



Crystal River Nuclear Plant  
15760 W. Power Line Street  
Crystal River, FL 34428  
Docket 50-302  
Docket 72-1035  
Operating License No. DPR-72

10 CFR 50.36a(a)(2)  
ODCM 6.4

April 24, 2018  
3F0418-01

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

Subject: Crystal River Unit 3 – 2017 Annual Radioactive Effluent Release Report

Dear Sir:

Duke Energy Florida, LLC (DEF), hereby provides the 2017 Radioactive Effluent Release Report for Crystal River Unit 3 (CR-3) in accordance with 10 CFR 50.36a(a)(2) and Section 6.4 of the Offsite Dose Calculation Manual (ODCM). 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 2017. The data provided in the attached report is consistent with the objectives outlined in the ODCM and the Process Control Program (PCP), and is in conformance with 10 CFR 50, Appendix I, Section IV.B.1.

CR-3 administrative procedure 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. Neither the ODCM nor the PCP was revised in 2017.

This letter contains no new regulatory commitments.

If you have any questions regarding this submittal, please contact Mr. Mark Van Sicklen, Licensing Lead, Nuclear Regulatory Affairs, at (352) 501-3045.

Sincerely,

Terry D. Hobbs  
General Manager, Decommissioning - SAFSTOR

TDH/mvs

Attachment 1: 2017 Annual Radioactive Effluent Release Report

xc: NMSS Project Manager  
Regional Administrator, Region I

**DUKE ENERGY FLORIDA, LLC**

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

**ATTACHMENT 1**

**2017 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT**

**ANNUAL RADIOACTIVE EFFLUENT  
RELEASE REPORT  
2017**



DUKE ENERGY FLORIDA, LLC  
CRYSTAL RIVER UNIT 3

Facility Operating License No. DPR-72

Docket No. 50-302

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## INTRODUCTION

This report is submitted as required by the Offsite Dose Calculation Manual, section 6.5, and procedure CP-500, section 4.4.1.2. All 40 CFR 190 limits have been met. There were no NEI 07-07 groundwater protection reportable events in 2017.

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-2017

## 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<br>% 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 | 0.00E+00  | 4.25 E-07 | 2.76 E-7 | 3.00E+01              |
| 2. Average Release Rate for Period       | uCi/sec | 0.00E+00 | 0.00E+00  | 5.35E-08  | 3.47E-08 |                       |
| 3. Gross Alpha Radioactivity             | Curies  | 0.00E+00 | 5.08 E-08 | 0.00E+00  | 0.00E+00 |                       |
| <b>D. Tritium</b>                        |         |          |           |           |          |                       |
| 1. Total Release                         | Curies  | 1.44E-01 | 5.60E-02  | 1.02E-01  | 6.79E-02 | 3.00E+01              |
| 2. Average Release Rate for Period       | uCi/sec | 1.85E-02 | 7.13E-03  | 1.28E-02  | 8.54E-03 |                       |

# EFFLUENT and WASTE DISPOSAL REPORT-2017

## 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-2017

## 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-2017

## 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-2017

## 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      | N/D      | 4.25 E-07 | 2.76 E-07 |
| Total                                 | Curies | N/D      | N/D      | 4.25 E-07 | 2.76 E-07 |
| <b>H-3</b>                            | Curies | 1.44E-01 | 5.60E-02 | 1.02E-01  | 6.79E-02  |
| <b>Gross Alpha</b>                    | Curies | N/D      | 5.08E-08 | N/D       | N/D       |

# EFFLUENT and WASTE DISPOSAL REPORT-2017

## 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<br>% Error |
|--|--------|----------|----------|----------|----------|-----------------------|
| <b>A. Fission &amp; Activation Products</b>            |        |          |          |          |          |                       |
| 1. Total Release (not including tritium, gases, alpha) | Curies | 1.03E-05 | 1.86E-03 | 2.96E-04 | 0.00E-00 | 2.50E+01              |
| 2. Average diluted concentration during period         | uCi/ml | 1.01E-13 | 7.83E-12 | 1.36E-12 | 0.00E-00 |                       |
| 3. Percent of Applicable Limit                         | %      | 1.01E-06 | 2.46E-05 | 4.20E-06 | 0.00E-00 |                       |
| <b>B. Tritium</b>                                      |        |          |          |          |          |                       |
| 1. Total Release                                       | Curies | 8.49E-05 | 1.07E-01 | 3.42E-02 | 1.69E-04 | 3.00E+01              |
| 2. Average diluted concentration during period         | uCi/ml | 8.35E-13 | 4.50E-10 | 1.57E-10 | 8.88E-13 |                       |
| 3. Percent of Applicable Limit                         | %      | 8.35E-09 | 4.50E-06 | 1.57E-06 | 8.88E-09 |                       |
| <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 | 2.85E+05 | 3.51E+05 | 5.30E+05 | 2.86E+05 | 1.00E+01              |
| <b>F. Dilution Water Volume During Period</b>          |        |          |          |          |          |                       |
|  | Liters | 1.02E+11 | 2.37E+11 | 2.18E+11 | 1.91E+11 | 1.00E+01              |

# EFFLUENT and WASTE DISPOSAL REPORT-2017

## Table 2B - Regulatory Guide 1.21

### Liquid Effluents - Batch Mode

**Unit: 3**

| Units | 1st Qtr | 2nd Qtr | 3rd Qtr | 4th Qtr |
|-------|---------|---------|---------|---------|
|-------|---------|---------|---------|---------|

**Fission & Activation Products**

|              |        |          |          |          |     |
|--------------|--------|----------|----------|----------|-----|
| Fe-55        | Curies | N/D      | 9.64E-05 | 2.31E-05 | N/D |
| Co-60        | Curies | N/D      | 1.61E-03 | 2.31E-04 | N/D |
| Ni-63        | Curies | N/D      | 1.05E-04 | 2.79E-05 | N/D |
| Cs-137       | Curies | 1.03E-05 | 4.34E-05 | 1.41E-05 | N/D |
| <b>Total</b> | Curies | 1.03E-05 | 1.86E-03 | 2.96E-04 | N/D |

**Dissolved and Entrained Gases**

|       |        |     |     |     |     |
|-------|--------|-----|-----|-----|-----|
| Total | Curies | N/D | N/D | N/D | N/D |
|-------|--------|-----|-----|-----|-----|

|            |        |          |          |          |          |
|------------|--------|----------|----------|----------|----------|
| <b>H-3</b> | Curies | 8.49E-05 | 1.07E-01 | 3.42E-02 | 1.69E-04 |
|------------|--------|----------|----------|----------|----------|

|                    |        |     |     |     |     |
|--------------------|--------|-----|-----|-----|-----|
| <b>Gross Alpha</b> | Curies | N/D | N/D | N/D | N/D |
|--------------------|--------|-----|-----|-----|-----|

# EFFLUENT and WASTE DISPOSAL REPORT-2017

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

### Liquid Effluents - Continuous Mode Unit: 3

|  | Units  | 1st Qtr | 2nd Qtr | 3rd Qtr | 4th Qtr |
|--|--------|---------|---------|---------|---------|
| <b>Fission &amp; Activation Products</b> |        |         |         |         |         |
| Total                                    | Curies | N/D     | N/D     | N/D     | N/D     |
| <b>Dissolved and Entrained Gases</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-2017

## Regulatory Guide 1.21

### Gaseous Batch Release Summary

Unit: 3

|   | Jan - Jun    | Jul - Dec    |
|---|--------------|--------------|
| Number of Batch Releases                | 0            | 0            |
| Total Time Period for Batch Releases    | 0.00E+00 min | 0.00E+00 min |
| Maximum Time Period for a Batch Release | 0.00E+00 min | 0.00E+00 min |
| Average Time Period for a Batch Release | 0.00E+00 min | 0.00E+00 min |
| Minimum Time Period for a Batch Release | 0.00E+00 min | 0.00E+00 min |

# EFFLUENT and WASTE DISPOSAL REPORT-2017

## Regulatory Guide 1.21

### Liquid Batch Release Summary Unit: 3

|  | Jan - Jun    | Jul - Dec    |
|--|--------------|--------------|
| Number of Batch Releases                   | 5            | 6            |
| Total Time Period for Batch Releases       | 1.17E+03 min | 1.55E+03 min |
| Maximum Time Period for a Batch Release    | 4.97E+02 min | 5.25E+02 min |
| Average Time Period for a Batch Release    | 2.34E+02 min | 2.58E+02 min |
| Minimum Time Period for a Batch Release    | 6.20E+01 min | 5.91E+01 min |
| Average Stream Flow During Release Periods | 2.83E+05 gpm | 1.89E+05 gpm |

# EFFLUENT and WASTE DISPOSAL REPORT-2017

## 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-2017

## Regulatory Guide 1.21

### Liquid Abnormal Release Summary

Unit: 3

|   | Jan - Jun    | Jul - Dec    |
|---|--------------|--------------|
| 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-2017

## 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 |
|-------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|
|-------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|

|            |          |          |          |          |          |          |          |          |          |          |
|------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Bone       | 3.45E-05 | 4.60E-04 | 1.35E-05 | 1.79E-04 | 4.02E-05 | 5.37E-04 | 2.66E-05 | 3.54E-04 | 1.15E-04 | 7.65E-04 |
| Liver      | 3.45E-05 | 4.60E-04 | 1.35E-05 | 1.79E-04 | 4.25E-05 | 5.67E-04 | 2.80E-05 | 3.74E-04 | 1.19E-04 | 7.90E-04 |
| Total Body | 3.45E-05 | 4.60E-04 | 1.35E-05 | 1.79E-04 | 2.81E-05 | 3.75E-04 | 1.87E-05 | 2.50E-04 | 9.48E-05 | 6.32E-04 |
| Thyroid    | 3.45E-05 | 4.60E-04 | 1.35E-05 | 1.79E-04 | 2.70E-05 | 3.61E-04 | 1.80E-05 | 2.40E-04 | 9.30E-05 | 6.20E-04 |
| Kidney     | 3.45E-05 | 4.60E-04 | 1.35E-05 | 1.79E-04 | 3.12E-05 | 4.16E-04 | 2.07E-05 | 2.76E-04 | 9.99E-05 | 6.66E-04 |
| Lung       | 3.45E-05 | 4.60E-04 | 1.35E-05 | 1.79E-04 | 2.87E-05 | 3.83E-04 | 1.91E-05 | 2.55E-04 | 9.58E-05 | 6.39E-04 |
| GI-Lli     | 3.45E-05 | 4.60E-04 | 1.35E-05 | 1.79E-04 | 2.71E-05 | 3.61E-04 | 1.80E-05 | 2.40E-04 | 9.31E-05 | 6.21E-04 |

Maximum Organ was LIVER.

# EFFLUENT and WASTE DISPOSAL REPORT-2017

## 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 |
|-------------------------|-------------------------|-------------------------|-------------------------|---------------|
|-------------------------|-------------------------|-------------------------|-------------------------|---------------|

| Organ      | Dose     | % of ODCM Limit |
|------------|----------|-----------------|----------|-----------------|----------|-----------------|----------|-----------------|----------|-----------------|
| Bone       | 6.49E-09 | 1.30E-07        | 6.92E-05 | 1.38E-03        | 8.28E-06 | 1.66E-04        | 1.82E-12 | 3.64E-11        | 7.75E-05 | 7.75E-04        |
| Liver      | 8.88E-09 | 1.78E-07        | 2.65E-05 | 5.30E-04        | 3.31E-06 | 6.61E-05        | 1.82E-12 | 3.64E-11        | 2.98E-05 | 2.98E-04        |
| Total Body | 5.82E-09 | 3.88E-07        | 7.32E-06 | 4.88E-04        | 1.07E-06 | 7.10E-05        | 1.82E-12 | 1.21E-10        | 8.39E-06 | 2.80E-04        |
| Thyroid    | 1.72E-12 | 3.44E-11        | 7.06E-10 | 1.41E-08        | 6.49E-10 | 1.29E-08        | 1.82E-12 | 3.64E-11        | 1.36E-09 | 1.36E-08        |
| Kidney     | 3.01E-09 | 6.03E-08        | 3.56E-07 | 7.11E-06        | 1.62E-07 | 3.24E-06        | 1.82E-12 | 3.64E-11        | 5.21E-07 | 5.21E-06        |
| Lung       | 1.00E-09 | 2.01E-08        | 1.29E-05 | 2.58E-04        | 1.46E-06 | 2.92E-05        | 1.82E-12 | 3.64E-11        | 1.44E-05 | 1.44E-04        |
| GI-Lli     | 1.74E-10 | 3.47E-09        | 1.46E-05 | 2.92E-04        | 1.70E-06 | 3.41E-05        | 1.82E-12 | 3.64E-11        | 1.63E-05 | 1.63E-04        |

#### 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-2017

## 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  | 6.49E-9 | 6.92E-5 | 8.28E-6 | 1.82E-12 | 7.75E-5 |
| <b>ODCM Limit</b>         | mrem  | 5.00    | 5.00    | 5.00    | 5.00     | 10.00   |
| <b>% of ODCM Limit</b>    | %     | 1.37E-7 | 1.38E-3 | 1.66E-4 | 3.64E-11 | 7.75E-4 |

Maximum Organ was Bone

|                        | Units | 1st Qtr | 2nd Qtr | 3rd Qtr | 4th Qtr  | Annual  |
|------------------------|-------|---------|---------|---------|----------|---------|
| <b>Total Body</b>      | mrem  | 5.82E-9 | 7.32E-6 | 1.07E-6 | 1.82E-12 | 8.39E-6 |
| <b>ODCM Limit</b>      | mrem  | 1.50    | 1.50    | 1.50    | 1.50     | 3.00    |
| <b>% of ODCM Limit</b> | %     | 3.88E-7 | 4.88E-4 | 7.10E-5 | 1.21E-10 | 2.80E-4 |

# EFFLUENT and WASTE DISPOSAL REPORT-2017

## 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 – There was no measurable noble gases released in 2017 due to the plant shutdown in 2009.**

**Due to the decision to decommission the plant, the facility will remain permanently defueled.**

#### **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-2017**

**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 sludge, evaporator bottoms, etc. | m3<br>Ci                                 | 0<br>0               | 25                 |
| b.   | Dry compressible waste, contaminated equipment, etc.  | m3<br>Ci                                 | 2.47E+02<br>9.89E-02 | 25                 |
| c.   | Irradiated components, control rods, etc.             | m3<br>Ci                                 | 0<br>0               | 25                 |
| d.   | Other (describe):                                     | m3<br>Ci                                 | 0<br>0               | 25                 |
| <b>2. Estimate of major nuclide composition (by type of waste in %)*</b> |   |  |                      |                    |
| a.   | NA  | NA                                       | NA                   | NA                 |
| b.   | C-14 11.6<br>Mn-54 0.02<br>Fe-55 2.67<br>Co-60 29.1   | Ni-63 44.2<br>Cs-137 4.97<br>Sb-125 0.34 |                      |                    |
| c.   | NA  | NA                                       | NA                   | NA                 |
| d.   | NA  | NA                                       | NA                   | NA                 |

\* 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>             |
|----------------------------|-------------------------------|--------------------------------|
|                            | (Trucking Shipments)          |                                |
| 4                          | Hittman Transport Services    | Energy Solutions – Gallaher Rd |
| 6                          | Hittman Transport Services    | Energy Solutions – Bear Creek  |

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

| <u>Number of Shipments</u> | <u>Mode of Transportation</u> | <u>Destination</u> |
|----------------------------|-------------------------------|--------------------|
| 0                          | NA                            | NA                 |

## **Unplanned Releases**

There were no unplanned releases in 2017.

## **Radioactive Waste Treatment Systems**

There were no significant changes to the radioactive waste treatment systems in 2017. Due to the shutdown status of Crystal River Unit 3, liquid waste volume and radioactivity concentration have continued to decrease. The liquid waste demineralizers did not have to be recharged in 2017 due to the very small amounts of water processed.

## **Annual Land Use Census**

The 2017 land-use census did not identify any new dose calculation locations.

## **Effluent Monitor Instrument Operability**

For the year 2017, the main gaseous effluent pathway is the auxiliary building ventilation exhaust system. Radiation monitor RM-A2N is the effluent monitor for this pathway. This monitor remains in service and has one back-up compensatory monitor, RM-A4, which samples closer to the spent fuel pool in the auxiliary building. The Reactor Building is now also lined-up for continuous venting via RM-A2 as a means of maintaining a habitable atmosphere inside containment.

The liquid effluent pathways are the primary plant liquid waste stream, which is monitored by radiation monitor RM-L2, and the secondary plant liquid waste stream, which is monitored by radiation monitor RM-L7. These liquid radiation monitors remain operable.

CR3 condition report 2148295 documents a flowrate monitor (WD-101-FQI) that was inoperable for more than 30 days, including during the release of the Laundry & Shower Tank (WDT-11A/B) on 7/18/17. The release was performed in accordance with all compensatory requirements listed in the ODCM. The flowrate monitor was put back into an operable status on 8/31/17 to coincide with a scheduled calibration. The reasons for inoperability of WD-101-FQ could not be determined, as the problem could not be reproduced during troubleshooting. The "lack of timely corrective action" was due to the fact that WD-101-FQI is needed very infrequently in the current decommissioning status of CR-3 and due to the fact that the annual calibration of WD-101-FQI was coming up on the schedule.

## **Assessment of Direct Radiation from ISFSI**

The Independent Spent Fuel Storage Installation (ISFSI) pad was partially loaded with spent fuel beginning in June 2017. Calculation N16-0003, performed prior to fuel movement into dry storage, documents a conservative annual dose estimate at 700 meters from the ISFSI pad of about 0.06 mrem. A distance of 700 meters is well within the site boundary owner controlled area in all directions. This small dose is not distinguishable from normal background fluctuations of several mrem per year as measured by the REMP TLDs. These TLDs are deployed in the controlled area, at locations adjacent to the site boundary, and at offsite locations. REMP TLD results for the second half of 2017 show no detectable changes in dose beyond the expected fluctuations. Based on this, and also including the dose contributions from effluent releases, the 40 CFR 190 dose limit was not exceeded in 2017.

### **Meteorology Instrumentation Evaluation**

During 2015 the metrology tower was abandoned. It was concluded that an on-site meteorological data collection system was no longer needed at CR3 to support its effluents program because:

- There is no explicit regulatory requirement or license condition to maintain an on-site meteorological program for a decommissioning unit (or facility), and
- From a technical perspective, a reasonably conservative estimate of dose to a member of the public in the unrestricted area can be performed without periodically assessing changes in atmospheric dispersion and deposition based on our low site source term and the conservative nature of the dispersion factors.

See NTM 229460-80 Met Tower Abandonment White Paper for additional details.

### **Offsite Dose Calculation Manual (ODCM) Changes**

The ODCM was not revised in 2017.

### **Process Control Program (PCP) Changes**

The PCP was not revised in 2017.

### **Carbon-14 Evaluation**

During the entire year of 2017, 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 through 2017 due to reactor building containment wall concrete delamination issues, there is no source term generation for carbon-14 production. Since the decision to retire the facility has been announced, there will be no C-14 source term generated ever again at CR-3.

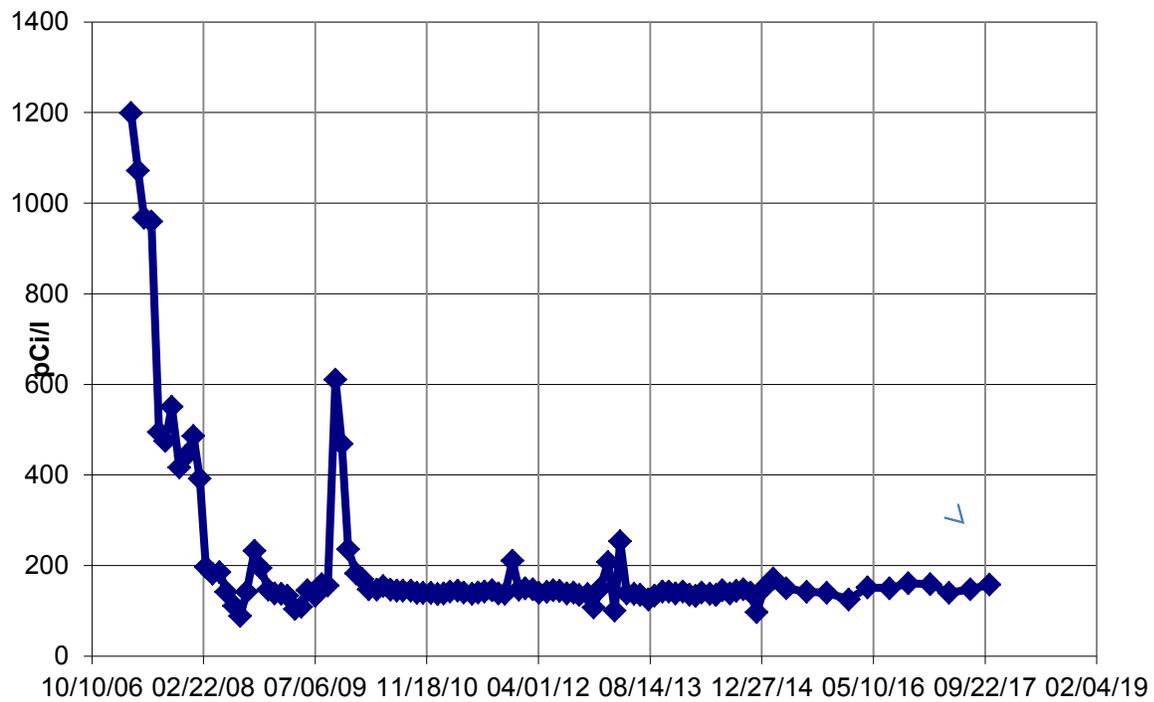
### **Nuclear Electric Institute (NEI) Required Information**

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 percolation 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 two wells are providing supplemental information. The LLD for tritium measurement of these environmental well samples is ~180 pCi/l. Measurements over the past several years have not showed tritium above LLD.

**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 SAFSTOR 1 organization) is working to shut down 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. As of January 2018, all spent fuel has been relocated from the spent fuel pool to the ISFSI facility.