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DUKE POWER COMPANY

EMERGENCY DOSE ASSESSMENT MANUAL

July 12, 1990

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EMERGENCY DOSE ASSESSMENT MANUAL
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CRISIS MANAGEMENT PLAN

IMPLEMENTING PROCEDURE

EDA - 3

"Off-Site Dose Projections for
McGuire Nuclear Station"

L E Harris — Approved By

5/30/90 — Date

Rev. 6
May 30, 1990

OFFSITE DOSE PROJECTIONS FOR MCGUIRE NUCLEAR STATION

1.0 Purpose

1.1 To describe a method for projecting dose commitment from a noble gas and/or iodine release, through the containment, the unit vent and/or the steam relief valves, during an emergency. Where appropriate, the Dose Assessment Coordinator, or designee, may deviate from this procedure due to varying plant conditions.

2.0 References

2.1 HP/0/B/1003/08, Determination of Radiation Monitor Setpoints (EMF's).

2.2 HP/0/B/1009/02, Alternative Method for Determining Dose Rate Within the Reactor Building.

2.3 HP/0/B/1009/10, Releases of Liquid Radioactive Material Exceeding Technical Specifications.

2.4 HP/1/B/1009/15 and HP/2/B/1009/15, Post-Accident Containment Air Sampling System Operating Procedures.

2.5 HP/0/B/1009/06, Procedure for Quantifying High Level Radioactivity Releases During Accident Conditions.

2.6 McGuire Nuclear Station Technical Specifications 3.6.1.2.

2.7 Offsite Dose Calucation Manual (ODCM).

2.8 Regulatory Guide 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors".

2.9 Regulatory Guide 1.109, "Calculations of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I".

2.10 NuReg-0396, EPA 520/1-78-016, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants".

2.11 NuReg-0654, FEMA-REP-1,Rev.1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants".

2.12 Letter from T.G. Hudson; September 30, 1985, re: Release Rate Information from McGuire and Catawba Nuclear Station.

2.13 McGuire Nuclear Station Class A Computer Model Validation.

3.0 Limits and Precautions

3.1 This procedure is an alternative method of dose assessment to the Class A Atmospheric Dispersion Model computer code.

3.2 This procedure applies to releases made from McGuire Nuclear Station only. Many of the values contained in this procedure are site specific.

3.3 It is assumed that the whole body dose from an iodine release is very small compared to the thyroid dose; therefore, iodine whole body dose is not considered here.

3.4 This procedure considers all releases to be ground level releases and that all meteorological data are 15 minute averages.

3.5 Once a zone has been added to the list of affected zones, it shall not be removed except under the direction of the Dose Assessment Coordinator.

3.6 Once the Crisis Management Center (CMC) has been activated, the doses calculated by the Technical Support Center (TSC) dose assessment group, shall be compared with those calculated by the CMC before an evacuation recommendation is made.

3.7 EMF's 38, 39, and 40 will isolate on a phase A containment isolation (1 psig in containment). Therefore, EMF's 38L, 38H, 39L, 39H, 40 and 48 should not be considered valid when containment pressure is $\geq$ 1 psig.

3.8 The sample pump to EMF's 35, 36, and 37 will trip when there is a Trip 1 on EMF 36 HH. Therefore, EMF's 35L, 35H, 36L, 36H, and 37 should not be considered valid when EMF 36 HH is $\geq$ Trip 1 (usually set at 5-7 R/Hr).

4.0 Procedure

NOTE: Much of the information for the meteorology assessment can be obtained on ~~the~~ OAC, (Tech. Spec. 04 program). See Enclosure 5.14 for instructions.

4.1 Meteorology Assessment

4.1.1 Acquire the following information and record on the Dose Assessment Report and Meteorology Worksheet (Enclosures 5.1 and 5.2 respectively).

4.1.1.1 Lower tower wind speed (WS) in miles per hour.

4.1.1.1.1 Use upper tower wind speed if lower tower wind speed is not available.

4.1.1.2 Upper tower wind direction in degrees from North (North = 0).

4.1.1.2.1 Use lower tower wind direction if upper tower wind direction is not available.

4.1.1.2.2 If the wind speed or wind direction can not be obtained from plant systems, obtain them from the National Weather Service (phone 399-6000). If the NWS information is unavailable, then obtain data from the CNS Control Room (8-831-2338).

4.1.1.3 Temperature gradient (ΔT) in degrees centigrade.

4.1.1.4 Using Enclosure 5.3, determine the stability class based on ΔT. If ΔT is unknown, then the following applies:

4.1.1.4.1 If between 1000 - 1600 hours, use stability class D;

4.1.1.4.2 If between 1600 - 1000 hours, use stability class G.

4.1.1.5 If necessary, use forecasted meteorological data for calculating doses due to changing meteorological conditions.

4.1.2 Determine the atmospheric dispersion parameters, $\overline{X/Q}$ (sec/m^3), for .5, 2, 5 and 10 miles (record on Enclosure 5.1).

4.1.2.1 Using ΔT, determine the two hour relative concentration value (C_H) from Enclosure 5.3.

4.1.2.2 Convert the C_H values to X/Q:

$$\overline{X/Q} = \frac{C_H}{\overline{WS}}$$

4.1.3 Using Enclosure 5.4, circle on Enclosure 5.1 the protective action zones (PAZ), based upon wind speed and wind direction.

4.1.4 Recheck meteorological conditions approximately every 15 minutes to ensure that other zones have not been affected.

4.2 Source Term Assessment - Steam Relief Valves (Enclosure 5.5)

NOTE: Much of the information for Steam Relief Valve source term assessment can be obtained from the OAC (General 19 program). See Enclosure 5.14 for instructions.

4.2.1 Determine the Sub-Noble Gas Release Rates, SQ_{NG} (Ci/sec), by the following method:

4.2.1.1 For Unit 1 - EMF24, EMF25, EMF26 and EMF27
For Unit 2 - EMF10, EMF11, EMF12, and EMF13

$$SQ_{NG} = mR/hr \times \frac{1}{VOPEN} \times LBM \times CF$$

where:

mR/hr = EMF reading
Unit 1 = EMF's 24, 25, 26, 27
Unit 2 = EMF's 10, 11, 12, 13
VOPEN = time the valve is open in seconds
LBM = lbm released for the time the valve was open
CF = the correction factor per Enclosure 5.6

$$\text{Units} = \frac{Ci}{lbm\ mR/hr}$$

4.2.2 Determine the Noble Gas Release Rate, Q_{NG} (Ci/sec):

Q_{NG} = SQ_{NG} (1EMF24 or 2EMF10) +
SQ_{NG} (1EMF25 or 2EMF11) +
SQ_{NG} (1EMF26 or 2EMF12) +
SQ_{NG} (1EMF27 or 2EMF13)

4.2.3 Determine the Iodine release rate, Q_I (Ci/sec):

$Q_I = Q_{NG} \times$ I/Xe ratio

where:
I/Xe ratio = ratio of I-131 eqv./Xe-133 eqv. from Enclosure 5.7

4.2.4 Record Q_{NG} and Q_I from the steam relief valves on Enclosure 5.1.

4.3 Source Term Assessment - Containment (Enclosure 5.8)

NOTE: Some of the information for Containment source term assessment can be obtained from the OAC (Tech Spec 04 program). See Enclosure 5.14 for instructions.

4.3.1 Determine the Noble Gas Release Rate, Q_{NG} (Ci/sec) based on one of the following methods:

NOTE: See Limit and Precaution 3.7.

4.3.1.1 Based on an EMF reading, where;

$Q_{NG} = EMF \times CF \times LR$

where:
EMF = 39(L), if EMF39(L) < 1E7 cpm,
EMF = 39(H), if EMF39(L) is offscale and EMF39(H) > 100 cpm,
EMF = 51A or 51B; if EMF39(H) is offscale

CF = the correction factor per Enclosure 5.9

LR = Leak Rate, (ml/hr) by one of the following methods:

based on containment pressure:

LR = RLR (from Enclosure 5.10)

based on an opening in containment:

LR = OIC (from Enclosure 5.11)

based on design leak rate:

LR = 1.714E5 (reference 2.13) assuming bypass leakage of 0.07.

4.3.1.2 Based on PAGS sample or sample collected in accordance with reference 2.5, where;

$$Q_{NG} = \text{Conc.} \times CF \times LR$$

where:

Conc = the Xe-133 equivalent concentration (μCi/ml) from Reference 2.4 or 2.5

CF = 2.78E-10 $\frac{\text{Ci hr}}{\text{sec } \mu\text{Ci}}$

LR = leak rate, as determined in step 4.3.1.1 above

4.3.2 Determine the Iodine Release Rate Q_I (Ci/sec), based on one of the following methods:

4.3.2.1 Based on Q_{NG};

$$Q_I = Q_{NG} \times \text{I/Xe ratio}$$

where:

Q_{NG} = noble gas release rate as

determined in Step 4.3.1 above

I/Xe ratio = ratio of I-131 eqv./Xe-133 eqv. from Enclosure 5.7.

4.3.2.2 Based on EMF40:

$$Q_I = \frac{\Delta CPM}{\Delta min} \times 6.54E\text{-}20 \frac{Ci\ hr\ min}{sec\ ml\ cpm} \times LR$$

where:

ΔCPM = reading from EMF40

Δmin = the time interval for EMF40 observation (normally 15 minutes)

LR = leak rate as determined in step 4.3.1.1 above

6.54E-20 = (4.0E-5 μCi/cpm x .1667 min/ft^3 x 3.53E-5 ft^3/ml x 1Ci/1E6 μCi x 1 hr/3600 sec)

4.0E-5 = correlation factor for EMF40 from Reference 2.1

.1667 min/ft^3 = inverse of EMF flow rate

4.3.2.3 Based on PAGS sample or sample collected in accordance with reference 2.5.

$$Q_I = Conc \times 2.78E\text{-}10 \frac{Ci\ hr}{sec\ \mu Ci} \times LR$$

where:

Conc = I-131 equivalent concentration (μCi/ml) from Reference 2.4 or reference 2.5

LR = leak rate as determined in step 4.3.1.1 above

4.3.3 Record ~~Q_{NG}~~ and Q_I from containment on Enclosure 5.1.

4.4 Source Term Assessment - Unit Vent (Enclosure 5.12)

NOTE: Some of the information for Unit Vent source term assessment can be obtained from the OAC (Tech Spec 04 program). See Enclosure 5.14 for instructions.

4.4.1 Determine the Noble Gas Release Rate, Q_{NG} (Ci/sec), based on one of the following methods:

4.4.1.1 Based on an EMF reading, where

NOTE: See Limit and Precaution 3.8.

$$Q_{NG} = EMF \times CF \times CFM$$

where:

EMF = 36(L) if EMF36(L) < 1E7 cpm

EMF = 36(H) if EMF36(L) is offscale and EMF36(H) is > 100 cpm

EMF = 36(HH) if EMF36(H) is offscale

CF = the correction factor per Enclosure 5.13

CFM = unit vent flow rate (ft^3/min)

4.4.1.2 Based on unit vent sample, where;

$$Q_{NG} = Conc. \times CF \times CFM$$

where:

Conc = the Xe-133 equivalent concentration (μCi/ml) from Reference 2.5

CF = 4.72E-4 $\frac{Ci\ min\ ml}{sec\ ft^3\ \mu Ci}$

CFM = Unit vent flow (ft^3/min)

4.4.2 Determine the Iodine Release Rate Q_I (Ci/sec) based on one of the following methods:

4.4.2.1 Based on Q_{NG};

$$Q_I = Q_{NG} \times I/Xe\ ratio$$

where:

Q_{NG} = noble gas release rate as determined in step 4.4.1 above

I/Xe ratio = ratio of I-131 eqv./Xe-133 eqv. from Enclosure 5.7

4.4.2.2 Based on EMF37:

$$Q_I = \frac{\Delta CPM}{\Delta min} \times 1.11E\text{-}13 \frac{Ci\ min\ min}{sec\ ft^3\ cpm} \times CFM$$

where:

ΔCPM = reading from EMF37

Δmin = the time interval for EMF37 observation (normally 15 minutes)

CFM = unit vent flow (ft^3/min)

1.11E-13 = (4.0E-5 μCi/cpm x .1667 min/ft^3 x 1 Ci/1E6 μCi x 1 min/60 sec)

4.0E-5 = correlation factor for EMF 37 from Reference 2.1

.1667 ft^3/min = inverse of EMF flow rate

4.4.2.3 Based on unit vent sample:

$$Q_I = Conc \times 4.72E\text{-}4 \frac{Ci\ min\ ml}{sec\ ft^3\ \mu Ci} \times CFM$$

where:

Conc = I-131 equivalent concentration (μCi/ml) from Reference 2.5

CFM = unit vent flow rate (ft^3/min)

4.4.3 Record Q_{NG} and Q_I from the unit vent on Enclosure 5.1.

4.5 Dose Assessment (Enclosure 5.1)

4.5.1 Determine the total Noble Gas and Iodine Release Rates (TQ_{NG} and TQ_I) by summing Q_{NG} and Q_I from all releases.

4.5.2 Determine the Projected Whole Body Dose Rate, DRwb (Rem/hr), due to noble gases for .5, 2, 5 and 10 miles:

$$DRwb = \overline{X/Q} \times TQ_{NG} \times 33.6 \frac{Rem\ m^3}{hr\ Ci}$$

where:

33.6 is the adult whole body dose conversion factor from Reference 2.9 in $\frac{Rem\ m^3}{hr\ Ci}$

4.5.3 Determine the Projected Whole Body Dose, Dwb (rem), due to noble gases for .5, 2, 5 and 10 miles:

$$Dwb = DRwb \times 2\ hr$$

where:

dose is integrated over 2 hour time period

4.5.4 Determine the Projected Child Thyroid Dose Rate, DRct (Rem/hr), due to iodine for .5, 2, 5 and 10 miles:

$$DRct = \overline{X/Q} \times TQ_{I} \times 2.26E6 \frac{Rem\ m^3}{hr\ Ci}$$

where:

2.26E6 is the child thyroid dose conversion factor from Reference 2.13 in $\frac{Rem\ m^3}{hr\ Ci}$

4.5.5 Determine the Projected Child Thyroid Dose, Dct(Rem), due to iodine for .5, 2, 5 and 10 miles:

$$Dct = DRct \times 2\ hr$$

where:

dose is integrated over 2 hour time period

4.6 Protective Action Recommendations (Enclosure 5.1, page 2 of 2):

4.6.1 Record the next sequential report number.

4.6.2 Determine release status by the following guidance criteria:

No Release - no potential release of activity generated by the event.

Potential Release - activity generated by the event that can potentially be released, but is not currently being released.

Release Within Normal Operating Limits - activity generated by the event currently or previously released within normal operating limits.

Release Above Normal Operating Limits - activity generated by the event currently or previously released above normal operating limits.

4.6.3 Circle the PAZs and the actions for the current and previous protective action recommendations.

4.6.4 If the projected dose in a PAZ is < 1 Rem whole body and < 5 Rem thyroid, then recommend no protective action (action A).

4.6.5 If the projected dose in a PAZ is 1 - 5 Rem whole body or 5 - 25 Rem thyroid, then recommend evacuation of children and pregnant women and shelter others (action B and E).

4.6.6 If the projected dose in a PAZ is > 5 Rem whole body or > 25 Rem thyroid, then recommend evacuation of everyone (action C).

4.6.7 If the dose rate at the site boundary is $\geq$ 5.0E-4 Rem/hr whole body, then recommend an Alert.

4.6.8 If the dose rate at the site boundary is $\geq$ .05 Rem/hr whole body or $\geq$ .25 Rem/hr thyroid, then recommend a Site Area Emergency if readings last 30 minutes.

4.6.9 If the dose rate at the site boundary is $\geq$ .5 Rem/hr whole body or $\geq$ 2.5 Rem/hr thyroid, then recommend a Site Area Emergency if readings last 2 minutes.

4.6.10 If the dose rate at the site boundary is $\geq$ 1 Rem/hr whole body of $\geq$ 5 Rem/hr thyroid, then recommend a General Emergency.

5.0 Enclosures

5.1 Dose Assessment Report

5.2 Meteorology Worksheet

5.3 Two-hour Relative Concentration Factors (C_H)

5.4 Protective Action Zones Determination

5.5 Source Term Assessment - Steam Relief Valves

5.6 EMF24, EMF25, EMF26, EMF27 or EMF10, EMF11, EMF12, EMF13 Noble Gas Correction Factors (Steam Line Monitors)

5.7 I-131 eqv./Xe-133 eqv. Ratio

5.8 Source Term Assessment - Containment

5.9 Containment Monitors - Correction Factors

5.10 Containment Leakage Rate versus Pressure

5.11 Containment Leakage Rate versus Pressure and Size Opening

5.12 Source Term Assessment - Unit Vent

5.13 Unit Vent Monitors - Correction Factors

5.14 OAC Instructions

McGUIRE NUCLEAR STATION
DOSE ASSESSMENT REPORT

[redacted] _____ Report # _____

Reactor Trip _____/_____ Projection based on data on _____/_____
(date/time) (date/time)

Prepared by: _____

Meteorology Assessment [ ] Current [ ] Hypothetical
Wind Speed _____ mph Wind Direction _____ degrees from North
Temperature Gradient (ΔT) _____ C Stability Class A B C D E F G

Miles	0 - 2	2 - 5	5 - 10
PAZ	L B M C	N A D O R	E F G H I J K P Q S

Total Source Term Assessment [ ] Current [ ] Hypothetical

Steam Relief Enclosure 5.5		Containment Enclosure 5.8		Unit Vent Enclosure 5.12		Total (Ci/sec)	
_____ Ci/sec	+	_____ Ci/sec	+	_____ Ci/sec	=	_____	= TQ_{NG}
_____ Ci/sec	+	_____ Ci/sec	+	_____ Ci/sec	=	_____	= TQ_{I}

Dose Assessment $\frac{C_H}{WS} = \overline{X/Q}$

<---< Adult whole body <---<

2 hr Dose (rem) <-- 2 x DRwb (rem/hr) <-- 33.6 x TQ_{NG} (Ci/sec) x $\overline{X/Q}$ (sec/m^3)

>---> Child thyroid >--->

$\overline{X/Q}$ x TQ_{I} (Ci/sec) x 2.26E6 >--> DRct (rem/hr) x 2 >--> 2 hr Dose (rem)

Distance miles	$\overline{X/Q}$ (sec/m^3)	Adult whole body: 2 hr Dose = 2 x DRwb = 33.6 x TQ_{NG}	Child thyroid: 2 hr Dose = $\overline{X/Q}$ x TQ_{I} x 2.26E6 = DRct x 2
.5	_____	_____ = 2 x _____ = 33.6 x _____	_____ x 2.26E6 = _____ x 2 = _____
2	_____	_____ = 2 x _____ = 33.6 x _____	_____ x 2.26E6 = _____ x 2 = _____
5	_____	_____ = 2 x _____ = 33.6 x _____	_____ x 2.26E6 = _____ x 2 = _____
10	_____	_____ = 2 x _____ = 33.6 x _____	_____ x 2.26E6 = _____ x 2 = _____
1	_____	_____ = 2 x _____ = 33.6 x _____	_____ x 2.26E6 = _____ x 2 = _____
4	_____	_____ = 2 x _____ = 33.6 x _____	_____ x 2.26E6 = _____ x 2 = _____
7	_____	_____ = 2 x _____ = 33.6 x _____	_____ x 2.26E6 = _____ x 2 = _____
8	_____	_____ = 2 x _____ = 33.6 x _____	_____ x 2.26E6 = _____ x 2 = _____

Field Data

Adult whole body

Location	Dose Rate Rem/hr	2hr Dose Rem
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Child thyroid

Location	Dose Rate Rem/hr	2hr Dose Rem
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

[redacted] Emergency [ ] Drill

McGUIRE NUCLEAR STATION
DOSE ASSESSMENT REPORT

To Emergency Coordinator _____ Report # _____

The emergency condition:

_____ (a) No release - no potential release of activity generated by the event.
_____ (b) Potential release - activity generated by the event that can potentially be released, but is not currently being released.
_____ (c) Release (within normal operating limits) - activity generated by the event currently or previously released within normal operating limits.
Started _____ Stopped _____ In progress _____
_____ (d) Release (above normal operating limits) - activity generated by the event, currently or previously released above normal operating limits.
Started _____ Stopped _____ In progress _____

The following protective actions are recommended:

Miles	PAZ	Current Actions	Previous Actions
0 - 2	L,B,M,C	A B C E	A B C E
2 - 5	N,A,D,O,R	A B C E	A B C E
5 - 10	E,F,G,H,I,J,K,P,Q,S	A B C E	A B C E

A - Monitor environmental radiation levels. No specific actions.
(Less than 1 Rem Whole Body and less than 5 Rem Thyroid)

B - Remain indoors with windows closed, turn off air conditioners and other ventilation, monitor EBS stations. Control access. (Action E also)
(1-5 Rem Whole Body or 5-25 Rem Thyroid)

C - Evacuate; seek shelter if immediate evacuation is not possible. Monitor environmental radiation levels. Control access.
(Greater than 5 Rem Whole Body or greater than 25 Rem Thyroid)

E - Pregnant women and children evacuate and go to designated shelter.
(1-5 Rem Whole Body or 5-25 Rem Thyroid)

* - based on field data

Emergency Classification based on Radiological Data

[ ] Recommend Alert
(Dose rate at 0.5 miles is > .5 mR/hr Whole Body)

[ ] Potential Site Area Emergency if readings last 30 minutes
[ ] Recommend Site Area Emergency Now, readings have lasted 30 minutes
(Dose rate at 0.5 miles is > .05 Rem/hr Whole Body or > .25 Rem/hr Thyroid)

[ ] Recommend Site Area Emergency if readings last 2 minutes
(Dose rate at 0.5 miles is > .5 Rem/hr Whole Body or > 2.5 Rem/hr Thyroid)

[ ] Recommend General Emergency
(Dose rate at 0.5 miles is > 1 Rem/hr Whole Body or > 5 Rem/hr Thyroid)

Comments:

Doses concur with CMC? (Yes/No/NA)

_____ _____/
Dose Assessment Coordinator Date/Time

[ ] Emergency
[ ] Drill

EDA-3
Enclosure 5.2

McGUIRE NUCLEAR STATION
METEOROLOGY

Unit: _____ Report #: _____

Reactor Trip: ____/____

Prepared by: _____

Wind speed (WS) _____ mph

Wind direction _____ °N

ΔT _____ °C

Default Data

1000 to 1600 hrs.	Wind speed (WS)	_____	mph
	Wind direction	_____	°N
	Stability Class	D	°C
1600 to 1000 hrs.	Wind speed (WS)	_____	mph
	Wind direction	_____	°N
	Stability Class	G	°C

NOTE: If the wind speed or wind direction cannot be obtained from plant systems, obtain them from the National Weather Service, 399-6000. If NWS information is unavailable, then obtain data from the Catawba Nuclear Station Control Room, 8-831-2338.

McGUIRE NUCLEAR STATION

TWO-HOUR RELATIVE CONCENTRATION FACTORS (C_H)

Temperature Gradient	Stability Class	Distance (Miles)										
		.5	1	2	3	4	5	6	7	8	9	10
1) $\Delta T < -.6$	A	1.4E-5	1.2E-6	5.9E-7	4.1E-7	3.2E-7	2.5E-7	2.0E-7	1.9E-7	1.8E-7	1.6E-7	1.5E-7
2) $-.6 \leqq \Delta T < -.5$	C	1.5E-4	4.5E-5	1.3E-5	6.3E-6	3.9E-6	2.7E-6	1.9E-6	1.4E-6	1.1E-6	8.3E-7	7.8E-7
3) $-.5 \leqq \Delta T < -.2$	D	3.8E-4	1.4E-4	4.9E-5	2.7E-5	1.7E-5	1.2E-5	9.2E-6	7.3E-6	6.0E-6	5.0E-6	4.3E-6
4) $-.2 \leqq \Delta T < +.4$	E	6.9E-4	2.5E-4	9.6E-5	5.5E-5	3.5E-5	2.5E-5	2.0E-5	1.6E-5	1.3E-5	1.1E-5	9.7E-6
5) $+.4 \leqq \Delta T < +1.2$	F	1.1E-3	5.1E-4	2.0E-4	1.2E-4	8.2E-5	6.3E-5	5.1E-5	4.3E-5	3.8E-5	3.3E-5	3.0E-5
6) $+1.2 \leqq \Delta T$	G	1.8E-3	1.1E-3	4.3E-4	2.7E-4	2.0E-4	1.7E-4	1.3E-4	1.2E-4	8.6E-5	7.8E-5	7.3E-5

NOTE: If ΔT is unavailable use: 1000-1600 hours Use Stability Class D

1600-1000 hours Use STability Class G

There is no B Stability Class for McGuire.

McGUIRE NUCLEAR STATION

PROTECTIVE ACTION ZONES DETERMINATION

Determine the affected zones (based on wind direction) from the table below and record on Enclosure 5.1.

NOTE: If wind speed is less than or equal to 5 mph - the affected zones for 0 - 5 miles shall be L,B,M,C,N,A,D,O,R

Wind Direction Degrees from North)	0 - 5 Miles	5 - 10 Miles
0 - 22.5	L,B,M,C,D,O,R	E,S,F
22.6 - 45.0	L,B,M,C,D,O,R	E,Q,S
45.1 - 67.5	L,B,M,C,D,O,R	E,Q,S
67.6 - 90.0	L,B,M,C,D,O,R,N	P,Q,S
90.1 - 112.5	L,B,M,C,O,R,N	K,P,Q,S
112.6 - 135.0	L,B,M,C,O,N,R,A	I,K,P,Q,S
135.1 - 157.5	L,B,M,C,O,A,N	I,K,P,Q
157.6 - 180.0	L,B,M,C,A,N	I,J,K,P
180.1 - 202.5	L,B,M,C,A,N	G,H,I,J,K,P
202.6 - 225.0	L,B,M,C,A,N,D	G,H,I,J,K,P
225.1 - 247.5	L,B,M,C,A,D	F,G,H,I,J
247.6 - 270.0	L,B,M,C,A,D	F,G,H,I,J
270.1 - 292.5	L,B,M,C,A,D	E,F,G,H,J
292.6 - 315.0	L,B,M,C,A,D	E,F,G
315.1 - 337.5	L,B,M,C,D,R	E,F,G
337.6 - 359.9	L,B,M,C,D,R	E,F,S

EDA-3
Enclosure 5.5
(BLUE)

McGUIRE NUCLEAR STATION
SOURCE TERM ASSESSMENT - STEAM RELIEF VALVES

Report # _____

Reactor Trip _____/_____
(date/time)

Projection based on data on _____/_____
(date/time)

Calculations based on _____ Melted Core _____ LOCA

NOBLE GAS

based on EMF24 or EMF10

_____ mR/hr x $\frac{1}{\text{_____ sec}}$ x _____ lbm x $\frac{\text{_____ Ci*}}{\text{lbm mR/hr}}$ = _____ Ci/sec

+

based on EMF25 or EMF11

_____ mR/hr x $\frac{1}{\text{_____ sec}}$ x _____ lbm x $\frac{\text{_____ Ci*}}{\text{lbm mR/hr}}$ = _____ Ci/sec

+

based on EMF26 or EMF12

_____ mR/hr x $\frac{1}{\text{_____ sec}}$ x _____ lbm x $\frac{\text{_____ Ci*}}{\text{lbm mR/hr}}$ = _____ Ci/sec

+

based on EMF27 or EMF13

_____ mR/hr x $\frac{1}{\text{_____ sec}}$ x _____ lbm x $\frac{\text{_____ Ci*}}{\text{lbm mR/hr}}$ = _____ Ci/sec

+

Total from all Steam Relief Valves, Q_{NG} = _____ Ci/sec

IODINE

From all Steam Relief valves

_____ Ci/sec(Q_{NG}) x _____ I-131 eqv./Xe-133 eqv. ratio (Enclosure 5.7) = _____ Ci/sec (Q_I)

[ ] Emergency [ ] Drill Prepared by: _____

McGUIRE NUCLEAR STATION
STEAM LINE MONITOR
NOBLE GAS CORRECTION FACTOR
EMF24, EMF25, EMF26, EMF27 or
EMF10, EMF11, EMF12, EMF13

Time Since Trip (hrs)	Correction Factor
≥ 0	6.3820×10^{-3}
≥ 2	1.1255×10^{-2}
≥ 4	1.2763×10^{-2}
≥ 8	1.4736×10^{-2}
≥ 24	1.6476×10^{-2}
≥ 48	1.6476×10^{-2}
≥ 100	1.6476×10^{-2}
≥ 250	1.6476×10^{-2}
≥ 500	1.6476×10^{-2}
≥ 720	1.6476×10^{-2}

* units in $\frac{\text{Ci}}{\text{lbm mR/hr}}$

* Enclosure 5.6 is the correlation factor per Reference 2.13 x 2.83E4 $\frac{\text{ml}}{\text{ft}^3}$ x .41 $\frac{\text{ft}^3}{\text{lbm}}$ x $\frac{\text{Ci}}{\text{1E6 } \mu\text{C}}$

.41 = specific gravity of steam per Reference 2.13.

McGUIRE NUCLEAR STATION
I-131 eqv./Xe-133 eqv. Ratio

NOTE: For containment releases in which I/Xe ratio is utilized to determine I-131 equiv. concentration, apply the appropriate correction from the table below.

Time Since Trip (hrs)	Column 1 Ratio based on LOCA	Column 2 Ration based on Melted Core
≥ 0	2.91E-3	2.24E-3
≥ 2	3.61E-3	9.66E-3
≥ 4	4.05E-3	1.59E-2
≥ 8	4.64E-3	2.85E-2
≥ 24	5.08E-3	7.52E-2
≥ 48	5.11E-3	1.11E-1
≥ 100	5.42E-3	1.33E-1
≥ 250	7.00E-3	1.80E-1
≥ 500	1.09E-2	2.90E-1
≥ 720	1.53E-2	4.33E-1

* Enclosure 5.7 is from Reference 2.13.

NOTE: For vent releases in which I/Xe ratio is utilized to determine I-131 equiv. concentration, apply the appropriate correction from the table below:

1. LOCA, use column 1 (based on LOCA).
2. LOCA through charcoal filters, divide column 1 value by 100.
3. Core damage, use column 2 (based on Core Melt).
4. Core damage through charcoal filters, divide column 2 values by 100.
5. Tube rupture, use 1.53E-5. (Column 1 value at ≥ 720 hrs. divided by 1000).
6. New fuel accident, use 2.217E-4. (Column 2 value at ≥ 100 hrs. divided by 600).
7. Old fuel accident, use 7.217E-4. (Column 2 value at ≥ 720 hrs. divided by 600).
8. Gas decay tank, assume no radioiodine released, only noble gases are considered to be released from gas tank.

NOTE: For steam releases in which I/Xe ratio is utilized to determine I-131 equiv. concentration, apply the appropriate correction from the table below:

1. Design basis primary coolant, divide column 1 value by 100.
2. Iodine spiked primary coolant, use column 1.
3. Core damage, divide column 2 value by 100.

EDA-3
Enclosure 5.8
(YELLOW)

McGUIRE NUCLEAR STATION
SOURCE TERM ASSESSMENT - CONTAINMENT

Report # _____

Reactor Trip ____/____ (date/time)

Projection based on data on ____/____ (date/time)

Calculations based on _____ Melted Core _____ LOCA
Containment pressure _____ psig
LR = _____ ml/hr
LR based on: (circle one) Realistic Leak Rate

Opening in Containment
Opening size: _____

Design Leak Rate
(1.714E5) assuming
bypass leakage of 0.07

NOBLE GAS

based on (check one)

EMF39(L) [ ] if < 1E7 cpm

EMF39(H) [ ] if > 100 cpm

EMF51 [ ] if 39(H) is offscale

EMF		CF		LR		Q_{NG}
_____ cpm or R/hr	x	_____ (Encl. 5.9)	x	_____ ml/hr	=	_____ Ci/sec

based on PAGS sample

_____ µCi/ml	x	2.78E-10 Ci hr / sec µCi	x	_____ mℓ/hr	=	_____ Ci/sec

IODINE

based on Q_{NG}

						Q_I
____ Ci/sec	x	_____		I-131 eqv./Xe-133 eqv. ratio (Encl. 5.7)	=	_____ Ci/sec

based on EMF40 — LR

_____ Δcpm / _____ Δmin	x	6.54E-20 Ci hr min / sec ml cpm	x	_____ ml/hr	=	_____ Ci/sec

based on PAGS sample

_____ µCi/ml	x	2.78E-10 Ci hr / sec µCi	x	_____ ml/hr	=	_____ Ci/sec

[ ] Emergency [ ] Drill

Prepared by: _____

McGUIRE NUCLEAR STATION
CONTAINMENT MONITORS NOBLE GAS CORRECTION FACTORS

EMF39L

Time Since Trip (hrs)	Correction Factor based on LOCA	Correction Factor based on Melted Core
≥ 0	6.394E-18	6.672E-17
≥ 2	6.394E-18	4.448E-17
≥ 4	6.394E-18	3.058E-17
≥ 8	6.394E-18	2.113E-17
≥ 24	6.394E-18	1.112E-17
≥ 48	6.394E-18	1.056E-17
≥ 100	6.394E-18	1.390E-17
≥ 250	6.394E-18	1.446E-17
≥ 500	6.394E-18	9.730E-18
≥ 720	6.394E-18	6.394E-18

Units in $\frac{\text{Ci hr}}{\text{sec ml cpm}}$

EMF39H

Time Since Trip (hrs)	Correction Factor based on LOCA	Correction Factor based on Melted Core
≥ 0	5.56E-14	1.429E-13
≥ 2	5.56E-14	1.003E-13
≥ 4	5.56E-14	1.232E-13
≥ 8	5.56E-14	1.195E-13
≥ 24	5.56E-14	7.339E-14
≥ 48	5.56E-14	6.060E-14
≥ 100	5.56E-14	5.699E-14
≥ 250	5.56E-14	5.588E-14
≥ 500	5.56E-14	5.560E-14
≥ 720	5.56E-14	5.560E-14

Units in $\frac{\text{Ci hr}}{\text{sec ml cpm}}$

EMF51 A or B

Time Since Trip (hrs)	Correction Factor based on LOCA	Correction Factor based on Melted Core
≥ 0	3.781E-10	1.190E-9
≥ 2	3.114E-10	5.894E-10
≥ 4	2.780E-10	4.726E-10
≥ 8	2.446E-10	3.392E-10
≥ 24	2.335E-10	1.890E-10
≥ 48	2.335E-10	1.668E-10
≥ 100	2.335E-10	1.612E-10
≥ 250	2.335E-10	1.557E-10
≥ 500	2.335E-10	1.251E-10
≥ 720	2.335E-10	1.056E-10

Units in $\frac{\text{Ci hr}}{\text{sec ml R/hr}}$

* Enclosure 5.9 is the correlation factor per Reference 2.13 x $\frac{\text{hr}}{3600 \text{ sec}}$ x $\frac{\text{Ci}}{1\text{E6 } \mu\text{Ci}}$

McGUIRE NUCLEAR STATION
CONTAINMENT LEAKAGE RATE VERSUS PRESSURE

PSIG	ml/hr
$\geq$ 0	1.460E4
$\geq$ 2	3.175E4
$\geq$ 4	5.821E4
$\geq$ 8	9.779E4
$\geq$ 10	1.114E5
$\geq$ 11	1.164E5
$\geq$ 12	1.199E5
$\geq$ 13	1.235E5
$\geq$ 14	1.260E5
= 15	1.285E5
> 15	Use design leak rate (1.714E5 mℓ/hr)

* Enclosure 5.10 is the realistic leakage rate (m^3/sec) per Reference 2.12 x 1E6 ml/m^3 x 3600 sec/hr x 0.07 (0.07 per Reference 2.6).

McGUIRE NUCLEAR STATION
CONTAINMENT LEAKAGE RATE VERSUS PRESSURE AND SIZE OPENING

For 1" diameter opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	2.209E8	>5.0	3.908E8	>12.5	5.862E8
>2.50	2.889E8	>7.5	4.588E8	>15.0	6.287E8
>3.75	3.483E8	>10.0	5.268E8		

For 2" diameter opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	8.496E8	>5.0	1.512E9	>12.5	2.243E9
>2.50	1.121E9	>7.5	1.784E9	>15.0	2.464E9
>3.75	1.342E9	>10.0	2.022E9		

For 4" diameter opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	3.144E9	>5.0	5.692E9	>12.5	8.496E9
>2.50	4.248E9	>7.5	6.797E9	>15.0	9.176E9
>3.75	5.098E9	>10.0	7.731E9		

For 6" diameter opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	7.137E9	>5.0	1.291E10	>12.5	1.937E10
>2.50	9.516E9	>7.5	1.529E10	>15.0	2.124E10
>3.75	1.138E10	>10.0	1.716E10		

For 8" diameter opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	1.257E10	>5.0	2.243E10	>12.5	3.381E10
>2.50	1.648E10	>7.5	2.634E10	>15.0	3.568E10
>3.75	1.971E10	>10.0	3.042E10		

For 12" diameter opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	2.719E10	>5.0	5.012E10	>12.5	7.476E10
>2.50	3.738E10	>7.5	5.947E10	>15.0	8.156E10
>3.75	4.452E10	>10.0	6.712E10		

For 18" diameter opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	5.522E10	>5.0	1.003E11	>12.5	1.529E11
>2.50	7.476E10	>7.5	1.189E11	>15.0	1.665E11
>3.75	8.836E10	>10.0	1.351E11		

For 34" diameter opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	1.869L	>5.0	3.398E11	>12.5	5.132E11
>2.50	2.583E	>7.5	4.078E11	>15.0	5.607E11
>3.75	3.093E	>10.0	4.588E11		

For Personnel Hatch Opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	2.379E12	>5.0	4.690E12	>12.5	6.967E12
>2.50	3.398E12	>7.5	5.573E12	>15.0	7.646E12
>3.75	4.111E12	>10.0	6.372E12		

For Equipment Hatch Opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	1.121E13	>5.0	2.022E13	>12.5	3.059E13
>2.50	1.478E13	>7.5	2.379E13	>15.0	3.398E13
>3.75	1.767E13	>10.0	2.719E13		

* Enclosure 5.11 is the containment leakage for an opening size in standard cubic feet per min (scfm) x 2.83E4 ml/ft^3 x 60 min/hr.

EDA-3
Enclosure 5.12
(GREEN)

McGUIRE NUCLEAR STATION
SOURCE TERM ASSESSMENT - UNIT VENT

Report # _____

Reactor Trip _____/_____ (date/time)

Projection based on data on _____/_____ (date/time)

Calculations based on _____ Melted Core _____ LOCA

CFM = _____ ft^3/min

NOBLE GAS

based on (check one)

EMF36(L) [ ] if < 1E7 cpm

EMF36(H) [ ] if > 100 cpm

EMF36(HH) [ ] if 36(H) is offscale

EMF		CF		CFM		Q_{NG}
_____ cpm or R/hr	x	_____ (Encl. 5.13)	x	_____ $\frac{ft^3}{min}$	=	_____ $\frac{Ci}{sec}$

based on Unit Vent Sample

_____ µCi/ml x 4.72E-4 $\frac{Ci\ min\ ml}{sec\ ft^3\ \mu Ci}$ x _____ $\frac{ft^3}{min}$ = _____ $\frac{Ci}{sec}$

IODINE

based on Q_{NG}

_____ $\frac{Ci}{sec}$ x _____ I-131 eqv./Xe-133 eqv. ratio (Encl. 5.7) = _____ $\frac{Ci}{sec}$ Q_I

based on EMF37 CFM

_____ Δcpm / _____ Δmin x 1.11E-13 $\frac{Ci\ min\ min}{sec\ ml\ cpm}$ x _____ $\frac{ft^3}{min}$ = _____ $\frac{Ci}{sec}$

based on Unit Vent Sample

_____ µCi/ml x 4.72E-4 $\frac{Ci\ min\ ml}{sec\ ft^3\ \mu Ci}$ x _____ $\frac{ft^3}{min}$ = _____ $\frac{Ci}{sec}$

[ ] Emergency [ ] Drill

Prepared by: _____

McGUIRE NUCLEAR STATION
UNIT VENT MONITORS NOBLE GAS CORRECTION FACTORS

Correction Factors for Melted Core Accidents with or without charcoal.

Time Since Trip (hrs)	EMF36L based on Melted Core $\left(\frac{\text{Ci min}}{\text{sec ft}^3 \text{ cpm}}\right)$	EMF36H based on Melted Core $\left(\frac{\text{Ci min}}{\text{sec ft}^3 \text{ cpm}}\right)$	EMF 36HH based on Melted Core $\left(\frac{\text{Ci min}}{\text{sec ft}^3 \text{ R/hr}}\right)$
≥ 0	1.133E-10	2.426E-7	1.887E-3
≥ 2	7.552E-11	1.704E-7	1.179E-3
≥ 4	5.192E-11	2.091E-7	9.905E-4
≥ 8	3.587E-11	2.030E-7	6.367E-4
≥ 24	1.888E-11	1.246E-7	2.931E-4
≥ 48	1.794E-11	1.029E-7	2.405E-4
≥ 100	2.360E-11	9.676E-8	2.358E-4
≥ 250	2.454E-11	9.481E-8	2.358E-4
≥ 500	1.652E-11	9.440E-8	2.358E-4
≥ 720	1.086E-11	9.440E-8	2.358E-4

Correction Factors for All Other Accidents

Accident	EMF 36L $\left(\frac{\text{Ci min}}{\text{sec ft}^3 \text{ cpm}}\right)$	EMF 36H $\left(\frac{\text{Ci min}}{\text{sec ft}^3 \text{ cpm}}\right)$	EMF 36HH $\left(\frac{\text{Ci min}}{\text{sec ft}^3 \text{ R/hr}}\right)$
New Fuel	2.360E-11	9.676E-8	2.358E-4
All Other Accidents*	1.086E-11	9.440E-8	2.358E-4

*Accidents include LOCA with or without charcoal, Tube Rupture, WGDT, and Old Fuel.

* Enclosure 5.13 is the correlation factor per Reference 2.13 x

$$2.83E4 \frac{\text{ml}}{\text{ft}^3} \times \frac{\text{min}}{60 \text{ sec}} \times \frac{\text{Ci}}{1E6 \ \mu\text{Ci}}$$

INSTRUCTIONS ON HOW TO OBTAIN DATA FROM THE OPERATOR AID COMPUTER OAC

1) Tech Spec 04 Program (Plant Data and Status Summary)

   a) At the OAC in the TSC or Computer Room, press [Tech Spec] 04
   b) Then press [Print] amd [Enter]
   c) The report will print out

2) General 19 Program (Main Steam Release Program)

   a) At the OAC in the TSC or Computer Room, press [General] 19
   b) Then press [Print] and [Enter]
   c) Using the arrow pointer keys, highlight "Main Steam Release" and press enter
   d) The report will print out

CRISIS MANAGEMENT PLAN

IMPLEMENTING PROCEDURE

EDA - 04

"Off-Site Dose Projections for
Oconee Nuclear Station"

R E Harris
Approved By

8/24/89
Date

Rev. 3
August 24, 1989

DUKE POWER COMPANY

OFF-SITE DOSE PROJECTIONS FOR

OCONEE NUCLEAR STATION

1.0 Purpose

This procedure describes a method for projecting dose commitment from a noble gas and/or iodine release through the containment, the unit vent, and/or the steam relief valves during an emergency.

2.0 References

2.1 PT/0/A/230/01, Radiation Monitor Check

2.2 HP/1,2,3/A/1009/17, Operating Procedure for Post-Accident Containment Air Sampling System

2.3 HP/0/B/1009/15, Procedure for Sampling and Quantifying High Level Gaseous, Radioiodine, and Particulate Radioactivity

2.4 ONS Technical Specification, Appendix A, Section 3.1.4 Reactor Coolant System Activity

2.5 Offsite Dose Calculation Manual (ODCM)

2.6 Regulatory Guide 1.4, Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors

2.7 Regulatory Guide 1.109, Calculations of Annual Doses to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I

2.8 NuReg-0396, EPA 520/1-78-016, Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans In Support of Light Water Nuclear Power Plants

2.9 NuReg-0654, FEMA-REP-1, Rev. 1, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants

2.10 Oconee Nuclear Station Class A Computer Model Validation (File: NUC-0306)

2.11 Letter from R. P. Todd, 1-3-86, re: R. B. Containment Leak Flow Rate File: ON-750.25

3.0 Limits and Precautions

3.1 This procedure is an alternative method of dose assessment to the Class A Atmospheric Dispersion Model Computer Code.

3.2 This procedure applies to releases made from Oconee Nuclear Station only. Many of the values contained in this procedure are site specific.

3.3 It is assumed that the whole body dose from an iodine release is very small compared to the thyroid dose, therefore this procedure does not consider iodine whole body dose.

3.4 This procedure considers all releases to be ground level releases and that meteorological data are fifteen minute averages.

3.5 Once a sector has been added to the list of affected sectors, it shall not be removed except under the direction of the Dose Assessment Coordinator.

3.6 Once the Crisis Management Center (CMC) has been activated, the doses calculated by the Technical Support Center (TSC) dose assessment group, should be compared with those calculated by the CMC before a protective action recommendation is made.

3.7 Vent releases can occur through more than one unit at a time. Check unit vent monitors on all 3 units during a vent release.

4.0 Procedure

4.1 Meteorology Assessment

4.1.1 Record the following information on Enclosure 5.1.

Note: The sources of data are listed in order of preference in the flowchart on Enclosure 5.1.

4.1.1.1 Unit(s) affected.

4.1.1.2 Date and time of reactor trip.

4.1.1.3 Report number.

4.1.1.4 Name of person preparing report.

4.1.1.5 Time Meteorological data taken.

4.1.1.6 Wind speed in miles per hour.

4.1.1.7 Direction from which the wind is blowing in degrees from North (North = 0).

4.1.1.8 Temperature gradient in degrees centigrade ($\Delta T°C$).

4.1.1.9 Stability class, based on ΔT.

Note: Refer to flowchart on Enclosure 5.1 to determine stability class when ΔT is unavailable.

4.1.2 Determine the atmospheric dispersion parameters, X/Q $\frac{sec}{m^3}$ corresponding to the ΔT determined in Step 4.1.1.8, for each point of interest downwind.

Note: If specific points have not been requested, use the 1, 2, 5, and 10 mile values.

4.1.2.1 Record the appropriate two hour relative concentration value, CH, from Enclosure 5.2 onto Enclosure 5.3.

4.1.2.2 Convert the CH values to X/Q by,

$$X/Q \left(\frac{sec}{m^3} \right) = \frac{CH \text{ (MPH - Sec/m}^3)}{\text{Wind Speed MPH}}$$

4.1.2.3 Record results from Step 4.1.2.2 on Enclosure 5.3.

4.1.3 Protective Action Zone Determination (Enclosure 5.4)

4.1.3.1 Determine the protective action zones (PAZ) according to the guidance provided in Enclosure 5.4.

4.1.3.2 Circle the PAZ on Enclosure 5.3.

4.1.4 Recheck meteorological conditions every 15 minutes to ensure that additional PAZ are identified as necessary.

4.2 Source Term Assessment

4.2.1 Steam Relief Valve Assessment (Enclosure 5.5)

4.2.1.1 Determine the noble gas release rate, Q_{NG} Ci/sec, by the following method;

For RIA's 16 and 17;

$$Q_{NG} = (\text{RIA } \frac{mR}{hr})(2.24 \frac{Ci/sec}{mR/hr})$$

where: RIA = RIA 16 + RIA 17 readings in $\frac{mR}{hr}$

$$2.24 = (28{,}320\ \frac{ml}{ft^3})(\frac{1\ Ci}{1E6\ \mu Ci})(0.3\ \frac{\mu Ci/ml}{mR/hr})(\frac{63{,}330\ ft^3/2}{120\ sec})$$

where: 28,320 = a conversion factor which converts cubic feet to milliliters

$\frac{1\ Ci}{1E6\mu Ci}$ = an activity conversion factor

$0.3\ \frac{\mu Ci/ml}{mR/hr}$ = a correlation value relating activity concentration to RIA's 16 and 17 response

$63{,}330\ ft^3$ = Steam volume released in a 2 minute (120 seconds) period. This is based on releasing 1.5E5 lbs of steam at 1050 psia with a 2 minute average steam release rate of $0.4222\ ft^3$/lb-m.

2 = The point at which the sum of RIA's 16 and 17 readings are averaged.

4.2.1.2 Record Q_{NG} on Enclosure 5.3.

4.2.1.3 Determine the iodine release rate, Qi (Ci/sec), by the following method:

$$Qi = Q_{NG} \times I_{rat}$$

Where:

Q_{NG} = Noble Gas Release Rate (Ci/sec) determined in Section 4.2.1.1.

I_{rat} = ratio of I-131 equiv./Xe-133 equiv. from Enclosure 5.6.

4.2.1.4 Record Qi on Enclosure 5.3.

4.2.2 Containment Assessment (Enclosure 5.7)

4.2.2.1 Determine the noble gas release rate, $Q_{NG}\ \frac{Ci}{sec}$, by one of the following methods;

4.2.2.1.1 Based on RIA 57/58 readings, as follows:

$$Q_{NG} = R/hr \times CF\ \frac{Ci\text{-}hr}{sec\text{-}ml\text{-}R/hr} \times LR\ \frac{ml}{hr}$$

Where:

R/hr = RIA 57 or 58 reading in R/hr.

CF = Correction factor per Enclosure 5.8.

LR = Leak rate in ml/hr by one of the following methods:

based upon containment pressure, LR = Realistic Leak Rate, RLR, Enclosure 5.9 (per Reference 2.10).

based upon an opening in (failure of) containment wall or penetration, LR = Opening In Containment, OIC, Enclosure 5.9 (per Reference 2.11).

based upon design leakage rate, LR = 5.6E6 (per Reference 2.10).

4.2.2.1.2 Based on survey instrument, as follows:

$$Q_{NG} = R/hr \times CF \frac{Ci\text{-}hr}{sec\text{-}ml\text{-}R/hr} \times LR \frac{ml}{hr}$$

Where:

R/hr = survey instrument (PIC-6A) reading in R/hr.

CF = correlation factor per Enclosure 5.8.

LR = Leak Rate in ml/hr as determined in Step 4.2.2.1.1 above.

4.2.2.1.3 Based on PAG sample as follows:

$$Q_{NG} = Conc. \times 2.78E\text{-}10 \frac{Ci\text{-}hr}{sec\text{-}\mu Ci} \times LR \frac{ml}{hr}$$

Where:

Conc. = the Xe-133 equiv. sample data (μCi/ml) from PAG sample.

2.78E-10 = units correction factor (1E - 6 Ci/μCi)(1 hr/3600 sec)

LR = Leak Rate in ml/hr as determined in Step 4.2.2.1.1 above.

4.2.2.2 Record Q_{NG} on Enclosure 5.3.

4.2.2.3 Determine the iodine release rate,

Q_I $\frac{Ci}{sec}$, by one of the following methods:

4.2.2.3.1 Based on Q_{NG} as follows:

$$Q_I = Q_{NG} \times I_{rat}$$

Where:

Q_{NG} = noble gas release rate determined in Section 4.2.2.1.

I_{rat} = ratio of I-131 equiv./Xe-133 equiv. from Enclosure 5.6

4.2.2.3.2 Based on PAG sample as follows:

$$Q_I = \text{Conc.} \times 2.78\ E\text{-}10\ \frac{Ci\text{-}hr}{sec\text{-}\mu Ci} \times LR$$

Where:

Conc. = I-131 equivalent sample data (μCi/ml) from PAG sample.

2.78E-10 = units correction factor.

LR = Leak Rate in ml/hr as determined in Step 4.2.2.1.1

4.2.2.4 Record Q_I on Enclosure 5.3.

4.2.3 Unit Vent Assessment (Enclosure 5.10)

4.2.3.1 Determine the noble gas release rate,

Q_{NG} $\frac{Ci}{sec}$, by one of the following methods

for <u>each</u> affected unit:

4.2.3.1.1 Based on RIA 45, 46 or 56 on-scale reading as follows:

Q_{NG} = U-1 (RIA x CF x CFM) +
U-2 (RIA x CF x CFM) +
U-3 (RIA x CF x CFM)

Where:

RIA = RIA reading in cpm or R/hr.

CF = correction factor per Enclosure 5.11.

CFM = unit vent flow rate in ft ^{3}/minute.

4.2.3.1.2 Based on unit vent sample as follows:

$$Q_{NG} = \text{U-1 (Conc x 4.72E-4 X CFM) + U-2 (Conc x 4.72E-4 x CFM) + U-3 (Con x 4.72E-4 x CFM)}$$

Where:

Conc. = the Xe-133 equiv. sample data in µCi/ml.

$$4.72E\text{-}4 \frac{\text{Ci-min-ml}}{\text{sec-ft}^3\text{-µCi}} = \text{units correction factor}$$

$$\frac{1\text{Ci}}{1E6\mu\text{Ci}} \times \frac{1 \text{ minute}}{60 \text{ seconds}} \times \frac{1 \text{ ml}}{3.5314E\text{-}5 \text{ ft}^3}$$

CFM = unit vent flow rate ft^3/minute

4.2.3.2 Record the noble gas release rate, Q_{NG}, on Enclosure 5.3.

4.2.3.3 Determine the iodine release rate, $Q_I \frac{Ci}{sec}$, by one of the following methods for <u>each</u> affected unit.

4.2.3.3.1 Based on Q_{NG} as follows:

$$Q_I = Q_{NG} \times I_{rat}$$

Where:

Q_{NG} = noble gas release rate determined in Section 4.2.3.1.

I_{rat} = ratio of I-131 equiv./Xe-133 equiv. from Enclosure 5.6.

4.2.3.3.2 Based on unit vent sample as follows:

$$Q_I = \text{U-1(Conc. x 4.72E-4 x CFM) + U-2 (Conc. x 4.72E-4 x CFM) + U-3 (Conc. x 4.72E-4 x CFM)}$$

Where:

Conc. = I-131 equiv. sample data in μCi/ml.

4.72E-4 = units conversion factor

CFM = unit vent flow rate in ft^3/minute

4.2.3.4 Record iodine release rate, Q_I, on Enclosure 5.3.

4.3 Dose Assessment (Enclosure 5.3)

4.3.1 Determine whole body dose due to noble gas as follows:

4.3.1.1 Determine the total noble gas release rate, TQ_{NG}, by adding Q_{NG} values from all source terms.

4.3.1.1.1 Record TQ_{NG} on Enclosure 5.3.

4.3.1.2 Determine the projected whole body dose in rem, D_{WB}, for appropriate distances (1, 2, 5 and 10 miles unless specified otherwise) by:

NOTE: D_{RWB} $\frac{REM}{hr}$ on Enclosure 5.3 is the whole body dose rate due to noble gas and is calculated for information or for use in other calculations.

$$D_{WB} = TQ_{NG} \times X/Q \times 33.6 \times 2$$

Where:

TQ_{NG} = total noble gas release rate, determined in Step 4.3.1.1.

X/Q = two-hour relative concentration value divided by wind speed, determined in Step 4.1.2.2.

33.6 = the adult whole body dose conversion factor in $\frac{rem\text{-}m^3}{hr\text{-}Ci}$.

2 = time period in hours over which dose is integrated.

4.3.1.2.1 Record D_{WB} on Enclosure 5.3.

4.3.2 Determine thyroid dose due to radioiodine as follows:

4.3.2.1 Determine the total iodine release rate, TQ_I, by adding Q_I values from all source terms.

4.3.2.1.1 Record TQ_I on Enclosure 5.3.

4.3.2.2 Determine the projected thyroid dose, D_T, for appropriate distances (1, 2, 5 and 10 miles unless specified otherwise) by:

NOTE: D_{RTHY} $\frac{REM}{hr}$ on Enclosure 5.3 is the thyroid dose rate due to iodine and is calculated for information or for use in other calculations.

$$D_T = TQ_I \times X/Q \times 2.26E6 \times 2$$

Where:

TQ_I = total iodine release rate, determined in Step 4.3.2.1.

X/Q = same as above, under 4.3.1.2.

2.26E6 = child thyroid dose conversion factor in $\frac{rem\text{-}m^3}{hr\text{-}Ci}$ (per Reference 2.10).

2 = same as above, under 4.3.1.2.

4.3.2.2.1 Record D_T on Enclosure 5.3.

4.3.3 Recommend protective action as follows:

4.3.3.1 Compare doses calculated in Steps 4.3.1.2 and 4.3.2.2 to guidelines provided on Enclosure 5.4.

4.3.3.2 Record the results of comparison in 4.3.3.1 on Enclosure 5.3.

4.3.3.3 Make the following recommendations to the Dose Assessment Coordinator if the dose rates described are achieved in the field and have not been previously calculated:

4.3.3.3.1 Recommend an Alert if the dose rate at the site boundary $\geq$ 5.0E-4 $\frac{REM}{hr}$ whole body.

4.3.3.3.2 Recommend a Site Area Emergency if the dose rate at the site boundary $\geq$ 0.05 $\frac{REM}{hr}$ whole body or $\geq$ 0.25 $\frac{REM}{hr}$ thyroid and these dose rates persist for 30 minutes.

4.3.3.3.3 Recommend a General Emergency if the dose rate at the site boundary $\geq$ 1 $\frac{REM}{hr}$ whole body or $\geq$ 5 $\frac{REM}{hr}$ thyroid.

5.0 Enclosures

5.1 Oconee Meteorology, 1 Page, 5/88

5.2 Oconee Two-Hour Relative Concentration Factors (CH), 1 Page, 5/88

5.3 Oconee Warning Message: Nuclear Facility to State/Local Government, 2 Pages, 5/88

5.4 Oconee Protective Action Zones Determinations, 2 Pages, 9/87

5.5 Oconee Source Term Assessment-Steam Relief Valves, 1 Page, 9/87

5.6 Oconee I-131 Equivalent/Xe-133 Equivalent Ratio, 1 Page, 5/88

5.7 Oconee Source Term Assessment-Containment, 1 Page, 9/87

5.8 Oconee Containment Noble Gas Correction Factor, 1 Page, 5/88

5.9 Oconee Containment Leakage Rate, 1 Page, 5/88

5.10 Oconee Source Term Assessment-Unit Vent, 1 Page, 9/87

5.11 Oconee Unit Vent Noble Gas Correction Factor, 1 Page, 5/88

OCONEE METEOROLOGY

EDA-4

Unit _____ Report # _____

Date/Time of Rx trip _____/_____

Prepared By: _____

METEOROLOGICAL DATA

(All data is 15 min average except NWS.)
National Weather Service (NWS) phone number is (803) 877-6998.

1000 to 1600 hrs.

- wind speed sources 1) lower; 2) river; 3) upper x 0.5; 4) NWS x 0.5
- wind direction sources 1) upper; 2) lower; 3) river; 4) NWS
- ΔT°C sources 1) tower; 2) Assume -0.26°C

1600 to 1000 hrs.

- River Wind 210° - 70°
  - wind speed 1) lower; 2) upper x 0.5; 3) Assume 1 mph
  - wind direction 1) upper; 2) lower; 3) assume 0-360°
  - ΔT°C 1) tower; 2) Assume > +2.0
- River wind * 70° - 210° or not available
  - wind speed 1) Assume 1 mph
  - wind direction 1) Assume 0-360°
  - ΔT°C 1) Assume > +2.0

* Based on experiment

-Time
_____
- wind speed
_____mph
- wind direction
_____°
- ΔT°C
_____°C
- Stability Class
_____

ΔT°C	Stability Class
<-0.95	A
-0.95 to -0.86	B
-0.85 to -0.76	C
-0.75 to -0.26	D
-0.25 to +0.74	E
+0.75 to +2.0	F
> +2.0	G

*Conversion formulas for the meteorological data obtained from the NWS are:

(1.15) x (knots) = mph

(1.8 x °C) + 32 = °F

OCONEE TWO-HOUR RELATIVE CONCENTRATION FACTORS (CH)

EDA-4

Temperature Difference ΔT°C	Stability Class	Distance (Miles)									
		1	2	3	4	5	6	7	8	9	10
< -0.95	A	1.8E-6	6.2E-7	4.3E-7	3.4E-7	2.8E-7	2.4E-7	2.1E-7	1.8E-7	1.7E-7	1.5E-7
-0.95 to -0.86	B	1.7E-5	4.2E-6	1.9E-6	1.1E-6	6.7E-7	4.7E-7	3.5E-7	2.7E-7	2.1E-7	1.7E-7
-0.85 to -0.76	C	4.6E-5	1.4E-5	6.4E-6	3.8E-6	2.6E-6	1.8E-6	1.4E-6	1.1E-6	8.8E-7	7.4E-7
-0.75 to -0.26	D	1.2E-4	5.2E-5	2.9E-5	1.8E-5	1.4E-5	1.0E-5	8.0E-6	6.7E-6	5.7E-6	4.9E-6
-0.25 to +0.74	E	2.7E-4	1.0E-4	5.9E-5	4.0E-5	3.0E-5	2.3E-5	1.8E-5	1.6E-5	1.4E-5	1.1E-5
+0.75 to +2.0	F	5.3E-4	2.3E-4	1.4E-4	9.6E-5	7.3E-5	5.8E-5	4.7E-5	4.0E-5	3.4E-5	3.0E-5
> +2.0	G	8.8E-4	4.5E-4	2.9E-4	2.0E-4	1.5E-4	1.2E-4	1.0E-4	8.8E-5	7.5E-5	6.6E-5

DUKE POWER COMPANY
OCONEE WARNING MESSAGE: NUCLEAR FACILITY TO STATE/LOCAL GOVERNMENT
EDA-4

Report #_____ Reviewed by:_____ Date:_____
Dose Report By:_____ ___Real Emergency
based on data from:_____(date/time) ___Exercise Message

1. Plant Status: OCONEE NUCLEAR STATION; Unit ____; Emergency Class _____
   Reactor(a)____ is tripped/(b)____ was tripped at (Time):_____
   Plant is at: (a) _____% power (c) _____hot shutdown (or hot standby)
   (b) _____cold shutdown (d) _____cooling down
   Prognosis is: (a) _____stable (c) _____degrading
   (b) _____improving (d) _____unknown
2. Emergency actions underway at the facility include: _____
3. Onsite support needed from offsite organizations:_____

****

4. Dose Projection Data
   Wind Speed: _____mph Wind Direction _____° (from) ΔT _____ °C
   Stability Class: A, B, C, D, E, F, G Release Type: Ground
   Weighted Dose Conversion Factor: (a) 33.6 R/hr/Ci/m^3 (whole body)
   (b) 2.2E6 R/hr/Ci/m^3 (child thyroid)

   Release Rate:

Stm Relief		Contain.		Vent		Total Ci/sec	
Q_{NG} _____	+	Q_{NG} _____	+	Q_{NG} _____	=	_____	TQ_{NG} (N.G. Eq. Ci/sec)
Q_I _____	+	Q_I _____	+	Q_I _____	=	_____	TQ_I (I. Eq. Ci/sec)

5. The type of actual or projected release is:
   _____ (a) airborne _____ (d) other _____
   _____ (b) waterborne _____ (e) No release is in progress or expected
   _____ (c) surface spill at this time
6. Release (a) _____ will begin at _____/(b) _____ began at _____
7. The estimated duration of the release is _____ hours.
8. The source and description of the release _____
9. Dose Projections: *Whole Body*

Mile	TQ_{NG}	x $\frac{CH}{Wind\ Speed}$	x	33.6 =	$D_{RWB}\frac{REM}{hr}$	x	2 =	D_{WB} REM
				33.6 =				
				33.6 =				
				33.6 =				
				33.6 =				

Child Thyroid

Mile	TQ_I	x $\frac{CH}{Wind\ Speed}$	x	2.26E6 =	$D_{RTHY}\frac{REM}{hr}$	x	2 =	D_{THY} REM
				2.26E6 =				
				2.26E6 =				
				2.26E6 =				
				2.26E6 =				

DUKE POWER COMPANY
OCONEE WARNING MESSAGE: NUCLEAR FACILITY TO STATE/LOCAL GOVERNMENT
EDA-4

10. Field Data

Time	Location	Distance from Plant	Direction from Plant	Whole Body*	Thyroid*

*Indicate units data is given in.

****

Protective Action Recommendations:

_____(a) No protective action is recommended at this time

_____(b) People living in zones _____ remain indoors with the doors and windows closed, turn off air conditioners and other ventilation, monitor EBS stations.

_____(c) People living in zones _____ evacuate their homes and businesses and go to a designated shelter.

_____(d) Pregnant women and children in zones _____ evacuate and go to a designated shelter.

_____(e) Other recommendations: _____

Miles	1	2	5	10
PAZ	AO	AO	A1,B1,C1,D1,E1,F1	A2,B2,C2,D2,E2,F2

Previous protective actions recommended:
_____(a) None

_____(b) & (d) Evacuate pregnant women and children; shelter remaining people. Zones _____

_____(c) Evacuate all people. Zones _____

OCONEE PROTECTIVE ACTION ZONES DETERMINATION

EDA-4

1. Determine PAZ by completing one of the options under A or B, using meteorological data from Enclosure 5.1. Record the PAZ on Enclosure 5.3.

   A. Daytime (1000-1600 hrs.)

      1) Wind speed $\geq$ 5 mph for tower or river wind direction; use the table below.

      2) Wind speed < 5 mph for tower or river wind direction. Assume Sectors A1, B1, C1, D1, E1, and F1 are affected. Then use the table below to determine additional PAZ.

      3) For NWS wind direction. Assume all sectors are affected (A1 through F1, A2 through F2).

   B. Nighttime (1600-1000 hrs.)

      (If river wind direction is unavailable, assume 70°-210°.)

      1) If river wind direction is between 210°-70°, use Option A (Daytime).

      2) If river wind direction is between 70°-210°, assume all sectors are affected (A1 through F1, A2 through F2).

Wind Direction	Protective Action Zones
14°-27°	C1, C2, D1, D2, E1, E2
27°-42°	C1, D1, D2, E1, E2
42°-66°	D1, D2, E1, E2
66°-85°	D1, D2, E1, E2, F2
85°-104°	D1, D2, E1, E2, F1, F2
104°-129°	E1, E2, F1, F2
129°-156°	A1, A2, E1, E2, F1, F2
156°-175°	A1, A2, E1, F1, F2
175°-181°	A1, A2, F1, F2
181°-219°	A1, A2, B1, B2, F1, F2
219°-255°	A1, A2, B1, B2
255°-271°	A1, A2, B1, B2, C1, C2
271°-297°	B1, B2, C1, C2
297°-312°	B1, B2, C1, C2, D2
312°-345°	B1, B2, C1, C2, D1, D2
345°-14°	C1, C2, D1, D2

OCONEE PROTECTIVE ACTION ZONES DETERMINATION

EDA-4

2. Submit protective action guides to the Offsite Radiological Coordinator based on the calculated dose from Enclosure 5.3 and the following information.

   A) Recommend Evacuation of Population in affected area. For doses:

      > 5 Rem Whole Body or,

      > 25 Rem Thyroid

   B) Recommend evacuation of children and pregnant women, and sheltering of remainder of personnel in the affected area. For doses:

      1-5 Rem Whole Body or,

      5-25 Rem Thyroid

   C) Recommend no action. For doses:

      < 1 Rem Whole Body or,

      < 5 Rem Thyroid

OCONEE SOURCE TERM ASSESSMENT-STEAM RELIEF VALVES
EDA-4

Unit(s) 1 2 3 (circle one)

Report # _____

Reactor Trip _____/_____ (date / time)

Projections based on data on _____ (date/time)

Calculations based on: Core Melt/LOCA (circle one)

Noble Gas based on RIA-16 and 17

(RIA-16 $\frac{mR}{hr}$ +RIA-17 $\frac{mR}{hr}$) x 2.24 = Q_{NG} $\frac{Ci}{sec}$
(_____ $\frac{mR}{hr}$ + _____ $\frac{mR}{hr}$) x 2.24 = _____

Iodine based on I-131 equiv./Xe-133 equiv. ratio, Encl.5.6

Q_{NG} $\frac{Ci}{sec}$ x I_{rat} (Encl 5.6) = Q_I $\frac{Ci}{sec}$
_____ $\frac{Ci}{sec}$ x _____ = _____

Prepared by: _____

OCONEE I-131 EQUIVALENT/Xe-133 EQUIVALENT RATIO

EDA-4

Time Since Trip (hrs)	Ratio Based On LOCA (Column 1)	Ratio Based On Core Melt (Column 2)
0	4.83E-3	2.24E-3
2	6.16E-3	1.06E-2
4	7.09E-3	1.56E-2
8	8.31E-3	2.79E-2
24	9.76E-3	7.40E-2
48	1.02E-2	1.10E-1
100	1.09E-2	1.34E-1
250	1.43E-2	1.79E-1
500	2.26E-2	2.90E-1
720	3.32E-2	4.31E-1

NOTE: A) For VENT releases in which I_{rat} is utilized to determine I-131 equiv. concentration, apply the appropriate correction from the table below. Ratios are per Reference 2.10.

1. LOCA , use column 1 (based on LOCA).
2. LOCA through charcoal filters, divide column 1 value by 100.
3. Core damage, use column 2 (based on Core Melt).
4. Core damage through charcoal filters, divide column 2 value by 100.
5. Tube rupture, use 3.32E-5.
6. New fuel accident, use 2.23E-4.
7. Old fuel accident, use 7.18E-4.
8. Gas decay tank, assume no radioiodine released, only noble gases are considered to be released from gas tank.

B) For Steam Release Valve releases in which Irat is utilized to determine I-131 eq concentration, apply the appropriate correction from the table below. Ratios are per Reference 2.10.

1. LOCA, divide Column 1 values by 100.
2. Core Melt, divide Column 2 valves by 100.

OCONEE SOURCE TERM ASSESSMENT-CONTAINMENT

EDA-4

Unit(s) 1 2 3 (circle one) Report # _____

Reactor Trip _____/_____ (date / time) Projection based on data on _____/_____ (date / time)

Calculations based on: Core Melt/LOCA (circle one)

Containment pressure _____ psig

LR = _____ ml/hr

LR based on (check one):
_____Realistic Leak Rate (Encl. 5.9)
_____Opening in Containment (Encl. 5.9) (circle one) 1" 2" 4" 6" 8" 12" 18" 48" Diameter opening
_____Design Leak Rate (5.6E6)

Noble Gas
Based on RIA-57 and 58

RIA (or PIC-6A) Reading $\frac{R}{hr}$	X	CF $\frac{Ci - hr}{sec\text{-}ml\text{-}R/hr}$ (Encl. 5.8)	X	LR $\frac{ml}{hr}$	=	Q_{NG} $\frac{Ci}{sec}$
_____	X	_____	X	_____	=	_____

Based on PAG sample

Conc. $\frac{\mu Ci}{ml}$	x	2.78E-10 $\frac{Ci\text{-}hr}{sec\text{-}\mu Ci}$	x	LR $\frac{ml}{hr}$	=	Q_{NG} $\frac{Ci}{sec}$
_____	x	2.78E-10	x	_____	=	_____

Iodine
Based on Irat

Q_{NG} $\frac{Ci}{sec}$	x	I_{rat} (Encl. 5.6)	=	Q_I $\frac{Ci}{sec}$
_____	x	_____	=	_____

Based on PAG sample

Conc. $\frac{\mu Ci}{ml}$	x	2.78E-10 $\frac{Ci\text{-}hr}{sec\text{-}\mu Ci}$	x	LR $\frac{ml}{hr}$	= Q_I	$\frac{Ci}{sec}$
_____	x	2.78E-10	x	_____	=	_____

Prepared By: _____

OCONEE CONTAINMENT NOBLE GAS CORRECTION FACTOR

EDA-4

Based on RIA-57 and 58

Time Since Trip (hrs)	Correlation Factor* Based On LOCA	Core Melt
0	5.17E-11	1.57E-10
2	4.31E-11	1.07E-10
4	3.86E-11	1.04E-10
8	3.36E-11	9.11E-11
24	2.81E-11	6.64E-11
48	2.63E-11	5.42E-11
100	2.55E-11	4.47E-11
250	2.58E-11	4.50E-11
500	2.74E-11	5.22E-11
720	2.94E-11	5.92E-11

Based on Survey Instrument

Time Since Trip (hrs)	Correlation Factor** Based On LOCA	Core Melt
0.1 to 0.5	1.71E-5	5.32E-5
>0.5 to 1.0	1.95E-5	6.05E-5
>1.0 to 1.5	2.18E-5	6.78E-5
>1.5 to 2.0	1.93E-5	3.28E-5
>2.0 to 2.5	2.09E-5	3.56E-5
>2.5 to 3.0	2.25E-5	3.83E-5
>3.0 to 4.0	2.21E-5	3.69E-5
>4.0 to 5.0	2.50E-5	4.18E-5
>5.0 to 6.0	2.65E-5	4.43E-5
>6.0 to 7.0	2.94E-5	4.92E-5
>7.0 to 8.0	2.86E-5	3.94E-5
>8.0 to 9.0	3.12E-5	4.30E-5
>9.0 to 10	3.38E-5	4.65E-5
> 10 to 15	4.68E-5	6.44E-5
> 15 to 20	6.76E-5	9.31E-5
> 20 to 25	8.32E-5	7.34E-5
> 25 to 30	1.11E-4	9.79E-5
> 30 to 35	1.50E-4	1.33E-4
> 35 to 40	1.96E-4	1.73E-4
> 40 to 45	2.54E-4	2.24E-4
> 45 to 50	3.18E-4	2.44E-4
> 50 to 60	5.45E-4	4.18E-4
> 60 to 70	7.26E-4	5.57E-4
> 70 to 80	1.18E-3	9.05E-4
> 80 to 90	1.70E-3	1.31E-3
> 90 to 100	3.30E-3	2.04E-3

* Units in $\frac{\text{Ci-hr}}{\text{sec-ml-R/hr}}$; correlation factors

per Reference 2.10 x hr/3600 sec x Ci/1E6μCi

**Units in $\frac{\text{Ci-hr}}{\text{sec-ml-R/hr}}$

OCONEE CONTAINMENT LEAKAGE RATE

EDA-4

Leak Rate versus Pressure (RLR)*

Pressure (psig)	Leakage Rate (ml/hr)
1	1.00E5
5	4.734E5
10	9.693E5
15	1.443E6
20	1.916E6
25	2.389E6
30	2.885E6
35	3.314E6
37	3.471E6
40	3.652E6
42	3.764E6
45	3.922E6
47	4.012E6
50	4.103E6
52	4.148E6
55	4.193E6
57	4.215E6
59	4.238E6

*NOTE: (Per Reference 2.10)

Leak Rate versus Size Opening (OIC)**

Opening Diameter (inches)	Actual ft^3/hr	Actual ml/hr
1	15,100	4.276E8
2	60,400	1.710E9
4	241,600	6.842E9
6	543,500	1.540E10
8	966,200	2.737E10
12	2,174,000	6.158E10
18	4,892,000	1.386E11
48	34,785,000	9.853E11

**Note: (Per Reference 2.11)

1) For all pressure greater than 30 psia and temperature greater than 280°F (conservative for lower temperatures or pressures).

2) Leak rates for 12 inches and larger are more than one reactor building volumn per hour. In an accident, these leak rates could not exist for more than a few minutes.

OCONEE SOURCE TERM ASSESSMENT-UNIT VENT

EDA-4

Unit(s) 1 2 3 Report # _____

Reactor Trip _____/_____ Projections based on: _____/_____
date / time date / time

Calculations on: Core Melt/LOCA
(circle one)

Noble Gas: Based on □45 □46 □56

RIA 45, 46 or 56 cpm or R/hr value	X	Appropriate Correction Factor (Enclosure 5.11)	X	Vent Flow CFM	= Q_{NG} $\frac{Ci}{sec}$	Q_{NG} Total (add U-1,2,3)
U-1)_____	X	_____		_____	= _____	
U-2)_____	X	_____		_____	= _____	
U-3)_____	X	_____		_____	= _____	_____

Vent Sample Activity $\frac{\mu Ci}{ml}$	X	4.72E-4	$\frac{Ci\text{-}min\text{-}ml}{sec\text{-}ft^3\text{-}\mu Ci}$	X	Vent Flow CFM	= Q_{NG} $\frac{Ci}{sec}$
_____	X	4.72E-4		X	_____	= _____

Iodine

Based on I/Xe ratio

Q_{NG} Total $\frac{Ci}{sec}$	X	I_{rat} (Encl. 5.6)	=	Q_I $\frac{Ci}{sec}$
_____	X	_____	=	_____

Based on Unit Vent Sample

Vent Sample Activity $\frac{\mu Ci}{ml}$	X	4.72E-4	$\frac{Ci\text{-}min\text{-}ml}{sec\text{-}ft^3\text{-}\mu Ci}$	X	Vent Flow CFM	= Q_I $\frac{Ci}{sec}$
_____	X	4.72E-4		X	_____	= _____

Prepared By: _____

OCONEE UNIT VENT NOBLE GAS CORRECTION FACTOR*

EDA-4

Time Since Trip (hrs.)	RIA-45 Core Melt	RIA-46 Core Melt	RIA-56 Core Melt
0	4.717E-11	2.170E-07	1.472E-03
2	4.528E-11	1.698E-07	6.651E-04
4	3.868E-11	2.311E-07	5.990E-04
8	2.736E-11	2.406E-07	4.358E-04
24	1.509E-11	1.509E-07	2.476E-04
48	1.179E-11	1.274E-07	2.113E-04
100	1.085E-11	1.226E-07	2.071E-04
250	1.132E-11	1.179E-07	1.943E-04
500	9.905E-12	1.179E-07	1.613E-04
720	7.075E-12	1.179E-07	1.340E-04

Other Accidents	RIA-45	RIA-46	RIA-56
LOCA	7.075E-12	1.179E-07	1.340E-04
LOCA thru Filter	7.075E-12	1.179E-07	1.340E-04
Tube Rupture	7.075E-12	1.179E-07	1.340E-04
Old Fuel	7.075E-12	1.179E-07	1.340E-04
New Fuel	1.085E-11	1.226E-07	2.071E-04
Gas Tank	7.075E-12	1.179E-07	1.340E-04

Units in Ci-min/sec-ft -cpm
or Ci-min/sec-ft -R/hr

Correlation factors per Reference 2.10 x 2.832E4 ml/ft x min/60 sec x m /1E6 ml