



Crystal River Nuclear Plant  
15760 W. Power Line Street  
Crystal River, FL 34428

Docket 50-302  
Operating License No. DPR-72

10 CFR 50.36a(a)(2)  
ITS 5.7.1.1(c)

March 27, 2014  
3F0314-06

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

Subject: Crystal River Unit 3 – 2013 Annual Radioactive Effluent Release Report

Dear Sir:

Duke Energy Florida, Inc., hereby provides the 2013 Radioactive Effluent Release Report for Crystal River Unit 3 (CR-3) in accordance with 10 CFR 50.36a(a)(2) and the CR-3 Improved Technical Specifications (ITS), Section 5.7.1.1(c). The attached report includes a summary of the quantities of radioactive liquid and gaseous effluents, and solid waste released from the CR-3 site during 2013. The material provided is consistent with the objectives outlined in the Off-Site Dose Calculation Manual (ODCM) and the Process Control Program (PCP), and is in conformance with 10 CFR 50, Appendix I, Section IV.B.1.

The CR-3 ITS, Section 5.6.2.3, requires submittal of licensee initiated changes to the ODCM as part of the Radioactive Effluent Release Report for the period of the report in which any changes were made. The ODCM and the PCP were not revised in 2013.

No new regulatory commitments are made in this letter

If you have any questions regarding this submittal, please contact Mr. Dan Westcott, Manager, Nuclear Regulatory Affairs, at (352) 563-4796.

Sincerely,

Blair P. Wunderly  
Plant Manager  
Crystal River Nuclear Plant

BPW/ff

Attachment: 2013 Annual Radioactive Effluent Release Report

xc: NRR Project Manager  
Regional Administrator, Region I

IE48  
NRR

**DUKE ENERGY FLORIDA, INC.**

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

**ATTACHMENT**

**2013 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT**

**ANNUAL RADIOACTIVE EFFLUENT  
RELEASE REPORT  
2013**



**DUKE ENERGY FLORIDA, INC  
CRYSTAL RIVER UNIT 3**

Facility Operating License No. DPR-72

Docket No. 50-302

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Sr. Scientist

Approved By: **Bryant Akins** *Bryant Akins*  
Manager Radiation Protection & Chemistry

Date: **03-24-2014**

## CONTENTS

Introduction .....	1
Tabular Data Summaries	
Gaseous Effluents - Quarters 1 to 4 .....	2
Liquid Effluents - Quarters 1 to 4 .....	7
Batch Release Summary .....	10
Abnormal Release Summary .....	12
Dose Evaluation .....	14
Appendix I Dose Summary .....	16
Radwaste Shipments .....	18
Unplanned Releases .....	19
Radioactive Waste Treatment Systems .....	19
Annual Land Use Census .....	19
Effluent Monitor Instrument Operability .....	19
Meteorology Instrumentation Evaluation .....	20
ODCM Changes .....	20
Process Control Program Changes .....	21
Emergency Feed Pump 2 .....	21
Carbon-14 Evaluation .....	21
NEI 07-07 Required Data .....	22

## 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.
- Information required to be included in this report per NEI 07-07 Industry Ground Water Protection Initiative-Final Guidance Document issued in August 2007.

**Note for reporting purposes, N/D = Not Detected.**

# EFFLUENT and WASTE DISPOSAL REPORT-2013

## Table 1A - Regulatory Guide 1.21

### Gaseous Effluents - Summation of All Releases Unit: 3

	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Est. Total % Error
<b>A. Fission &amp; Activation Gases</b>						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E+01
2. Average Release Rate for Period	uCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
<b>B. Iodines</b>						
1. Total Iodine-131	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E+01
2. Average Release Rate for Period	uCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
<b>C. Particulates</b>						
1. Particulates with half-lives > 8 days	Curies	0.00E+00	2.36E-07	0.00E+00	6.98E-07	3.00E+01
2. Average Release Rate for Period	uCi/sec	0.00E+00	3.01E-08	0.00E+00	8.78E-08	
3. Gross Alpha Radioactivity	Curies	3.73E-08	0.00E+00	4.02E-08	2.36E-09	
<b>D. Tritium</b>						
1. Total Release	Curies	7.80E-01	1.14E+00	9.77E-01	7.25E-01	3.00E+01
2. Average Release Rate for Period	uCi/sec	1.00E-01	1.44E-01	1.23E-01	9.12E-01	

# EFFLUENT and WASTE DISPOSAL REPORT-2013

## Table 1B - Regulatory Guide 1.21

### Gaseous Effluents - Elevated Batch Mode Unit: 3

(This Table Does Not Apply to Crystal River Unit 3)

	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
<b>Fission &amp; Activation Gases</b>					
Total	Curies	N/D	N/D	N/D	N/D
<b>Iodines</b>					
Total	Curies	N/D	N/D	N/D	N/D
<b>Particulates</b>					
Total	Curies	N/D	N/D	N/D	N/D
<b>H-3</b>	Curies	N/D	N/D	N/D	N/D
<b>Gross Alpha</b>	Curies	N/D	N/D	N/D	N/D

## EFFLUENT and WASTE DISPOSAL REPORT-2013

### Table 1B – (Continued) Regulatory Guide 1.21

#### Gaseous Effluents - Elevated Continuous Mode Unit: 3

(This Table Does Not Apply to Crystal River Unit 3)

	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
<b>Fission &amp; Activation Gases</b>					
Total	Curies	N/D	N/D	N/D	N/D
<b>Iodines</b>					
Total	Curies	N/D	N/D	N/D	N/D
<b>Particulates</b>					
Total	Curies	N/D	N/D	N/D	N/D
<b>H-3</b>	Curies	N/D	N/D	N/D	N/D
<b>Gross Alpha</b>	Curies	N/D	N/D	N/D	N/D

# EFFLUENT and WASTE DISPOSAL REPORT-2013

## Table 1C - Regulatory Guide 1.21

### Gaseous Effluents - Ground Batch Mode Unit: 3

	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
<b>Fission &amp; Activation Gases</b>					
Total	Curies	N/D	N/D	N/D	N/D
<b>Iodines</b>					
Total	Curies	N/D	N/D	N/D	N/D
<b>Particulates</b>					
Total	Curies	N/D	N/D	N/D	N/D
<b>H-3</b>	Curies	N/D	N/D	N/D	N/D
<b>Gross Alpha</b>	Curies	N/D	N/D	N/D	N/D

## EFFLUENT and WASTE DISPOSAL REPORT-2013

### Table 1C – (Continued) Regulatory Guide 1.21

#### Gaseous Effluents - Ground Continuous Mode Unit: 3

	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
<b>Fission &amp; Activation Gases</b>					
Total	Curies	N/D	N/D	N/D	N/D
<b>Iodines</b>					
Total	Curies	N/D	N/D	N/D	N/D
<b>Particulates</b>					
Cs-137	Curies	N/D	2.36E-07	N/D	6.98E-07
Total	Curies	N/D	2.36E-07	N/D	6.98E-07
<b>H-3</b>	Curies	7.80E-01	1.14E+00	9.77E-01	7.25E-01
<b>Gross Alpha</b>	Curies	3.73E-08	N/D	4.08E-08	2.36E-09

# EFFLUENT and WASTE DISPOSAL REPORT-2013

## Table 2A - Regulatory Guide 1.21

### Liquid Effluents - Summation of All Releases Unit: 3

	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Est. Total % Error
<b>A. Fission &amp; Activation Products</b>						
1. Total Release (not including tritium, gases, alpha)	Curies	1.60E-05	1.57E-04	6.10E-03	5.01E-04	2.50E+01
2. Average diluted concentration during period	uCi/ml	8.64E-14	6.20E-13	2.23E-11	2.52E-12	
3. Percent of Applicable Limit	%	3.09E-07	2.32E-06	3.59E-05	7.98E-06	
<b>B. Tritium</b>						
1. Total Release	Curies	1.42E-01	5.69E+00	6.56E+00	6.70E+00	3.00E+01
2. Average diluted concentration during period	uCi/ml	7.68E-10	2.24E-08	2.39E-08	3.37E-08	
3. Percent of Applicable Limit	%	7.68E-06	2.24E-04	2.39E-04	3.37E-04	
<b>C. Dissolved and Entrained Gases</b>						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E+01
2. Average diluted concentration during period	uCi/ml	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
3. Percent of Applicable Limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
<b>D. Gross Alpha Radioactivity</b>						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E+01
<b>E. Waste Volume Released (Pre-Dilution)</b>						
	Liters	2.13E+06	2.73E+06	4.01E+06	2.79E+06	1.00E+01
<b>F. Dilution Water Volume During Period</b>						
	Liters	1.85E+11	2.54E+11	2.74E+11	1.99E+11	1.00E+01

## EFFLUENT and WASTE DISPOSAL REPORT-2013

### Table 2B - Regulatory Guide 1.21

#### Liquid Effluents - Batch Mode Unit: 3

Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
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#### Fission & Activation Products

Mn-54	Curies	N/D	N/D	8.71E-06	2.79E-06
Fe-55	Curies	N/D	N/D	2.73E-03	7.14E-05
Co-60	Curies	1.54E-05	1.04E-04	2.56E-03	1.64E-04
Ni-63	Curies	N/D	N/D	7.02E-04	1.56E-04
Ag-110m	Curies	N/D	3.39E-06	N/D	N/D
Sb-125	Curies	N/D	2.72E-05	N/D	5.48E-06
Cs-134	Curies	N/D	N/D	1.84E-06	1.90E-06
Cs-137	Curies	5.82E-07	2.26E-05	9.54E-05	9.92E-05
<b>Total</b>	Curies	1.60E-05	1.57E-04	6.10E-03	5.01E-04

#### Dissolved and Entrained Gases

<b>Total</b>	Curies	N/D	N/D	N/D	N/D
<b>H-3</b>	Curies	1.42E-01	5.69E+00	6.56E+00	6.70E+00
<b>Gross Alpha</b>	Curies	N/D	N/D	N/D	N/D

# EFFLUENT and WASTE DISPOSAL REPORT-2013

## Table 2B - (Continued) Regulatory Guide 1.21

### Liquid Effluents - Continuous Mode

Unit: 3

Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
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#### Fission & Activation Products

Total	Curies	N/D	N/D	N/D	N/D
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#### Dissolved and Entrained Gases

Total	Curies	N/D	N/D	N/D	N/D
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<b>H-3</b>	Curies	N/D	N/D	N/D	1.48E-04
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<b>Gross Alpha</b>	Curies	N/D	N/D	N/D	N/D
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# EFFLUENT and WASTE DISPOSAL REPORT-2013

## Regulatory Guide 1.21

### Gaseous Batch Release Summary

Unit: 3

	Jan - Jun	Jul - Dec
Number of Batch Releases	6	0
Total Time Period for Batch Releases	3.63E+03 min	0.00E+00 min
Maximum Time Period for a Batch Release	1.04E+03 min	0.00E+00 min
Average Time Period for a Batch Release	6.06E+02 min	0.00E+00 min
Minimum Time Period for a Batch Release	3.09E+02 min	0.00E+00 min

# EFFLUENT and WASTE DISPOSAL REPORT-2013

## Regulatory Guide 1.21

### Liquid Batch Release Summary

Unit: 3

	Jan - Jun	Jul - Dec
Number of Batch Releases	36	74
Total Time Period for Batch Releases	7.65E+03 min	1.18E+04 min
Maximum Time Period for a Batch Release	4.15E+02 min	4.20E+02 min
Average Time Period for a Batch Release	2.13E+02 min	1.60E+02 min
Minimum Time Period for a Batch Release	2.20E+01 min	5.00E+01 min
Average Stream Flow During Release Periods	2.62E+05 gpm	3.76E+05 gpm

# **EFFLUENT and WASTE DISPOSAL REPORT-2013**

## **Regulatory Guide 1.21**

### **Gaseous Abnormal Release Summary**

**Unit: 3**

	<b>Jan - Jun</b>	<b>Jul - Dec</b>
Number of Abnormal Releases	0	0
Total Time Period for Abnormal Releases	0.00E+00 min	0.00E+00 min
Maximum Time Period for an Abnormal Release	0.00E+00 min	0.00E+00 min
Average Time Period for an Abnormal Release	0.00E+00 min	0.00E+00 min
Minimum Time Period for an Abnormal Release	0.00E+00 min	0.00E+00 min
Total Activity for Abnormal Releases	0.00E+00 Ci	0.00E+00 Ci

# **EFFLUENT and WASTE DISPOSAL REPORT-2013**

## **Regulatory Guide 1.21**

### **Liquid Abnormal Release Summary Unit: 3**

	<b>Jan - Jun</b>	<b>Jul - Dec</b>
Number of Abnormal Releases	0	0
Total Time Period for Abnormal Releases	0.00E+00 min	0.00E+00 min
Maximum Time Period for an Abnormal Release	0.00E+00 min	0.00E+00 min
Average Time Period for an Abnormal Release	0.00E+00 min	0.00E+00 min
Minimum Time Period for an Abnormal Release	0.00E+00 min	0.00E+00 min
Total Activity for Abnormal Releases	0.00E+00 Ci	0.00E+00 Ci

# EFFLUENT and WASTE DISPOSAL REPORT-2013

## Regulatory Guide 1.21

### Gaseous NNG Organ Dose

Unit: 3

Receptor Name: Infant Max Ind NW at 1.34 km

	1 <sup>st</sup> Quarter		2 <sup>nd</sup> Quarter		3 <sup>rd</sup> Quarter		4 <sup>th</sup> Quarter		Calendar Year	
Organ	Dose	% of ODCM Limit	Dose	% of ODCM Limit						
Bone	1.87E-04	2.50E-03	2.81E-04	3.75E-03	2.35E-04	3.13E-03	2.00E-04	2.67E-03	9.03E-04	6.02E-03
Liver	1.87E-04	2.50E-03	2.83E-04	3.77E-03	2.35E-04	3.13E-03	2.04E-04	2.72E-03	9.08E-04	6.05E-03
Total Body	1.87E-04	2.50E-03	2.75E-04	3.66E-03	2.35E-04	3.13E-03	1.80E-04	2.40E-03	8.77E-04	5.84E-03
Thyroid	1.87E-04	2.50E-03	2.74E-04	3.65E-03	2.35E-04	3.13E-03	1.78E-04	2.38E-03	8.74E-04	5.83E-03
Kidney	1.87E-04	2.50E-03	2.76E-04	3.69E-03	2.35E-04	3.13E-03	1.85E-04	2.47E-03	8.83E-04	5.89E-03
Lung	1.87E-04	2.50E-03	2.75E-04	3.67E-03	2.35E-04	3.13E-03	1.81E-04	2.41E-03	8.78E-04	5.85E-03
GI-Li	1.87E-04	2.50E-03	2.74E-04	3.65E-03	2.35E-04	3.13E-03	1.78E-04	2.38E-03	8.74E-04	5.83E-03

Maximum Organ was LIVER.

# EFFLUENT and WASTE DISPOSAL REPORT-2013

## Regulatory Guide 1.21

### Liquid Organ & Whole Body Dose

Unit: 3

Receptor Name: Adult W at 1.34 km

1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	Calendar Year
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Organ	1 <sup>st</sup> Quarter		2 <sup>nd</sup> Quarter		3 <sup>rd</sup> Quarter		4 <sup>th</sup> Quarter		Calendar Year	
	Dose	% of ODCM Limit	Dose	% of ODCM Limit						
Bone	7.27E-09	1.45E-07	5.65E-07	1.13E-05	1.45E-03	2.91E-02	5.21E-05	1.04E-03	1.51E-03	1.51E-02
Liver	8.54E-09	1.71E-07	7.29E-07	1.46E-05	8.27E-04	1.65E-02	1.57E-05	3.15E-04	8.44E-04	8.44E-03
Total Body	9.94E-09	6.63E-07	5.61E-07	3.74E-05	2.01E-04	1.34E-02	5.35E-06	3.57E-04	2.07E-04	6.91E-03
Thyroid	7.14E-09	1.43E-07	1.63E-07	3.25E-06	3.88E-07	7.76E-06	2.81E-07	5.62E-06	8.39E-07	8.39E-06
Kidney	7.20E-09	1.44E-07	3.50E-07	6.99E-06	1.63E-06	3.26E-05	9.18E-07	1.84E-05	2.90E-06	2.90E-05
Lung	7.16E-09	1.43E-07	2.25E-07	4.50E-06	4.48E-04	8.97E-03	6.73E-06	1.35E-04	4.55E-04	4.55E-03
GI-Li	3.00E-08	6.00E-07	6.88E-07	1.38E-05	4.81E-04	9.63E-03	8.00E-06	1.60E-04	4.90E-04	4.90E-03

**Liquid Effluent Dose Limits**

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

## EFFLUENT and WASTE DISPOSAL REPORT-2013

### Regulatory Guide 1.21

#### Liquid App I Dose Assessment Unit: 3

#### Adult W at 1.34km

	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
<b>Maximum Organ Dose</b>	mRem	7.27E-09	5.65E-07	1.45E-03	5.21E-05	1.51E-03
<b>ODCM Limit</b>	mRem	5.00	5.00	5.00	5.00	10.00
<b>% of ODCM Limit</b>	%	1.45E-07	1.13E-05	2.91E-02	1.04E-03	1.51E-02

Maximum Organ was Bone

	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
<b>Total Body</b>	mRem	9.94E-09	5.61E-07	2.01E-04	5.35E-06	2.07E-04
<b>ODCM Limit</b>	mRem	1.50	1.50	1.50	1.50	3.00
<b>% of ODCM Limit</b>	%	6.63E-07	3.74E-05	1.34E-02	3.57E-04	6.91E-03

## EFFLUENT and WASTE DISPOSAL REPORT-2013

### Regulatory Guide 1.21

### App I Dose Assessment

#### Unit: 3

#### Airborne Noble Gas Doses Child Site Boundary NW at 1.34 km

	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
<b>Beta Air</b>	mRad	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<b>ODCM Limit</b>	mRad	10.00	10.00	10.00	10.00	20.00
<b>% of ODCM Limit</b>	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
<b>Gamma Air</b>	mRad	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<b>ODCM Limit</b>	mRad	5.00	5.00	5.00	5.00	10.00
<b>% of ODCM Limit</b>	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

#### Gaseous Release Dose Summary

**Note:** There were no noble gases released in 2013 due to the extended plant shutdown from refueling outage 16 that began in September 2009. The plant remains shutdown in mode 7 (defueled) for all of 2010, 2011, 2012, and 2013 due to reactor building containment concrete wall delamination issues.

#### 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

**TABLE 3**  
**EFFLUENT and WASTE DISPOSAL REPORT-2013**  
**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 Ci	1.01E+01 7.80E+01	25
b. Dry compressible waste, contaminated equipment, etc.	m3 Ci	3.71E+02 1.02E-01	25
c. Irradiated components, control rods, etc.	m3 Ci	0.00E+00 0.00E+00	25
d. Other (describe): Combined DAW package	m3 Ci	5.81E-01 3.98E+00	25
<b>2. Estimate of major nuclide composition (by type of waste in %)*</b>			
a.	Fe-55 4.01 Sb-125 0.14 Mn-54 0.04 C-14 0.17	Co-60 5.69 Ni-63 45.20 Ni-59 0.33 Cs-134 1.60	Cs-137 42.51 Sr-90 0.27 Ce-144 0.02
b.	C-14 8.80 Fe-55 7.25 Co-60 42.43 Sb-125 0.90 Co-57 0.04	Ni-63 34.70 Mn-54 1.24 Cs-137 4.23 Cs-134 0.24	Zn-65 0.07 Ag-110m 0.07 Ce-144 0.03
c.	N/A	N/A	N/A
d.	Mn-54 4.24 Fe-55 0.24 Co-57 0.05 Co-58 18.61 Co-60 25.21	Ni-63 10.57 Zr-95 1.49 Ag-110m 4.19 Cs-134 10.70	Cs-137 20.03 Ce-144 4.66

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

**3. Solid Waste Disposition**

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
09	Truck Shipments	Energy Solutions
11	Truck Shipments	Energy Solutions-Bear Creek
04	Truck Shipments	Studs vik Processing Facility, LLC

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

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
0	N/A	N/A

## **Unplanned Releases**

There were no unplanned releases in 2013.

## **Radioactive Waste Treatment Systems**

There were no significant changes to the radioactive waste treatment systems in 2013. Due to the lengthy shutdown of Crystal River Unit 3, liquid waste volume and radioactivity concentration had continued to decrease until the decision to retire CR3 and begin decommissioning was made in February of 2013. As part of the preparation to place the unit in SAFSTOR, liquid waste inventory of all systems no longer required to support spent fuel cooling are being processed for discharge as liquid wastes, where possible. The liquid waste demineralizers were recharged with new condensate resin that was previously loaded into the condensate demineralizers to support the plant restart from the refuel 16 outage. This resin is a 2:1 cation to anion macroporous gel mixture of Ambersep 200H cation resin and IRN78 anion resin. This resin has performed extremely well while processing higher activity waste tanks including reactor coolant and borated water refueling water.

## **Annual Land Use Census**

The 2013 land-use census did not identify any new dose calculation locations.

## **Effluent Monitor Instrument Operability**

In June 2012 gaseous effluent radiation monitors RM-A1 and RM-A2, along with the associated post accident range monitors for these release pathways were taken out of service for planned replacement of these monitors with new monitor modules built by Mirion Technologies. The monitors were installed, functionally tested, and the normal range monitors returned to service in December 2012 for RM-A2 and in January 2013 for RM-A1. RM-A1 is the effluent monitor for the reactor building purge exhaust ventilation system and RM-A2 is the effluent monitor for the auxiliary building ventilation exhaust system. The design, procurement, factory acceptance testing, installation, procedural development, functional testing, and return to service instructions were performed under Engineering Change # 76363. During the time when RM-A2 was out of service, compensatory sampling was performed using alternate gaseous monitors RM-A4 and RM-A8. During the time that RM-A1 was out of service, there were no reactor building ventilation purges performed, so there was no alternate monitoring required for the reactor building ventilation exhaust pathway. There continued to be no reactor building purge evolutions performed in 2013.

The 3 waste gas decay tanks (WGDTs), which had previously been emptied of radioactive gases, were purged with nitrogen gas, isolated, and permanently taken out of service to support decommissioning. During the time period these releases were to occur, the flow instrument used to measure release rate (WD-19-FQI) became inoperable on 4-24-13. The ODCM (section 2.2, table 2-3, item 1.b, action 26) allows WGDT releases to be made with this instrumentation out of service as long as flow estimates are made once per 4 hours. This action was performed when needed. The flow instrument was inoperable for more than 30 days. Since the WGDTs have been abandoned, this instrumentation will not be repaired. Condition report 605656 documents this evolution.

Additionally, the WGDT radioactive gaseous release monitor, RM-A11, which is utilized for monitoring WGDT permitted discharges, is being abandoned to support decommissioning activities described above. Once all of the WGDTs were purged with nitrogen and permanently removed from service, surveillance activities on RM-A11 have been permanently suspended. Condition report 622740 documents this evolution.

## Meteorology Instrumentation Evaluation

During 2013 the yearly instrumentation data recovery for all meteorology tower instruments has remained in the range of > or = 99.64%. Actual meteorological tower data is available and is maintained at the Crystal River site. The actual meteorological data is not provided in this report as is allowed by the ODCM.

### Offsite Dose Calculation Manual (ODCM) Changes

- The ODCM was not revised in 2013.
- The ODCM was revised two times in 2012. The first revision, #33, incorporated the following changes:
  1. Table 2-3, page 13, 14, of action 28; guidance was added regarding actions needed if the auxiliary building ventilation system is secured. Also compensatory actions for sampling requirements if RM-A2 is out of service was updated to allow trending radiation monitors RM-A4 and RM-A8 instead of collecting grab samples. An update was needed to allow use of other in service radiation monitors for real time data gathering instead of periodic momentary grab sampling. This improves the efficiency of tracking effluent data.
  2. Pages 52 and 134-137 corrected typos.
  3. Page 92, on the flow diagram for liquid waste processing, removed the waste evaporators as a source of liquid waste and inserted the miscellaneous waste storage tank to update the diagram to current plant configuration.
  4. Pages 138-143, added methodology for accounting for C-14 in radiological effluents.
  5. Page 145 updated the location descriptor for vegetation sampling station C48A as the previous location was removed due to site construction.
  6. Page 161, guidance was added to also contact American Nuclear Insurers (ANI) if an event occurs where a radiological spill or leak occurs and the water could reach groundwater.
- The second revision, #34, incorporated the following changes:
  1. This revision was made entirely to support replacing the ventilation effluent radiation monitors, RM-A1 and RM-A2 and their associated post accident sampling monitors. RM-A1 monitors the reactor ventilation exhaust system and RM-A2 monitors the auxiliary building ventilation exhaust system.
  2. Page 2 added the "A" frequency for annual to support yearly calibration of the new gaseous effluent monitors per manufacturer's recommendations.
  3. Page 11, table 2-3 changed operating range to normal range and changed mid range monitor to accident range monitor. Also removed the high range monitor for items number 2 and 3.
  4. Page 15, table 2-4 same changes as table 2-3, plus changed the frequency of surveillance requirements to match the manufacturer's recommendations and plant PM programs for items number 2 and 3.
  5. Page 16 item "#" changed RM-A1 operating range to normal range.
  6. Page 27 table 2-6 table notation item "d" rewritten to agree with NUREG 1301 verbiage as we no longer have "live" iodine channels for RM-A1 and RM-A2 with the new monitors.
  7. Page 40, section 2.14 item "H" changed mid and high range to accident range.
  8. Page 57, table I, deleted RM-A1 and RM-A2 iodine channel setpoint references as there are no live iodine channels associated with the new monitors.
  9. Page 60, Gaseous Effluent Setpoint Specification 1.1-3 Iodine channels for RM-A1 and RM-A2, deleted verbiage relating to iodine channel setpoints.
  10. Page 70, Pre-Release Calculation 1.3-3 for Gaseous Effluent Iodine Monitors, changed title to Pre-Release Calculation for Iodine Evaluation; changed the introduction to discuss iodine loading on the

sample cartridge, item I.D. changed the flow rate from 1 to 2 scfm and corresponding cc/sec value to match the new monitor design flow of 2 scfm, also changed the corresponding total flow through the cartridge.

11. Page 71, sub item "f" changed the flows as described in #10 above, changed the calculated uCi in the building vents based on the new flow information, and deleted the last sentence as there is no longer a live iodine channel on RM-A1 and RM-A2.
12. Pages 72 through 79 changes setpoint methodology for gaseous releases to a fixed method based on conservative isotopic mix and vendor information for the calibration slope response of the respective monitor.

### Process Control Program (PCP) Changes

The PCP was not revised in 2013.

### Emergency Feed Pump 2 & Steam Releases

Emergency Feed Pump 2 (EFP-2) over-speed testing is performed quarterly using steam from CR-3's steam generators. Due to a historical small primary to secondary leak, an evaluation is normally performed to estimate the quantity of radioactive material which would be released during 2013 due to operation of this pump. In addition, radioactive releases due to other steam releases are normally estimated and included. These values normally include any plant trips with associated secondary plant atmosphere steam relief valve initiation. The results are given below in units of Curies/year.

Due to the extended plant shutdown for refueling outage 16, which began in September of 2009, the plant was still shutdown for the containment building wall repair in 2013. The emergency feed pump 2 has not operated and there were no secondary plant steam releases during 2010, 2011, 2012, or 2013. Based on the decision to retire and decommission CR-3, the emergency feed pump 2 will never operate again and there will be no steam releases.

Xe-133	0.00E+00	I-131	0.00E+0	Cs-137	0.00E+00
Xe-135	0.00E+00	I-133	0.00E+0		
H-3	0.00E+00				

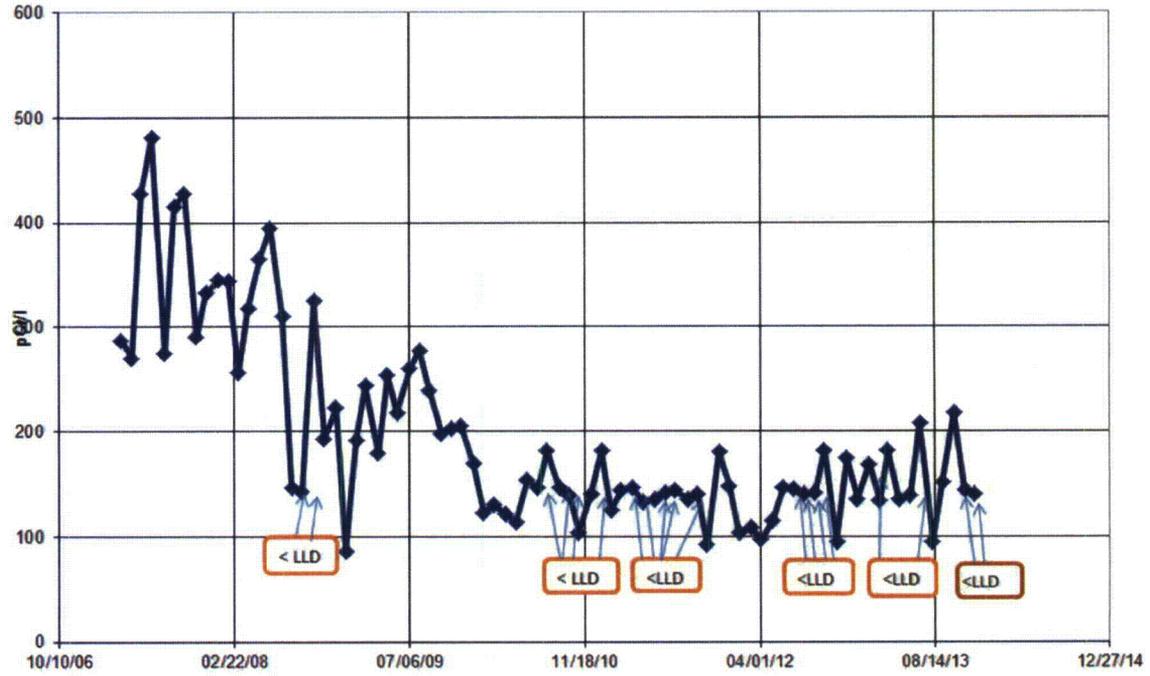
### Carbon-14 Evaluation

During the entire year of 2013, Crystal River Unit 3 has been in a cold shutdown, defueled mode. The plant was taken off line in September of 2009 for refueling outage 16. In 2009, the primary plant was degassed, the reactor building was purged of radioactivity, waste gas decay tanks were released, a construction opening was made in the side of the reactor building containment wall, and both once through steam generators were replaced. Since the plant has been in cold shutdown for the entire years of 2010, 2011, 2012, and 2013 due to reactor building containment wall delamination issues, there is no source term generation for carbon-14 production in 2010, 2011, 2012, or 2013. Since the decision to retire the facility has been announced, there will be no C-14 source term generated ever again at CR-3.

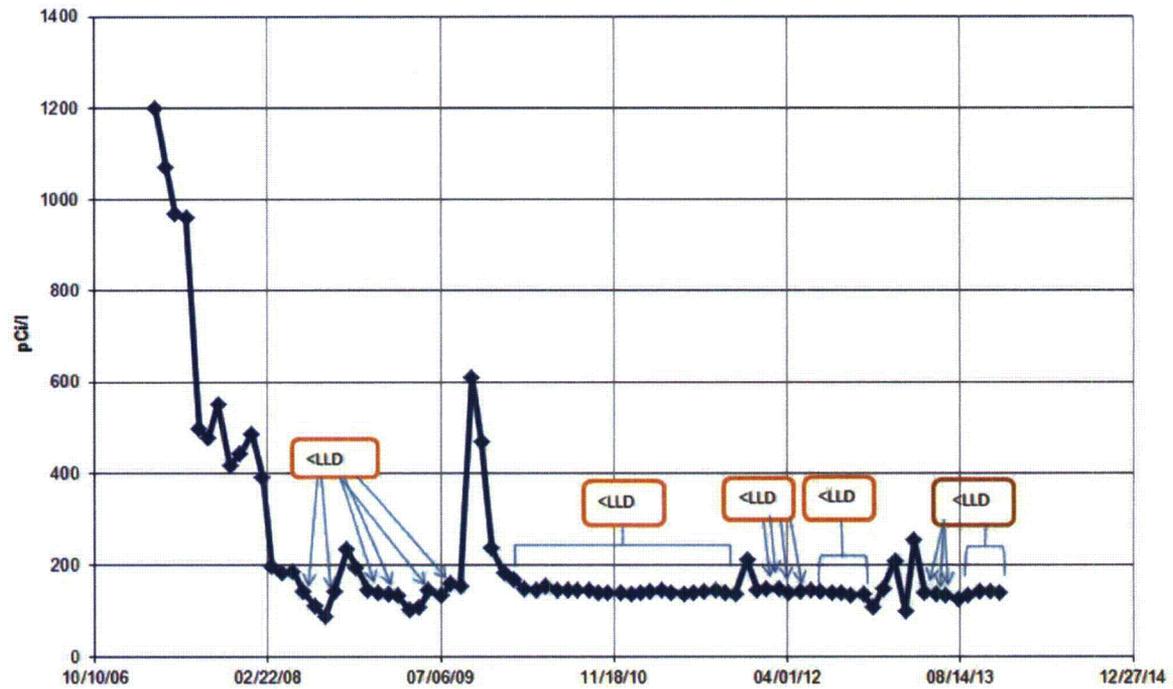
### **Nuclear Electric Institute (NEI) Required Information**

The following environmental data is being included in this report per objective 2.4.b.i and 2.4.b.ii of NEI 07-07 Industry Ground Water Protection Initiative, as this groundwater well data is used to assist in evaluation of groundwater at the site, but is not officially included in the Radiological Environmental Monitoring Program (REMP) or the Offsite Dose Calculation Manual (ODCM). These 2 graphs are of tritium measurements in units of pCi/l, taken from groundwater monitoring wells located west of CR-3 on either side (north and south) of the site settling ponds. There are many other groundwater monitoring wells included in the REMP that are used for evaluating the groundwater in the vicinity of the CR-3 site. These 2 wells are providing supplemental information. The LLD for tritium measurement of these environmental well samples is ~150 pCi/l.

Tritium Measurements GW Well # MWC-IF2



Tritium Measurements GW Well # MWC-27



## **Additional Information**

On February 5, 2013, Duke Energy announced that a decision has been made to permanently retire Crystal River Unit 3. The decision was made due to the high cost of repair and risk associated with repairing the containment building's delaminated concrete wall. The company is working to develop a comprehensive decommissioning plan and intends to place the facility in SAFSTOR for the immediate future and eventual dismantling. The plant staff (called decommissioning transition organization) is working to shutdown and abandon as many systems as possible, by removing energy sources, lubrications, greases, electrical, and system fluids to prepare the unit for SAFSTOR and eventual dismantlement.