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EMERGENCY PLAN IMPLEMENTING PROCEDURE

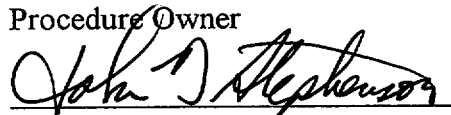
EM-204A

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

OFF-SITE DOSE ASSESSMENT DURING
RADIOLOGICAL EMERGENCIES
(CONTROL ROOM METHOD)

APPROVED BY: Procedure Owner


(SIGNATURE ON FILE)

DATE:

4/20/00

PROCEDURE OWNER: Radiological Emergency Planning

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1.0

PURPOSE

The purpose of this procedure is to provide a timely method for Control Room personnel to estimate the radiation exposure at the Site Boundary (0.83 miles) during a radiological emergency. The procedure was developed for use during the first hour of a monitored, filtered release through the Auxiliary Building Vent. [NOCS 00389, 01029, 01062, 01128, 01582, 01589, 01592, 09815, 13140]

2.0

REFERENCES

2.1

IMPLEMENTING REFERENCES

2.1.1 None

2.2

DEVELOPMENTAL REFERENCES

2.2.1 Radiological Emergency Response Plan for Crystal River Unit 3, RERP, Florida Power Corporation.

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

2.2.3 Response Technical Manual (RTM-92)

2.2.4 Radiation Monitor Sensitivity Curve Log, Crystal River 3, Florida Power Corporation.

3.0

PERSONNEL INDOCTRINATION

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

3.1

DEFINITIONS

- 3.1.1 Affected Sectors - As a minimum, the downwind sector(s) and the adjacent sectors, as indicated by the table on the last page of each enclosure.
- 3.1.2 Committed Dose Equivalent (CDE) - Dose to an organ due to the intake of radioactive materials. For emergency dose assessment, FPC considers only dose to the thyroid when calculating CDE (CDE dose = Thyroid dose).
- 3.1.3 Deep Dose Equivalent (DDE) - External whole body dose.
- 3.1.4 Sigma-Theta - The standard deviation of a set of wind range measurements. The Sigma-Theta meter automatically calculates and displays the standard deviation of wind range for the previous 15 minutes.
- 3.1.5 Thyroid (THY) Dose - Dose to the thyroid due to intake of radioactive iodine. For emergency dose assessment, FPC considers only dose to the thyroid when calculating Committed Dose Equivalent (see Step 3.1.2).
- 3.1.6 Total Dose (TEDE) - The Total Effective Dose Equivalent is the sum of external Dose (DDE) and the equivalent amount of whole body dose due to the individual organ uptakes.
- 3.1.7 Wind Direction - Direction the wind is coming from, where north = 0°, east = 90°, south = 180°, and west = 270°.
- 3.1.8 Wind Range - Wind direction variation, preferably found by observing a 15 minute interval on the wind direction recorder. Wind range is the greatest deviation observed over the 15 minute period (measured in degrees).

3.2 RESPONSIBILITIES

- 3.2.1 The Emergency Coordinator (EC) is responsible during all emergencies for the implementation of procedures. The EC is required to initially evaluate the situation by EM-202, Duties of the Emergency Coordinator. Responsibility for performing this procedure will be assigned by the EC.

3.3 LIMITS AND PRECAUTIONS

- 3.3.1 Stability classes have been grouped into three categories: (A,B,C), (D,E), (F,G). The most stable dispersion factor is applied to all the classes in each category. Table dose rates will be more conservative for classes A, B, D, and F (i.e., actual dose rates will be lower).
- 3.3.2 No credit is taken for radioactive decay. Table dose rates become more conservative as time progresses (i.e., actual dose rates will be lower).
- 3.3.3 Reactor Building Spray is assumed to be off. Table dose rates will be more conservative if spray is on (i.e., actual dose rates will be lower).

4.0 INSTRUCTIONS

- 4.0.1 Record all input parameters and dose estimates on the data sheet in Enclosure 1. If the data are also required by the State Notification Message Form, the right margin of the data sheet lists the section number of the State Notification Message Form.

4.1 RADIOLOGICAL DATA

- 4.1.1 IF RM-A2 low-range gas channel is not in service,
OR does not contain representative sample flow,
THEN
- Exit this procedure and base protective action recommendations on plant conditions.
 - Inform the State Warning Point that dose information will be provided in follow-up notifications.

4.1.2 IF RM-A2 low-range gas channel is on-scale,
THEN read the counts per minute and RECORD ON THE DATA SHEET.

4.1.3 IF RM-A2 low-range gas channel is off-scale high,
THEN:

- Request that the control board operator switch the RM-A2 mid/high range controller to auto.
- When the mid-range monitor has stabilized, read the mR/hr.
- RECORD ON THE DATA SHEET.

4.2 METEOROLOGICAL DATA

NOTE: The preferred source of meteorological data is the 33' Primary Tower. Alternate sources are the 175' Primary Tower and the 33' Alternate Tower.

NOTE: If the wind direction, or wind speed recorders are not in service, the appropriate meter may be observed for a brief period (possibly 30 seconds) to obtain an estimate.

4.2.1 Read the Sigma-Theta meter on the alternate tower panel and RECORD ON THE DATA SHEET.

4.2.2 IF Sigma-Theta is not available,
THEN estimate the previous 15 minute wind range from the 33' recorder.

NOTE: If the wind direction instrumentation is not available, visual indicators such as clouds, stacks, cooling towers, etc. may be used to determine wind direction.

4.2.3 Estimate the previous 15 minute average wind direction (direction wind is coming from) from the 33' recorder. RECORD ON THE DATA SHEET.

NOTE: If the wind speed instrumentation is not available, the default wind speeds are 2 meters per second for a day release or 1 meter per second for a night release.

4.2.4 Estimate the previous 15 minute average wind speed from the 33' recorder.
RECORD ON THE DATA SHEET.

NOTE: If stability class cannot be determined, the default is the D & E group.

4.2.5 Determine the stability class from the table below.

SIGMA-THETA (degrees) (primary method)	WIND RANGE (degrees) (secondary method)	STABILITY CLASS
≥ 22.5	≥ 135	A (most dispersed plume)
<22.5 to 17.5	134 to 105	B
<17.5 to 12.5	104 to 75	C
<12.5 to 7.5	74 to 45	D
<7.5 to 3.8	44 to 23	E
< 3.8	< 23	F,G (most concentrated plume)

4.3 DOSE RATE TABLES

4.3.1 IF RM-A2 low-range gas channel was on-scale,
THEN find the following dose rates on Enclosure 2, Table 1, corresponding to the count rate in cpm and the stability class (from Step 4.2.5) and RECORD ON THE DATA SHEET.

- DDE mR/hr
- Total (TEDE) mR/hr
- Thyroid mR/hr

4.3.2 IF RM-A2 low-range gas channel was off-scale and the mid-range monitor mR/hr was recorded,
THEN find the following dose rates on Enclosure 2, Table 2, corresponding to the monitor count rate in mR/hr and the stability class (from Step 4.2.5) and RECORD ON THE DATA SHEET.

- DDE mR/hr
- Total (TEDE) mR/hr
- Thyroid mR/hr

4.4 WIND CORRECTION CALCULATION

CAUTION: EM-202 Enclosure 1 indicates a Site Area Emergency if effluent monitors or portable devices detect the following dose rates at the Site Boundary (0.83 miles):

- * >50 mR/hr DDE for 30 minutes
- * >500 mR/hr DDE for 2 minutes

- * >250 mR/hr Thyroid (CDE) for 30 minutes
- * >2500 mR/hr Thyroid (CDE) for 2 minutes

4.4.1 Correct the DDE dose rate, Total (TEDE) dose rate, and Thyroid dose rate for wind speed by dividing by the meters per second from Step 4.2.4. RECORD ON DATA SHEET.

4.5 DOSE CALCULATION

NOTE: If the release duration cannot be estimated or determined, the default is 1 hour.

4.5.1 Estimate the release/exposure duration. RECORD ON THE DATA SHEET.

CAUTION: EM-202 Enclosure 1 indicates a General Emergency if any of the following doses are projected (for actual or planned releases) at the Site Boundary (0.83 miles). However, if no core damage has occurred, doses should be less than these values:

- * >1000 mR TEDE based on 1 hour of exposure
- * >5000 mR Thyroid (CDE)

4.5.2 Determine the DDE dose, Total (TEDE) dose, and Thyroid dose by multiplying the wind-corrected dose rate for each by the release/exposure duration. **RECORD ON THE DATA SHEET.**

4.6 **ADDITIONAL STATE NOTIFICATION FORM INFORMATION**

4.6.1 On the same table used to determine dose rates, find the Noble Gas Ci/sec and Iodine Ci/sec corresponding to the monitor count rate (from Steps 4.3.1, 4.3.2). **RECORD ON THE DATA SHEET.**

4.6.2 Determine the affected sectors on Enclosure 3 corresponding to wind direction from 4.2.3. **RECORD ON THE DATA SHEET.**

4.7 **DOCUMENTATION**

4.7.1 Record person's name performing the procedure, and the date and time initial assessment was made.

4.7.2 Submit this procedure to the Emergency Coordinator for review and signature.

4.7.3 All documentation and calculations created by this procedure shall be transmitted to Records Management after appropriate reviews.

DATA SHEET

STEP #	RAD AND MET MONITOR DATA			STATE NOT. FORM
4.1.2	RM-A2 LOW RANGE GAS CHANNEL		CPM	
or 4.1.3	RM-A2 MID-RANGE GAS CHANNEL		mR/HR	
4.2.1	SIGMA-THETA		DEGREES* *	
or 4.2.2	WIND RANGE (33')		DEGREES	
4.2.3	WIND FROM (33')		DEGREES *	11.A
4.2.4	WIND SPEED (33')		M/SEC*	11.C mph = m/sec x 2.24
4.2.5	STABILITY CLASS			11.D
* 15 minute average from chart recorder on meteorological panel ** Meter displays a rolling 15 minute average				

DATA SHEET

STEP#	SITE BOUNDARY DOSE INFORMATION			STATE NOT. FORM
4.3.1 or 4.3.2	DDE mR/HR	THYROID mR/HR	TEDE mR/HR	
4.4.1	DOSE RATE CORRECTED FOR WIND SPEED = (mR/HR ÷ M/SEC)			10
	DDE mR/HR	THYROID mR/HR	TEDE mR/HR	
	Enter on State Form		Enter on State Form	
4.5.1	PROJECTED RELEASE DURATION _____ HOURS. (If duration can't be estimated, assume 1 hour.)			7.C,D
4.5.2	DOSE = (CORRECTED DOSE RATE X DURATION HOURS)			
	DDE mR	THYROID mR	TEDE mR	
4.6.1	NOBLE GAS CI/SEC	IODINE CI/SEC		8.A,B
4.6.2	AFFECTED SECTORS _____, _____, _____, _____ (three minimum)			11.B
4.7.1	Performed by Date/Time			
4.7.2	Emergency Coordinator Date/Time			

TABLE 1
RM-A2 LOW-RANGE MONITOR
SITE BOUNDARY (0.83-MILE)
DOSE RATE (MR/HR)

LOWRANGE CPM	NG uCi/cc	NG CI/SEC	I CI/SEC	STABILITY CLASS A,B,C			STABILITY CLASS D,E			STABILITY CLASS F,G		
				DDE mR/HR	THY mR/HR	TEDE mR/HR	DDE mR/HR	THY mR/HR	TEDE mR/HR	DDE mR/HR	THY mR/HR	TEDE mR/HR
100	2.2E-06	1.6E-04	3.3E-08	1.6E-04	4.9E-04	1.8E-04	7.8E-04	2.3E-03	8.5E-04	2.8E-03	8.3E-03	3.1E-03
200	3.9E-06	2.9E-04	6.0E-08	3.0E-04	8.9E-04	3.3E-04	1.4E-03	4.2E-03	1.6E-03	5.0E-03	1.5E-02	5.6E-03
400	7.5E-06	5.5E-04	1.1E-07	5.7E-04	1.7E-03	6.2E-04	2.7E-03	8.1E-03	3.0E-03	9.6E-03	2.9E-02	1.1E-02
600	1.1E-05	8.1E-04	1.7E-07	8.3E-04	2.5E-03	9.2E-04	4.0E-03	1.2E-02	4.4E-03	1.4E-02	4.2E-02	1.6E-02
800	1.5E-05	1.1E-03	2.2E-07	1.1E-03	3.3E-03	1.2E-03	5.2E-03	1.6E-02	5.8E-03	1.9E-02	5.6E-02	2.1E-02
1000	1.8E-05	1.3E-03	2.8E-07	1.4E-03	4.1E-03	1.5E-03	6.5E-03	2.0E-02	7.2E-03	2.3E-02	7.0E-02	2.6E-02
2000	3.6E-05	2.6E-03	5.5E-07	2.7E-03	8.1E-03	3.0E-03	1.3E-02	3.9E-02	1.4E-02	4.6E-02	1.4E-01	5.1E-02
4000	7.1E-05	5.3E-03	1.1E-06	5.4E-03	1.6E-02	5.9E-03	2.6E-02	7.7E-02	2.8E-02	9.2E-02	2.7E-01	1.0E-01
6000	1.1E-04	7.9E-03	1.6E-06	8.1E-03	2.4E-02	8.9E-03	3.8E-02	1.2E-01	4.2E-02	1.4E-01	4.1E-01	1.5E-01
8000	1.4E-04	1.0E-02	2.2E-06	1.1E-02	3.2E-02	1.2E-02	5.1E-02	1.5E-01	5.6E-02	1.8E-01	5.5E-01	2.0E-01
1E+04	1.8E-04	1.3E-02	2.7E-06	1.3E-02	4.0E-02	1.5E-02	6.4E-02	1.9E-01	7.0E-02	2.3E-01	6.8E-01	2.5E-01
2E+04	3.6E-04	2.6E-02	5.4E-06	2.7E-02	8.1E-02	3.0E-02	1.3E-01	3.8E-01	1.4E-01	4.6E-01	1.4E+00	5.0E-01
4E+04	7.1E-04	5.2E-02	1.1E-05	5.4E-02	1.6E-01	5.9E-02	2.5E-01	7.6E-01	2.8E-01	9.1E-01	2.7E+00	1.0E+00
6E+04	1.1E-03	7.8E-02	1.6E-05	8.1E-02	2.4E-01	8.9E-02	3.8E-01	1.1E+00	4.2E-01	1.4E+00	4.1E+00	1.5E+00
8E+04	1.4E-03	1.0E-01	2.2E-05	1.1E-01	3.2E-01	1.2E-01	5.1E-01	1.5E+00	5.6E-01	1.8E+00	5.5E+00	2.0E+00
1E+05	1.8E-03	1.3E-01	2.7E-05	1.3E-01	4.0E-01	1.5E-01	6.4E-01	1.9E+00	7.0E-01	2.3E+00	6.8E+00	2.5E+00
2E+05	3.6E-03	2.6E-01	5.4E-05	2.7E-01	8.1E-01	3.0E-01	1.3E+00	3.8E+00	1.4E+00	4.6E+00	1.4E+01	5.0E+00
4E+05	7.1E-03	5.2E-01	1.1E-04	5.4E-01	1.6E+00	5.9E-01	2.5E+00	7.6E+00	2.8E+00	9.1E+00	2.7E+01	1.0E+01
6E+05	1.1E-02	7.8E-01	1.6E-04	8.1E-01	2.4E+00	8.9E-01	3.8E+00	1.1E+01	4.2E+00	1.4E+01	4.1E+01	1.5E+01
8E+05	1.4E-02	1.0E+00	2.2E-04	1.1E+00	3.2E+00	1.2E+00	5.1E+00	1.5E+01	5.6E+00	1.8E+01	5.5E+01	2.0E+01
1E+06	1.8E-02	1.3E+00	2.7E-04	1.3E+00	4.0E+00	1.5E+00	6.4E+00	1.9E+01	7.0E+00	2.3E+01	6.8E+01	2.5E+01

BASED ON RM-A2 GAS CALIBRATION ON 4/11/00
DOSE RATES ARE DETERMINED FOR 1 METER/SEC WIND SPEED
BASED ON A VENT FLOW OF 156000 CFM

TABLE 2
RM-A2 MID-RANGE MONITOR
SITE BOUNDARY (0.83-MILE)
DOSE RATE (MR/HR)

MIDRANGE mR/HR	NG μCi/cc	NG CI/SEC	I CI/SEC	STABILITY CLASS A,B,C			STABILITY CLASS D,E			STABILITY CLASS F,G		
				DDE mR/HR	THY mR/HR	TEDE mR/HR	DDE mR/HR	THY mR/HR	TEDE mR/HR	DDE mR/HR	THY mR/HR	TEDE mR/HR
0.01	1.7E-04	1.3E-02	2.6E-06	1.3E-02	3.9E-02	1.4E-02	6.1E-02	1.8E-01	6.7E-02	2.2E-01	6.5E-01	2.4E-01
0.02	3.4E-04	2.5E-02	5.2E-06	2.6E-02	7.7E-02	2.8E-02	1.2E-01	3.7E-01	1.3E-01	4.4E-01	1.3E+00	4.8E-01
0.04	6.8E-04	5.0E-02	1.0E-05	5.1E-02	1.5E-01	5.7E-02	2.4E-01	7.3E-01	2.7E-01	8.7E-01	2.6E+00	9.6E-01
0.06	1.0E-03	7.5E-02	1.6E-05	7.7E-02	2.3E-01	8.5E-02	3.7E-01	1.1E+00	4.0E-01	1.3E+00	3.9E+00	1.4E+00
0.08	1.4E-03	1.0E-01	2.1E-05	1.0E-01	3.1E-01	1.1E-01	4.9E-01	1.5E+00	5.4E-01	1.7E+00	5.2E+00	1.9E+00
0.1	1.7E-03	1.3E-01	2.6E-05	1.3E-01	3.9E-01	1.4E-01	6.1E-01	1.8E+00	6.7E-01	2.2E+00	6.5E+00	2.4E+00
0.2	3.4E-03	2.5E-01	5.2E-05	2.6E-01	7.7E-01	2.8E-01	1.2E+00	3.7E+00	1.3E+00	4.4E+00	1.3E+01	4.8E+00
0.4	6.8E-03	5.0E-01	1.0E-04	5.1E-01	1.5E+00	5.7E-01	2.4E+00	7.3E+00	2.7E+00	8.7E+00	2.6E+01	9.6E+00
0.6	1.0E-02	7.5E-01	1.6E-04	7.7E-01	2.3E+00	8.5E-01	3.7E+00	1.1E+01	4.0E+00	1.3E+01	3.9E+01	1.4E+01
0.8	1.4E-02	1.0E+00	2.1E-04	1.0E+00	3.1E+00	1.1E+00	4.9E+00	1.5E+01	5.4E+00	1.7E+01	5.2E+01	1.9E+01
1	1.7E-02	1.3E+00	2.6E-04	1.3E+00	3.9E+00	1.4E+00	6.1E+00	1.8E+01	6.7E+00	2.2E+01	6.5E+01	2.4E+01
2	3.4E-02	2.5E+00	5.2E-04	2.6E+00	7.7E+00	2.8E+00	1.2E+01	3.7E+01	1.3E+01	4.4E+01	1.3E+02	4.8E+01
4	6.8E-02	5.0E+00	1.0E-03	5.1E+00	1.5E+01	5.7E+00	2.4E+01	7.3E+01	2.7E+01	8.7E+01	2.6E+02	9.6E+01
6	1.0E-01	7.5E+00	1.6E-03	7.7E+00	2.3E+01	8.5E+00	3.7E+01	1.1E+02	4.0E+01	1.3E+02	3.9E+02	1.4E+02
8	1.4E-01	1.0E+01	2.1E-03	1.0E+01	3.1E+01	1.1E+01	4.9E+01	1.5E+02	5.4E+01	1.7E+02	5.2E+02	1.9E+02
10	1.7E-01	1.3E+01	2.6E-03	1.3E+01	3.9E+01	1.4E+01	6.1E+01	1.8E+02	6.7E+01	2.2E+02	6.5E+02	2.4E+02
20	3.4E-01	2.5E+01	5.2E-03	2.6E+01	7.7E+01	2.8E+01	1.2E+02	3.7E+02	1.3E+02	4.4E+02	1.3E+03	4.8E+02
40	6.8E-01	5.0E+01	1.0E-02	5.1E+01	1.5E+02	5.7E+01	2.4E+02	7.3E+02	2.7E+02	8.7E+02	2.6E+03	9.6E+02
60	1.0E+00	7.5E+01	1.6E-02	7.7E+01	2.3E+02	8.5E+01	3.7E+02	1.1E+03	4.0E+02	1.3E+03	3.9E+03	1.4E+03
80	1.4E+00	1.0E+02	2.1E-02	1.0E+02	3.1E+02	1.1E+02	4.9E+02	1.5E+03	5.4E+02	1.7E+03	5.2E+03	1.9E+03
100	1.7E+00	1.3E+02	2.6E-02	1.3E+02	3.9E+02	1.4E+02	6.1E+02	1.8E+03	6.7E+02	2.2E+03	6.5E+03	2.4E+03
200	3.4E+00	2.5E+02	5.2E-02	2.6E+02	7.7E+02	2.8E+02	1.2E+03	3.7E+03	1.3E+03	4.4E+03	1.3E+04	4.8E+03
400	6.8E+00	5.0E+02	1.0E-01	5.1E+02	1.5E+03	5.7E+02	2.4E+03	7.3E+03	2.7E+03	8.7E+03	2.6E+04	9.6E+03
600	1.0E+01	7.5E+02	1.6E-01	7.7E+02	2.3E+03	8.5E+02	3.7E+03	1.1E+04	4.0E+03	1.3E+04	3.9E+04	1.4E+04
1000	1.7E+01	1.3E+03	2.6E-01	1.3E+03	3.9E+03	1.4E+03	6.1E+03	1.8E+04	6.7E+03	2.2E+04	6.5E+04	2.4E+04

DOSE RATES ARE DETERMINED FOR 1 METER/SEC WIND SPEED.

μCi/cc is calculated using the most conservative factor in the first hour from curve 30 in the Radiation Monitor Sensitivity Curve Log.

DETERMINATION OF AFFECTED SECTORS

WIND DIRECTION (°FROM)	AFFECTED SECTORS
349-11	H J K
12-33	J K L
34-56	K L M
57-78	L M N
79-101	M N P
102-123	N P Q
124-146	P Q R
147-168	Q R A
169-191	R A B
192-213	A B C
214-236	B C D
237-258	C D E
259-281	D E F
282-303	E F G
304-326	F G H
327-348	G H J