

February 21, 2013  
13-021

ATTN: Document Control Desk  
Director, Office of Nuclear Material Safety & Safeguards  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Reference: License No. SNM-42, Docket 70-27

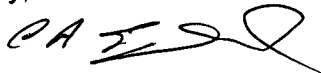
Subject: Semi-Annual Effluent Monitoring Report

Dear Sir or Madam:

The Semi-Annual Effluent Report for Babcock & Wilcox Nuclear Operations Group, Inc. (B&W NOG), Lynchburg facility, covering the second semi-annual effluent monitoring period for 2012 is enclosed. This report is being submitted in accordance with the requirements of 10 CFR 70.59.

If you have any questions regarding this report, please contact me at 434.522.6405.

Sincerely,



Charles A. England  
Manager, Licensing & Safety Analysis  
Babcock & Wilcox Nuclear Operations Group, Inc. - Lynchburg

Enclosure

cc: NRC, Region II  
NRC, Resident Inspector  
NRC, M. Baker  
B&W NOG, K. Conway  
B&W NOG, T. Smith  
B&W NOG, G. Pritchett

# **ENCLOSURE**

**7 pages**

I. GASEOUS EFFLUENTS (Continuously Sampled Stacks)

Reporting Period: 07/02/12 to 12/30/12 (Weeks Ending 07/08/12 to 12/30/12)

Stack: WASTE MGMT CENTER (# 39)

Average Flow Rate: 1.10 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	<1.00E-14	<1.00E-14	1.00E-02	5.4E-06

Stack: MFP LOAD (# 19)

Average Flow Rate: 1.43 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	<1.00E-14	<1.00E-14	4.00E-02	2.2E-05

Stack: 2A STACK (# 23)

Average Flow Rate: 1.11 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	1.00E-14	2.00E-14	3.00E-14	2.50E-01	1.3E-04

Stack: 2A PRODUCTION SUPPORT (# 44)

Average Flow Rate: 2.48 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	<1.00E-14	<1.00E-14	2.00E-02	1.1E-05

Stack: 1A MAINTENANCE (# 43)

Average Flow Rate: 5.32 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	<1.00E-14	<1.00E-14	1.00E-01	5.4E-05

I. GASEOUS EFFLUENTS (Continuously Sampled Stacks)

Reporting Period: 07/02/12 to 12/30/12 (Weeks Ending 07/08/12 to 12/30/12)

Stack: RECLAMATION (# 20)

Average Flow Rate: 0.29 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	<1.00E-14	<1.00E-14	1.00E-02	5.6E-06

Stack: PHARMACY (# 24)

Average Flow Rate: 1.69 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	<1.00E-14	<1.00E-14	5.00E-02	2.7E-05

Stack: NMC STORAGE (# 42)

Average Flow Rate: 0.76 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	(x E-12) $\mu\text{Ci/ml}$ ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	<1.00E-14	<1.00E-14	3.00E-02	1.4E-05

Stack: MET LAB (# 26)

Average Flow Rate: 4.86 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	2.00E-14	<1.00E-14	<1.00E-14	1.16E+00	6.2E-04

Stack: RTRT (# 16)

Average Flow Rate: 6.25 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	<1.00E-14	<1.00E-14	3.20E-01	1.6E-04

I. GASEOUS EFFLUENTS (Continuously Sampled Stacks)

Reporting Period: 07/02/12 to 12/30/12 (Weeks Ending 07/08/12 to 12/30/12)

Stack: SFF (# 11)

Average Flow Rate: 9.66 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	1.00E-14	1.00E-14	4.50E-01	2.7E-04

Stack: 13A/14A/15A DRY (# 38)

Average Flow Rate: 13.78 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	1.00E-14	2.00E-14	3.00E-14	1.57E+00	9.3E-04

Stack: CHEM LAB SCRUBBER (# 37)

Average Flow Rate: 11.66 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	1.00E-14	<1.00E-14	<1.00E-14	2.36E+00	1.4E-03

Stack: 14A MAINTENANCE (# 35)

Average Flow Rate: 3.06 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	2.00E-14	3.00E-14	1.60E-01	9.5E-05

Stack: RECOVERY (# 15)

Average Flow Rate: 12.57 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (F)	2.94E-12	7.00E-14	3.00E-14	5.73E+02	3.1E-03

I. GASEOUS EFFLUENTS (Continuously Sampled Stacks)

Reporting Period: 07/02/12 to 12/30/12 (Weeks Ending 07/08/12 to 12/30/12)

Stack: LAUNDRY STACK (# 30)

Average Flow Rate: 2.80 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	4.00E-14	2.00E-14	3.00E-14	1.98E+00	1.3E-03

Stack: COMPACTOR (# 32)

Average Flow Rate: 1.37 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	<1.00E-14	<1.00E-14	5.00E-02	3.2E-05

Stack: RETENTION TANKS (# 36)

Average Flow Rate: 0.54 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	<1.00E-14	<1.00E-14	3.00E-02	1.9E-05

Stack: WT SCRUBBER (# 31)

Average Flow Rate: 2.13 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	1.70E-13	1.00E-14	1.00E-14	5.71E+00	3.5E-03

Stack: DECON (# 33)

Average Flow Rate: 1.80 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	3.00E-14	2.00E-14	3.00E-14	8.70E-01	5.5E-04

I. GASEOUS EFFLUENTS (Continuously Sampled Stacks)

Reporting Period: 07/02/12 to 12/30/12 (Weeks Ending 07/08/12 to 12/30/12)

Stack: LTC 50 METER STACK

Average Flow Rate: 15.52 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	<1.00E-14	<1.00E-14	<1.00E-14	6.52E-01	6.7E-05
Sr-90 (S)	2.18E-14	1.00E-14	<1.00E-14	5.18E+00	
H-3 (F)	1.49E-09	1.10E-14	4.23E-13	3.44E+05	

Stack: LTC AC STACK

Average Flow Rate: 1.44 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	1.00E-14	1.00E-14	<1.00E-14	1.46E-01	1.2E-04
Sr-90 (S)	2.42E-14	1.25E-14	<1.00E-14	5.29E-01	

Stack: LTC RCL STACK

Average Flow Rate: 1.64 cubic meters/second

Radionuclide	Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	MDC ( $\mu\text{Ci/ml}$ )	Quantity Released ( $\mu\text{Ci}$ )	Off-Site Dose (mrem)
U-234 (S)	1.00E-14	<1.00E-14	<1.00E-14	1.68E-01	2.1E-04
Pu-238 (M)	<1.00E-14	<1.00E-14	<1.00E-14	3.41E-02	
Sr-90 (S)	2.60E-14	1.22E-14	1.00E-14	6.43E-01	
H-3 (F)	2.77E-12	8.83E-13	1.35E-12	7.15E+01	

## I. GASEOUS EFFLUENTS (Continuously Sampled Stacks)

Reporting Period: 07/02/12 to 12/30/12 (Weeks Ending 07/08/12 to 12/30/12)

### NOTES:

- (1) The total exposure from all stacks is 0.0126 mrem. Doses were determined using the EPA COMPLY code. Actual stack and building heights were used. A distance from source to receptor of 540 meters was used, with wind blowing towards the receptor at a speed of 2 meters/sec, 25% of the time. Other default parameters such as temperature were used if prompted. Comply itself is conservative.
- (2) All alpha activity is conservatively reported as U-234 for the NOG-L Stacks as this is the predominant uranium nuclide and has the most conservative dose conversion factor of the various uranium isotopes. No nuclides other than Uranium were found in the NOG-L Stack Semi-Annual Composite Samples. For the LTC Stacks each alpha emitting nuclide above MDC is reported. If there are no alpha emitting nuclides above MDC in the Semi-Annual Composite Samples, the Gross Alpha result is reported as U-234.
- (3) Beta/Gamma nuclides are not reported unless they exceed the respective MDC based on isotopic analysis. All beta activity for the LTC stacks is conservatively reported as Sr-90 (except for H-3 from the 50 Meter Stack and RCL Stack) as this has the most conservative dose conversion factor. A H-3 monitoring program was continued for the 50 Meter Stack during the 2nd Half of 2012 due to special work being performed. H-3 was also identified in the Semi-Annual impinger composite from the RCL Stack. This release is also being reported for the 2nd half of 2012.
- (4) Average concentrations, errors and MDCs are quoted as 1E-14 uCi/ml for stacks when these values are between 5E-15 uCi/ml and 1E-14 uCi/ml, and they are quoted as <1E-14 uCi/ml when the values are less than 5E-15 uCi/ml.
- (5) Activities are quoted as 1E-02 uCi when these values are between 5E-03 uCi and 1E-02 uCi, and they are quoted as <1E-02 uCi when the values are less than 5E-03 uCi. 5E-03 uCi is conservatively used to calculate the offsite dose when the activity is <1E-02 uCi.
- (6) The error estimate is the daily error at the 95% confidence interval propagated over the six month period. However, the Pu-238 and H-3 error estimate for the RCL Stack is the Semi-Annual Composite error at the 95% confidence interval for the six month composite.
- (7) Quantity released (uCi) is the sum of the activities calculated daily based on the calculated daily concentration for all concentrations > 0.
- (8) Twenty three (23) stacks were monitored during this monitoring period.
- (9) Average concentrations, errors and MDCs are quoted to one significant digit except for the Recovery, Waste Treatment, and three LTC stacks.



## II. LIQUID EFFLUENT

A. Reporting Period: 07/01/12 to 12/31/12

B. Location of Sample: Collection Prior to Discharge into the James River.

C. Total Liquid Flow: 2.557E+08 liters

D. Sample Collection: Batch composite sampler.

Radionuclide	Concentration (pCi/l)	Error Estimate (±pCi/l)	MDC (pCi/l)	Quantity	
				Released (μCi)	Total Dose (mrem)
U-234	1.01E+01	2.49E+00	1.57E-01	2,577.87	3.27E-02
U-235	3.40E-01	3.80E-01	1.25E-01	86.94	1.04E-03
U-236	6.65E-02	2.01E-01	1.10E-01	16.99	2.04E-04
U-238	8.00E-02	2.22E-01	1.37E-01	20.45	2.33E-04

Total 3.42E-02

### NOTES:

- (1) The total dose calculated for liquid release uses a dilution factor of 18:1. Regulatory Guide 1.109 was used as guidance, with conservative assumptions to estimate the exposure.
- (2) The semi-annual concentration reported above is a volume-weighted average for the six months and may be less than the averaged MDC for the same period.
- (3) Isotopic analysis is performed on the monthly composite samples for the most commonly utilized beta/gamma nuclides such as Sr-90, Tc-99 and Cs-137. The analysis of these nuclides typically indicates results less than minimum detectable concentration (MDC). Only nuclides with concentration above the respective MDC are reported. No beta/gamma nuclides exceeded their MDC for the reporting period.