  
 This change is applicable to Catawba Nuclear Station only. Added an alternate method for determining the Unit Vent Flow when the Unit Vent flow is less than 97,500 CFM. See attached sheet.
- (7) Reason for Change:  
 Catawba Engineering has determined that the Unit Vent Flow Monitor may not be accurate for flow rates less than 97,500 CFM. This change implements an alternate method for determining the Unit Vent Flow rate when the Unit Vent flow is less than 97,500 CFM.
- (8) Prepared By Dwain Johnson Date 7-11-03
- (9) Reviewed By Col R. [Signature] (QR) Date 7-11-03  
 Cross-Disciplinary Review By GARY L MITCHELL (QR) NA \_\_\_\_\_ Date 7-11-03  
 Reactivity Mgmt. Review By \_\_\_\_\_ (QR) NA col Date 7-11-03  
 Mgmt. Involvement Review By \_\_\_\_\_ (Ops. Supt.) NA col Date 7-11-03
- (10) Additional Reviews  
 Reviewed By \_\_\_\_\_ Date \_\_\_\_\_  
 Reviewed By \_\_\_\_\_ Date \_\_\_\_\_
- (11) Temporary Approval *(if necessary)*  
 By \_\_\_\_\_ (OSM/QR) Date \_\_\_\_\_  
 By \_\_\_\_\_ (QR) Date \_\_\_\_\_
- (12) Approved By James McKenzie Date 7-11-03

**SH/0/B/2005/001, Emergency Offsite Dose Projections**

**Restricted Major Change B**

**This change is applicable to Catawba Only.**

**Change Summary:**

- Enclosure 5.4, Unit Vent Source Term Release, Page 2 of 4, was changed as follows:

Added NOTE before Step (e):

**NOTE:** Catawba Engineering has determined that the Unit Vent Flow Rate Monitor may **NOT** be accurate for flow rates less than 97,500 CFM

Added New Step (e):

For Catawba Only: **IF** the Unit Vent Flow Monitor indicates a flow rate less than 97,500 CFM, use Enclosure 5.7 to determine the Unit Vent Flow.

- Added New Enclosure 5.7, Catawba Unit Vent Flow Calculation Worksheet  
See attachment.

**Enclosure 5.7**  
**Catawba Unit Vent Flow Calculation Worksheet**

- 5.7.1 Determine the status (On or Off) of each fan in list below.  
5.7.2 **IF** the Fan is "ON", place the Expected Flow (CFM) value into the Flow column of this worksheet.  
5.7.3 **IF** the Fan is "OFF", place "0" CFM into the Flow column of this worksheet.  
5.7.4 Total the values in the Flow column to calculate the Calculated Unit Vent Flow.

Unit 1 / Unit 2 (circle one)	Expected Flow (CFM)	Fan Status (Circle one)	Flow (CFM)
<b>Aux. Building Ventilation (VA)</b>			
Auxiliary Building Ventilation (VA) Filtered Exhaust Fan A	12,500	(On / Off)	_____
Auxiliary Building Ventilation (VA) Filtered Exhaust Fan B	12,500	(On / Off)	_____
Auxiliary Building Ventilation (VA) Unfiltered Exhaust Fan A	20,350	(On / Off)	_____
Auxiliary Building Ventilation (VA) Unfiltered Exhaust Fan B	20,350	(On / Off)	_____
<b>Fuel Pool Ventilation (VF)</b>			
Fuel Pool Ventilation (VF) "A" Train Exhaust Fans (A1 & A2)	33,130	(On / Off)	_____
Fuel Pool Ventilation (VF) "B" Train Exhaust Fans (B1 & B2)	33,130	(On / Off)	_____
<b>Annulus Ventilation (VE)</b>			
Annulus Ventilation (VE) Fan A	750	(On / Off)	_____
Annulus Ventilation (VE) Fan B	750	(On / Off)	_____
<b>Containment Air Release and Addition (VQ)</b>			
VQ Fans (assume fans ARE running)	300	(On)	_____
<b>Calculated Total Vent Flow:</b>			_____

**NOTE: A Spreadsheet may be used in place of this enclosure.**

**Duke Power Company**  
**PROCEDURE PROCESS RECORD**  
**FOR STANDARD PROCEDURES**

(1) ID No. SH/0/B/2005/001Revision No. 002**PREPARATION**(2) Procedure Title: Emergency Response Offsite Dose Projections

(3) Prepared By

Drahman Johnson

Date

1-9-2003

(4) Applicable To:	<input type="checkbox"/> ONS	<input checked="" type="checkbox"/> MNS	<input checked="" type="checkbox"/> CNS
(5) Technical Advisor	<u>N/A</u>	<u>Gary Sinner</u>	<u>[Signature]</u>
(6) Requires NSD 228	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Applicability Determination	YES = New procedure or reissue with major changes NO = Reissue with minor changes OR to incorporate previously approved changes		
(7) Review (QR)	By _____ Date _____	By <u>Carl D. Dyre</u> Date <u>2/27/03</u>	By <u>Carl D. Dyre</u> Date <u>2/27/03</u>
Cross-Disciplinary Review (QR)	By _____ NA _____ Date _____	By <u>Alan Z. Brown</u> NA _____ Date <u>2/26/03</u>	By <u>GARY L. MITCHELL</u> NA _____ Date <u>2-11-03</u>
Reactivity Mgmt. Review (QR)	By _____ NA _____ Date _____	By _____ NA <u>CDL</u> Date <u>2/27/03</u>	By _____ NA <u>CDL</u> Date <u>2/27/03</u>
Mgmt. Involvement Review (Ops. Supt.)	By _____ NA _____ Date _____	By _____ NA <u>CDL</u> Date <u>2/27/03</u>	By _____ NA <u>CDL</u> Date <u>2/27/03</u>
(8) Additional Reviews	By _____ (QA) Date _____  By _____ Date _____	By _____ (QA) Date _____  By <u>K.L. Munay</u> Date <u>3-3-03</u>	By _____ (QA) Date _____  By <u>E.T. Buddle</u> Date <u>2/11/03</u>
(9) Approved	By _____ Date _____	By <u>Lanue E. Lumbas</u> Date <u>03-04-03</u>	By <u>3-4-03</u> Date <u>[Signature]</u>
(10) Use Level	Reference Use		

**PERFORMANCE** (Compare with Control Copy every 14 calendar days while work is being performed.)

(11) Compared with Control Copy \_\_\_\_\_ Date \_\_\_\_\_  
 Compared with Control Copy \_\_\_\_\_ Date \_\_\_\_\_  
 Compared with Control Copy \_\_\_\_\_ Date \_\_\_\_\_

(12) Date(s) Performed \_\_\_\_\_

Work Order Number (WO#) \_\_\_\_\_

**COMPLETION**

(13) Procedure Completion Verification

- ☐ Yes ☐ NA Check lists or blanks properly initialed, signed, dated, or filled in NA, as appropriate?  
☐ Yes ☐ NA Required enclosures attached?  
☐ Yes ☐ NA Data sheets attached, completed, dated, and signed?  
☐ Yes ☐ NA Charts, graphs, etc., attached and properly dated, identified, and marked?  
☐ Yes ☐ NA Procedure requirements met?

Verified By \_\_\_\_\_

Date \_\_\_\_\_

(14) Procedure Completion Approved \_\_\_\_\_

Date \_\_\_\_\_

(15) Remarks (attach additional pages, if necessary)

<b>Duke Power Company</b> <b>Catawba and McGuire Nuclear Stations</b>  <b>Emergency Response Offsite Dose Projections</b>   <b>Reference Use</b>	<b>Procedure No.</b> <b>SH/0/B/2005/001</b>
	<b>Revision No.</b> <b>002</b>
	<b>Electronic Reference No.</b> <b>MP0070PF</b>



## Emergency Response Offsite Dose Projections

### 1. Purpose

To provide instruction to Emergency Response Organization (ERO) dose assessors for determining source term and calculating the projected offsite dose to the public using Raddose 5 (Earth Tech <sup>TM</sup> Windows© based computer program); and to provide dose assessment guidance for completion of Emergency Notification form.

**NOTE:** This procedure is an Emergency Plan Implementing Procedure (EPIP) to be used for Catawba and McGuire Nuclear Stations. Emergency Planning must be notified of any changes to this procedure.

### 2. References

- 2.1 Earth Tech Raddose 5 Operator's Manual, Detailed Design Manual, System Design Specification, Verification and Validation Report Vol 1 and 2
- 2.2 Station specific procedures for alternate method of determining Reactor Building dose rate:
  - CNS - HP/0/B/1009/006      Alternative Method for Determining Dose Rate Within the Reactor Building
  - MNS - HP/0/B/1009/002      Alternative Method for Determining Dose Rate Within the Reactor Building
- 2.3 Station specific procedure for abnormal unit vent sampling:
  - MNS - HP/0/B/1009/006      Procedure for Quantifying High Level Radioactivity Releases During Accident Conditions
- 2.4 EPA 400-R-92-001 Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
- 2.5 Letter from F.G. Hudson, September 20, 1985, Re: Release Rate Information for McGuire and Catawba Nuclear Stations (File: GS-750.25, NUC-0306)
- 2.6 Letter from H.B. Tucker, November 30, 1989, Re: Follow-up on McGuire Alert (March 7 - 8, 1989) Critique Action Items
- 2.7 U.S. Nuclear Regulatory Commission Response Technical Manual (RTM-93)

2.8 Station specific procedures for classification of emergencies:

CNS - RP/0/A/5000/001	Classification of Emergency
MNS - RP/0/A/5700/000	Classification of Emergency

### 3. Limits and Precautions

- 3.1 Use this procedure during abnormal or emergency conditions (including exercises and drills).
- 3.2 This procedure may be performed in sections or parts, using steps in any sequential order, to evaluate and/or assess offsite radiological conditions.

### 4. Procedure

- 4.1 Use Raddose 5 program to calculate Total Effective Dose Equivalent (TEDE) exposure, Committed Dose Equivalent (CDE) Thyroid exposure, and Effective Dose Equivalent (EDE) exposure in ten mile Emergency Planning Zone (EPZ).
- Provide information for offsite dose exposure and projected offsite dose rate results, from any radioactive material(s) released offsite, to ERO Management.
- 4.2 Access the Raddose 5 software.
- 4.2.1 Click on the Raddose 5 icon.
- 4.2.2 A dialog box should appear stating "Note: this workstation is configured as (EOF or TSC)". Click on "OK" to access the DAS (Dose Assessment Software) Desktop.
- 4.2.3 IF the dialog box above does NOT appear, change the DAS configuration as follows:
- 4.2.3.1 At the DAS Desktop, click on "FILE".
- 4.2.3.2 Click on "DAS Configuration".
- 4.2.3.3 Click on appropriate Work Station Type (EOF or TSC) and Mode (Production or Training).
- 4.2.3.4 Restart Raddose 5 for changes to take affect.
- 4.2.4 Select the appropriate Station and Unit from the DAS Desktop.

**NOTE:** This procedure is for "Normal Mode" operation of Raddose only. The "Automatic Mode" contains limited choices and default assumptions. The "Automatic Mode" is used for on-shift dose assessment only.

4.2.5 Select "Normal Mode" at the Dialog Box.

4.2.6 Select "Accident Mode" or "Drill Mode" as appropriate.

4.2.7 Select "PI Server" or "Manual" as appropriate.

- Select "PI Server" for program query of fifteen minute average data from Operator Aided Computer (OAC).
- Select "Manual" for keyboard entry of data.

4.2.8 **IF** this is the initial dose assessment calculation, select "Begin New Incident".

4.2.8.1 Enter information (e.g., reactor trip date, reactor trip time, release date and release time).

- **IF** the reactor did not trip, and shutdown is in progress, **THEN** use current time in the blank for reactor trip time.

**CAUTION:** **IF** the automatic transfer of Raddose data into the Electronic Emergency Notification Form is going to be used, per the "Save Green Form Data To Ini File" Function, it is important that the release time entered is the time of the actual release. This time is transferred to the Electronic Emergency Notification Form.

- Enter release time (estimated or known).
- Enter operator initials and use the mouse to accept and/or cancel.

4.2.9 **IF** this is a continuation of a previous incident, **AND IF** previous TSC or EOF files are valid, select "Continue Previous Incident".

4.2.9.1 Select "Local Data" to continue previous dose assessment calculation that was previously performed on the current workstation.

4.2.9.2 Select "Network Data" to continue previous dose assessment calculation that was previously performed at another facility.

- Select "TSC" to retrieve previous dose calculation that was performed at the TSC.
- Select "EOF" to retrieve previous dose calculation that was performed at the EOF.

4.3 Select "Enter/Edit Meteorological Data" from program selection.

4.3.1 IF "Manual" was selected in Step 4.2.7, select "OK" to Raddose pop-up message: "No automatic meteorological data available. Enter data manually."

4.3.2 Input data for current meteorological conditions.

- Use actual site meteorology for assessment of a release until it is appropriate to use forecasted data provided by a meteorologist

4.3.3 IF site meteorology cannot be obtained from meteorological tower systems, refer to Enclosure 5.1 (Meteorology) for alternate methods for obtaining meteorological data.

4.3.4 Enter meteorological data, or "Requery" for automatic meteorological input.

4.3.4.1 IF manual meteorological data entries are required use Enclosure 5.1 (Meteorology) as necessary.

- Enter lower wind speed in miles per hour (mph).
- Enter upper wind direction; where wind direction is from North (N=0 degrees).
- Enter Delta temperature gradient ( $\Delta T$ ) in degrees centigrade ( $\Delta T = ^\circ C$ ).
- Enter air temperature in degrees centigrade (Temperature in  $^\circ C$ ).
- Enter precipitation occurring (inches per fifteen minute period).
- Mean mixing height (in meters) is computer selected from a table of seasonal afternoon mixing heights for each station.

- Manually overwrite meteorological data or "Requery" for data that is acceptable.

4.3.5 Select the appropriate button for the meteorological data acceptance.

4.3.5.1 IF all of the meteorological data entered or retrieved is correct, click on "Accept".

4.3.5.2 IF new automatic data retrieval is needed, click on "Requery".

4.3.5.3 IF a new time step is needed, click on "Add New Step".

4.3.5.4 IF the meteorological data input needs to be aborted, click on "Cancel" to return to the main menu.

4.4 Select "Enter/Edit Source Term Data".

4.4.1 IF "Manual" was selected in Step 4.2.7, select "OK" to pop-up message: "No automatic monitor data available. Enter data manually."

4.4.2 Select the appropriate Accident Type from the list below.

- Consult with ERO personnel (e.g., TSC Operations Engineering and/or EOF Accident Assessment) as necessary.
- IF the Containment High Range Monitor is greater than 117 R/hr, the "gap release" accident types (LOCAG, SGTRG, and LOCOG) should be considered.
- IF the Containment High Range Monitor is greater than the values in the Table in Step 4.5.2, the "melt release" accident types (LOCAM, SGTRM, and LOCOM) should be considered.
- "LOCA" - Loss of coolant (normal coolant) - leaks released into containment with those fission products normally found in coolant.
- "LOCAG" - Loss of coolant gap release - coolant leaks into containment of fission products in the fuel pin gap after fuel cladding has failed (e.g., core being uncovered, fuel pin heat up, and/or if mechanical fuel pin damage has occurred).
- "LOCAM" - Loss of coolant core melt - coolant leaks released into containment of fission products expected to be released from a core that is partially melted after being uncovered for some period of time.

- "SGTR" - Steam generator tube rupture (normal coolant) - steam generator release accidents with those fission products normally found in coolant.
- "SGTRG" - Steam generator tube rupture gap release - steam generator tube release accidents that release fission products in the fuel pin gap after fuel cladding has failed (e.g., core uncover or fuel pin heat up and/or after mechanical fuel pin damage has occurred).
- "SGTRM" - Steam generator tube rupture core melt - steam generator tube release accidents that release fission products expected to be released from a core that is partially melted after being uncovered for some period of time.
- "LOCO" - LOCA outside containment (normal coolant) - leaks released directly from containment to outside environment (e.g., Annulus or Auxiliary Building) with fission products normally found in reactor coolant.
- "LOCOG" - LOCA outside containment gap release - leaks released directly from containment to outside environment (e.g., Annulus or Auxiliary Building) with fission products in the fuel pin gap after fuel cladding has failed (e.g., core uncover or fuel pin heat up and/or after mechanical fuel pin damage has occurred).
- "LOCOM" - LOCA outside containment core melt - leaks released directly from containment to outside environment (e.g., Annulus or Auxiliary Building) with fission products expected to be released from a core that is partially melted after being uncovered for some period of time.
- "FUEL" - Fuel handling gap release - fuel pin fission products released from fuel during refueling, or Spent Fuel Pool accident.
- Use consistent Accident Type and identify release path(s) for each fifteen minute time step; changing Accident Type only when reactor and/or plant status indicate conditions degrading to a different accident.

4.4.3 Choose the appropriate NG Method based on the release pathway:

- 4.4.3.1 **IF** a steam release is occurring or suspected, refer to Enclosure 5.2 (Steam Source Term Release) for NG Method selection.
- 4.4.3.2 **IF** a containment release is occurring or suspected, refer to Enclosure 5.3 (Containment Source Term Release) for NG Method selection.

4.4.3.3 **IF** a unit vent release is occurring or suspected, refer to Enclosure 5.4 (Unit Vent Source Term Release) for NG Method selection.

4.4.4 Select the appropriate button for the Source Term Data acceptance.

4.4.4.1 **IF** all of the Source Term Data entered or retrieved is correct, click on "Accept".

4.4.4.2 **IF** new automatic data retrieval is needed, click on "Requery".

4.4.4.3 **IF** a new time step is needed, click on "Add New Step".

4.4.4.4 **IF** the Source Term Data input needs to be aborted, click on "Cancel" to return to the Main Menu.

4.5 Select "Emergency Classification" from the Raddose 5 main menu.

**NOTE:** This menu item is used to select the Current Emergency Classification in a drill or accident. Do **NOT** select a classification based on radiological conditions only.

4.5.1 Select the current Emergency Classification (Unusual Event, Alert, Site Area Emergency, General Emergency) from the menu.

4.5.2 **IF** General Emergency is chosen, respond to dialog box question: "Is the Fission Product inventory inside containment greater than gap activity?"

- **IF** the Containment High Range Monitor is greater than the values in the table below, answer the question "Yes".

Time After Shutdown (hours)	High Range Containment Monitor Reading (EMF 51 A/B or EMF 53 A/B)
0-2	864 R/Hr
2-4	624 R/Hr
4-8	450 R/Hr
>8	265 R/Hr

4.6 Select "Perform Calculations" to calculate Real Time Mode dose results which are displayed on ten-mile map.

4.6.1 Select "Continue" from map display to go to the Real Time Mode Output Menu.

4.6.2 Select applicable *real-time* mode output options:

4.6.2.1 **IF** forecasted doses and an Emergency Notification Form is needed at this time, select "Continue Calculations".

4.6.2.2 Other menu items may be selected as follows:

- "Display Grid Receptor Doses" is used to display the Grid Receptor doses.
- "Display Plume Arrival Times" is used to display *real-time* plume arrival times.
- "Display 2-Mile Map" is used to see *real-time* Plume EDE and Adult Thyroid dose rates within two miles of the site.
- "Display 10-Mile Map" is used to see *real-time* Plume EDE and Adult Thyroid dose rates within ten miles of the site.
- "Display 50-Mile Map" is used to see *real-time* Plume EDE and adult thyroid dose rates within 50 miles of the site.
- "Review GenEmergency PAZ PARs" to display the PAZs that are recommended to be evacuated.
- "Display Point-of-Interest Doses" is used to see *real-time* dose rates at any point of interest. This choice may be used to display dose rates beyond the 10-mile radius of the site.
- "Display 50-Mile Deposition Data" is used to display the 50-mile deposition data.
- "Display Survey Point Receptors" is used to see *real-time* dose rates and accumulated doses for predetermined sample points.
- "Go To Report Menu" is used if output of *real-time* is desired. The *real-time* mode report menu choices are:
  - "View Reports" may be selected to view all of the *real-time* reports



- "View Protective Action Zones" may be selected to view the Wind Direction/Affected Zone table.
- "Print Summary Form" may be selected to print the *real-time* summary report.

**NOTE:** The *real-time* mode RQ Report is available from the "Print Reports and Maps" selection. This report is used to display the "EPA RQ Fraction" released for each nuclide and a "Sum of the Ratios" for all of the nuclides released

- "Print Reports and Maps" may be selected to print any combination of the available *real-time* mode reports.

- 4.7 Select "Perform Forecast" to calculate TEDE and CDE dose rates (mrem/hr), and forecasted dose (mrem), for the release duration in Forecast Mode.
  - 4.7.1 IF General Emergency was chosen in Step 4.5.1, the following screen prompt will appear: "General Emergency Classification is chosen. Is the Fission Product inventory inside Containment greater than gap activity?"
    - Answer this prompt as the same as was done in Step 4.5.2.
  - 4.7.2 Select the appropriate Emergency Release Status (e.g., None, Potential, Is Occurring, Has Occurred), using the following logic:
    - 4.7.2.1 "None" - no release of radioactivity generated by the event and no release expected.
    - 4.7.2.2 "Potential" - radioactivity generated during an event that has potential to be released but is not currently being released.
      - Discretionary option for the Emergency Coordinator or the EOF Director.

4.7.2.3 "Is Occurring" - radioactivity generated during an event that is currently being released through any defined accident pathway, using any of the following indicators:

- EITHER containment particulate, gaseous, iodine monitor readings indicate an increase in activity,

OR

Containment monitor readings indicate greater than 1.5 R/hr,

AND

EITHER containment pressure is greater than 0.3 psig,

OR

An actual containment breach is known to exist.

- Unit vent particulate, gaseous, iodine monitor readings indicate an increase in activity.
- Condenser air ejector exhaust monitor or other alternate means indicate Steam Generator tube leakage.
- Confirmed activity in the environment reported by Field Monitoring Team(s).
- Knowledge of the event and the impact on systems operation and resultant release paths.

4.7.2.4 "Has Occurred" - any radioactivity generated during an event that has been released previous to ERO activation that may require offsite agency notification.

4.7.3 Select the appropriate Status of Projected Offsite Dose (e.g., New or Unchanged).

<b>NOTE:</b> 0.5 hours is the lower limit allowed as a forecast period and the forecast period must be in increments of .5 hours.
---

4.7.4 Enter a Forecast Period (in hours).

4.7.5 IF all inputs are correct, select "OK".

- 4.7.6 Select "OK" to the screen prompt "Note: Forecast will use the meteorological and source term data from Step 1. Continue?"

**NOTE:** Forecast Mode doses are calculated using the most current time step and are displayed on ten mile EPZ map.

- 4.7.7 IF General Emergency was selected in Step 4.5, THEN select "Both PARs" to display the General Emergency Protective Action Recommendations, and the Dose Protective Action Recommendations.
- 4.7.8 Select "Continue" from map display to go to the Forecast Mode Output Menu.
- 4.7.9 At the popup dialog box item "Do you want to save PAZs identified in forecast mode for evacuation?", select "Yes".
- 4.7.10 Select "Go To Report Menu" to go to the Forecast Mode Report Options Menu and access the Raddose 5 Green Form.

**NOTE:** Refer to Step 4.6.2.2 for a description of the other choices on this menu. However, it should be noted that all outputs will consist of *forecasted* data instead of *real-time* data.

- 4.7.11 Select "Print Green Form + Summary Form" to print the Emergency Notification Form (green sheet) and the Summary Report.
- 4.7.12 Select "Save Green Form Data to Ini File" to transfer the Raddose data to the Electronic Notification Form application.
- 4.7.13 Other menu items may be selected as follows:
- "View Green Form" is used to display the Green Form report.
  - "View Reports" is used to view all reports.
  - "Print Green Form" is used to print the Green Form report.
  - "Print Summary Form" is used to print the Summary Form report.
  - "Print Reports and Maps" is used to select any combination of the available reports.
- 4.7.14 Select "Return to Output Menu" when done with Forecast Mode reports.
- 4.7.15 Select "Continue Calculations" to return to the main menu in *real-time* mode.

- 4.7.16 Select "OK" to the Raddose prompt: "You have just completed a forecast. Remember to check the meteorological and source term data for current information".
- 4.8 Refer to Enclosure 5.5 (Radiological Emergency Action Levels) and evaluate the Emergency Action Levels (EALs) based on radiological conditions.
- 4.8.1 Provide EAL radiological assessment classifications to ERO Management in the TSC and/or EOF.
- 4.9 IF desired, obtain the Self Reading Dosimeter Correction Factor ( $SRD_{CF}$ ) from the Real-Time Summary Report.

**NOTE:** Raddose 5 calculates Effective Dose Equivalent (EDE) exposure and provides Self Reading Dosimeter (SRD) correction factor ( $SRD_{CF}$ ).

$$SRD_{CF} = \frac{TEDE}{EDE}$$

$SRD_{CF}$  = SRD correction factor

TEDE = Total Effective Dose Equivalent

EDE = Effective Dose Equivalent

**NOTE:** The  $SRD_{CF}$  value is based on accident specific source term nuclide(s) and is a calculation of TEDE to EDE ratio at site boundary.

- $SRD_{CF}$  is provided to offsite Emergency Workers during an accident, after a declared General Emergency, and when a release is occurring.
- $SRD_{CF}$  is used as a multiplier of Emergency Worker SRD readings for EPA 400 Manual Of Protective Action Guides And Protective Actions For Nuclear Incidents, "Early Phase" Emergency Worker TEDE estimate.

- Provide the  $SRD_{CF}$  the Field Monitoring Coordinator and the OSC.

- 4.10 IF manual completion of the Emergency Notification Form is to be used, provide the Radiological Assessment Manager (RAM), Lead TSC Dose Assessor and/or ERO personnel the following information for each of the Emergency Notification Form line items:

- 4.10.1 Obtain "Green Form Report" (example shown on Enclosure 5.6).
- 4.10.2 Line # 10 - Emergency Release(s); use the guidance in Step 4.7.2.
- 4.10.3 Line # 11 - Type of Release; check Ground Level release and record Airborne or Liquid release with start time and stop time; if known.
- 4.10.4 Line # 12 - Release Magnitude in Ci/Sec released.

**NOTE:** The Normal Operating Limit in the Technical Specifications are: EDE  $5.0\text{E-}2$  mRem/hr, Child Thyroid  $1.711\text{E-}1$  mRem/hr.

- 4.10.4.1 Select "Above" or "Below" to indicate if the release is above or below the Normal Operating Limits.
  - Release Below Normal Operating Limits is radioactivity released at any time during an event and/or radioactivity that may have been previously released that is **NOT** above site boundary normal operating limits.
  - Release Above Normal Operating Limits is any radioactivity released during the event and/or any radioactivity previously released that is above normal site boundary operating limits.
- 4.10.4.2 Record value (in Ci/Sec) for each form of radioactive material released offsite.
  - Noble gases
  - Iodines
  - Particulates

- 4.10.5 Line # 13 - Record Estimate of Projected Offsite Dose as "New" or "Unchanged":
- Record projection time of forecast.
  - Record estimated duration of release. This value shall be the forecast period used in Step 4.7.4.
  - IF the release is below normal operating limits, as determined in Step 4.10.4.1, enter "Not Required" in the TEDE and CDE fields on the Emergency Notification Form.
  - IF the release is above normal operating limits, as determined in step 4.11.3.1, record the TEDE and CDE mrem forecasted dose at Site Boundary, 2 miles, 5 miles and at 10 miles.
- 4.10.6 Line #14 - Record meteorological data.
- 4.10.6.1 Wind Direction from North where N=0 degrees
- 4.10.6.2 Wind Speed (miles per hour)
- 4.10.6.3 Stability Class
- 4.10.6.4 Precipitation (type) (in/15min)
- 4.10.7 Line #15 - Recommended PAZ protective actions as indicated on the "Green Form Report" (example displayed on Enclosure 5.6).
- 4.10.8 Provide Raddose 5 printouts and summary reports to Federal, State and County agencies supporting ERO activation, with approval by lead TSC dose Assessor or EOF RAM.
- 4.10.9 Retain logs, computer printouts and computer generated dose assessment files, whenever ERO is activated.
- Exercise and Drill records are retained for Emergency Planning disposition.

## **5. Enclosure**

**5.1 Meteorology**

**5.2 Steam Source Term Release**

**5.3 Containment Source Term Release**

**5.4 Unit Vent Source Term Release**

**5.5 Radiological Emergency Action Levels**

**5.6 Raddose 5 Green Form Report**

**5.7 Catawba Unit Vent Flow Calculation Worksheet <--CHANGE B**

5.1.1 Meteorological Tower OAC data is normally provided as 15 min. average.

- Use lower tower wind speed (WS) in miles per hour
- Use upper tower wind speed (WS) if lower tower wind speed is not available
- Use upper tower wind direction; in degrees from North (N) = 0°.
- Use lower tower wind direction if upper tower wind direction is not available: in degrees from North (N) = 0°

5.1.2 IF Meteorological Tower is not available, obtain meteorological information from:

- Duke meteorologist at 594-0341/0289
- Unaffected plants control room:
  - CNS - Unit-1 8-831-5345
  - Unit-2 8-831-5344
  - MNS - Unit-1 8-875-4262
  - Unit-2 8-875-4263
- National Weather Service (NWS) at 1-800-268-7785
- Gastonia Automated Surface Observation System (ASOS) at 704-868-9034

5.1.3 IF meteorological tower temperature gradient ( $\Delta T^\circ$ ) is unknown, use the following default values:

	CNS		MNS	
	$\Delta t$	Stability Class	$\Delta t$	Stability Class
Between 1000-1600 hours:	-0.3	D	-0.3	D
Between 1600-1000 hours:	+1.3	F	+1.3	F



5.1.4 Use the following tables to determine stability class when  $\Delta T$  data is available:

Stability Class	<u>CNS</u>	<u>MNS</u>
	( $\Delta T$ in $^{\circ}\text{C}$ )	( $\Delta T$ in $^{\circ}\text{C}$ )
A - Extremely Unstable	$\Delta T \leq -0.97$	$\Delta T \leq -0.95$
B - Moderately Unstable	$-0.97 < \Delta T \leq -0.87$	$-0.95 < \Delta T \leq -0.86$
C - Slightly Unstable	$-0.87 < \Delta T \leq -0.76$	$-0.85 < \Delta T \leq -0.76$
D - Neutral	$-0.76 < \Delta T \leq -0.25$	$-0.75 < \Delta T \leq -0.26$
E - Slightly Stable	$-0.25 < \Delta T \leq +0.76$	$-0.25 < \Delta T \leq +0.74$
F - Moderately Stable	$+0.76 < \Delta T \leq +2.04$	$+0.75 < \Delta T \leq +2.00$
G - Extremely Stable	$+2.04 < \Delta T$	$+2.00 < \Delta T$

**5.2.1 Determine type of accident, source term release path and EMF monitor method.**

**5.2.2 Select an Accident Type for an affected release pathway:**

- "SGTR" - steam generator tube rupture (normal coolant)
- "SGTRG" - steam generator tube rupture gap release
- "SGTRM" - steam generator tube rupture core melt

**5.2.3 Select the appropriate steam line EMF Noble Gas Method as follows:**

- **IF steam line monitor data is available, use the following guidance for Noble Gas Method selection:**
  - (a) Review the steam line monitor data.
  - (b) Select appropriate steam line monitor: SG-A, SG-B, SG-C, or SG-D.
  - (c) Select "Partitioned" or "Not Partitioned" using the guidance below:
    - (i) **IF the steam generator tube leak/break is below the secondary side water level AND the steam generator is NOT overfilled, select "Partitioned".**
    - (ii) **IF the steam generator leak/break is above the secondary side water level OR the steam generator is overfilled, select "Not Partitioned".**
  - (d) Click on "OK".
  - (e) **IF manual data entry was selected in Step 4.2.7, enter the monitor data and the flow rate.**
- **IF secondary side steam sample data is available, select GRABSL.**
  - (a) Enter the secondary side steam sample data.
  - (b) When all data is entered, click on "OK".
  - (c) Enter the Steam release rate in pounds mass per 15 minutes (LBM/15min).
- **IF field team data is available, select BACKSL.**
  - (a) Enter the field team data.
  - (b) Click on "OK" for Raddose to calculate the source term in Ci/sec.

**NOTE:** Raddose 5 calculates the steam source term release rate for the SG-A, SG-B, SG-C, and SG-D methods as follows:

- Ci/sec is distributed by isotope spectrum based on accident type and time after reactor shutdown
- Raddose 5 calculates the steam source term as follows:

$$RR = EMF \times CF \times AJ \times LR \times (0.41 \text{ ft}^3/\text{lbm} \times 28320 \text{ ml}/\text{ft}^3 \times 1\text{E-}6 \text{ Ci}/\mu\text{Ci} \times 1/3600/\text{hr/s})$$

Where:

RR = release rate activity in Ci/sec

CF = steam line radiation monitor Correlation Factor

EMF = radiation monitor reading in mR/hr (normally a 15 minute average reading)

AJ = Adjustment Factor (unit-less) based on accident types (SGTR, SGTRG, SGTRM)

LR = Steam release rate from safety valve in pounds mass of steam released through each valve during valve open period (lbm/15 min), where;  
default release rate = 5.235E4 lbm/15 min

**NOTE:** Raddose 5 calculates steam source term for the GRABSL method as follows:

$$RR = SL_g \times LR \times (0.41 \text{ ft}^3/\text{lbm} \times 28320 \text{ ml}/\text{ft}^3 \times 1\text{E-}6 \text{ Ci}/\mu\text{Ci} \times 1/3600/\text{hr/s})$$

Where:

RR = release rate activity in Ci/sec

$SL_g$  = secondary grab sample ( $\mu\text{Ci}/\text{ml}$ )

LR = steam release rate from safety valves pounds mass of steam released through the respective valves during the valve open period (lbm/hr)  
default release rate = 5.235E4 lbm/15 min

**NOTE:** Raddose calculates the steam source term for the BACKSL method as follows:

$$RR = \text{Field Measurement Device Reading (mR/hr)} \times \text{FM Device Correlation} \\ (\mu\text{Ci/cc})/(\text{mR/hr})/X/Q(\text{sec/m}^3) \times (1\text{E-6 Ci}/\mu\text{Ci} \times 1\text{E+6 cc/m}^3=1)$$

**5.2.4 For Catawba only, use Step 5.2.5 source term assessment worksheet steam generator tube rupture coincident with loss of offsite power; when appropriate and due to the following:**

- Loss of offsite power and steamline radiation monitor is unavailable
- Primary to secondary coolant leakage is occurring
- Steam source term release is occurring
- Steam generator sample cannot be obtained
- Computer program for calculating steam release is not available

**Enclosure 5.2**  
**Steam Source Term Release**

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**5.2.5 (Catawba Only) Source term assessment worksheet with steam generator tube rupture coincident with loss of offsite power for unavailable Steam Line Monitor EMF \_\_\_\_\_.**

Unit \_\_\_\_\_ Dose Projection based on: \_\_\_\_/\_\_\_\_/\_\_\_\_:\_\_\_\_ Time since trip: \_\_\_\_\_ hours  
mm dd yy hh mm

EMF53 reading\* Correction Factor\*\* LR<sub>ps</sub> dT Lbsmr\*\*\* 1/VOPEN

\_\_\_\_\_ R/hr x \_\_\_\_\_  $\frac{\mu\text{Ci/ml}}{\text{R/hr}}$  x \_\_\_\_\_  $\frac{\text{gal}}{\text{min}}$  x \_\_\_\_\_ min x  $\frac{\text{lbsmr}}{2400 \text{ lbm}}$  x  $\frac{1}{\text{sec}}$

\*Note: If EMF53 < 5 R/hr, use 5 R/hr.

x  $3.785\text{E-}3 \frac{\text{Ci ml}}{\mu\text{Ci gal}}$  x =  $\frac{\text{Activity noble Gas}}{\text{sec}}$

Activity noble Gas x Iodine Ratio LOCA = Activity LOCA Iodine 131 Equivalent  
\_\_\_\_\_ = \_\_\_\_\_ Ci/sec

Activity noble Gas x Iodine Ratio core melt = Activity Lcore Melt Iodine 131 Equivalent  
\_\_\_\_\_ = \_\_\_\_\_ Ci/sec

Where:

LR<sub>ps</sub> = Primary to secondary leak rate in gal/min.

dT = Time that primary to secondary leakage has lasted from the start of the leak to the time of date that the projection is based on, in minutes.

Lbsmr = Mass of steam released from the PORV and/or code safety valves, in lbm.

VOPEN = Time the valve(s) are open in hours.

3.785E-3 =  $1\text{E-}6 \text{ Ci}/\mu\text{Ci} \times 3.785\text{E}3 \text{ ml/gal}$

2400 = Mass of steam in the faulted steam generator; conservative value is 2400 lbm (mass of steam from S/G nozzle to MSIV)\*\*\* If Lbsmr > 2400 lbm; use 2400 lbm.

Time since Rx Trip (hours)	EMF 53 Correction Factor ** (CF)	Iodine Ratio LOCA	Iodine Ratio Core Melt
≥ 0	7.74 E+3	1.52 E-3	4.23 E-3
≥ 2	9.82 E+3	1.95 E-3	1.46 E-3
≥ 4	9.96 E+3	2.24 E-3	2.21 E-2
≥ 8	1.28 E+4	2.63 E-3	4.09 E-2
≥ 24	2.15 E+4	3.00 E-3	1.14 E-1
≥ 48	3.69 E+4	3.05 E-3	1.78 E-1

Emergency ☐ or Drill ☐ Prepared by: \_\_\_\_\_

- 5.3.1 Determine type of accident source term release path and EMF monitor method.
- 5.3.2 Select an Accident Type for an affected release pathway:
- "LOCA"-Loss of Coolant Accident (normal coolant)
  - "LOCAG"-Loss of Coolant Accident gap release
  - "LOCAM"-Loss of Coolant Accident core melt
- 5.3.3 Select containment Noble Gas Method as follows:
- IF containment sample line is NOT isolated AND containment sample pump is NOT tripped, use the following guidance for Noble Gas Method selection:
    - (a) IF EMF 39(L)  $\leq$  1E7 counts per minute (cpm), select "CONL".
    - (b) IF EMF 39(L)  $>$  1E7 cpm AND EMF 39(H)  $\leq$  1E6 cpm, select "CONH".
    - (c) IF EMF 39(H)  $>$  1E6 cpm, select "CONHH".
  - IF containment sample line is isolated OR containment sample pump is tripped, use the following guidance for Noble Gas Method selection:
    - (a) IF containment sample results are available, select "GRABC".
    - (b) IF containment sample results are NOT available, select "CONHH".
- 5.3.4 IF CONL, OR CONH, OR CONHH was selected in Step 5.3.3, Raddose displays the Containment Bypass Release Pathway screen. Choose the appropriate selections for:
- (a) Ice Condenser: "No Recirculation", "Recirculation", or "No Ice"
  - (b) Hold-Up: " $\leq$ 24 Hours" or " $>$ 24 Hours"
  - (c) Spray Status: "On" or "Off"
  - (d) Containment Leak Rate Method: "Containment Pressure and Hole Size" or "Predefined/User Leak Rate"
  - (e) Enter or verify the Containment Pressure
  - (g) When all inputs on the Containment Bypass Release Pathway screen are correct, click on "OK"

<p><b>NOTE:</b> Containment source term can be calculated using containment EMF readings, containment samples, or field team data. Reference 2.2 can be used if no other data is available.</p>
---

- (h) IF "Manual" was selected in Step 4.2.7, enter the monitor reading.

**NOTE:** Raddose 5 calculates the containment source term for the CONL, CONH, AND CONHH methods as follows:

$$RR = EMF \times CF \times AJ \times BY \times Ci/\mu Ci \times 1/3600 \text{ hr/sec}$$

Where:

RR = release rate activity in Ci/sec

EMF = EMF39(L) count per minute (cpm) and  $EMF39(L) \leq 1E+7$  cpm; and containment sample line is not isolated and/or containment EMF sample pump is not tripped (CONL Method)

EMF = EMF39(H) cpm whenever EMF39(L) reading is  $> 1E+7$  cpm (offscale) and  $EMF39(H) \leq 1E+6$  cpm and/or sample line is not isolated and sample pump is not tripped (CON-H Method)

EMF = EMF53A/B - CNS or EMF51A/B - MNS R/hr reading whenever EMF39(H) is  $> 1E+6$  cpm (offscale) or EMF39 sample line is isolated, or EMF containment sample pump is tripped (CONHH Method)

CF = Containment Noble Gas monitor Correlation Factor

AJ = Adjustment factors for Noble Gas; Iodine's and Particulates

BY = Containment Bypass Fraction - Fraction of containment leakage of gases from inside containment which bypasses the annulus and auxiliary building and passes directly to the environment where, (default value = 0.07)

LR = Leak Rate of containment air to the annulus or environment (ml/hr) based on one of the following methods:

(a) Based on containment pressure and hole size corresponding to:

1. Normal Leakage - 0.3% per day at design pressure (15 psig)
2. Small Hole - 100% per day at design pressure (15 psig)

(b) Pre-defined Leak Rate corresponding to:

1. Normal Leakage (0.3% per day)
2. Small Hole (100% per day)
3. Large Hole (100% per hour)

**Enclosure 5.3**  
**Containment Source Term Release**

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**NOTE:** Raddose 5 calculates the containment source term for the GRABC method as follows:

$$RR = EMF \times CF \times AJ \times BY \times Ci/\mu Ci \times 1/3600 \text{ hr/sec}$$

Where:

$CON_g =$  Containment grab sample ( $\mu Ci/ml$ )

- All other parameters are the same as defined in the NOTE above.



**Enclosure 5.4**  
**Unit Vent Source Term Release**

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5.4.1 Determine type of accident, source term release pathway, and EMF monitor method.

5.4.2 Enter an accident type for affected release pathway.

- "LOCA" - Loss of Coolant Accident (normal coolant)
- "LOCAG" - Loss of Coolant Accident gap release
- "LOCAM" - Loss of Coolant Accident core melt
- "LOCO" - LOCA outside of containment (normal coolant)
- "LOCOG" - LOCA outside of containment gap release
- "LOCOM" - LOCA outside of containment core melt
- "SGTR" - Steam Generator Tube Rupture (normal coolant) with Condensate Stem Air Ejector(CSAE) pathway to unit vent
- "SGTRG" - Steam Generator Tube Rupture gap release Condensate Steam Air Ejector (CSAE) pathway to unit vent
- "SGTRM" - Steam Generator Tube Rupture core melt Condensate Steam Air Ejector (CSAE) pathway to unit vent
- "FUEL" - Fuel handling gas release

5.4.3 Select the appropriate unit vent EMF Noble Gas Method as follows:

- **IF** Unit Vent EMF Data is available, **AND** unit vent sample pump is **NOT** tripped, use the following guidance for Noble Gas Method selection:
  - (a) **IF**  $\text{EMF } 36(\text{L}) \leq 1\text{E}7$  counts per minute (cpm), select "UV1L" or "UV2L" as appropriate.
  - (b) **IF**  $\text{EMF } 36(\text{L}) > 1\text{E}7$  cpm **AND**  $\text{EMF } 36(\text{H}) \leq 1\text{E}6$  cpm, select "UV1H" or "UV2H" as appropriate.
  - (c) **IF**  $\text{EMF } 36(\text{H}) > 1\text{E}6$  cpm, select "UV1HH" or "UV2HH" as appropriate.

**Enclosure 5.4**  
**Unit Vent Source Term Release**

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- (d) Select the appropriate response for the Unit Vent Release Pathway Data screen as follows:
- (i) Filter Status - "On" or "Off"
  - (ii) Ice Condenser: "No Recirculation", "Recirculation", or "No Ice"
  - (iii) Hold-Up: "<= 24 Hours" or "> 24 Hours"
  - (iv) Spray Status: "On" or "Off"
  - (v) When all inputs on the Unit Vent Release Pathway screen are correct, click on "OK"

See Change B  
below

- (f) ~~(f)~~ IF "Manual" was selected in Step 4.2.7, enter the unit vent monitor reading
- (g) ~~(g)~~ Verify or enter the unit vent flow rate
- IF Unit Vent EMF Data is NOT available, use the following guidance for Noble Gas Method selection:
    - (a) IF Unit Vent Isotopic Sample data is available, select "GRABV1" or "GRABV2" as appropriate.
      - (i) Enter the grab sample data.
      - (ii) Click on "OK" for Raddose to calculate the source term in Ci/sec.
    - (b) IF Field Team Data is available, select "UV1-BACK" or "UV2-BACK" as appropriate.
      - (i) Enter the field team data.
      - (ii) Click on "OK" for Raddose to calculate the source term in Ci/sec.
    - (c) IF Total Source Term calculations are available, select "DRCT1" or "DRCT2" as appropriate.
      - (i) Enter the Noble Gas, Iodine, and Particulate source term data.
      - (ii) Click on "OK" for Raddose to calculate the source term in Ci/sec.
  - Check unaffected unit vent monitor data.
  - IF appropriate, repeat Step 5.4.3 to include source term assessment for unaffected unit.

**Change B**

**NOTE:** Catawba Engineering has determined that the Unit Vent Flow Monitor may NOT be accurate for flow rates less than 97,500 CFM

- (e) For Catawba ONLY. IF the Unit Vent Flow Monitor indicates a flow rate less than 97,500 CFM, use Enclosure 5.7 to determine the Unit Vent Flow.

**NOTE:** Raddose 5 calculates the unit vent source term for the UV1L, UV1H, UV1HH, UV2L, UV2H, AND UV2HH methods as follows:

- Ci/sec is distributed by isotope spectrum based on accident type and time after reactor shutdown.
- Raddose 5 calculates unit vent source term as follows:

$$RR = EMF \times CF \times AJ \times FR \times 1E-6 \text{ Ci}/\mu\text{Ci} \times 1/60 \text{ min/sec} \times 28320 \text{ ml/ft}^3$$

Where:

RR = release rate activity in Ci/sec

EMF = Use EMF36L counts per minute (cpm), if reading  $\leq 1E+7$  cpm and vent EMF sample pump is not tripped (UV1L, UV2L)

EMF = Use EMF36H cpm reading if EMF36L is offscale and  $EMF36H \leq 1E+6$  cpm and sample pump is not tripped (UV1H, UV2H)

EMF = Use EMF54 - CNS, EMF36HH - MNS (R/hr) reading if EMF36L and EMF36H are offscale, and/or vent EMF sample pump is tripped (UV1HH, UV2HH)

CF = Unit Vent radiation monitor Noble Gas Correlation Factor

AJ = Adjustment Factors for Noble Gas, Iodines and Particulates for accident types

FR = Unit vent flow rate in  $\text{ft}^3$  per minute, (No default rate); vent flow rate is a manual Raddose 5 input if query data is unavailable

**NOTE:** Raddose 5 calculates the unit vent source term for the GRABV1 and GRABV2 methods as follows:

$$RR = UV_g \times FR \times 1E-6 \text{ Ci}/\mu\text{Ci} \times 1/60 \text{ min/sec} \times 28320 \text{ ml/ft}^3$$

Where:

RR = release rate activity in Ci/sec

$UV_g$  = unit vent grab sample ( $\mu\text{Ci/ml}$ )

FR = Unit vent flow rate in  $\text{ft}^3$  per minute; (No default rate); vent flow rate is a manual Raddose 5 input if queried data is unavailable

**NOTE:** Raddose 5 calculates the source term for the UV1-BACK, UV2-BACK method as follows:

$$RR = \text{Field Measurement Device Reading (mR/hr)} \times \text{FM Device Correlation} \\ (\mu\text{Ci/cc})/(\text{mR/hr})/X/Q(\text{sec/m}^3) \times (1E-6 \text{ Ci}/\mu\text{Ci} \times 1E+6 \text{ cc/m}^3=1)$$

**Enclosure 5.5**  
**Radiological Emergency Action Levels**

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**5.5.1 Evaluate the Emergency Action Levels (EALs) based on radiological conditions in the affected site's EAL procedure:**

**CNS - RP/0/A/5000/001 - Classification of Emergency**

**MNS - RP/0/A/5700/000 - Classification of Emergency**

Enclosure 5.6  
Raddose 5 Green Form Report

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**Catawba Nuclear Station Unit No 1 Dose Assessment**  
**RADDOSE-V Version 3.0c**  
**Copyright 2002 Earth Tech**

Current Date: 12/09/2002  
Current Time: 14:41  
Operator: GTJ

Step #: 1  
Step Date: 12/09/2002  
Step Time: 12:15

\*\*\* FORECAST FOR 4 HOURS \*\*\*

**ACCIDENT DESCRIPTION:** General Emergency has NOT been declared  
Reactor Shutdown: 12/09/2002 1200 hrs

Accident Time: 12/09/2002 1200 hrs

**PATHWAY 1**

Accident Type:	LOCA	Flow Rate:	1.31E+05 ft <sup>3</sup> /min
Noble Gas Method	UV1HH (EMF54)	Monitor Reading:	1.54E+00 R/hr (P)
VentCF =	0.328		

**RELEASE RATES:**

Noble Gas Release Rate (Ci/sec):	3.12E+01 Ci/s	Above Normal Operating Limits
Iodine Release Rate (Ci/sec):	4.61E-02 Ci/s	
Particulate Release Rate (Ci/sec):	3.54E-03 Ci/s	

**ACTUAL, FORECAST AND TOTAL (Forecast + Integrated) DOSES:**

Distance (miles)	TEDE (mrem)			Thyroid CDE (mrem)		
	Actual	Forecast	Total	Actual	Forecast	Total
0.50	1.67E+01	2.67E+02	2.84E+02	1.71E+02	2.74E+03	2.91E+03
1.00	7.71E+00	1.23E+02	1.31E+02	6.46E+01	1.03E+03	1.10E+03
2.00	3.36E+00	5.40E+01	5.74E+01	2.32E+01	3.74E+02	3.97E+02
5.00	0.00E+00	1.42E+01	1.42E+01	0.00E+00	9.41E+01	9.41E+01
10.00	0.00E+00	4.79E+00	4.79E+00	0.00E+00	2.81E+01	2.81E+01

**METEOROLOGICAL DATA:**

Wind Speed:	9.5 mph (P)	Stability Class:	D (P)
Wind Direction:	From 44.90 deg To 224.90 deg		

**RECOMMENDED PROTECTIVE  
ACTIONS:**

Evacuate :	None
Shelter :	None

**Enclosure 5.6**  
**Raddose 5 Green Form Report**

**SH/0/B/2005/001**  
**Page 2 of 2**

**Catawba Nuclear Station Unit No 1 Dose Assessment**  
**RADDOSE-V Version 3.0c**  
**Copyright 2002 Earth Tech**

Current Date: 12/09/2002  
 Current Time: 14:41  
 Operator: GTJ

Step #: 1  
 Step Date: 12/09/2002  
 Step Time: 12:15

**\*\*\* FORECAST FOR 4 HOURS \*\*\***

**TOTAL (Forecast + Integrated) DOSES FROM 12/09/2002 12:00 TO 16:15:**

Distance (miles)	Current Dose Rates (mrem/hr)		Dose (mrem)		X/Q (sec/m3)
	TEDE	Thyroid CDE	TEDE	Thyroid CDE	
0.50	6.68E+01	6.85E+02	2.84E+02	2.91E+03	3.55E-05
1.00	3.08E+01	2.59E+02	1.31E+02	1.10E+03	1.34E-05
2.00	1.35E+01	9.35E+01	5.74E+01	3.97E+02	4.85E-06
5.00	3.49E+00	2.35E+01	1.42E+01	9.41E+01	1.22E-06
10.00	1.36E+00	8.03E+00	4.79E+00	2.81E+01	4.16E-07

**DOSE CONVERSION FACTORS:**

mrem \*m^3/Ci\*hr

TEDE:	2.15E+07
PlumeEDE:	8.65E+04
Ground EDE:	7.33E+06
CDE Thyroid:	4.18E+08
Inhalation:	1.41E+07

**EMERGENCY CLASS:**

	Total Effective Dose Equivalent	Adult Thyroid
Site Area Emergency :	Yes >= 100 mrem	Yes >= 500 mrem
General Emergency :	No < 1000 mrem	No < 5000 mrem
PAG Dose Limits:	1 rem	5 rem
PAG Exceeded at Site Boundary?	No	No
PAG Distances (miles):	N/A	N/A -

**MONITOR CORRECTION FACTORS:**

	Pathway 1
Time Since Trip (Hrs)	0.00
Ice Condenser	No Recirc
Sprays	On
Hold-Up Time	<=24 hrs
Cont Leak Rate Method	.....
Cont Leak Type	
Cont Pressure	
Cont Leak Rate	.....
Cont Bypass Fraction	.....
Filters	No
SG Partitioned	.....
Pool Scrubbing	.....
Field Measurement	.....
Distance	.....
Direction	.....
Fuel Assembly Age (Days)	.....

Enclosure 5.7  
Catawba Unit Vent Flow Calculation Worksheet

- 5.7.1 Determine the status (On or Off) of each fan in list below.  
5.7.2 **IF** the Fan is "ON", place the Expected Flow (CFM) value into the Flow column of this worksheet.  
5.7.3 **IF** the Fan is "OFF", place "0" CFM into the Flow column of this worksheet.  
5.7.4 Total the values in the Flow column to calculate the Calculated Unit Vent Flow.

Unit 1 / Unit 2 (circle one)	Expected Flow (CFM)	Fan Status (Circle one)	Flow (CFM)
<b>Aux. Building Ventilation (VA)</b>			
Auxiliary Building Ventilation (VA) Filtered Exhaust Fan A	12,500	(On / Off)	_____
Auxiliary Building Ventilation (VA) Filtered Exhaust Fan B	12,500	(On / Off)	_____
Auxiliary Building Ventilation (VA) Unfiltered Exhaust Fan A	20,350	(On / Off)	_____
Auxiliary Building Ventilation (VA) Unfiltered Exhaust Fan B	20,350	(On / Off)	_____
<b>Fuel Pool Ventilation (VF)</b>			
Fuel Pool Ventilation (VF) "A" Train Exhaust Fans (A1 & A2)	33,130	(On / Off)	_____
Fuel Pool Ventilation (VF) "B" Train Exhaust Fans (B1 & B2)	33,130	(On / Off)	_____
<b>Annulus Ventilation (VE)</b>			
Annulus Ventilation (VE) Fan A	750	(On / Off)	_____
Annulus Ventilation (VE) Fan B	750	(On / Off)	_____
<b>Containment Air Release and Addition (VQ)</b>			
VQ Fans (assume fans ARE running)	300	(On)	_____
<b>Calculated Total Vent Flow:</b>			_____

NOTE: A Spreadsheet may be used in place of this enclosure.