

BYR 2017-014

ENCLOSURE 1

YANKEE NUCLEAR POWER STATION
INDEPENDENT SPENT FUEL STORAGE INSTALLATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY – DECEMBER 2016

**YANKEE NUCLEAR POWER STATION
INDEPENDENT SPENT FUEL STORAGE INSTALLATION**

License Nos. DPR-3 and SFGL-13

**ANNUAL RADIOACTIVE EFFLUENT
RELEASE REPORT**

January - December 2016



March 2017

Prepared by:

Radiation Safety & Control Services

**91 Portsmouth Avenue
Stratham, NH 03885-2468**

EXECUTIVE SUMMARY

Tables 1 and 2 summarize the quantity of radioactive gaseous and liquid effluents, respectively, for each quarter of 2016. There were no gaseous or liquid releases in 2016. Table 3 summarizes waste shipped off-site for disposal for each half year of 2016. There was waste shipped for disposal in 2016.

Appendices A and B indicate the status of reportable items per the requirements of the Off-site Dose Calculation Manual (ODCM). There were no reportable items in 2016. Appendix C presents any changes in the ODCM. The ODCM was not revised in 2016.

Table 1

**YNPS ISFSI
Effluent and Waste Disposal Annual Report
2016 Gaseous Effluents-Summation of All Releases**

Nuclides Released	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Error
A. Fission and Activation Gases						
Total Release	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Average release rate	µCi/s	N/A*	N/A*	N/A*	N/A*	
Percent of regulatory limit	%	N/A*	N/A*	N/A*	N/A*	
B. Iodines						
Total Iodines released	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Average release rate	µCi/s	N/A*	N/A*	N/A*	N/A*	
Percent of regulatory limit	%	N/A*	N/A*	N/A*	N/A*	
C. Particulates						
Particulates Released	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Average release rate	µCi/s	N/A*	N/A*	N/A*	N/A*	
Percent of regulatory limit	%	N/A*	N/A*	N/A*	N/A*	
Gross alpha radioactivity	Ci	N/A*	N/A*	N/A*	N/A*	
D. Tritium						
Total release	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Average release rate	µCi/s	N/A*	N/A*	N/A*	N/A*	
Percent of regulatory limit	%	N/A*	N/A*	N/A*	N/A*	

N/A*= Not Applicable

There are no gaseous effluents associated with the Yankee Nuclear Power Station Independent Spent Fuel Storage Installation (ISFSI)

Table 1A

**YNPS ISFSI
Effluent and Waste Disposal Annual Report
2016 Gaseous Effluents - Ground Level Releases - Batch Mode**

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
1. Fission Gases						
Krypton-85	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-85m	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-87	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-88	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-133	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-135	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-135m	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-138	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Unidentified	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Total for period	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
2. Iodines						
Iodine-131	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iodine-133	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iodine-135	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Total for period	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
3. Particulates						
Strontium-89	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Strontium-90	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-134	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-137	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cobalt-60	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Barium-Lanthanum-140	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Others-						
Plutonium-238	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Curium-243,244	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Uranium-234	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Uranium-238	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Thorium-232	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Radium-226	Ci	N/A*	N/A*	N/A*	N/A*	N/A*

N/A*= Not Applicable

There are no gaseous effluents associated with the Yankee Nuclear Power Station Independent Spent Fuel Storage Installation (ISFSI)

Table 1B

YNPS ISFSI
Effluent and Waste Disposal Annual Report
2016 Gaseous Effluents - Ground Level Releases - Continuous Mode

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
1. Fission Gases						
Krypton-85	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-85m	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-87	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-88	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-133	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-135	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-135m	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-138	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Unidentified	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Total for period	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
2. Iodines						
Iodine-131	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iodine-133	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iodine-135	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Total for period	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
3. Particulates						
Strontium-89	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Strontium-90	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-134	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-137	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cobalt-60	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Barium-Lanthanum-140	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Others-						
Plutonium-238	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Curium-243,244	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Uranium-234	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Uranium-238	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Thorium-232	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Radium-226	Ci	N/A*	N/A*	N/A*	N/A*	N/A*

N/A*= Not Applicable

There are no gaseous effluents associated with the Yankee Nuclear Power Station Independent Spent Fuel Storage Installation (ISFSI)

Table 1C

YNPS ISFSI
Effluent and Waste Disposal Annual Report
2016 Gaseous Effluents - Elevated Releases – Batch Mode

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
1. Fission Gases						
Krypton-85	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-85m	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-87	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-88	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-133	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-135	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-135m	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-138	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Unidentified	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Total for period	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
2. Iodines						
Iodine-131	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iodine-133	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iodine-135	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Total for period	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
3. Particulates						
Strontium-89	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Strontium-90	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-134	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-137	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cobalt-60	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Barium-Lanthanum-140	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Others-						
Plutonium-238	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Curium-243,244	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Uranium-234	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Uranium-238	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Thorium-232	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Radium-226	Ci	N/A*	N/A*	N/A*	N/A*	N/A*

N/A*= Not Applicable

There are no gaseous effluents associated with the Yankee Nuclear Power Station Independent Spent Fuel Storage Installation (ISFSI)

Table 1D

YNPS ISFSI
Effluent and Waste Disposal Annual Report
2016 Gaseous Effluents - Elevated Releases – Continuous Mode

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
1. Fission Gases						
Krypton-85	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-85m	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-87	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Krypton-88	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-133	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-135	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-135m	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Xenon-138	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Unidentified	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Total for period	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
2. Iodines						
Iodine-131	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iodine-133	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iodine-135	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Total for period	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
3. Particulates						
Strontium-89	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Strontium-90	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-134	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-137	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cobalt-60	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Barium-Lanthanum-140	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Others-						
Plutonium-238	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Curium-243,244	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Uranium-234	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Uranium-238	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Thorium-232	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Radium-226	Ci	N/A*	N/A*	N/A*	N/A*	N/A*

N/A*= Not Applicable

There are no gaseous effluents associated with the Yankee Nuclear Power Station Independent Spent Fuel Storage Installation (ISFSI)

Table 2

YNPS ISFSI
Effluent and Waste Disposal Annual Report
2016 Liquid Effluents - Summation of All Releases

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Error
A. Fission and Activation Products						
Total Release (not including tritium, gases, alpha)	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Average diluted concentration during period	µCi/ml	N/A*	N/A*	N/A*	N/A*	
Percent of applicable limit	%	N/A*	N/A*	N/A*	N/A*	
B. Tritium						
Total Release	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Average diluted concentration during period	µCi/ml	N/A*	N/A*	N/A*	N/A*	
Percent of applicable limit	%	N/A*	N/A*	N/A*	N/A*	
C. Dissolved and Entrained Gases						
Total Release	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Average diluted concentration during period	µCi/ml	N/A*	N/A*	N/A*	N/A*	
Percent of applicable limit	%	N/A*	N/A*	N/A*	N/A*	
D. Gross Alpha Radioactivity						
Total release	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Average diluted concentration during period	µCi/ml	N/A*	N/A*	N/A*	N/A*	
E. Volume of Waste Released (prior to dilution)	Liters	N/A*	N/A*	N/A*	N/A*	
F. Volume of Dilution Water Used During Period	Liters	N/A*	N/A*	N/A*	N/A*	

N/A*= Not Applicable

There are no liquid effluents associated with the Yankee Nuclear Power Station Independent Spent Fuel Storage Installation (ISFSI)

Table 2A

YNPS ISFSI
Effluent and Waste Disposal Annual Report
2016 Liquid Effluents – Batch Mode

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Totals
Strontium-89	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Strontium-90	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-134	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-137	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iodine-131	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cobalt-58	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cobalt-60	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iron-59	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Zinc-65	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Manganese-54	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Chromium-51	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Zirconium-Niobium-95	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Molybdenum-99	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Technetium-99m	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Barium-Lathanium-140	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cerium-141	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Others- Iron-55	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Antimony-125	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Unidentified	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Total for period (above)	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Dissolved and Entrained Gasses	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Tritium	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Gross Alpha	Ci	N/A*	N/A*	N/A*	N/A*	N/A*

N/A*= Not Applicable

There are no liquid effluents associated with the Yankee Nuclear Power Station Independent Spent Fuel Storage Installation (ISFSI)

Table 2B

YNPS ISFSI
Effluent and Waste Disposal Annual Report
2016 Liquid Effluents – Continuous Mode

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Totals
Strontium-89	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Strontium-90	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-134	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cesium-137	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iodine-131	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cobalt-58	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cobalt-60	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Iron-59	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Zinc-65	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Manganese-54	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Chromium-51	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Zirconium-Niobium-95	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Molybdenum-99	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Technetium-99m	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Barium-Lanthanum-140	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Cerium-141	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Others- Iron-55	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Antimony-125	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Unidentified	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Total for period (above)	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Dissolved and Entrained Gasses	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Tritium	Ci	N/A*	N/A*	N/A*	N/A*	N/A*
Gross Alpha	Ci	N/A*	N/A*	N/A*	N/A*	N/A*

N/A*= Not Applicable

There are no liquid effluents associated with the Yankee Nuclear Power Station Independent Spent Fuel Storage Installation (ISFSI)

Table 3

YNPS ISFSI
Effluent and Waste Disposal Annual Report
First Half 2016 Low Level Waste Shipments

Resins, Filters and Evaporator Bottoms		Volume		Curies Shipped
Waste Class	Solidifying Agent	ft ³	m ³	Curies
A		0	0	0
B		0	0	0
C		0	0	0
All		0	0	0
Major radionuclides for above data:				
Dry Active Waste		Volume		Curies Shipped
Waste Class	Solidifying Agent	ft ³	m ³	Curies
A		0	0	0
B		0	0	0
C		0	0	0
All		0	0	0
Major radionuclides for above data:				
Irradiated Components		Volume		Curies Shipped
Waste Class	Solidifying Agent	ft ³	m ³	Curies
A		0	0	0
B		0	0	0
C		0	0	0
All		0	0	0
Major radionuclides for above data:				
Other Waste		Volume		Curies Shipped
Waste Class	Solidifying Agent	ft ³	m ³	Curies
A		0	0	0
B		0	0	0
C		0	0	0
All		0	0	0
Major radionuclides for above data:				

Table 3A

YNPS ISFSI
Effluent and Waste Disposal Annual Report
Second Half 2016 Low Level Waste Shipments

Resins, Filters and Evaporator Bottoms		Volume		Curies Shipped
Waste Class	Solidifying Agent	ft ³	m ³	Curies
A		0	0	0
B		0	0	0
C		0	0	0
All		0	0	0
Major radionuclides for above data:				
Dry Active Waste		Volume		Curies Shipped
Waste Class	Solidifying Agent	ft ³	m ³	Curies
A		0	0	0
B		0	0	0
C		0	0	0
All		0	0	0
Major radionuclides for above data:				
Irradiated Components		Volume		Curies Shipped
Waste Class	Solidifying Agent	ft ³	m ³	Curies
A		0	0	0
B		0	0	0
C		0	0	0
All		0	0	0
Major radionuclides for above data:				
Other Waste		Volume		Curies Shipped
Waste Class	Solidifying Agent	ft ³	m ³	Curies
A	None	0.29	0.008	1.54E-5
B		0	0	0
C		0	0	0
All		0	0	0
Major radionuclides for above data: Cl-36, Cs-137				

Appendix A

Radiation Dose Assessment

There were no gaseous or liquid effluent releases in 2016. Therefore, an assessment of radiation doses to the most likely exposed member(s) of the public to show compliance with 40CFR190 or 10CFR72.104 from effluents was not required.

Appendix B
Unplanned Releases

There were no unplanned releases of radioactive materials in effluents in 2016.

Appendix C

Off-site Dose Calculation Manual Changes

There were no changes to the Off-site Dose Calculation Manual in 2016.