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Robert J. Murillo
Licensing Manager
Waterford 3

W3F1-2009-0016

April 30, 2009

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

Subject: Annual Radioactive Effluent Release Report - 2008
Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

Dear Sir or Madam:

Attached is the annual Radioactive Effluent Release report for the period January 1, 2008 through December 31, 2008. This report is being submitted pursuant to the requirements of Technical Specification Section 6.9.1.8.

Please contact Robert J. Murillo at (504) 739-6715 if you have questions regarding this information.

There are no new commitments contained in this submittal.

Sincerely,

RJM/JDW/ssf

Attachment: Annual Radioactive Effluent Release Report - 2008

IE48
NRR

cc: Mr. Elmo E. Collins, Jr.
Regional Administrator
U. S. Nuclear Regulatory Commission
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NRC Senior Resident Inspector
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Attachment

W3F1-2009-0016

Annual Radioactive Effluent Release Report - 2008

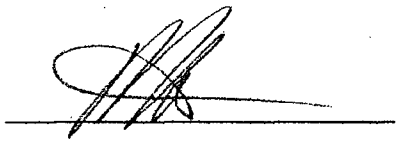
Entergy

Annual Radioactive Effluent Release Report

January 1, 2008 - December 31, 2008

Waterford 3 SES
Entergy Operations, Inc.

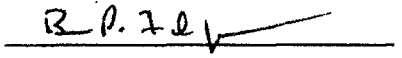
Docket Number 50-382 License Number NPF-38

Originator: 

4/15/09

Paul Prejean
Environmental Specialist
Waterford 3 SES

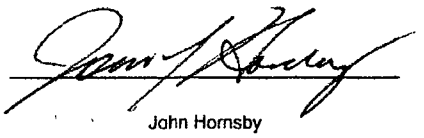
Date

Reviewed By: 

4/15/09

Brian Falgoust
Environmental Specialist
Waterford 3 SES

Date

Approved By: 

4/15/09

John Hornsby
Chemistry Superintendent
Waterford 3 SES

Date

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Table of Contents

1.0 Introduction

This Annual Radioactive Effluent Release Report is submitted as required by Waterford 3's Technical Specification 6.9.1.8. It covers the period from January 1, 2008 through December 31, 2008. Information in this report is presented in the format outlined in Appendix B of Regulatory Guide 1.21 and in Section 5.8.1 of the Offsite Dose Calculation Manual (UNT-005-014).

The information contained in this report includes:

- A summary of the quantities of radioactive liquid and gaseous effluents and solid wastes released from the plant during the reporting period.
- A summary of the meteorological data collected during 2008.
- Assessment of radiation doses due to liquid and gaseous radioactive effluents released during 2008.
- A discussion of Unplanned/Abnormal releases that occurred during the reporting period.
- A discussion and submittal of changes to the Offsite Dose Calculation Manual, UNT-005-014, and Process Control Program, EN-RW-105, if applicable during this reporting period.
- A discussion of why required radioactive effluent monitoring instrumentation was not returned to service within the time specified.
- A discussion of any instances in which effluent samples were not collected within the required frequency.

2.0 Supplemental Information

2.1 Regulatory Limits

The limits applicable to the release of radioactive material in liquid and gaseous effluents are described in the following sections. These limits are addressed by reference in UNT-005-014, Offsite Dose Calculation Manual, and directly in the Technical Requirements Manual (TRM).

2.1.1 Fission and Activation Gases (Noble Gases)

The dose rate due to radioactive noble gases released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to less than or equal to:

- 500 mrem/yr to the total body; and,
- 3000 mrem/yr to the skin.

The air dose due to noble gases released in gaseous effluents from the site to areas at or beyond the site boundary shall be limited to the following:

- During any calendar quarter, Less than or equal to:
  - 5 mrad for gamma radiation; and,
  - 10 mrad for beta radiation.
- During any calendar year, Less than or equal to:
  - 10 mrad for gamma radiation; and,
  - 20 mrad for beta radiation.

2.1.2 Iodines, Particulates with Half Lives > Eight (8) Days, and Tritium

The dose rate due to Iodine-131 and 133, Tritium, and all radionuclides in particulate form with half lives greater than eight (8) days, released in gaseous effluents from the site to areas at and beyond the site boundary, shall be limited to less than or equal to:

- 1500 mrem/yr to any organ.

The dose to a member of the public from Iodine-131 and 133, Tritium, and all radionuclides in particulate form with half lives greater than eight (8) days in gaseous effluents released to areas at and beyond the site boundary shall be limited to the following:

- During any calendar quarter, Less than or equal to:
  - 7.5 mrem to any organ.
- During any calendar year, Less than or equal to:
  - 15 mrem to any organ.

2.1.3 Liquid Effluents

The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to ten times the concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-4 µCi/ml (Total Activity).

The dose or dose commitment to a member of the public from radioactive materials in liquid effluents released to unrestricted areas shall be limited to the following:

During any calendar quarter, Less than or equal to:

- 1.5 mrem to the total body; and,
- 5 mrem to any organ, and

During any calendar year, less than or equal to

- 3 mrem to the total body; and,
- 10 mrem to any organ.

2.1.4 Uranium Fuel Cycle Sources

The dose or dose commitment to any member of the public due to releases of radioactivity and radiation from uranium fuel cycle sources over 12 consecutive months shall be limited to less than or equal to:

- 25 mrem to the Total Body or any organ (except thyroid organ); and,
- 75 mrem to the Thyroid

2.2 Maximum Permissible Concentrations

2.2.1 Fission and Activation Gases, Iodines, and Particulates, With Half Lives > Eight (8) Days

For gaseous effluents, maximum permissible concentrations are not directly used in release rate calculations since the applicable limits are expressed in terms of dose rate at the site boundary.

2.2.2 Liquid Effluents

Ten times the effluent concentration (EC) values specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 are used as the permissible concentrations of liquid radioactive effluents at the unrestricted area boundary. A value of 2.0E-4 µCi/ml is used as the concentration limit for dissolved and entrained noble gases in liquid effluents.

2.3 Average Energy (E-Bar)

This is not applicable to Waterford 3's effluent specifications. E-Bar's are not required to be calculated from effluent release data. The average energy (E-Bar) for the Reactor Coolant System (RCS) is supplied as additional information in the report further below.

2.4 Measurements and Approximations of Total Radioactivity

The quantification of radioactivity in liquid and gaseous effluents was accomplished by performing the sampling and radiological analysis of effluents in accordance with the requirements of Tables 4.11-1 and 4.11-2 of the Technical Requirements Manual (TRM).

2.4.1 Fission and Activation Gases (Noble Gases)

For continuous releases, a gas grab sample was analyzed monthly for noble gases. Each week a Gas Ratio (GR) was calculated according to the following equation:

$$GR = \frac{\text{Average Weekly Noble Gas Monitor Reading}}{\text{Monitor Reading During Noble Gas Sampling}}$$

The monthly sample analysis and weekly Gas Ratio were then used to determine noble gases discharged continuously for the previous week. For gas decay tank and containment purge batch releases, a gas grab sample was analyzed prior to release to determine noble gas concentrations in the batch. In all cases, the total radioactivity in gaseous effluents was determined from measured concentrations of each radionuclide present and the total volume discharged.

2.4.2 Iodines, Particulates, and Tritium

Iodines and particulates discharged were sampled using a continuous sampler which contained a charcoal cartridge and a particulate filter. Each week the charcoal cartridge and particulate filter were analyzed for gamma emitters using gamma spectroscopy. The determined radionuclide concentrations and effluent volumes discharged were used to calculate the previous week's activity released. The particulate samples were composited and analyzed quarterly for Sr-89 and Sr-90 by a contract laboratory (Areva, Environmental). Particulate gross alpha activity was measured weekly using alpha scintillation or gas-flow proportional counting techniques. The determined activities were used to estimate effluent concentrations in subsequent releases until the next scheduled analysis was performed.

Grab samples of continuous releases were analyzed at least monthly for tritium. Containment Purge batch releases are analyzed prior to release. The determined concentrations were used to estimate tritium activity in subsequent releases until the next scheduled analysis was performed.

2.4.3 Liquid Effluents

For continuous releases, samples were collected weekly and analyzed using gamma spectroscopy. The measured concentrations were used to determine radionuclide concentrations in the following week's releases. For batch releases, gamma analysis was performed on the sample prior to release.

For both continuous and batch releases, composite samples were analyzed quarterly by a contract laboratory (Areva, Environmental) for Sr-89, Sr-90, and Fe-55. Samples were composited and analyzed monthly for tritium and gross alpha using liquid scintillation and gas flow proportional counting techniques, respectively. For radionuclides measured in the composite samples, the measured concentrations in the composite samples from the previous month or quarter were used to estimate released quantities of these isotopes in liquid effluents during the current month or quarter when the analysis results became available.

The total radioactivity in liquid effluent releases was determined from the measured and estimated concentrations of each radionuclide present and the total volume of the effluent discharged.

2.5 Batch Releases

A summary of information for gaseous and liquid batch releases is included in Table 1.

2.6 Unplanned/Abnormal Releases

2.6.1 Unplanned/Abnormal Gaseous Releases

There were no unplanned/abnormal gaseous releases during the reporting period.

2.6.2 Unplanned/Abnormal Liquid Releases

There were no unplanned/abnormal liquid releases during this reporting period.

3.0 Gaseous Effluents

The quantities of radioactive material released in gaseous effluents are summarized in Tables 1A, 1B, and 1C. Note that there were no elevated releases, since all Waterford 3 releases are considered to be at ground level. The estimated total error in % is based upon several statistical uncertainties due to sample counting, efficiency, volume, etc.

4.0 Liquid Effluents

The quantities of radioactive material released in liquid effluents are summarized in Tables 2A and 2B. The estimated total error in % is based upon several statistical uncertainties due to sample counting, efficiency, volume, etc.

5.0 Solid Wastes

The summary of radioactive solid wastes shipped offsite for disposal is listed in Table 3. For certain waste forms, Waterford 3 uses volume reduction services provided by a contractor. These waste forms are included in Table 3 and the volumes reported reflect the volume of waste shipped offsite, not final disposal volumes. Final disposal volumes for wastes compacted offsite are available upon request. The estimated total error in % is based upon several statistical uncertainties due to sample counting, efficiency, volume, etc.

6.0 Meteorological Data

In Table 4, the hourly meteorological data from January 1, 2008 through December 31, 2008, is presented in the form of a joint frequency distribution of wind speed, wind direction, and atmospheric stability (hourly data is also available upon request). The standard Pasquill classification scheme, as presented in Regulatory Guide 1.23, is used to determine stability class from differential temperature measurements. The Waterford-3 data recovery results by parameter are as follows:

Differiential Temp.	100.00%
Wind Speed	100.00%
Wind Direction	100.00%
Overall*	100.00%

* - Simultaneous occurrence of valid data for all three parameters.

Dispersion and deposition values were determined from the 2008 data and used in the assessment of doses due to gaseous effluents released from site during the 2008 period.

7.0 Assessment of Doses

7.1 Dose Due to Gaseous Effluents

7.1.1 Air Doses at the Site Boundary

Air doses from gaseous effluents were evaluated at the closest offsite location that could be occupied continuously during the term of plant operation and that would result in the highest dose. This location was determined by examining the atmospheric dispersion parameters (χ/Q's) at the closest offsite locations that could be continuously occupied during plant operation in each of the meteorological sectors surrounding the plant. The location that would have the highest dose would be that location having the most restrictive (largest) χ/Q value.

Based on actual meteorological data collected during 2008, this location was determined to be in the NE and NNE sector (χ/Q = 2.0E-05 sec/m^3) at a distance of 869 meters (0.54 miles) from the reactor building. Doses were assessed at this location in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual considering only beta and gamma exposures in air due to noble gas. The results of these assessments for the year 2008 are summarized as follows:

Beta air dose:	0.375 mrad
Gamma air dose:	0.141 mrad

The above beta and gamma air doses represent the following percentage of the Annual Dose limits:

1.87% of the Beta air dose limit (20 mrad).
1.41% of the Gamma air dose limit (10 mrad).

Dose calculation results are summarized by quarters in Table 5A. The doses were calculated in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual.

7.1.2 Maximum Organ Dose to the Critical Receptor

The maximum organ dose to a MEMBER OF THE PUBLIC from I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than eight (8) days in gaseous effluents released to areas at and beyond the site boundary was determined for 2008.

An assessment of the maximum organ dose was performed for the critical receptor. The critical receptor was assumed to be located at the nearest residence to the plant having the most restrictive atmospheric dispersion (χ/Q) and deposition (D/Q) parameters. Furthermore, it was assumed that the receptor living at this residence consumed food products that were either raised or produced at this residence.

Using land use census and meteorological data for 2008 the residence with the highest χ/Q value (7.5E-06 sec/m^3) and the highest D/Q value (1.8E-08 m^{-2}) was determined to be in the NE sector at a distance of 1432 meters (0.89 miles) from the reactor building. The dose calculation was performed in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual considering the inhalation, ground plane exposure, and ingestion pathways. The maximum organ dose to the critical receptor was determined to be:

0.119 mrem to the infant thyroid.

This represents 0.79% of the Annual Organ Dose limit (15 mrem).

Dose calculation results are summarized by quarters in Table 5A. The doses were calculated in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual.

7.2 Doses Due to Liquid Effluents

The annual doses to the maximum exposed individual, an adult, resulting from exposure to liquid effluents released during 2008 from Waterford 3 were:

6.03E-04 mrem	to the Total Body.
7.04E-04 mrem	to the maximum exposed organ (Gi-LLi).

The above doses represent the following percentage of the Annual Dose limits:

0.02% of the Total Body Dose Limit (3 mrem), and
0.007% of the Organ Dose Limit (10 mrem).

Dose calculation results are summarized by quarter in Table 5B. The doses were calculated in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual.

7.3 40 CFR Part 190 Dose Evaluation

In accordance with Technical Requirements Manual (TRM), Specification 3/4.11.4, Total Dose, dose evaluations to demonstrate compliance with Surveillance Requirements 4.11.4.1 and 4.11.4.2 of the Technical Requirements Manual (TRM), dealing with dose from the uranium fuel cycle, need to be performed only if quarterly doses exceed 3 mrem to the total body (liquid releases), 10 mrem to any organ (liquid releases), 10 mrad gamma air dose, 20 mrad beta air dose, or 15 mrem to any organ from radioiodines and particulates.

At no time during 2008 were any of these limits exceeded; therefore, the evaluation was not required.

7.4 Doses to Public Inside the Site Boundary

The Member of the Public inside the site boundary expected to have the maximum exposure due to gaseous effluents would be an employee at the Waterford 1 and 2 fossil fuel plants, located in the NW sector at a distance of approximately 670 meters (0.42 miles) from the reactor building.

The doses for such an individual were determined by scaling the full-time occupancy doses due to airborne effluents by the occupancy time due to a normal working year. Based on an assumed occupancy of 25% (40 hour work week) and the fact that all employees are adults, the calculated doses were determined to be less than:

3.23E-03 mrem to the maximum exposed organ (Thyroid)

1.51E-02 mrem to the Total body

2.84E-02 mrem to the skin

During refuel 15 outage Entergy allowed employees working the outage to use the RV trailer park at the Skills Training center parking lot. The RV site is located in the South sector at a distance of approximately 500 meters (0.31 miles) from the reactor building. The doses for such individuals were determined by scaling the full-time occupancy doses due to airborne effluents by the time the employees occupied the park while not working during the outage. Based on a 12 hr/day 6 days/wk work schedule the assumed occupancy was 5.8% of the calculated annual doses, the actual doses were determined to be less than:

2.24E-03 mrem to the maximum exposed organ (Adult Thyroid)

1.05e-2 mrem to the Total body

1.98E-2 mrem to the skin

All doses for receptors inside the site boundary were calculated according to the methodology described in the Waterford 3 Offsite Dose Calculation Manual considering only the inhalation and ground plane exposure pathways.

8.0 Related Information

8.1 Changes to the Process Control Program

There were changes to EN-RW-105, Process Control Program, in 2008:

- The revision to EN-RW-105 included a major re-write to provide updates to allow Vermont Yankee, Palisades and Indian Point to be included as sites implementing this Process Control Program.
- The following are updates:
  - Waste management practices section replaced dry and liquid waste management
  - Waste stream sampling methods and frequency section added
  - Waste classification section added
  - Quality Control section added
  - Dewatering section added
  - Waste packaging section added

Miscellaneous section added for special tools/equipment & training requirements. A copy of the EN-RW-105, "Process Control Program" is provided in Attachment 11.1.

8.2 Changes to the Offsite Dose Calculation Manual

There were no changes to UNT-005-014, Offsite Dose Calculation Manual, in 2008.

8.3 Unavailability of REMP Milk Samples

Due to the unavailability of three milk sampling locations within five kilometers of the plant, Broad Leaf sampling is performed in accordance with Technical Requirements Manual (TRM) Table 3.12-1. Milk is collected, when available, from the control location and one identified sampling location as indicated in UNT-005-014, Offsite Dose Calculation Manual, Attachment 7.13.

8.4 Report of Required Effluent Instrument Inoperability

Technical Requirements Manual (TRM) Specifications 3.3.3.10 and 3.3.3.11 require reporting in the Annual Radioactive Effluent Release Report of why designated inoperable effluent monitoring instrumentation was not restored to operability within the time specified in the Action Statement.

During the reporting period, all instrumentation was restored to operability within the time specified.

8.5 Activity Released Via Secondary Pathways

The following secondary release paths were continuously monitored for radioactivity:

- The Hot Machine Shop Exhaust (AH-35),
- Decontamination Shop Exhaust (AH-34),
- The RAB H&V Equipment Room Ventilation system Exhaust (E-41A and E-41B); and,
- The Switchgear/Cable Vault Area Ventilation System (AH-25).

Continuous sampling for these areas is maintained in order to demonstrate the operability of installed treatment systems and to verify integrity of barriers separating primary and secondary ventilation systems. Sampling for these areas was limited to continuous particulate and iodine sampling and monthly noble gas grab sampling. The activity released via these secondary pathways resulted from routine operations and remained below significant levels.

8.6 Missed Effluent Samples

During the reporting period, no incident occurred for which effluent samples were not sampled and/or analyzed as required by the ODCM/TRM.

8.7 Major Changes to Radioactive Waste Systems

During the reporting period, no major changes were made to any Radioactive Waste Systems. All major changes to Radioactive Waste Systems are included in Waterford 3's FSAR updates.

8.8 Biennial Land Use Census

A land use census was last performed in 2008. The land use census performed in 2008 did not identify the need for any changes to locations being used for effluent dose calculations or radiological environmental sampling.

8.9 Gaseous Storage Tank Total Radioactivity Limit

Technical Specification 3/4.11.2.6 specifies that the quantity of radioactivity contained in each gas storage tank be maintained less than or equal to 8.5E+04 Curies noble gas (considered as Xe-133 equivalent). At no time during the reporting period was this value exceeded.

8.10 Unprotected Outside Tank Total Radioactivity Limit

Technical Specification 3/4.11.1.4 specifies that the quantity of radioactive material contained in each unprotected outdoor tank be maintained less than or equal to 7.85E-04 Curies (excluding tritium and dissolved and entrained noble gases). During this reporting period, there were no instances in which this limit was exceeded.

9.0 Additional Information

9.1 Reactor Coolant System Average Energy (E-Bar)

Reactor Coolant System E-Bar calculations were done on 3/17/08 and 10/2/08 with values of 0.2113 and 0.1757 Mev/disintegration, respectively. Reactor Coolant System E-Bar is supplied for information only and is not used for effluent dose calculations.

9.2 Groundwater Initiative Data

Groundwater wells were monitored at Waterford 3 during 2008 as part of the NEI Groundwater Initiative. Sampling of the three installed wells was conducted on a quarterly basis. All results were less than minimum detectable activity for gamma emitters and tritium during 2008.

10.0 Tables

11.0 Attachments

11.1 Copy of EN-RW-105, "Process Control Program" Revision 1.

Table 1
Batch Release Summary

Batch Release Summary information for 2008 Report Period.

Report Category : Batch Release Summary
Release Point : All
Type of Release : Batch Liquid and Gaseous
Period Start Time : 01-jan-2008 00:00:00
Period End Time : 31-dec-2008 23:59:59

Liquid Releases		
Number of Releases	93	
Total Time for All Releases	25419.1	Minutes
Maximum Time for a Release	349.0	Minutes
Average Time for a Release	273.3	Minutes
Minimum Time for a Release	80.0	Minutes
Average Stream Flow	796670.1	GPM

Gaseous Releases		
Number of Releases	12	
Total Time for All Releases	2675.0	Minutes
Maximum Time for a Release	600.0	Minutes
Average Time for a Release	222.9	Minutes
Minimum Time for a Release	37.0	Minutes

Batch Release Summary information for 2008 by Quarter.

Report Category : Batch Release Summary
Release Point : All
Type of Release : Batch Liquid and Gaseous
Period Start Time : 01-jan-2008 00:00:00
Period End Time : 31-dec-2008 23:59:59

Liquid Releases	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
Number of Releases	15	36	24	18	
Total Time for All Releases	3846.0	9572.1	6956.0	5045.0	Minutes
Maximum Time for a Release	344.0	349.0	348.0	332.0	Minutes
Average Time for a Release	256.4	265.9	289.8	280.3	Minutes
Minimum Time for a Release	80.0	132.0	232.0	228.0	Minutes
Average Stream Flow	787159.9	747140.6	893839.8	763917.6	GPM

Gaseous Releases	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
Number of Releases	2	4	3	3	
Total Time for All Releases	289.0	1459.0	587.0	340.0	Minutes
Maximum Time for a Release	160.0	600.0	377.0	183.0	Minutes
Average Time for a Release	144.5	364.8	195.7	113.3	Minutes
Minimum Time for a Release	129.0	180.0	92.0	37.0	Minutes

Table 1A
Annual Summation of All Releases by Quarter
All Airborne Effluents

Report Category : Summation of All Releases
Type of Activity : All Airborne Effluents
Period Start Time : 01-jan-2008 00:00:00
Period End Time : 31-dec-2008 23:59:59

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est.Total Error %
A. Fission and Activation Gases						
1. Total Release	Curies	5.37e+00	4.44e+02	7.56e+00	6.87e+01	1.50e+01
2. Average Release Rate for Period	uCi/sec	6.83e-01	5.64e+01	9.51e-01	8.65e+00	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
B. Radioiodines						
1. Total Iodine-131	Curies	7.90e-06	1.40e-04	1.25e-05	2.25e-06	1.50e+01
2. Average Release Rate for Period	uCi/sec	1.00e-06	1.79e-05	1.57e-06	2.82e-07	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
C. Particulates						
1. Particulates (Half-lives > 8 Days)	Curies	7.68e-07	2.19e-05	6.73e-07	7.03e-08	1.50e+01
2. Average Release Rate for Period	uCi/sec	9.77e-08	2.79e-06	8.47e-08	8.84e-09	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
1. Gross Alpha Radioactivity	Curies	1.27e-06	1.69e-06	1.23e-06	4.99e-07	1.50e+01
D. Tritium						
1. Total Release	Curies	8.05e+00	1.61e+01	1.30e+01	3.07e+01	1.50e+01
2. Average Release Rate for Period	uCi/sec	1.02e+00	2.05e+00	1.63e+00	3.87e+00	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	

Table 1B
Annual Airborne Continuous Elevated and Ground Level Releases
Totals for Each Nuclide Released

Report Category : Airborne Continuous Elevated and Ground Level Releases.
: Totals for Each Nuclide Released.
Type of Activity : Fission Gases, Iodines, and Particulates
Period Start Time : 01-jan-2008 00:00:00
Period End Time : 31-dec-2008 23:59:59

		Elevated Releases				Ground Releases			
Nuclide	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fission and Activation Gases									
Kr-87	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.18e+00	0.00e+00	0.00e+00
Xe-133	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.07e+00	4.08e+02	0.00e+00	6.42e+01
Xe-135	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	9.95e+00	0.00e+00	2.44e+00
Total for Period	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.07e+00	4.20e+02	0.00e+00	6.66e+01
Radioiodines									
I-131	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.40e-08	1.36e-04	1.20e-05	1.52e-06
I-133	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.84e-06	4.33e-06	4.98e-07	7.24e-07
Total for Period	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.90e-06	1.40e-04	1.25e-05	2.25e-06
Particulates									
H-3	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.68e+00	1.47e+01	1.16e+01	3.04e+01
Cr-51	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.01e-07	0.00e+00	0.00e+00
Co-58	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.94e-06	0.00e+00	0.00e+00
Co-60	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.67e-07	6.28e-07	0.00e+00	0.00e+00
Ru-103	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.46e-07	0.00e+00	0.00e+00
Sb-125	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	4.61e-08	0.00e+00	0.00e+00
Cs-137	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	6.01e-07	1.72e-07	0.00e+00	7.03e-08
Os-185	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	9.84e-07	6.31e-09	0.00e+00
Os-191	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.67e-05	6.67e-07	0.00e+00
Gralpha	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.27e-06	1.69e-06	1.23e-06	4.99e-07
Total for Period	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.68e+00	1.47e+01	1.16e+01	3.04e+01

Table 1C
Annual Airborne Batch Elevated and Ground Level Releases
Totals for Each Nuclide Released

Report Category : Airborne Batch Elevated and Ground Level Releases.
: Totals for Each Nuclide Released.
Type of Activity : Fission Gases, Iodines, and Particulates
Period Start Time : 01-jan-2008 00:00:00
Period End Time : 31-dec-2008 23:59:59

		Elevated Releases				Ground Releases			
Nuclide	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fission and Activation Gases									
Ar-41	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.32e-01	2.36e-01	7.24e-02	1.15e-01
Kr-85	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.80e-01	8.79e-01	0.00e+00	0.00e+00
Xe-127	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.42e-04	0.00e+00	0.00e+00
Xe-131m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.84e-01	1.19e-01	1.96e-02
Xe-133	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.78e+00	2.25e+01	7.30e+00	2.01e+00
Xe-133m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.48e-01	5.31e-02	0.00e+00
Xe-135	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	6.32e-03	4.07e-02	1.25e-02	8.31e-03
Total for Period	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.30e+00	2.40e+01	7.56e+00	2.15e+00
Radioiodines									
None									
Particulates									
H-3	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.68e-01	1.46e+00	1.39e+00	3.09e-01
Total for Period	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.68e-01	1.46e+00	1.39e+00	3.09e-01

Table 2A
Annual Summation of All Releases by Quarter
All Liquid Effluents

Report Category : Summation of All Releases
Type of Activity : All Liquid Effluents
Period Start Time : 01-jan-2008 00:00:00
Period End Time : 31-dec-2008 23:59:59

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est.Total Error %
A. Fission and Activation Products						
1. Total Release (Not Including Tritium, Gases, and Alpha	Curies	5.76e-03	1.23e-02	4.39e-03	1.30e-03	1.50e+01
2. Average Diluted Concentration During Period	uCi/sec	5.80e-12	1.68e-11	4.77e-12	1.80e-12	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
B. Tritium						
1. Total Release	Curies	7.84e+01	1.84e+02	1.17e+02	6.57e+01	1.50e+01
2. Average Diluted Concentration During Period	uCi/sec	7.90e-08	2.52e-07	1.27e-07	9.13e-08	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
C. Dissolved and Entrained Gases						
1. Total Release	Curies	2.00e-04	1.68e-02	6.34e-03	1.61e-01	1.50e+01
2. Average Diluted Concentration During Period	uCi/sec	2.01e-13	2.30e-11	6.90e-12	2.24e-10	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
D. Gross Alpha Radioactivity						
1. Total Release	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.50e+01
E. Waste Volume Released (Pre-Dilution)	Liters	1.19e+07	2.32e+07	1.47e+07	9.27e+06	1.50e+01
F. Volume of Dilution Water Used	Liters	9.92e+11	7.29e+11	9.19e+11	7.20e+11	1.50e+01

Table 2B
Annual Liquid Continuous and Batch Releases
Totals for Each Nuclide Released

Report Category : Liquid Continuous and Batch Releases.
: Totals for Each Nuclide Released.
Type of Activity : All Radionuclides
Period Start Time : 01-jan-2008 00:00:00
Period End Time : 31-dec-2008 23:59:59

		Continuous Releases				Batch Releases			
Nuclide	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
All Nuclides									
H-3	Curies	9.62e-02	9.06e-02	7.36e-02	1.36e-01	7.83e+01	1.84e+02	1.16e+02	6.56e+01
Cr-51	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.07e-04	9.03e-05	0.00e+00	0.00e+00
Mn-54	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.67e-04	5.37e-04	5.00e-05	4.45e-05
Fe-55	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.65e-03	5.50e-03	2.69e-03	7.90e-04
Fe-59	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.91e-05	1.48e-05	0.00e+00	0.00e+00
Co-57	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.22e-06	1.66e-05	0.00e+00	0.00e+00
Co-58	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	9.80e-04	3.18e-03	3.67e-04	1.76e-04
Co-60	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.81e-04	1.09e-03	2.03e-04	1.55e-04
Zn-65	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.04e-05	0.00e+00	0.00e+00	0.00e+00
Kr-85	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.20e-02	0.00e+00	1.11e-02
Kr-85m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.63e-06	0.00e+00	4.14e-05
Zr-95	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.43e-04	4.06e-04	6.10e-05	2.68e-05
Nb-95	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	4.48e-04	8.16e-04	1.03e-04	4.53e-05
Ru-103	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.07e-06	0.00e+00	1.26e-06	0.00e+00
Ag-110m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.82e-06	0.00e+00	0.00e+00
Sn-113	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.61e-06	1.40e-05	0.00e+00	0.00e+00
Sb-124	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.77e-05	1.15e-05	0.00e+00
Sb-125	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.34e-04	3.57e-04	8.91e-04	4.54e-05
I-131	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.50e-05	4.79e-06	1.38e-06
I-132	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.23e-05	0.00e+00	0.00e+00
Xe-131m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.58e-04	1.87e-03
Xe-133	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.97e-04	4.68e-03	6.04e-03	1.44e-01
Xe-133m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.76e-05	1.45e-05	1.89e-03
Xe-135	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.36e-06	1.31e-05	3.24e-06	2.51e-03
Xe-135m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.38e-05	0.00e+00
Xe-138	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.58e-06	0.00e+00
Cs-134	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.27e-05	0.00e+00	0.00e+00
Cs-137	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.59e-05	0.00e+00	0.00e+00
Pb-214	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	9.70e-06	0.00e+00	0.00e+00
Bi-212	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.07e-05
Bi-214	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	6.73e-06	0.00e+00	3.75e-06
Np-239	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	9.56e-05	0.00e+00	0.00e+00
Total for Period	Curies	9.62e-02	9.06e-02	7.36e-02	1.36e-01	7.83e+01	1.84e+02	1.16e+02	6.58e+01

Table 3
Solid Waste Shipped Offsite for Burial or Disposal

SUMMARY BY MAJOR WASTE TYPES

Waste Stream : Resins, Filters, and Evaporator Bottoms ♦

Waste Class	Volume Ft^3	Volume M^3	Curies Shipped	% Error (Ci)
A	3.49E+02	9.88E+00	4.22E+01	+/- 25%
B	0.00E+00	0.00E+00	0.00E+00	+/- 25%
C	0.00E+00	0.00E+00	0.00E+00	+/- 25%
ALL	3.49E+02	9.88E+00	4.22E+01	+/- 25%

Waste Stream : Dry Active Waste ♣

Waste Class	Volume Ft^3	Volume M^3	Curies Shipped	%Error (Ci)
A	1.51E+04	4.28E+02	2.79E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
ALL	1.51E+04	4.28E+02	2.79E+00	+/-25%

Waste Stream : Irradiated Components

Waste Class	Volume Ft^3	Volume M^3	Curies Shipped	%Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
ALL	0.00E+00	0.00E+00	0.00E+00	+/-25%

Waste Stream : Other Waste (Combined Packages)

Waste Class	Volume Ft^3	Volume M^3	Curies Shipped	%Error (Ci)
A	1.77E+03	5.01E+01	1.26E-02	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
ALL	1.77E+03	5.01E+01	1.26E-02	+/-25%

Waste Stream : Sum of All 4 Categories

Waste Class	Volume Ft^3	Volume M^3	Curies Shipped	%Error (Ci)
A	1.72E+04	4.88E+02	4.50E+01	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
ALL	1.72E+04	4.88E+02	4.50E+01	+/-25%

♣ Activity determined by estimations

♦ Activity determined by measurements

Estimate of major nuclide composition (by waste type)

Waste Stream : Resins, Filters, and Evap Bottoms

Nuclide Name	Percent Abundance	Curies
H-3	1.892%	7.98E-01
C-14	0.194%	8.20E-02
Mn-54	0.939%	3.96E-01
Fe-55	59.785%	2.52E+01
Co-57	0.250%	1.06E-01
Co-58	0.596%	2.51E-01
Co-60	2.782%	1.17E+00
Ni-63	22.886%	9.65E+00
Zn-65	0.074%	3.12E-02
Sr-90	0.041%	1.73E-02
Sb-125	1.289%	5.44E-01
Cs-134	3.113%	1.31E+00
Cs-137	5.208%	2.20E+00
Ce-141	0.781%	3.30E-01
Ce-144	0.066%	2.78E-02
Pu-238	0.012%	5.14E-03
Pu-241	0.076%	3.20E-02
Am-241	0.011%	4.53E-03
Cm-243	0.003%	1.23E-03
Cm-244	0.003%	1.23E-03

Estimate of major nuclide composition (by waste type)

Waste Stream : Dry Active Waste

Nuclide Name	Percent Abundance	Curies
H-3	1.895%	5.29E-02
C-14	0.195%	5.44E-03
Mn-54	0.941%	2.63E-02
Fe-55	59.843%	1.67E+00
Co-57	0.176%	4.92E-03
Co-58	0.419%	1.17E-02
Co-60	2.786%	7.78E-02
Ni-63	22.929%	6.40E-01
Zn-65	0.052%	1.45E-03
Sr-90	0.041%	1.15E-03
Sb-125	1.290%	3.60E-02
Cs-134	3.116%	8.70E-02
Cs-137	5.217%	1.46E-01
Ce-141	0.948%	2.65E-02
Ce-144	0.046%	1.30E-03
Pu-238	0.012%	3.41E-04
Pu-241	0.076%	2.12E-03
Am-241	0.011%	3.00E-04
Cm-243	0.003%	8.16E-05
Cm-244	0.003%	8.15E-05

Estimate of major nuclide composition (by waste type)

Waste Stream : Irradiated Components

N/A - None Shipped in 2008.

Estimate of major nuclide composition (by waste type)

Waste Stream : Other Waste (Combined Packages)

Nuclide Name	Percent Abundance	Curies
H-3	6.148%	7.78E-04
C-14	0.182%	2.31E-05
Mn-54	0.827%	1.05E-04
Fe-55	58.188%	7.36E-03
Co-57	0.000%	0.00E+00
Co-58	0.008%	1.00E-06
Co-60	2.765%	3.50E-04
Ni-63	21.981%	2.78E-03
Zn-65	0.000%	0.00E+00
Sr-90	0.035%	4.43E-06
Sb-125	1.077%	1.36E-04
Cs-134	2.811%	3.56E-04
Cs-137	4.728%	5.98E-04
Ce-141	1.160%	1.47E-04
Ce-144	0.000%	0.00E+00
Pu-238	0.010%	1.31E-06
Pu-241	0.065%	8.19E-06
Am-241	0.009%	1.15E-06
Cm-243	0.002%	3.14E-07
Cm-244	0.002%	3.14E-07

Estimate of major nuclide composition (by waste type)

Waste Stream : Sum of All 4 Categories

Nuclide Name	Percent Abundance	Curies
H-3	1.893%	8.51E-01
C-14	0.194%	8.75E-02
Mn-54	0.939%	4.22E-01
Fe-55	59.788%	2.69E+01
Co-57	0.246%	1.10E-01
Co-58	0.585%	2.63E-01
Co-60	2.782%	1.25E+00
Ni-63	22.888%	1.03E+01
Zn-65	0.073%	3.26E-02
Sr-90	0.041%	1.85E-02
Sb-125	1.289%	5.80E-01
Cs-134	3.113%	1.40E+00
Cs-137	5.208%	2.34E+00
Ce-141	0.792%	3.56E-01
Ce-144	0.065%	2.91E-02
Pu-238	0.012%	5.48E-03
Pu-241	0.076%	3.41E-02
Am-241	0.011%	4.83E-03
Cm-243	0.003%	1.31E-03
Cm-244	0.003%	1.31E-03

Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
13	Hittman Transport Services	Energy Solutions
2	Hittman Transport Services	Studsvik Processing Facility LLC-Erwin

Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
None	N/A	N/A

Table 4
Joint Frequency Distribution of Meteorological Data

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2008 00:00:00 TO 12/31/2008 23:59:59 PASQUILL CLASS A

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	Total
N	0	0	0	0	0	1	9	16	3	0	0	0	29
NNE	0	0	0	0	1	0	5	1	0	0	0	0	7
NE	0	0	0	0	0	5	38	6	0	0	0	0	49
ENE	0	0	0	0	0	1	3	0	0	0	0	0	4
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	1	0	0	0	1
SE	0	0	0	0	0	0	3	2	0	0	0	0	5
SSE	0	0	0	0	0	1	3	10	1	0	0	0	15
S	0	0	0	0	0	2	4	5	0	0	0	0	11
SSW	0	0	0	0	0	0	1	1	0	0	0	0	2
SW	0	0	0	0	0	1	5	1	0	0	0	0	7
WSW	0	0	0	0	0	0	1	3	0	0	0	0	4
W	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	3	2	0	0	0	0	5
NW	0	0	0	0	0	0	3	4	0	0	0	0	7
NNW	0	0	0	0	0	1	9	8	2	0	0	0	20
Total	0	0	0	0	1	12	87	59	7	0	0	0	166

Number of calms for A Stability: 0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2008 00:00:00 TO 12/31/2008 23:59:59 PASQUILL CLASS B

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	Total
N	0	0	0	0	0	1	13	8	2	0	0	0	24
NNE	0	0	0	0	0	2	1	3	0	0	0	0	6
NE	0	0	0	0	0	7	66	8	0	0	0	0	81
ENE	0	0	0	0	1	1	8	1	0	0	0	0	11
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	1	0	0	1	0	0	0	2
SE	0	0	0	0	0	1	4	3	1	0	0	0	9
SSE	0	0	0	0	0	2	26	24	1	0	0	0	53
S	0	0	0	0	0	4	12	6	6	0	0	0	28
SSW	0	0	0	0	1	4	5	5	0	0	0	0	15
SW	0	0	0	0	0	6	10	2	1	0	0	0	19
WSW	0	0	0	0	0	3	1	3	0	0	0	0	7
W	0	0	0	0	0	2	0	2	0	0	0	0	4
WNW	0	0	0	0	0	5	5	4	0	0	0	0	14
NW	0	0	0	0	0	0	9	3	0	0	0	0	12
NNW	0	0	0	0	0	3	8	11	5	0	0	0	27
Total	0	0	0	0	2	42	168	83	17	0	0	0	312

Number of calms for B Stability: 0

Table 4
Joint Frequency Distribution of Meteorological Data

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2008 00:00:00 TO 12/31/2008 23:59:59 PASQUILL CLASS C

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	Total
N	0	0	0	0	3	6	24	6	0	0	0	0	39
NNE	0	0	0	0	0	3	10	0	0	0	0	0	13
NE	0	0	0	0	0	19	75	5	1	0	0	0	100
ENE	0	0	0	0	0	5	8	8	0	0	0	0	21
E	0	0	0	0	0	2	2	1	0	0	0	0	5
ESE	0	0	0	0	0	1	2	4	0	0	0	0	7
SE	0	0	0	0	1	3	15	16	0	0	0	0	35
SSE	0	0	0	0	1	5	28	29	4	0	0	0	67
S	0	0	0	0	0	6	25	19	6	0	0	0	56
SSW	0	0	0	0	1	16	17	9	2	0	0	0	45
SW	0	0	0	0	1	18	24	4	1	0	0	0	48
WSW	0	0	0	0	4	15	9	2	0	0	0	0	30
W	0	0	0	0	1	11	15	1	0	0	0	0	28
WNW	0	0	0	0	0	6	6	1	0	0	0	0	13
NW	0	0	0	0	1	3	8	1	0	0	0	0	13
NNW	0	0	0	0	1	8	17	8	1	0	0	0	35
Total	0	0	0	0	14	127	285	114	15	0	0	0	555

Number of calms for C Stability: 1

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2008 00:00:00 TO 12/31/2008 23:59:59 PASQUILL CLASS D

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	Total
N	0	0	1	4	17	74	124	47	19	0	0	0	286
NNE	0	0	3	7	16	73	86	58	28	4	0	0	275
NE	0	0	1	4	27	104	195	47	8	0	2	0	388
ENE	0	0	0	6	8	28	88	42	9	0	3	0	184
E	0	0	0	6	2	10	27	9	3	0	1	0	58
ESE	0	0	0	1	2	6	29	40	1	3	0	1	83
SE	0	0	1	3	5	19	103	89	20	5	1	1	247
SSE	0	0	1	1	7	53	176	128	36	2	0	0	404
S	0	0	0	4	16	62	109	52	45	0	0	0	288
SSW	0	1	2	3	17	48	58	27	12	0	0	0	168
SW	0	0	0	11	28	44	57	29	0	0	0	0	169
WSW	0	0	1	13	30	54	43	5	0	0	0	0	146
W	0	0	3	13	18	33	31	10	0	0	0	0	108
WNW	0	1	1	5	15	24	28	8	0	0	0	0	82
NW	0	0	0	4	11	16	37	6	1	0	0	0	75
NNW	0	0	0	5	17	57	121	53	15	0	0	0	268
Total	0	2	14	90	236	705	1312	650	197	14	7	2	3229

Number of calms for D Stability: 1

Table 4
Joint Frequency Distribution of Meteorological Data

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2008 00:00:00 TO 12/31/2008 23:59:59 PASQUILL CLASS E

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	Total
N	0	3	1	12	25	64	85	6	3	0	0	0	199
NNE	0	4	3	10	24	63	54	16	0	1	0	0	175
NE	0	4	1	9	27	72	77	4	0	0	0	0	194
ENE	0	2	1	2	7	27	77	9	2	0	0	0	127
E	0	0	2	7	7	24	38	6	5	0	0	0	89
ESE	0	0	2	4	6	17	103	28	6	0	0	0	166
SE	0	1	1	5	5	52	148	26	0	0	0	0	238
SSE	0	1	2	12	48	160	137	11	3	0	0	0	374
S	0	3	8	30	54	101	49	5	3	0	0	0	253
SSW	0	2	10	37	56	57	53	2	0	1	0	0	218
SW	0	5	7	26	35	50	20	2	1	0	0	0	146
WSW	0	7	9	46	34	30	18	3	0	0	0	0	147
W	0	3	10	25	12	15	7	0	0	0	0	0	72
WNW	0	3	5	24	17	18	8	0	0	0	0	0	75
NW	0	1	5	13	14	29	11	1	0	0	0	0	74
NNW	0	2	2	12	20	53	51	13	1	0	0	0	154
Total	0	41	69	274	391	832	936	132	24	2	0	0	2701

Number of calms for E Stability: 0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2008 00:00:00 TO 12/31/2008 23:59:59 PASQUILL CLASS F

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	Total
N	0	4	9	19	19	11	0	0	0	0	0	0	62
NNE	0	2	1	7	7	10	1	0	0	0	0	0	28
NE	0	0	1	3	12	23	8	0	0	0	0	0	47
ENE	3	1	1	2	3	8	1	0	0	0	0	0	19
E	0	3	3	2	0	3	0	0	0	0	0	0	11
ESE	0	0	6	2	0	1	2	0	0	0	0	0	11
SE	0	2	1	2	3	2	5	0	0	0	0	0	15
SSE	0	4	5	6	53	52	8	0	0	0	0	0	128
S	0	4	12	65	57	24	1	0	0	0	0	0	163
SSW	0	6	21	72	49	16	0	0	0	0	0	0	164
SW	2	10	18	61	15	2	1	0	0	0	0	0	109
WSW	2	13	15	41	11	2	1	0	0	0	0	0	85
W	3	8	21	22	10	1	1	0	0	0	0	0	66
WNW	1	6	11	31	13	2	0	0	0	0	0	0	64
NW	1	7	11	12	8	4	0	0	0	0	0	0	43
NNW	1	4	5	16	8	5	1	0	0	0	0	0	40
Total	13	74	141	363	268	166	30	0	0	0	0	0	1055

Number of calms for F Stability: 0

Table 4
Joint Frequency Distribution of Meteorological Data

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2008 00:00:00 TO 12/31/2008 23:59:59 PASQUILL CLASS G

Wind Direction	Wind Speed (M/S) at 10-m Level												
	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	Total
N	2	1	5	10	9	0	0	0	0	0	0	0	27
NNE	4	6	4	3	0	1	0	0	0	0	0	0	18
NE	3	3	2	1	3	1	0	0	0	0	0	0	13
ENE	1	1	1	0	0	0	0	0	0	0	0	0	3
E	0	3	2	1	0	0	0	0	0	0	0	0	6
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	2	3	0	1	1	0	0	0	0	0	0	0	7
SSE	0	0	2	6	9	11	0	0	0	0	0	0	28
S	0	1	9	31	16	4	0	0	0	0	0	0	61
SSW	1	8	17	54	27	2	0	0	0	0	0	0	109
SW	14	14	36	36	8	0	0	0	0	0	0	0	108
WSW	7	22	35	20	0	1	0	0	0	0	0	0	85
W	10	42	47	28	1	0	0	0	0	0	0	0	128
WNW	10	24	26	22	5	0	0	0	0	0	0	0	87
NW	5	18	13	7	1	0	0	0	0	0	0	0	44
NNW	3	10	9	12	4	0	0	0	0	0	0	0	38
Total	62	156	208	232	84	20	0	0	0	0	0	0	762

Number of calms for G Stability: 2

Total valid hours for all stabilities = 8760
Total invalid hours for all stabilities = 0

Table 5A
Doses Due to Gaseous Radioactive Effluents

Doses due to Noble Gases (mRad or mrem)

Age Group : All

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Total-body	1.6566e-03	1.0124e-01	1.7968e-03	1.5789e-02	1.2048e-01
Skin	3.5629e-03	2.4035e-01	3.9337e-03	3.6245e-02	2.8409e-01
Air Beta	3.9869e-03	3.1815e-01	5.1650e-03	4.8129e-02	3.7543e-01
Air Gamma	1.8775e-03	1.1846e-01	2.0993e-03	1.8470e-02	1.4091e-01

Doses due to Radioiodines/Particulates/Tritium (mrem)

Age Group : Adult

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	1.0833e-05	4.2501e-05	2.8646e-06	1.4438e-06	5.7643e-05
Liver	4.6895e-03	9.4182e-03	7.5360e-03	1.7851e-02	3.9495e-02
Total-body	4.6880e-03	9.3998e-03	7.5345e-03	1.7851e-02	3.9473e-02
Thyroid	4.6993e-03	2.3481e-02	8.7787e-03	1.8009e-02	5.4968e-02
Kidney	4.6852e-03	9.4476e-03	7.5387e-03	1.7851e-02	3.9523e-02
Lung	4.6838e-03	9.3750e-03	7.5322e-03	1.7850e-02	3.9441e-02
Gi-lli	4.6842e-03	9.3877e-03	7.5334e-03	1.7850e-02	3.9456e-02
Skin	7.0119e-06	1.3004e-05	2.4389e-07	6.3465e-07	2.0894e-05

Age Group : Teen

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	1.4243e-05	6.2240e-05	4.5228e-06	2.0510e-06	8.3056e-05
Liver	5.3115e-03	1.0681e-02	8.5329e-03	2.0209e-02	4.4735e-02
Total-body	5.3056e-03	1.0649e-02	8.5303e-03	2.0208e-02	4.4693e-02
Thyroid	5.3234e-03	3.0574e-02	1.0291e-02	2.0432e-02	6.6619e-02
Kidney	5.3044e-03	1.0728e-02	8.5372e-03	2.0209e-02	4.4779e-02
Lung	5.3023e-03	1.0612e-02	8.5268e-03	2.0207e-02	4.4649e-02
Gi-lli	5.3011e-03	1.0626e-02	8.5280e-03	2.0207e-02	4.4662e-02
Skin	7.0119e-06	1.3004e-05	2.4389e-07	6.3465e-07	2.0894e-05

Age Group : Child

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	2.5564e-05	1.3052e-04	1.0271e-05	4.0976e-06	1.7045e-04
Liver	7.3524e-03	1.4800e-02	1.1811e-02	2.7970e-02	6.1933e-02
Total-body	7.3389e-03	1.4748e-02	1.1807e-02	2.7968e-02	6.1862e-02
Thyroid	7.3771e-03	5.2566e-02	1.5148e-02	2.8393e-02	1.0348e-01
Kidney	7.3400e-03	1.4869e-02	1.1818e-02	2.7969e-02	6.1996e-02
Lung	7.3360e-03	1.4682e-02	1.1801e-02	2.7967e-02	6.1786e-02
Gi-lli	7.3340e-03	1.4691e-02	1.1802e-02	2.7967e-02	6.1794e-02
Skin	7.0119e-06	1.3004e-05	2.4389e-07	6.3465e-07	2.0894e-05

Age Group : Infant

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	2.4004e-05	2.2867e-04	1.8986e-05	5.0121e-06	2.7667e-04
Liver	3.3380e-03	6.8953e-03	5.3545e-03	1.2642e-02	2.8230e-02
Total-body	3.3222e-03	6.7518e-03	5.3429e-03	1.2639e-02	2.8056e-02
Thyroid	3.3992e-03	8.8933e-02	1.2603e-02	1.3562e-02	1.1850e-01
Kidney	3.3229e-03	6.9329e-03	5.3582e-03	1.2641e-02	2.8255e-02
Lung	3.3193e-03	6.6407e-03	5.3323e-03	1.2637e-02	2.7929e-02
Gi-lli	3.3170e-03	6.6480e-03	5.3331e-03	1.2637e-02	2.7935e-02
Skin	7.0119e-06	1.3004e-05	2.4389e-07	6.3465e-07	2.0894e-05

Table 5B
Doses Due to Liquid Radioactive Effluents

Cumulative Dose Information for 2008 (mrem)

Age Group : Adult

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	1.0915e-05	1.6131e-04	8.9662e-06	3.0293e-06	1.8422e-04
Liver	8.5382e-05	4.6386e-04	9.3410e-05	6.0965e-05	7.0362e-04
Total-body	7.4320e-05	3.8184e-04	8.8315e-05	5.8831e-05	6.0330e-04
Thyroid	6.5697e-05	2.0215e-04	8.7675e-05	5.7834e-05	4.1335e-04
Kidney	7.0720e-05	2.6984e-04	8.6027e-05	5.7748e-05	4.8434e-04
Lung	6.9391e-05	2.1872e-04	8.9149e-05	5.8572e-05	4.3583e-04
Gi-lli	1.6511e-04	3.5707e-04	1.0972e-04	7.2404e-05	7.0431e-04

ATTACHMENT 11.1

Copy of of EN-RW-105, "Process Control Program" Revision 1.

PROCESS CONTROL PROGRAM

Procedure Contains NMM REFLIB Forms: YES ☐ NO ☒

Effective Date	Procedure Owner: Title: Site:	Mark L. Carver Manager, Fleet Radwaste Echelon – HQN	Executive Sponsor: Title: Site:	Kevin Walsh VP - Operations Waterford 3
7/30/2008				

Exception Date*	Site	Site Procedure Champion	Title
	ANO	David Moore	RPM
N/A	BRP	N/A	N/A
	GGNS	Roy Wilson	RPM
	IPEC	Dennis Loope	RPM
	JAF	John Solowski	RPM
	PLP	Chuck Sherman	RPM
	PNPS	Jack Priest	RPM
	RBS	Brad Houston	RPM
	VY	Sam Wender IV	RPM
	W3	Blake Pilutti	RPM
N/A	NP	N/A	N/A
N/A	HQN	Mark L. Carver	Manager, Fleet Radwaste

Site and NMM Procedures Canceled or Superseded By This Revision

Palisades Nuclear Plant, Process Control Program (PCP) – Rev. 11

Process Applicability Exclusion All Sites: ☐

Specific Sites: ANO ☐ BRP ☐ GGNS ☐ IPEC ☐ JAF ☐ PLP ☐ PNPS ☐ RBS ☐ VY ☐ W3 ☐ NP ☐

Change Statement

- The revision to EN-RW-105 included a major re-write to provide updates to allow VTY, PLP and IPEC to be included as sites implementing this Process Control Program.
- The following are updates:
  - Waste management practices section replaced dry and liquid waste management
  - Waste stream sampling methods and frequency section added
  - Waste classification section added
  - Quality Control section added
  - Dewatering section added
  - Waste packaging section added
  - Miscellaneous section added for special tools/equipment & training requirements

* Exception Dates to permit appropriate change management training and to facilitate outage schedules.

TABLE OF CONTENTS

1.0 PURPOSE

The Process Control Program (PCP) requires formulas, sampling, analyses, test and determinations to be made to ensure that the processing and packing of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61 and 71, State Regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste. The scope of a PCP is to assure that radioactive waste will be handled, shipped, and disposed of in a safe manner in accordance with approved site or vendor procedures, whichever is applicable. **[GGNS UFSAR, Chapter 16B.1 / TRM – 7.6.3.8 paragraph 1]**

1.1 The purpose of this document is to provide a description of the solid radioactive waste Process Control Program (PCP) at all the Entergy fleet sites. The PCP describes the methods used for processing, classification and packaging low-level wet radioactive waste into a form acceptable for interim on-site storage, shipping and disposal, in accordance with 10 CFR Part 61 and current disposal site criteria.

1.2 To ensure the safe operation of the solid radwaste system, the solid radwaste system will be used in accordance with this Process Control Program to process radioactive wastes to meet interim on-site storage, shipping and burial ground requirements.

1.3 This document addresses the process control program in the context of disposal criteria, on-site processing and vendor processing requirements.

1.4 The Process Control Program implements the requirements of 10CFR50.36a and General Design Criteria 60 of Appendix A to 10CFR Part 50. The process parameters included in the Process Control Program may include but are not limited to waste type, waste pH, waste/liquid/solidification agent/catalyst ratios, waste oil content, waste principal chemical constituents, and mixing and curing times.

1.5 This document does NOT address the requirements for 10CFR Part 61.56 (waste characteristics) for material sent to intermediate processors, because the final treatment and packaging is performed at the vendor facilities.

2.0 REFERENCES

[1] EN-QV-104, "Entergy Quality Assurance Program Manual Control"

[2] Title 49, Code of Federal Regulations

[3] Title 10, Code of Federal Regulations, Part 20

[4] Title 10, Code of Federal Regulations, Part 61

[5] Title 10, Code of Federal Regulations, Part 71, Appendix H **[QAPM, Section A.1.c]**

2.0 continued

[6] Low-Level Waste Licensing Branch Technical Position on Radioactive Waste Classification, 11 May 1983

[7] Disposal Site Criteria and License

[8] Waste Processor Acceptance Criteria

[9] EN-LI-100, "Process Applicability Determination"

[10] NRC Information and Enforcement Bulletins

- NRC Information Notice 79-19: Packaging of Low-Level Radioactive Waste for Transport and Burial.
- NRC Information Notice 80-24: Low-Level Radioactive Waste Burial Criteria.
- NRC Information Notice 80-32: Clarification of Certain Requirements for Exclusive-Use Shipments of Radioactive Materials.
- NRC Information Notice 80-32, Rev. 1: Clarification of Certain Requirements for Exclusive-Use Shipments of Radioactive Materials.
- NRC Information Notice 83-05: Obtaining Approval for Disposing of Very-Low-Level Radioactive Waste - 10CFR Section 20.302.
- NRC Information Notice 83-10: Clarification of Several Aspects Relating to Use of NRC-Certified Transport Packages.
- NRC Information Notice 83-33: Non-Representative Sampling of Contaminated Oil.
- NRC Information Notice 84-50: Clarification of Scope of Quality Assurance Programs for Transport Packages Pursuant to 10CFR 50 Appendix B.
- NRC Information Notice 84-72: Clarification of Conditions for Waste Shipments Subject to Hydrogen Gas Generation.
- NRC Information Notice 85-92: Surveys of Wastes Before Disposal from Nuclear Reactor Facilities.
- NRC Information Notice 86-20: Low-Level Radioactive Waste Scaling Factors, 10CFR 61.
- NRC Information Notice 86-90: Requests to Dispose of Very Low-Level Radioactive Waste Pursuant 10CFR 20.302
- NRC Information Notice 87-03: Segregation of Hazardous and Low-Level Radioactive Wastes
- NRC Information Notice 87-07: Quality Control of On-Site Dewatering/ Solidification Operations by Outside Contractors

2.0 continued

[11] NRC Information and Enforcement Bulletins (continued)

- NRC Information Notice 89-27: Limitations on the Use of Waste Forms and High Integrity Containers for the Disposal of Low-Level Radioactive Waste
- NRC Information Notice 92-62: Emergency Response Information Requirements for Radioactive Material Shipments
- NRC Information Notice 92-72: Employee Training and Shipper Registration Requirements for Transporting Radioactive Materials
- NRC Generic Letter 89-01, "Implementation of Programmatic Controls for Radiological Effluent Technical Specifications in the Administrative Controls Section of the Technical Specifications and the Relocation of Procedural Details of RETS to the Offsite Dose Calculation Manual or to the Process Control Program".

[12] Nureg-0800 Standard Review Plan Section 11.4 Revision 2, Solid Waste Management Systems.

[13] NRC Waste Form Technical Position, Revision 1 Jan 24 1991.

[14] NRC SECY 94-198 Review of Existing Guidance Concerning the Extended Storage of Low-Level Radioactive Waste.

[15] EPRI TR-106925 Rev-1, Interim On-Site Storage of Low Level Waste: Guidelines for Extended Storage - October1996

[16] NRC Branch Technical Position On Concentration Averaging And Encapsulation Jan 17 1995

[17] Commitment Documents (U-2 and U-3)

- IPN-99-079, "Supplement to Proposed Changes to Technical Specifications Incorporating Recommendations of Generic Letter 89-01 and the Revised 10 CFR Part 20 and 10 CFR Part 50.36a.
- Appendix B Technical Specifications, Section 4.5 **[IP, RECS ODCM Part 1]**

3.0 DEFINITIONS

[1] **Batch** – A quantity of waste to be processed having essentially consistent physical and chemical characteristics as determined through past experience or system operation knowledge by the Radwaste Shipping Specialist. A batch could be a waste tank, several waste tanks grouped together or a designated time period such as between outages as with the DAW waste stream. An isolated quantity of feed waste to be processed having essentially constant physical and chemical characteristics. (The addition or removal of water will not be considered to create a new batch).

3.0 continued

[2] **Certificate of Compliance** - Document issued by the USNRC regulating use of a NRC licensed cask or issued by (SCDHEC) South Carolina Department of Health and Environmental Conservation regulating a High Integrity Container.

[3] **Chelating Agents** - EDTA, DTPA, hydroxy-carboxylic acids, citric acid, carbolic acid and glucinic acid.

[4] **Compaction** - The process of volume reducing solid waste by applying external pressure.

[5] **Confirmatory Analysis** - The practice of verifying that gross radioactivity measurements using MCA are reasonably consistent with independent laboratory sample data.

[6] **Dewatered Waste** - Wet waste that has been processed by means other than solidification, encapsulation, or absorption to meet the free standing liquid requirements of 10CFR Part 61.56 (a)(3) and (b)(2).

[7] **De-watering** - The removal of water or liquid from a waste form, usually by gravity or pumping.

[8] **Dilution Factor** - The RADMAN computer code factor to account for the non-radioactive binder added to the waste stream in the final product when waste is solidified.

[9] **Dry Waste** - Radioactive waste which exist primarily in a non-liquid form and includes such items as dry materials, metals, resins, filter media and sludges.

[10] **Encapsulation** - Encapsulation is a means of providing stability for certain types of waste by surrounding the waste by an appropriate encapsulation media.

[11] **Gamma-Spectral-Analysis** - Also known as IG, MCA, Ge/Li and gamma spectroscopy.

[12] **Gross Radioactivity Measurements** - More commonly known as dose to curie conversion for packaged waste characterization and classification.

[13] **Homogeneous** - Of the same kind or nature; essentially alike. Most Volumetric waste streams are considered homogeneous for purposes of waste classification.

[14] **Incineration** – The process of burning a combustible material to reduce its volume and yield an ash residue.

[15] **Liquid Waste** - Radioactive waste that exist primarily in a liquid form and is contained in other than installed plant systems, to include such items as oil, EHC fluid, and other liquids. This waste is normally processed off-site.

3.0 continued

[16] **Low-Level Radioactive Waste (LLW)** - Those wastes containing source, special nuclear, or by-product material that are acceptable for disposal in a land disposal facility. For the purposes of this definition, low-level radioactive waste has the same meaning as in the Low-Level Waste Policy Act, that is, radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or by-product material as defined in section 11e.(2) of the Atomic Energy Act (uranium or thorium tailings and waste).

[17] **Measurement of Specific Radionuclides** - More commonly known as direct sample or container sample using MCA data for packaged waste characterization and classification.

[18] **Operable** - A system, subsystem, train, component or device SHALL be OPERABLE or have OPERABILITY when it is capable of performing its specified functions(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).

[19] **Prequalification Program** - The testing program implemented to demonstrate that the proposed method of wet waste processing will result in a waste form acceptable to the land disposal facility and the NRC.

[20] **Processing** - Changing, modifying, and/or packaging radioactive waste into a form that is acceptable to a disposal facility.

[21] **Quality Assurance/Quality Control** - As used in this document, "quality assurance" comprises all those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to the physical characteristics of a material structure, component, or system to predetermined requirements.

[22] **Reportable Quantity Radionuclides (RQ)** - Any radionuclide listed in column (1) of Table 2 of 49CFR Part 172.101 which is present in quantities as listed in column (3) of Table 2 of 49CFR Part 172.101.

[23] **Sampling Plan** - A program to ensure that representative samples from the feed waste and the final waste form are obtained and tested for conformance with parameters stated in the PCP and waste form acceptance criteria.

[24] **Scaling Factor** - A dimensionless number which relates the concentration of an easy to measure radionuclide (gamma emitter) to one which is difficult to measure (beta and/or alpha emitters).

3.0 continued

[25] **Significant Quantity** - For purposes of waste classification all the following radionuclide values SHALL be considered significant and must be reported on the disposal manifest.

- Any value (real or LLD) for radionuclides listed in Appendix G to 10CFR20 (H-3, C-14, I-129, Tc-99).
- Greater than or equal to 1 percent of the concentration limits as listed in 10CFR Part 61.55 Table 1.
- Greater than or equal to 1 percent of the Class A concentration limits listed in 10CFR Part 61.55 Table 2.
- Greater than or equal to 1 percent of the total activity.
- Greater than or equal to 1 percent of the Reportable Quantity limits listed on 49CFR Part 172.101 Table 2.

[26] **Solidification** - The conversion of wet waste into a free-standing monolith by the addition of an agent so that the waste meets the stability and free-standing liquid requirements of the disposal site.

[27] **Special Radionuclides** - The RADMAN computer code term for radionuclides listed in Appendix G to 10CFR20 (i.e., H-3, C-14, I-129 & Tc-99)

[28] **Stability** – Structural stability per 10CFR61.2, Waste Form Technical Position, and Waste Form Technical Position Revision 1. This can be provided by the waste form, or by placing the waste in a disposal container or structure that provides stability after disposal. Stability requires that the waste form maintain its structural integrity under the expected disposal conditions.

[29] **Training** - A systematic program that ensures a person has knowledge of hazardous materials and hazardous materials regulations.

[30] **Type A Package** - Is the packaging together with its radioactive contents limited to A1 or A2 as appropriate that meets the requirements of 49CFR Part 173.410 and Part 173.412, and is designed to retain the integrity of containment and shielding under normal conditions of transport as demonstrated by the tests set forth in 49CFR Part 173.465 or Part 173.466 as appropriate.

[31] **Type B Package** - Is the packaging together with its radioactive contents that is designed to retain the integrity of containment and shielding when subjected to the normal conditions of transport and hypothetical accident test conditions set forth in 10CFR Part 71.

3.0 continued

[32] **Volume Reduction** – any process that reduces the volume of waste. This includes but is not limited to, compaction and incineration.

[33] **Waste Container** - A vessel of any shape, size, and composition used to contain the waste media.

[34] **Waste Form** - Waste in a waste container acceptable for disposal at a licensed disposal facility.

[35] **Waste Stream** - A Plant specific and constant source of waste with a distinct radionuclide content and distribution.

[36] **Waste Type** – A single packaging configuration and waste form tied to a specific waste stream.

4.0 RESPONSIBILITIES

[1] The **Vice President Operations Support (VPOS)** is responsible for the implementation of this procedure.

[2] Each site **Senior Nuclear Executive (SNE)** is responsible for ensuring that necessary site staff implements this procedure.

[3] The **Low Level RadWaste (LLRW) Focus Group** is responsible for evaluating and recommending changes and revisions to this procedure.

[4] Each site **RP Department – Radwaste Supervisor / Specialist** (title may vary at the site's respectively) has the overall responsibility for implementing the PCP and is responsible for processing and transportation is tasked with the day-to-day responsibilities for the following:

- Implementing the requirements of this document.
- Ensuring that radioactive waste is characterized and classified in accordance with 10CFR Part 61.55 and Part 61.56.
- Ensuring that radioactive waste is characterized and classified in accordance with volume reduction facility and disposal site licenses and other requirements.
- Designating other approved procedures (if required) to be implemented in the packaging of any specific batch of waste.
- Providing a designated regulatory point of contact between the Plant and the NRC, volume reduction facility or disposal site.

4.0 continued

- Maintaining records of on-site and off-site waste stream sample analysis and Plant evaluations.
- Suspending shipments of defectively processed or defectively packaged radioactive wastes from the site when the provisions of this process control program are not satisfied.

5.0 DETAILS

An isotopic analysis SHALL be performed on every batch for each waste stream so that the waste can be classified in accordance with 10CFR61. The isotopic and curie content of each shipping container SHALL be determined in accordance with 49CFR packaging requirements. The total activity in the container may be determined by either isotopic analysis or by dose-rate-to-curie conversion.

5.1. Precautions and Limitations

[1] Precautions

(a) Radioactive materials SHALL be handled in accordance with applicable radiation protection procedures.

(b) All radioactive waste must be processed or packaged to meet the minimum requirements listed in 10CFR Part 61.56 (a) (1) through (8).

(c) If the provisions of the Process Control Program are not satisfied, suspend shipment of the defectively processed or defectively packaged waste from the site. Shipment may be accomplished when the waste is processed / packaged in accordance with the Process Control Program.

(d) The generation of combustible gases is dependent on the waste form, radioactive concentration and accumulated dose in the waste. Changes to organic inputs (e.g. oil) to waste stream may change biogas generation rates.

[2] Limitations

(a) Only qualified personnel will characterize OR package radioactive waste OR radioactive materials for transportation or disposal.

(b) All site personnel that have any involvement with radioactive waste management computer software SHALL be familiar with its functions, operation and maintenance.

5.2. Waste Management Practices

[1] Waste processing methods include the following:

(a) Present and planned practice is NOT to solidify or encapsulate any waste streams.

(b) Waste being shipped directly for burial in a HIC (High Integrity Container) is dewatered to less than 1 percent by volume prior to shipment.

(c) Waste being shipped directly for burial in a container other than a HIC is dewatered to less than 0.5 percent by volume prior to shipment.

(d) IF solidification is required in the future, THEN at least one representative test specimen from at least every 10th batch of each type of radioactive waste will be checked to verify solidification.

(1) IF any specimen fails to verify solidification, THEN the solidification of the batch under test SHALL be suspended until such time as additional test specimens can be obtained, alternative solidification parameters can be determined, and a subsequent test verifies solidification. If alternative parameters are determined, the subsequent tests shall be verified using the alternative parameters determined.

(2) IF the initial test specimen from a batch of waste fails to verify solidification, THEN provide for the collection and testing of representative test specimens from each consecutive batch of the same type of waste until at least 3 consecutive initial test specimens demonstrates solidification. The process SHALL be modified as required to assure solidification of subsequent batches of waste.

[2] Operation and maintenance of dewatering systems and equipment include the following:

(a) Present and planned practice is to utilize plant personnel supplemented by vendor personnel or contracted vendor personnel, to operate AND maintain dewatering systems and equipment (as needed to meet disposal site requirements).

(b) All disposal liners are manufactured by and purchased from QA-approved vendors.

[3] ALARA considerations are addressed in all phases of the processes involving handling, packaging AND transfer of any type OR form of radioactive waste (dewatered or dry). Resin, charcoal media, spent filter cartridges AND sludges are typically processed within shields. Sluiceable demineralizers are shielded when in service. Radiation exposure and other health physics requirements are controlled by the issuance of a Radiation Work Permit (RWP) for each task.

5.3. Waste Stream Sampling Methods and Frequency

[1] The following general requirements apply to Plant waste stream sampling:

(a) Treat each waste stream separately for classification purposes.

(b) Ensure samples are representative of or can be correlated to the final waste form.

(c) Determine the density for each new waste stream initially or as needed (not applicable for DAW and filters).

(d) Perform an in-house analysis for gamma-emitting radionuclides for each sample sent to an independent laboratory.

(e) Periodically perform in-house analysis for gamma emitting radionuclides for comparison to the current data base values for gamma emitters. (The current database is usually based on the most recent independent laboratory results.)

(f) Resolve any discrepancies between in-house results AND the independent laboratory results for the same or replicate sample as soon as possible.

(g) Maintain records of on-site and off-site waste stream sample analysis and evaluations.

[2] When required, waste stream samples should be analyzed, re-evaluated and if necessary, shipped to a vendor laboratory for additional analysis. The same is true when there is a reason to believe that an equipment or process change has significantly altered the previously determined scaling factors by a factor of 10.

Specific examples include but are not limited to:

- Changes in oxidation reduction methods such as zinc, injection, hydrogen water chemistry,
- Changes in purification methods including media specialization, media distribution, ion/cation ratios,
- Changes in fuel performance criteria including fuel leaks
- Other changes in reactor coolant chemistry.
- Sustained, unexplained, changes in the routinely monitored Beta/Alpha ratios, as determined by Radiation Protection,
- When there is an extended reactor shutdown (> 90 days).
- When there are changes to liquid waste processing, such as bypassing filters, utilizing filters or a change in ion exchange media.
- When there are changes to the waste stream that could change the biogas generation rate.

5.3 continued

[3] The following requirements apply to infrequent or abnormal waste types:

(a) Infrequent OR abnormal waste types that may be generated must be evaluated on a case-by-case basis.

(b) The RP Department Supervisor / Specialist responsible for processing AND shipping will determine if the waste can be correlated to an existing waste stream.

(c) IF the radioactive waste cannot be correlated to an existing waste stream, THEN the RP Department Supervisor / Specialist responsible for processing and shipping SHALL determine specific off-site sampling and analysis requirements necessary to properly classify the material.

[4] Specific sampling methods and data evaluation criteria are detailed in EN-RW-104 for specific waste streams.

5.4. Waste Classification

[1] General requirements for scaling factors include the following:

(a) The Plant has established an inferential measurement program whereby concentrations of radionuclides which cannot be readily measured are estimated through ratio-ing with radionuclides which can be readily measured.

(b) Scaling factor relationships are developed on a waste stream-specific basis. These relationships are periodically revised to reflect current independent lab data from direct measurement of samples. The scaling factor relationships currently used by the sites are as follows:

- Hard to detect ACTIVATION product radionuclides and C-14 are estimated by using scaling factors with measured Co-60 activities.
- Hard to detect FISSION product radionuclides and H-3, Tc-99 and I-129 are estimated by using scaling factors with measured Cs-137 activities.
- Hard to detect TRANSURANIC radionuclides are estimated by using scaling factors with measured Ce-144 activities. Where Ce-144 cannot be readily measured, transuranics are estimated by using scaling factors with measured Cs-137 activities. Second order scaling of transuranics is acceptable when Cs-137 and Ce-144 are not readily measurable.

5.4 ***continued***

[2] General requirements for the determination of total activity and radionuclide concentrations include the following:

(a) The activity for the waste streams is estimated by using either Gross Radioactivity Measurement OR Direct Measurement of Radionuclides. Current specific practices are as follows:

- DAW - Gross radioactivity measurement in conjunction with the RADMAN computer codes, other approved computer codes or hand calculation.
- Filters - Gross radioactivity measurement in conjunction with the FILTRK computer code, other approved computer codes or hand calculation.
- All Other Waste Streams - Direct measurement of radionuclides in conjunction with the RADMAN computer codes, other approved computer codes or hand calculation.

(b) Determination of the NRC waste classification is performed by comparing the measured or calculated concentrations of significant radionuclides in the final waste form to those listed in 10CFR Part 61.55.

5.5. Quality Control

[1] The RADMAN computer code provides a mechanism to assist the Plant in conducting a quality control program in accordance with the waste classification requirements listed in 10CFR Part 61.55. All waste stream sample data changes are written to a computer data file for future review and reference.

[2] Audits and Management Review includes the following:

(a) Appendix G to 10CFR20 requires conduct of a QC program which must include management review of audits.

(b) Management audits of the Plant Sampling and Classification Program SHALL be periodically performed to verify the adequacy of maintenance sampling and analysis.

(c) Audits and assessments are performed and documented by any of the following:

- Radiation Protection Department
- Quality Assurance Department
- Qualified Vendors

(d) Certain elements of the Entergy Quality Assurance Program Manual are applied to the Process Control Program. **[QAPM, Section A.1.c]**

5.6. Dewatering Operations

[1] Processing requirements during dewatering operations include the following:

(a) All dewatering operations are performed per approved Plant or vendor operating procedures and instructions.

(b) Dewatering limitations and capabilities are verified by vendor Topical Reports or Operating and Testing Procedures.

[2] Dewatered resin activity limitations include the following:

(a) Dewatered resins will not be shipped off-site that have activities which will produce greater than 1.0E+8 rads total accumulated dose over 300 years. This is usually verified by comparing the container specific activity at the time of shipment to the following concentration limits for radionuclides with a half-life greater than five years:

- 10 Ci (0.37 TBq) per cubic foot.
- 350 uCi (12.95 MBq) per cubic centimeter

5.7. Waste Packaging

Waste in final form will be packaged in accordance with Title 10 and Title 49 of the Code of federal regulations and in accordance with current burial site criteria as is detailed in EN-RW-102.

5.8. Administrative Controls

[1] Information on solid radioactive waste shipped off-site is reported annually to the Nuclear Regulatory Commission in the Annual Radioactive Effluent Release Report as specified by the Offsite Dose Calculation Manual (ODCM) or Technical Specification. **[ANO1 Technical Specifications - 5.6.3] [ANO2 Technical Specifications – 6.9.3] [WF3 Technical Specifications – 6.9.18] [GGNS ODCM – 5.6.3.c] [JAF Technical Specifications – 5.6.3] [PLP ODCM, Appendix A – IV. A].**

[2] All changes to the PCP SHALL be documented. All records of reviews performed SHALL be retained as required by the Quality Assurance Program. The documentation of the changes **SHALL [GGNS UFSAR, Chapter 16B.1 / TRM – 7.6.3.8 paragraph 2]:**

(a) Contain sufficient information to support the change with appropriate analyses or evaluations justifying the change.

(b) Include a determination that the change will maintain the overall conformance of the solidified waste product (if applicable) to existing requirements of Federal, State or other applicable regulations.

[3] All changes in the Process Control Program and supporting documentation are included in each site's next Annual Radiological Effluent Release Report to the Nuclear Regulatory Commission. **[ANO ODCM - L3.2.1.B] [VTY TRM 6.12]**

[4] The changes to EN-RW-105 SHALL become effective upon review and acceptance by the site's General Plant Manager except as listed below:

(a) For Grand Gulf Nuclear Station, the changes to RW-105 SHALL be accomplished as specified in Grand Gulf Nuclear Station Technical Requirements Manual (TRM) Section 7.6.3.8. The changes SHALL become effective upon review and acceptance by the On-site Safety Review Committee (OSRC) and the approval of the GGNS Plant General Manager. **[GGNS UFSAR, Chapter 16B.1 / TRM – 7.6.3.8 paragraph 2]**

(b) For River Bend Nuclear Station, the procedure approval along with changes to RW-105 SHALL be accomplished per the River Bend Nuclear Station Technical Requirements, Section 5.5.14.1. The changes SHALL become effective upon review and acceptance by approval from the River Bend Nuclear Station Plant Manager or Radiation Protection Manager. **[RBS Technical Requirements – 5.5.14.1, 5.5.14.2 & 5.8.2]**

5.8 Continued

(c) For Waterford 3, the procedure approval along with changes to RW-105 SHALL be accomplished per Waterford 3 Technical Specifications 6.13.2. The changes SHALL become effective upon review and acceptance by the Waterford 3 General Plant Manager. **[WF3 Technical Specifications – 6.13.2.b]**

(d) For James A. FitzPatrick Nuclear Station, the procedure approval along with changes to EN-RW-105 SHALL be accomplished per the James A. FitzPatrick Station Technical Specifications, Section 5.6.3. The changes SHALL become effective upon review and acceptance through approval from the James A. FitzPatrick Nuclear Station On-Site Safety Review Committee. **[JAF UFSAR, Chapter 11.3.5]**

(e) For Vermont Yankee, Changes to the Process Control Program SHALL become effective after review and acceptance by the (OSRC) On-Site Safety Review Committee and the Site VP.

(f) For IPEC, Changes to the Process Control Program SHALL become effective after final review and acceptance by the On-Site Safety Review Committee (OSRC).

5.9. Vendor Requirements

[1] Vendors performing radwaste services under 10CFR61 and 10CFR71 requirements will be on the Entergy Qualified Supplier's List (QSL). **[QAPM, Section A.1.c]**

[2] Vendors performing radwaste services on-site are to comply with the following:

(a) Dewatering and solidification services SHALL have a NRC-approved Topical Report or other form of certification documenting NRC approval of the processes and associated equipment/containers.

(b) All vendor procedures utilized for performing on-site radwaste processing services (to assure compliance with 10 CFR Parts 20, 61 and 71, State Regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste) will be reviewed per the requirements of EN-LI-100, technically by the applicable site's Radiation Protection organization and only be accepted per the approvals specified in Section 5.8 [4].

(c) All changes to vendor procedures for ongoing on-site radwaste services will be reviewed technically by the site's Radiation Protection organization and screened per the requirements of EN-LI-100. Significant procedural changes will require the approvals specified in Section 5.8 [4]. During screening, the level of significance for procedural changes on equipment and process parameters may warrant the full 10CFR50.59 documentation and approval process.

5.9 continued

(d) Plant management SHALL review vendor(s) topical reports and test procedures per applicable requirements in Section 5.8.

NOTE

The PCP does not have to include the vendor's Topical Report if it has NRC approval, or has been previously submitted to the NRC.

(e) Plant management review will assure that the vendor's operations and requirements are compatible with the responsibilities and operation of the Plant.

(f) Training requirements and records listed in Section 5.10 also apply to contracted vendors.

5.10. Miscellaneous

[1] Special tools and equipment

(a) Frequency of Use and Descriptions

Required tools and equipment will vary depending on the specific process and waste container that is used. The various tools and equipment which may be required are detailed in specific procedures developed to govern activities described in this document.

[2] Pre-requisites

(a) Maintenance of Regulatory Material

Ensure that a current set of DOT, NRC, EPA and applicable State regulations, vendor processing facility and disposal site regulations and requirements are maintained at the site and are readily available for reference. The use of web based regulations is acceptable.

(b) Representative Radionuclide Sample Data

Ensure that representative radionuclide sample data is on file for each active waste stream. Unless operation conditions or changes in processing methods require increased sample frequency, data is considered to be current if it meets the requirements of EN-RW-104.

5.10 continued

(c) Initial and Cyclic Training

- A training program SHALL be developed, implemented and maintained for all personnel involved in processing, packaging, handling and transportation of radioactive waste to ensure radwaste operations are performed within the requirements of NRC Information Bulletin 79-19 and 49CFR Part 172.700 through Part 172.704.
- Training requirements and documentation also apply to contracted on-site vendors.

NOTE

Cyclic training is defined as within three years for DOT, and two years for IATA

(d) Specific employee training is required for each person who performs the following job functions [172.702(b)].

- Classifies hazardous materials.
- Packages hazardous materials.
- Fills, loads and/or closes packages.
- Marks and labels packages containing hazardous materials.
- Prepares shipping papers for hazardous materials.
- Offers or accepts hazardous materials for transportation.
- Handles hazardous materials.
- Marks or placards transport vehicles.
- Operates transport vehicles.
- Works in a transportation facility and performs functions in proximity to hazardous materials which are to be transported.
- Inspects or tests packages.

5.10 continued

(e) Cyclic training is defined as within three years for DOT & within two years for IATA.

Copies of training records are required for as long as a person is employed and 90 days thereafter. The records should include, as a minimum, the following:

- Trainee's name and signature
- Training dates
- Training material or source reference
- Trainer's information

6.0 INTERFACES

[1] EN-LI-100, "Process Applicability Determination"

[2] EN-RW-104, "Scaling Factors"

[3] EN-QV-104, "Entergy Quality Assurance Program Manual Control"

7.0 RECORDS

[1] Documentation of pertinent data required to classify waste and verify solidification will be maintained on each batch of processed waste as required by approved procedures.

[2] Documentation will also be maintained to ensure that containers, shipping casks, and methods of packaging wastes meet applicable Federal regulations and disposal site criteria. The records of reviews performed and documents associated with these reviews will be maintained as QA records.

8.0 OBLIGATION AND REGULATORY COMMITMENT CROSS-REFERENCES

Document	Document Section	NMM Procedure Section	Site Applicability
ANO ODCM	L3.2.1.B	5.8 [3]	ANO
ANO1 Technical Specifications	5.6.3	5.8 [1]	ANO
ANO2 Technical Specifications	6.9.3	5.8 [1]	ANO
RBS Technical Requirements	5.5.14	*	RBS
RBS Technical Requirements	5.5.14.1	5.8 [3] 5.8 [4] (b)	RBS
RBS Technical Requirements	5.5.14.2	5.8 [4] (b)	RBS
RBS Technical Requirements	5.8.2	5.8 [4] (b)	RBS
WF3 Technical Specifications	1.22	*	WF3
WF3 Technical Specifications	6.9.18	5.8 [1]	WF3
WF3 Technical Specifications	6.13.2.b	5.8 [4] (c)	WF3
JAF ODCM	6.2.1	5.8 [1]	JAF
JAF Technical Specifications	5.6.3	5.8 [1], 5.8 [4]	JAF
JAF FSAR	Chapters 7 and 11	5.8 [4]	JAF
11759 – NRC IN 79-19	All	*	WF3
GGNS UFSAR, Chapter 16B.1 / TRM	7.6.3.8 paragraph 1	1.0	GGNS
GGNS ODCM	5.6.3.c	5.8 [1]	GGNS
GGNS FSAR	11.4.5.S2	5.9 [2](a)	GGNS
GGNS FSAR	11.4.2.3AS7	5.9 [2](a)	GGNS
IPN-99-079	All	*	IPEC
Appendix B Technical Specifications	Section 4.5, RECS ODCM Part 1	*	IPEC
PLP Technical Specifications	5.5.15	5.8 [4]	PLP
PLP ODCM	Appendix A – IV. A	5.8 [1]	PLP
NRC Letter 1.98.091	All	*	VY
NRC Letter 1.88.078	All	*	VY
VY TRM	6.12	5.8 (3)	VY
QAPM	Section A.1.c	*	All

* Covered by directive as a whole or by various paragraphs of the directive.

9.0 ATTACHMENTS

None