

**PROGRESS ENERGY FLORIDA, INC.**

**CRYSTAL RIVER UNIT 3**

**DOCKET NUMBER 50-302 / LICENSE NUMBER DPR-72**

**ATTACHMENT A**

**RADIOACTIVE EFFLUENT RELEASE REPORT 2005**

**RADIOACTIVE EFFLUENT  
RELEASE REPORT  
2005**

**PROGRESS ENERGY FLORIDA, INC.**

**CRYSTAL RIVER UNIT 3**

**Facility Operating License No. DPR-72**

**Docket No. 50-302**

Prepared By: Rudy Pinner  
Sr. Science and Lab Services Specialist

Approved By: J. S. Taylor  
Superintendent Environmental and Chemistry

Date: 4/20/06

## CONTENTS

Introduction .....	1
Tabular Data Summaries	
Gaseous Effluents - Quarters 1 & 2 .....	2
Gaseous Effluents - Quarters 3 & 4 .....	4
Liquid Effluents - Quarters 1 & 2 .....	6
Liquid Effluents - Quarters 3 & 4 .....	9
Radwaste Shipments .....	12
Unplanned Releases .....	13
Radioactive Waste Treatment Systems.....	13
Annual Land Use Census .....	13
Effluent Monitor Instrument Operability .....	13
ODCM & PCP Changes .....	13
Emergency Feed Pump 2.....	13
Appendix I Dose Summary .....	14

## INTRODUCTION

This report is submitted as required by the Offsite Dose Calculation Manual, section 6.5, and Technical Specifications 5.6.2.3.3 and 5.7.1.1.c.

The scope of this report includes:

- A summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the plant.
- Quarterly and annual dose summaries.
- A list and description of unplanned releases to unrestricted areas.
- A description of any changes to the:
  - Process Control Program (PCP), and
  - Offsite Dose Calculation Manual (ODCM).
- Significant changes to any radioactive waste treatment system.
- A list of new dose calculation location changes identified by the annual land-use census.
- Information relating to effluent monitors or required supporting instrumentation being inoperable for 30 or more days.

**TABLE 1**  
**EFFLUENT AND WASTE DISPOSAL REPORT - 2005**  
**GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES**

Unit	Quarter 1	Quarter 2	Est. Total Error %
------	--------------	--------------	-----------------------

A. Fission and activation gases

1. Total release	Ci	5.61E+00	5.09E+00	30
2. Average release rate for period	μCi/sec	7.21E-01	6.48E-01	
3. Percent of technical specification limit	%	7.89E-03	6.20E-03	

B. Iodines

1. Total Iodine-131	Ci	9.65E-07	0.00E+00	30
2. Average release rate for period	μCi/sec	1.24E-07	0.00E+00	
3. Percent of technical specification limit	%	1.12E-02	0.00E+00	

C. Particulates\*

1. Particulates with half-lives > 8 days	Ci	4.53E-05	2.56E-08	30
2. Average release rate for period	μCi/sec	5.83E-06	3.25E-09	
3. Percent of technical specification limit	%	1.12E-02	2.61E-03	
4. Gross alpha radioactivity	Ci	2.37E-10	1.12E-08	

D. Tritium

1. Total release	Ci	9.19E-01	7.83 E-01	30
2. Average release rate for period	μCi/sec	1.18E-01	9.95E-02	
3. Percent of technical specification limit	%	1.12E-02	2.61E-03	

\* The sum of the particulates reported on this page may be less than the sum from Table 2, as Table 2 includes all particulates, while this table includes only those with half-lives greater than 8 days.

**TABLE 2**  
**EFFLUENT AND WASTE DISPOSAL REPORT - 2005**  
**GASEOUS EFFLUENTS - GROUND LEVEL RELEASES**

Nuclides Released	Unit	CONTINUOUS MODE		BATCH MODE	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2

A. Fission gases

Argon-41	Ci				
Krypton-85	Ci			3.95E+00	2.63E+00
Krypton-85m	Ci				
Krypton-87	Ci				
Krypton-88	Ci				
Xenon-131m	Ci				1.70E-02
Xenon-133	Ci			4.55E-01	2.38E+00
Xenon-133m	Ci	1.20E+00			1.17E-04
Xenon-135	Ci			1.51E-03	7.01E-02
Xenon-135m	Ci				
Xenon-138	Ci				
Total for period	Ci	1.20E+00	0.00E+00	4.41E+00	5.09E+00

B. Iodines

Iodine-131	Ci	9.65E-07			
Iodine-132	Ci				
Iodine-133	Ci	5.65E-07	1.26E-06		
Iodine-135	Ci				
Total for period	Ci	1.53E-06	1.26E-06	0.00E+00	0.00E+00

C. Particulates

Zinc-72	Ci				
Cobalt-58*	Ci				
Cobalt-60*	Ci				
Strontium-89*	Ci				
Strontium-90*	Ci				
Niobium-95m	Ci				
Technicium-99m	Ci				
Tellurium-132	Ci				
Cesium-134*	Ci				
Cesium-137*	Ci	2.20E-07			2.56E-08
Cesium-138	Ci				
Barium-139	Ci				
Lanthanum-142	Ci				
Cerium-141*	Ci				
Cerium-143*	Ci				
Rhenium-188	Ci				
Total for period	Ci	2.20E-07	0.00E+00	0.00E+00	2.56E-08

\* > 8 day half-life

**TABLE 3**

**EFFLUENT AND WASTE DISPOSAL REPORT - 2005**

**GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES**

Unit	Quarter 3	Quarter 4	Est. Total Error %
------	--------------	--------------	-----------------------

A. Fission and activation gases

1. Total release	Ci	6.34E+00	3.02E+01	30
2. Average release rate for period	μCi/sec	7.98E-01	3.80E+00	
3. Percent of technical specification limit	%	6.83E-03	2.85E-02	

B. Iodines

1. Total Iodine-131	Ci	0.00E+00	9.97E-06	30
2. Average release rate for period	μCi/sec	0.00E+00	1.25E-06	
3. Percent of technical specification limit	%	0.00E+00	9.84E-02	

C. Particulates\*

1. Particulates with half-lives > 8 days	Ci	1.49E-07	2.19E-06	30
2. Average release rate for period	μCi/sec	1.87E-08	2.76E-07	
3. Percent of technical specification limit	%	5.22E-03	9.84E-02	
4. Gross alpha radioactivity	Ci	0.00E+00	1.11E-07	

D. Tritium

1. Total release	Ci	1.60E+00	4.34E+00	30
2. Average release rate for period	μCi/sec	2.02E-01	5.46E-01	
3. Percent of technical specification limit	%	5.22E-03	9.84E-02	

\* The sum of the particulates reported on this page may be less than the sum from Table 4, as Table 4 includes all particulates, while this table includes only those with half-lives greater than 8 days.

**TABLE 4**  
**EFFLUENT AND WASTE DISPOSAL REPORT - 2005**  
**GASEOUS EFFLUENTS - GROUND LEVEL RELEASES**

Nuclides Released	Unit	CONTINUOUS MODE		BATCH MODE	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4

A. Fission gases

Argon-41	Ci				1.75E-01
Krypton-85	Ci			2.08E+00	4.02E+00
Krypton-85m	Ci				
Krypton-87	Ci				
Krypton-88	Ci				
Xenon-131m	Ci			8.39E-03	3.65E-02
Xenon-133	Ci	8.75E-01	1.50E+01	3.32E+00	1.03E+01
Xenon-133m	Ci			5.32E-03	3.63E-01
Xenon-135	Ci			5.48E-02	3.96E-01
Xenon-135m	Ci				
Xenon-138	Ci				
Total for period	Ci	8.75E-01	1.50E+01	5.47E+00	1.53E+01

B. Iodines

Iodine-131	Ci		9.54E-06		4.30E-07
Iodine-132	Ci				
Iodine-133	Ci				
Iodine-135	Ci				
Total for period	Ci	0.00E+01	9.54E-06	0.00E+01	4.30E-07

C. Particulates

Zinc-72	Ci				
Cobalt-58*	Ci		9.03E-07		
Chromium-51*	Ci		7.55E-07		
Strontium-89*	Ci				
Strontium-90*	Ci				
Niobium-95*	Ci		1.89E-07		
Tin-113*	Ci				
Indium-113m	Ci				
Barium-133m	Ci				
Cesium-137*	Ci	1.49E-07			
Cesium-138	Ci				
Barium-139	Ci				
Lanthanum-142	Ci				
Cerium-141	Ci				
Cerium-143	Ci				
Cerium-144*	Ci		3.44E-07		
Rhenium-188	Ci				
Total for period	Ci	1.49E-07	2.19E-06	0.00E+00	0.00E+00

\* > 8 day half-life



**TABLE 5**

**EFFLUENT AND WASTE DISPOSAL REPORT - 2005**

**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**

	Unit	Quarter 1	Quarter 2	Est. Total Error %
<b>A. Fission and activation products</b>				
1. Total release (not including tritium, gases, alpha)	Ci	4.79E-04	3.59E-03	25
2. Average diluted concentration during period	μCi/ml	8.88E-13	6.39E-12	
3. Percent of applicable limit	%	1.84E-04	6.16E-04	
<b>B. Tritium</b>				
1. Total release	Ci	1.30E+02	2.38E+02	30
2. Average diluted concentration during period	μCi/ml	2.41E-07	4.24E-07	
3. Percent of applicable limit	%	2.35E-01	4.38E-01	
<b>C. Dissolved and entrained gases</b>				
1. Total release	Ci	3.63E-02	1.12E-02	25
2. Average diluted concentration during period	μCi/ml	6.73E-11	1.99E-11	
3. Percent of applicable limit	%	3.29E-03	1.03E-03	
<b>D. Gross alpha radioactivity</b>				
1. Total release	Ci	0.00E+00	6.31E-05	30
<b>E. Volume of waste released (prior to dilution)</b>				
1. Batch and continuous modes	Liters	5.97E+06	7.01E+06	10
<b>F. Volume of dilution water used during period</b>				
1. Batch and continuous modes	Liters	5.39E+11	5.62E+11	10

**TABLE 6**  
**EFFLUENT AND WASTE DISPOSAL REPORT - 2005**  
**LIQUID EFFLUENTS**

Fission and activation products	Unit	CONTINUOUS MODE		BATCH MODE	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2
Sodium-24	Ci				
Chromium-51	Ci				
Manganese-54	Ci				1.10E-06
Manganese-56	Ci				
Iron-55	Ci			3.09E-05	
Iron-59	Ci				
Cobalt-57	Ci				
Cobalt-58	Ci				
Cobalt-60	Ci			9.80E-06	1.89E-04
Zinc-69	Ci				
Strontium-85	Ci				
Strontium-89	Ci				
Strontium-90	Ci				
Yttrium-91m	Ci				
Yttrium-92	Ci				7.26E-06
Yttrium-93	Ci				
Niobium-95	Ci				1.02E-06
Niobium-95m	Ci				5.56E-06
Niobium-97	Ci				
Zirconium-95	Ci				
Zirconium-97	Ci				
Molybdenum-99	Ci				
Technetium-99m	Ci				
Technetium-101	Ci			2.36E-05	3.61E-06
Ruthenium-103	Ci				
Ruthenium-106	Ci				
Silver-110m	Ci				1.19E-04
Tin-113	Ci				
Indium-113m	Ci				
Antimony-122	Ci				3.52E-06
Antimony-124	Ci				
Antimony-125	Ci				1.51E-05
Tellurium-129	Ci			1.22E-04	
Tellurium-132	Ci				1.17E-06
Iodine-131	Ci				
Iodine-133	Ci				
Iodine-135	Ci				
Cesium-134	Ci			1.10E-04	1.22E-03
Cesium-137	Ci			1.78E-04	2.00E-03
Cesium-138	Ci				
Barium-133m	Ci				1.31E-05
Barium-140	Ci				
Lanthanum-140	Ci				
Cerium-141	Ci			4.64E-06	
Cerium-143	Ci				1.22E-05
Neodymium-147	Ci				
Tungsten-187	Ci				
Neptunium--239	Ci				
<b>Total for period</b>	<b>Ci</b>	<b>0.00E+00</b>	<b>0.00E+00</b>	<b>4.79E-04</b>	<b>3.59E-03</b>

TABLE 6 (CONTINUED)

EFFLUENT AND WASTE DISPOSAL REPORT - 2005

LIQUID EFFLUENTS

Dissolved and entrained gases	Unit	CONTINUOUS MODE		BATCH MODE	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2
Argon-41	Ci				
Krypton-85	Ci			1.45E-02	6.89E-03
Krypton-85m	Ci				
Krypton-87	Ci			1.25E-05	2.33E-06
Krypton-88	Ci				
Xenon-131m	Ci			1.40E-04	
Xenon-133	Ci			2.11E-02	4.21E-03
Xenon-133m	Ci			2.26E-04	
Xenon-135	Ci			2.60E-04	7.07E-05
Xenon-135m	Ci				
Total for period	Ci	0.00E+00	0.00E+00	3.63E-02	1.12E-2
Tritium	Ci	0.00E+00	0.00E+00	1.30E+02	2.38E+02

**TABLE 7**

**EFFLUENT AND WASTE DISPOSAL REPORT - 2005**

**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**

Unit	Quarter 3	Quarter 4	Est. Total Error %
------	--------------	--------------	-----------------------

**A. Fission and activation products**

1. Total release (not including tritium, gases, alpha)	Ci	8.46E-02	1.55E-02	25
2. Average diluted concentration during period	μCi/ml	1.44E-10	2.97E-11	
3. Percent of applicable limit	%	5.19E-02	1.39E-02	

**B. Tritium**

1. Total release	Ci	2.59E+02	6.72E+01	30
2. Average diluted concentration during period	μCi/ml	4.42E-07	1.29E-07	
3. Percent of applicable limit	%	4.58E-01	9.04E-02	

**C. Dissolved and entrained gases**

1. Total release	Ci	1.09E-02	2.88E-02	25
2. Average diluted concentration during period	μCi/ml	1.86E-11	5.52E-11	
3. Percent of applicable limit	%	9.63E-04	1.93E-03	

**D. Gross alpha radioactivity**

1. Total release	Ci	1.36E-04	1.36E-04	30
------------------	----	----------	----------	----

**E. Volume of waste released (prior to dilution)**

1. Batch and continuous modes	Liters	8.68E+06	8.83E+06	10
-------------------------------	--------	----------	----------	----

**F. Volume of dilution water used during period**

1. Batch and continuous modes	Liters	5.86E+11	5.22E+11	10
-------------------------------	--------	----------	----------	----

**TABLE 8**  
**EFFLUENT AND WASTE DISPOSAL REPORT - 2005**

**LIQUID EFFLUENTS**

Fission and activation products	Unit	CONTINUOUS MODE		BATCH MODE	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
Sodium-24	Ci				
Chromium-51	Ci				
Manganese-54	Ci			4.74E-04	4.17E-05
Manganese-56	Ci				
Iron-55	Ci			1.25E-04	4.76E-04
Iron-59	Ci				3.25E-05
Cobalt-57	Ci			3.98E-06	
Cobalt-58	Ci		4.02E-05		1.02E-03
Cobalt-60	Ci			4.21E-02	3.21E-03
Zinc-69	Ci				
Zinc-72	Ci				
Strontium-85	Ci				
Strontium-89	Ci				
Strontium-90	Ci				7.53E-05
Strontium-92	Ci				
Yttrium-91	Ci				
Yttrium-92	Ci				
Yttrium-93	Ci				
Rubidium-88	Ci				
Niobium-95	Ci				3.25E-05
Niobium-95m	Ci				
Zirconium-95	Ci				3.51E-05
Molybdenum-99	Ci				
Technetium-99m	Ci				
Technetium-101	Ci				
Ruthenium-106	Ci			1.35E-03	1.35E-04
Silver-110m	Ci			2.81E-02	8.29E-03
Tin-113	Ci				
Indium-113m	Ci				
Antimony-122	Ci			1.06E-05	9.08E-06
Antimony-124	Ci				
Antimony-125	Ci			1.49E-03	1.26E-03
Tellurium-129	Ci				
Tellurium-132	Ci				
Iodine-131	Ci			9.36E-07	1.23E-04
Iodine-132	Ci				
Iodine-133	Ci			2.73E-07	
Iodine-135	Ci				
Cesium-134	Ci			3.94E-03	2.01E-04
Cesium-136	Ci				
Cesium-137	Ci		7.70E-05	6.83E-03	3.68E-04
Barium-133m	Ci				
Barium-139	Ci				1.29E-05
Barium-140	Ci				
Lanthanum-140	Ci				
Cerium-144	Ci			1.41E-04	4.33E-05
Cerium-143	Ci			9.79E-06	5.44E-06
Praseodymium-144	Ci				
Neodymium-147	Ci				
Rhenium-188	Ci				
Total for period	Ci	0.00E+01	1.17E-04	8.45E-02	1.54E-02

**TABLE 8 (CONTINUED)**

**EFFLUENT AND WASTE DISPOSAL REPORT - 2005**

**LIQUID EFFLUENTS**

Dissolved and entrained gases	Unit	CONTINUOUS MODE		BATCH MODE	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
Argon-41	Ci				
Krypton-85	Ci				7.68E-03
Krypton-85m	Ci				
Krypton-87	Ci			3.02E-06	
Krypton-88	Ci				
Xenon-131m	Ci				5.75E-04
Xenon-133	Ci			1.09E-02	2.03E-02
Xenon-133m	Ci				1.18E-04
Xenon-135	Ci			3.44E-05	2.14E-04
Xenon-135m	Ci				
Total for period	Ci	0.00E+00	0.00E+00	1.09E-02	2.88E-02
Tritium	Ci	0.00E+00	5.70E-02	2.59E+02	6.72E+01

**TABLE 9**

**EFFLUENT AND WASTE DISPOSAL REPORT - 2005**

**SOLID WASTE AND IRRADIATED FUEL SHIPMENTS**

**A. SOLID WASTE SHIPPED OFFSITE FOR PROCESSING OR BURIAL (Non-irradiated fuel)**

1. Type of waste	Unit	12 month period	Est. Total Error %	
a. Spent resins, filter sludges, evaporator bottoms, etc.	m3	1.36E+01	25	
	Ci	5.06E+02		
b. Dry compressible waste, contaminated equipment, etc.	m3	3.68E+02	25	
	Ci	8.29E-01		
c. Irradiated components, control rods, etc.	m3	0.00E+00	25	
	Ci	0.00E+00		
d. Other (describe): Combined DAW package	m3	1.70E+01	25	
	Ci	1.59E+00		
<b>2. Estimate of major nuclide composition (by type of waste in %)*</b>				
a.	Co-60	11.9	Cs-134	16.3
	Cs-137	55.5	Fe-55	5.3
	Ni-63	10.9		
b.	Fe-55	31.9	Cs-137	2.2
	Ni-63	27.8	Sb-125	1.2
	Co-60	20.1	Ag-110m	1.4
			Cs-134	1.7
			C-14	13.0
c.				
d.	Fe-55	5.7	Ni-63	1.3
	Co-60	7.9	Cs-134	21.3
	Cs-137	44.0	Nb-95	16.3

\* Curie values and principle radionuclides are estimates based on a combination of direct and indirect methods.

**3. Solid Waste Disposition**

Number of Shipments	Mode of Transportation *	Destination
7	Hittman	Duratek (TN)
5	Hittman	Studsvik Processing Facility (TN)

\* All exclusive use trucks

**B. IRRADIATED FUEL SHIPMENTS (Disposition)**

Number of Shipments	Mode of Transportation	Destination
0	N/A	N/A

### Unplanned Releases

There were no unplanned releases in 2005.

### Radioactive Waste Treatment Systems

There were no significant changes to the radioactive waste treatment systems.

### Annual Land Use Census

The 2005 land-use census did not identify any new dose calculation locations.

### Effluent Monitor Instrument Operability

Required effluent monitor instrumentation was not out of service for more than 30 days during 2005.

### ODCM & PCP Changes

The ODCM was revised in 2005 to correct and clarify locations for REMP sample station locations. Affected pages are 140, 141, and 142. Reference NCRs 130223 & 164046.

The PCP was not revised in 2005.

### Emergency Feed Pump 2 & Steam Releases

Emergency Feed Pump 2 (EFP-2) overspeed testing is performed quarterly using steam from CR-3's steam generators. Due to a small primary to secondary leak, an evaluation was performed to estimate the quantity of radioactive material which was released during 2005 due to operation of this pump. In addition, radioactive releases due to other steam releases have been estimated and included. The results are given below in units of Curies/year.

Xe-133	6.40E-07	I-131	1.68E-08	Cs-134	2.96E-08
Xe-135	3.20E-06	I-133	8.00E-08	Cs-137	2.32E-08
H-3	4.00E-06				

These values are not included in Tables 1 through 4.



**2005 Appendix I Dose Summary**  
**Maximum Hypothetical Individual**

**Liquid Effluent Dose Limits**

Total Body: 1.5 mrem/quarter, 3 mrem/year  
 Any Organ: 5 mrem/quarter, 10 mrem/year

**Liquid Effluent Dose Summary**

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual Total
Total Body Dose (mrem)	2.76E-06	9.24E-06	5.33E-05	2.11E-06	8.64E-05
Maximum Organ Dose (mrem)	2.53E-06	1.48E-05	2.60E-03	6.94E-04	3.31E-03
Maximum Organ was GI					

**Gaseous Effluent Dose Limits**

Gamma Air Dose: 5 mrad/quarter, 10 mrad/year  
 Beta Air Dose: 10 mrad/quarter, 20 mrad/year  
  
 Any Organ: 7.5 mrem/quarter, 15 mrem/year

**Gaseous Release Dose Summary**

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual Total
Gamma Air Dose (mrad)	4.94E-05	8.11E-05	1.29E-04	7.83E-04	1.04E-03
Beta Air Dose (mrad)	7.89E-04	6.20E-04	6.83E-04	2.85E-03	4.94E-03
Total Body Dose (mrem)	2.23E-04	1.88E-04	3.86E-04	1.05E-03	1.36E-03
Maximum Organ Dose (mrem)	8.39E-04	1.95E-04	3.86E-04	7.38E-03	8.80E-03
Maximum Organ was Thyroid					