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United States Nuclear Regulatory Commission
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H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/RENEWED LICENSE NO. DPR-23

2015 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Ladies and Gentlemen:

Attached is the Annual Radioactive Effluent Release Report for H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2 for the period of January 1, 2015 through December 31, 2015. This report is submitted in accordance with 10 CFR 50.4, as required by 10 CFR 50.36a(a)(2) and HBRSEP, Unit No. 2, Technical Specifications (TS) Section 5.6.3.

This document contains no new Regulatory Commitments. If you have any questions regarding this submittal, please contact Mr. Scott Connelly, Manager (Acting) – Nuclear Regulatory Affairs, at (843) 857-1569.

Sincerely,

David S. Hoffman
Director – Nuclear Organization Effectiveness

DSH/am

Attachment

c: NRC Regional Administrator, NRC, Region II
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United States Nuclear Regulatory Commission
Attachment to Serial: RNP-RA/16-0029
50 Pages (including cover page)

DUKE ENERGY

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

RENEWED OPERATING LICENSE NO. DPR-23

DOCKET NO. 50-261

RADIOACTIVE EFFLUENT RELEASE REPORT

ANNUAL REPORT

JANUARY 1, 2015 – DECEMBER 31, 2015



H.B. Robinson Steam Electric Plant Unit 2

Annual Radioactive Effluent Release Report

January 1, 2015 through December 31, 2015

Docket 50-261



Introduction

The Annual Radioactive Effluent Release Report is pursuant to H.B. Robinson Steam Electric Plant Technical Specification 5.6.3 and ODCM 9.1. The below listed attachments to this report provide the required information. In addition, the ODCM is included pursuant to H.B. Robinson Steam Electric Plant Technical Specification 5.5.1.

- Attachment 1 Summary of Gaseous and Liquid Effluents
- Attachment 2 Supplemental Information
- Attachment 3 Solid Radioactive Waste Disposal
- Attachment 4 Meteorological Data
- Attachment 5 Unplanned Offsite Releases
- Attachment 6 Assessment of Radiation Dose from Radioactive Effluents to Members of the Public
- Attachment 7 Information to Support the NEI Ground Water Protection Initiative
- Attachment 8 Inoperable Equipment
- Attachment 9 Summary of Changes to the Offsite Dose Calculation Manual
- Attachment 10 Summary of Changes to the Process Control Program
- Attachment 11 Summary of Major Modifications to the Radioactive Waste Treatment Systems
- Attachment 12 Errata to a Previous Year's ARERR

Attachment 1
Summary of Gaseous and Liquid Effluents

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 1

Summary of Gaseous and Liquid Effluents

This attachment includes a summary of the quantities of radioactive liquid and gaseous effluents as outlined in Regulatory Guide 1.21, Appendix B.

Attachment 1
Summary of Gaseous and Liquid Effluents

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Gaseous Effluents - Summation of All Releases

	<u>Units</u>	<u>Qtr 1</u>	<u>Qtr 2</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Year</u>
A. Fission and Activation Gases						
1. Total Release	Ci	1.18E-01	3.05E+00	3.99E-01	2.69E+00	6.26E+00
2. Avg. Release Rate	μCi/sec	1.51E-02	3.88E-01	5.01E-02	3.38E-01	1.98E-01
B. Iodine-131						
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Avg. Release Rate	μCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C. Particulates Half-Life ≥ 8 days						
1. Total Release	Ci	0.00E+00	4.14E-06	2.66E-08	0.00E+00	4.17E-06
2. Avg. Release Rate	μCi/sec	0.00E+00	5.27E-07	3.35E-09	0.00E+00	1.32E-07
D. Tritium						
1. Total Release	Ci	3.14E+00	7.37E+00	6.25E+00	6.11E+00	2.29E+01
2. Avg. Release Rate	μCi/sec	4.04E-01	9.37E-01	7.87E-01	7.69E-01	7.25E-01
E. Carbon-14						
1. Total Release	Ci	1.90E+00	1.92E+00	1.94E+00	1.94E+00	7.70E+00
2. Avg. Release Rate	μCi/sec	2.44E-01	2.44E-01	2.44E-01	2.44E-01	2.44E-01
F. Gross Alpha						
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Avg. Release Rate	μCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**Attachment 1
Summary of Gaseous and Liquid Effluents**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Gaseous Effluents - Elevated Releases - Continuous Mode *

	<u>Units</u>	<u>Qtr 1</u>	<u>Qtr 2</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Year</u>
A. Fission and Activation Gases						
N/A	Ci	-	-	-	-	-
Total for Period	Ci	-	-	-	-	-
B. Iodines						
N/A	Ci	-	-	-	-	-
Total for Period	Ci	-	-	-	-	-
C. Particulates Half-Life ≥ 8 days						
N/A	Ci	-	-	-	-	-
Total for Period	Ci	-	-	-	-	-
D. Tritium						
N/A	Ci	-	-	-	-	-
E. Carbon-14						
N/A	Ci	-	-	-	-	-
F. Gross Alpha						
Total for Period	Ci	-	-	-	-	-

* H.B. Robinson Steam Electric Plant Unit 2 does not have elevated releases.

**Attachment 1
Summary of Gaseous and Liquid Effluents**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Gaseous Effluents - Elevated Releases - Batch Mode *

	<u>Units</u>	<u>Qtr 1</u>	<u>Qtr 2</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Year</u>
A. Fission and Activation Gases						
N/A	Ci	-	-	-	-	-
Total for Period	Ci	-	-	-	-	-
B. Iodines						
N/A	Ci	-	-	-	-	-
Total for Period	Ci	-	-	-	-	-
C. Particulates Half-Life ≥ 8 days						
N/A	Ci	-	-	-	-	-
Total for Period	Ci	-	-	-	-	-
D. Tritium						
N/A	Ci	-	-	-	-	-
E. Carbon-14						
N/A	Ci	-	-	-	-	-
F. Gross Alpha						
Total for Period	Ci	-	-	-	-	-

* H.B. Robinson Steam Electric Plant Unit 2 does not have elevated releases.

Attachment 1
Summary of Gaseous and Liquid Effluents

H.B. Robinson Steam Electric Plant Unit 2
 Period 1/1/2015 - 12/31/2015

Gaseous Effluents - Ground & Mixed-Mode Releases - Continuous Mode

	<u>Units</u>	<u>Qtr 1</u>	<u>Qtr 2</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Year</u>
A. Fission and Activation Gases						
Ar-41	Ci	0.00E+00	2.55E+00	0.00E+00	0.00E+00	2.55E+00
Xe-133	Ci	8.94E-03	2.53E-03	3.43E-01	2.63E+00	2.98E+00
Total for Period	Ci	8.94E-03	2.56E+00	3.43E-01	2.63E+00	5.54E+00
B. Iodines						
None	Ci	-	-	-	-	-
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C. Particulates Half-Life ≥ 8 days						
Co-58	Ci	0.00E+00	1.95E-06	0.00E+00	0.00E+00	1.95E-06
Total for Period	Ci	0.00E+00	1.95E-06	0.00E+00	0.00E+00	1.95E-06
D. Tritium						
H-3	Ci	3.09E+00	7.22E+00	6.16E+00	6.03E+00	2.25E+01
E. Carbon-14						
C-14	Ci	1.39E+00	7.06E-01	1.42E+00	1.23E+00	4.74E+00
F. Gross Alpha						
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Attachment 1
Summary of Gaseous and Liquid Effluents

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Gaseous Effluents - Ground & Mixed Mode Releases - Batch Mode

	<u>Units</u>	<u>Qtr 1</u>	<u>Qtr 2</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Year</u>
A. Fission and Activation Gases						
Ar-41	Ci	3.13E-02	4.91E-01	5.52E-02	5.89E-02	6.36E-01
Kr-85m	Ci	2.56E-05	0.00E+00	0.00E+00	3.77E-06	2.94E-05
Xe-131m	Ci	3.54E-04	0.00E+00	0.00E+00	0.00E+00	3.54E-04
Xe-133m	Ci	1.52E-03	0.00E+00	0.00E+00	0.00E+00	1.52E-03
Xe-133	Ci	6.62E-02	2.37E-03	0.00E+00	2.30E-03	7.09E-02
Xe-135	Ci	9.33E-03	0.00E+00	0.00E+00	5.92E-05	9.39E-03
Total for Period	Ci	1.09E-01	4.93E-01	5.52E-02	6.13E-02	7.19E-01
B. Iodines						
None	Ci	-	-	-	-	-
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C. Particulates Half-Life ≥ 8 days						
Co-58	Ci	0.00E+00	2.18E-06	0.00E+00	0.00E+00	2.18E-06
Co-60	Ci	0.00E+00	6.92E-09	2.66E-08	0.00E+00	3.35E-08
Cs-137	Ci	0.00E+00	4.25E-09	0.00E+00	0.00E+00	4.25E-09
Total for Period	Ci	0.00E+00	2.19E-06	2.66E-08	0.00E+00	2.22E-06
D. Tritium						
H-3	Ci	4.41E-02	1.48E-01	9.41E-02	7.67E-02	3.63E-01
E. Carbon-14						
C-14	Ci	8.62E-01	4.39E-01	8.81E-01	7.68E-01	2.95E+00
F. Gross Alpha						
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**Attachment 1
Summary of Gaseous and Liquid Effluents**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Liquid Effluents - Summation of All Releases

	<u>Units</u>	<u>Qtr 1</u>	<u>Qtr 2</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Year</u>
A. Fission and Activation Products *						
1. Total Release	Ci	2.93E-03	1.98E-02	1.41E-02	8.27E-04	3.77E-02
2. Avg. Diluted Conc.	µCi/ml	1.23E-11	1.22E-10	5.71E-11	3.39E-12	4.23E-11
B. Tritium						
1. Total Release	Ci	2.25E+02	1.73E+02	1.43E+01	9.82E+01	5.11E+02
2. Avg. Diluted Conc.	µCi/ml	9.46E-07	1.07E-06	5.77E-08	4.02E-07	5.73E-07
C. Dissolved & Entrained Gases						
1. Total Release	Ci	1.15E-03	1.90E-02	0.00E+00	1.15E-04	2.03E-02
2. Avg. Diluted Conc.	µCi/ml	4.83E-12	1.17E-10	0.00E+00	4.72E-13	2.27E-11
D. Gross Alpha						
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Avg. Diluted Conc.	µCi/ml	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E. Volume of Liquid Waste						
1. Continuous Releases	liters	3.74E+06	0.00E+00	0.00E+00	1.44E+06	5.18E+06
2. Batch Releases	liters	4.39E+05	1.09E+06	3.66E+05	2.34E+05	2.13E+06
F. Volume of Dilution Water						
1. Continuous Releases	liters	2.28E+11	1.62E+11	2.47E+11	2.44E+11	8.91E+11
2. Batch Releases	liters	2.28E+11	1.62E+11	2.47E+11	2.44E+11	8.91E+11

* Excludes tritium, dissolved and entrained noble gases, and gross alpha.

**Attachment 1
Summary of Gaseous and Liquid Effluents**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Liquid Effluents - Continuous Mode

	<u>Units</u>	<u>Qtr 1</u>	<u>Qtr 2</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Year</u>
A. Fission and Activation Products						
F-18	Ci	0.00E+00	0.00E+00	0.00E+00	1.16E-06	1.16E-06
Co-58	Ci	1.42E-05	0.00E+00	0.00E+00	0.00E+00	1.42E-05
Co-60	Ci	1.05E-06	0.00E+00	0.00E+00	0.00E+00	1.05E-06
Total for Period	Ci	1.52E-05	0.00E+00	0.00E+00	1.16E-06	1.64E-05
B. Tritium						
H-3	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C. Dissolved & Entrained Gases						
None	Ci	-	-	-	-	-
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D. Gross Alpha						
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**Attachment 1
Summary of Gaseous and Liquid Effluents**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Liquid Effluents - Batch Mode

	<u>Units</u>	<u>Qtr 1</u>	<u>Qtr 2</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Year</u>
A. Fission and Activation Products						
Mn-54	Ci	1.23E-05	0.00E+00	0.00E+00	0.00E+00	1.23E-05
Fe-55	Ci	7.86E-05	9.28E-04	1.33E-04	7.50E-05	1.21E-03
Co-57	Ci	4.68E-06	1.33E-05	3.45E-06	0.00E+00	2.14E-05
Co-58	Ci	6.47E-05	3.12E-03	3.28E-03	1.73E-04	6.64E-03
Co-60	Ci	2.37E-03	3.40E-03	3.42E-04	2.04E-05	6.13E-03
Ni-63	Ci	1.28E-04	2.30E-03	2.01E-03	3.16E-04	4.75E-03
Sr-89	Ci	0.00E+00	0.00E+00	0.00E+00	7.47E-06	7.47E-06
Sr-90	Ci	0.00E+00	0.00E+00	0.00E+00	9.74E-07	9.74E-07
Nb-95	Ci	0.00E+00	2.07E-06	1.21E-06	0.00E+00	3.28E-06
Ag-110m	Ci	1.47E-06	3.10E-06	8.72E-06	0.00E+00	1.33E-05
Sn-117m	Ci	1.97E-06	4.97E-04	4.88E-05	0.00E+00	5.48E-04
Sb-122	Ci	0.00E+00	1.40E-05	0.00E+00	0.00E+00	1.40E-05
Sb-124	Ci	0.00E+00	3.46E-04	1.02E-04	0.00E+00	4.48E-04
Sb-125	Ci	1.70E-04	8.54E-03	8.07E-03	2.32E-04	1.70E-02
Te-123m	Ci	2.02E-06	5.10E-04	5.01E-05	0.00E+00	5.62E-04
Te-131m	Ci	2.48E-05	3.94E-06	0.00E+00	0.00E+00	2.87E-05
Te-132	Ci	0.00E+00	4.29E-06	4.75E-06	0.00E+00	9.04E-06
I-134	Ci	0.00E+00	0.00E+00	4.03E-06	0.00E+00	4.03E-06
I-135	Ci	0.00E+00	0.00E+00	1.48E-06	0.00E+00	1.48E-06
Cs-137	Ci	3.95E-05	4.04E-05	5.21E-05	0.00E+00	1.32E-04
Ba-133	Ci	0.00E+00	7.46E-07	0.00E+00	0.00E+00	7.46E-07
Ce-141	Ci	3.09E-07	0.00E+00	0.00E+00	0.00E+00	3.09E-07
Eu-152	Ci	1.41E-05	4.01E-05	1.04E-05	0.00E+00	6.46E-05
Total for Period	Ci	2.91E-03	1.98E-02	1.41E-02	8.26E-04	3.76E-02
B. Tritium						
H-3	Ci	2.25E+02	1.73E+02	1.43E+01	9.82E+01	5.11E+02
C. Dissolved & Entrained Gases						
Kr-89	Ci	0.00E+00	1.04E-02	0.00E+00	0.00E+00	1.04E-02
Xe-131m	Ci	0.00E+00	1.63E-05	0.00E+00	0.00E+00	1.63E-05
Xe-133m	Ci	0.00E+00	5.08E-05	0.00E+00	0.00E+00	5.08E-05
Xe-133	Ci	1.15E-03	8.51E-03	0.00E+00	1.15E-04	9.78E-03
Xe-135	Ci	0.00E+00	3.04E-06	0.00E+00	0.00E+00	3.04E-06
Total for Period	Ci	1.15E-03	1.90E-02	0.00E+00	1.15E-04	2.03E-02
D. Gross Alpha						
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**Attachment 2
Supplemental Information**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 2

Supplemental Information

This attachment includes supplemental information to the gaseous and liquid effluents report.

**Attachment 2
Supplemental Information**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

I. Regulatory Limits - Per Unit

A. Noble Gases - Air Dose

1. Calendar Quarter Gamma Dose	= 5	mRAD
2. Calendar Quarter Beta Dose	= 10	mRAD
3. Calendar Year Gamma Dose	= 10	mRAD
4. Calendar Year Beta Dose	= 20	mRAD

B. Liquid Effluents - Dose

1. Calendar Quarter Total Body Dose	= 1.5	mREM
2. Calendar Quarter Organ Dose	= 5	mREM
3. Calendar Year Total Body Dose	= 3	mREM
4. Calendar Year Organ Dose	= 10	mREM

C. Gaseous Effluents - Iodine-131 & 133, Tritium, and Particulates with Half-lives > 8 days

1. Calendar Quarter Organ Dose	= 7.5	mREM
2. Calendar Year Organ Dose	= 15	mREM

II. Maximum Permissible Effluent Concentrations

A. Gaseous Effluents

- Information found in Offsite Dose Calculation Manual

B. Liquid Effluents

- Information found in 10 CFR Part 20, Appendix B, Table 2, Column 2

**III. Average Energy
(not applicable)**

IV. Measurements and Approximations of Total Radioactivity

Analyses of specific radionuclides in selected or composited samples as described in the ODCM are used to determine the radionuclide composition of the effluent. A summary description of the method used for estimating overall errors associated with radioactivity measurements is provided as part of this attachment.

V. Batch Releases

A. Liquid Effluents

		Jan - Jun	Jul - Dec
1. Total Number of Batch Releases	=	6.00E+01	2.20E+01
2. Total Time (min) for Batch Releases	=	1.12E+04	4.24E+03
3. Maximum Time (min) for a Batch Release	=	3.24E+02	2.44E+02
4. Average Time (min) for Batch Releases	=	1.87E+02	1.93E+02
5. Minimum Time (min) for a Batch Release	=	1.10E+01	1.30E+02
6. Average Dilution Water Flow During Release (gpm)	=	3.25E+05	4.00E+05

B. Gaseous Effluents

		Jan - Jun	Jul - Dec
1. Total Number of Batch Releases	=	4.90E+01	4.00E+01
2. Total Time (min) for Batch Releases	=	4.55E+04	2.61E+04
3. Maximum Time (min) for a Batch Release	=	1.84E+04	9.78E+03
4. Average Time (min) for Batch Releases	=	9.28E+02	6.53E+02
5. Minimum Time (min) for a Batch Release	=	1.70E+01	3.80E+01

VI. Abnormal Releases

See Attachment 5, Unplanned Offsite Releases.

Attachment 2 Supplemental Information

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Carbon-14

Carbon-14 (C-14), with a half-life of 5730 years, is a naturally occurring isotope of carbon produced by cosmic ray interactions in the atmosphere. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. C-14 is also produced in commercial nuclear reactors, but the amounts produced are much less than those produced naturally or from weapons testing.

In Regulatory Guide 1.21, Revision 2, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste", the NRC recommends U.S. nuclear power plants evaluate whether C-14 is a "principal radionuclide", and if so, report the amount of C-14 released. Improvements over the years in effluent management practices and fuel performance have resulted in a decrease in gaseous radionuclide (non-C-14) concentrations, and a change in the distribution of gaseous radionuclides released to the environment. As a result, many sites show C-14 has become a "principal radionuclide" for the gaseous effluent pathway, as defined in Regulatory Guide 1.21, Rev. 2. H.B. Robinson Steam Electric Plant 2015 ARERR contains estimates of C-14 radioactivity released in 2015, and estimates of public dose resulting from the C-14 effluent.

Because the dose contribution of C-14 from liquid radioactive waste is much less than that contributed by gaseous radioactive waste, evaluation of C-14 in liquid radioactive waste is not required (Ref. Reg. Guide 1.21, Rev. 2). The quantity of gaseous C-14 released to the environment can be estimated by use of a C-14 source term scaling factor based on power generation (Ref. Reg. Guide 1.21, Rev. 2). Many documents provide information related to the magnitude of C-14 in typical effluents from commercial nuclear power plants. Those documents suggest that nominal annual releases of C-14 in gaseous effluents are approximately 5 to 7.3 curies from PWRs (Ref. Reg. Guide 1.21, Rev. 2). A more recent study recommends a higher C-14 gaseous source term scaling factor of approximately 9.0 to 9.8 Ci/GWe-yr for a PWR (Westinghouse) (Ref. EPRI 1021106). The H.B. Robinson Steam Electric Plant ODCM states the expected C-14 generation to be 7.3 Curies assuming 292 effective full power days (EFPD) in a calendar year. 2.8 of the 7.3 Curies are released in batch mode from the Containment building and Waste Gas Decay Tanks. The remaining 4.5 Curies are released in continuous mode from the Auxiliary and Fuel Handling buildings. The total C-14 activity released compares favorably with more recent studies. For the H.B. Robinson Steam Electric Plant 2015 ARERR, a source term scaling factor using actual EFPD of 307.59 days is assumed. Using the source term scaling factor from H.B. Robinson Steam Electric Plant in 2015 results in a site total C-14 gaseous release estimate to the environment of 7.86 Curies, 2.95 Curies in batch mode and 4.74 Curies in continuous mode.

C-14 releases in PWRs occur primarily as a mix of organic carbon and carbon dioxide released from the waste gas system. Since the PWR operates with a reducing chemistry, most, if not all, of the C-14 species initially produced are organic (e.g., methane). As a general rule, C-14 in the primary coolant is essentially all organic with a large fraction as a gaseous species. Any time the RCS liquid or gas is exposed to an oxidizing environment (e.g. during shutdown or refueling), a slow transformation from an organic to an inorganic chemical form can occur. Various studies documenting measured C-14 releases from PWRs suggest a range of 70% to 95% organic with an average of 80% organic with the remainder being CO₂ (Ref. EPRI TR-105715). For the H.B. Robinson Steam Electric Plant 2015 ARERR a value of 70% organic C-14 is assumed.

Public dose estimates from airborne C-14 are performed using dose models in and Regulatory Guide 1.109. The dose models and assumptions used are documented in the H.B. Robinson Steam Electric Plant ODCM. The estimated C-14 dose impact on the maximum organ dose from airborne effluents released from H.B. Robinson Steam Electric Plant in 2015 is well below the 10CFR50, Appendix I, ALARA design objective (i.e., 15 mrem/yr per unit).

Attachment 2 Supplemental Information

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Dose from Evaporation of Lake Robinson

Evaporation of water containing tritium in Lake Robinson creates an exposure pathway to a member of the public. Murray and Trettle, Inc. was contracted to perform an evaluation of the dose to a member of the public from evaporation of tritium in Lake Robinson. Results of the evaluation are contained in report "Impact of Tritium Release from Lake Robinson at the Robinson Nuclear Plant for 2015". Using the methodology described in ODCM 2.5.3, the following is a summary of tritium activity released through evaporation and resulting dose for 2015.

	<u>Units</u>	<u>Year</u>
1. H-3 Activity Released	Ci	4.83E+01
2. H-3 Dose	mREM	2.45E-01

Receptor Location 6.38 km N
Critical Age **CHILD**
Critical Organ **N/A ***

Tritium in Fish from Lake Robinson ^{NOTE}

Concentrations of radionuclides used in this specific fish consumption pathway are determined by averaging the monthly concentrations detected in environmental location (REMP) SW-40. In 2015, no plant related gamma emitting radionuclides were detected. Tritium was detected each month, as expected. Since tritium is consistently detected in Lake Robinson REMP samples, tritium concentration in the fish is assumed to be in equilibrium with Lake Robinson. Using the methodology and data described in NRC Regulatory Guide 1.109, Rev.1, October 1977, Equation A-1, Table E-5, and Table E-11, the following is a summary of average concentration consumed and resulting dose for 2015.

	<u>Units</u>	<u>Year</u>
1. Avg. H-3 Concentration	pCi/L	2.60E+03
2. H-3 Dose	mREM	5.73E-03

Critical Age **ADULT**
Critical Organ **N/A ***

* The dose factor for H-3 is the same for all organs and Total Body (with the exception of Bone, which is 0.00E+00).

NOTE: This information was previously included in the H.B. Robinson Steam Electric Plant AREOR. DRR 02012901 was written to include the fish dose calculation methodology in the next ODCM revision, and report in the ARERR.

**Attachment 2
Supplemental Information**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Overall Estimate of Error for Effluent Radioactivity Release Reported

The estimated percentage of overall error for both Liquid and Gaseous effluent release data at H.B. Robinson Steam Electric Plant has been determined to be $\pm 30.3\%$. This value was derived by taking the square root of the sum of the squares of the following discrete individual estimates of error:

1. Flow Rate Determining Devices = $\pm 20\%$
2. Counting Statistical Error = $\pm 20\%$
3. Calibration Error = $\pm 10\%$
4. Calibration Source Error = $\pm 2.5\%$
5. Sample Preparation Error = $\pm 3\%$

**Attachment 2
Supplemental Information**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Summary of Changes in Land Use Census Affecting Effluent Dose Calculations

The 2015 Land Use Census was performed July 30, 2015, and the results were certified and made available for use on February 29, 2016. The following are changes to residences, gardens, and milk animals from the previous year.

Residences

No changes to nearest residence in each sector.

Gardens

The garden in the WSW sector at 0.86 miles was removed and no other garden was identified within the 5 mile radius.

Meat Animals

No changes to nearest meat animal in each sector.

Milk Animals

No changes to nearest milk animal in each sector.

Environmental Monitoring Locations

No changes to environmental monitoring locations in each sector.

Attachment 3
Solid Radioactive Waste Disposal

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 3

Solid Radioactive Waste Disposal

This attachment includes a summary of the solid waste shipped off-site for burial and/or disposal, including:

- Container volume
- Total Curie content (specify whether determined by measurement or estimate)
- Principal Radionuclides
- Source/Type of waste
- Solidification agent or absorbent
- Type of shipping container
- Number of shipments
- Other relevant information as necessary

**Attachment 3
Solid Radioactive Waste Disposal**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Type of Waste Shipped	Number of Shipments	Number of Containers	Waste Class	Container Type	Solidification Agent	Burial Volume (m ³)	Total Activity (Curies) *
1. <u>Waste from Liquid Systems</u>							
a. Dewatered Secondary Resins	-	-	-	-	-	-	-
b. Dewatered Primary Resins	2	2	A-S	8-120 Poly HIC	N/A	6.814	8.95
c. Evaporator Concentrates	-	-	-	-	-	-	-
d. Dewatered Mechanical Filters	-	-	-	-	-	-	-
e. Dewatered Demineralizers	-	-	-	-	-	-	-
f. Solidified (cement) Acids, Oils, Sludge	-	-	-	-	-	-	-
2. <u>Dry Solid Waste</u>							
a. Dry Active Waste (compacted)	7	9	A-U	20' Sealand	N/A	283	0.491
b. Dry Active Waste (non-compacted)	1	1	A-U	14-195 Steel Liner	N/A	5.874	0.751
c. Dry Active Waste (brokered)	-	-	-	-	-	-	-
d. Irradiated Components	-	-	-	-	-	-	-
3. <u>Total Solid Waste</u>	10	12	-	-	-	295.688	10.192

* Measurement

**Attachment 3
Solid Radioactive Waste Disposal**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Type of Waste Shipped	Radionuclide	% Abundance
1. <u>Waste from Liquid Systems</u>		
a. Dewatered Secondary Resins	N/A	N/A
b. Dewatered Primary Resins	Ni-63	30.4
	Fe-55	24.8
	Co-60	20.8
	Co-58	9.08
	C-14	6.23
	Cs-137	2.84
	Mn-54	2.58
	Sb-125	1.02
	Cs-134	0.673
	Co-57	0.611
	Ag-110m	0.279
	H-3	0.265
	Ni-59	0.167
	Sr-90	0.067
	Nb-95	0.046
	Ce-144	0.035
	Sb-124	0.028
	Sn-113	0.023
	Tc-99	0.022
	I-129	0.002
c. Evaporator Concentrates	N/A	N/A
d. Dewatered Mechanical Filters	N/A	N/A
e. Dewatered Demineralizers	N/A	N/A
f. Solidified (cement) Acids, Oils, Sludge	N/A	N/A
2. <u>Dry Solid Waste</u>		
a. Dry Active Waste (compacted)	Ni-63	36.0
	Fe-55	32.7
	Co-60	25.2
	Co-58	2.58
	H-3	0.975
	Sb-125	0.568
	Nb-95	0.547
	C-14	0.415
	Zr-95	0.302
	Mn-54	0.263
	Ag-110m	0.105
	Ce-144	0.101
	Tc-99	0.052
	Cs-137	0.047
	Co-57	0.032
	Cr-51	0.027
	Sn-113	0.024
	Sr-90	0.010
	I-129	0.007
	Te-123m	0.005
	Fe-59	0.004

Attachment 3
Solid Radioactive Waste Disposal

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

b. Dry Active Waste (non-compacted)	Ni-63	49.2
	Co-60	23.7
	Fe-55	21.7
	Co-58	3.21
	Nb-95	0.857
	C-14	0.492
	Zr-95	0.365
	Mn-54	0.141
	Ce-144	0.121
	H-3	0.093
	Cs-137	0.045
	Sr-90	0.018
	Tc-99	0.017
	I-129	0.004
c. Dry Active Waste (brokered)	N/A	N/A
d. Irradiated Components	N/A	N/A

**Attachment 4
Meteorological Data**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 4

Meteorological Data

This attachment includes a summary of meteorological joint frequency distributions of wind speed, wind direction, and atmospheric stability (hours of occurrence).

Attachment 4 Meteorological Data

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Stability Class	Wind Speed (mph)	Hours of Occurrence															
		Sector															
		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
A	0.75-3.50	0	0	1	3	7	2	5	1	1	2	1	0	0	0	0	0
	3.51-7.50	3	12	16	23	10	33	39	27	18	34	30	36	18	12	5	1
	7.51-12.50	10	5	1	1	0	0	0	7	20	29	45	25	11	12	7	3
	12.51-18.50	1	0	0	0	0	0	0	0	1	4	6	0	0	0	2	3
	18.51-25.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	25+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	0.75-3.50	1	5	4	7	12	12	10	5	1	7	3	5	2	0	1	0
	3.51-7.50	29	42	46	18	15	20	22	17	15	20	36	26	12	7	12	11
	7.51-12.50	11	7	3	0	0	0	2	3	8	9	24	21	0	4	11	8
	12.51-18.50	0	0	0	0	0	0	0	0	0	2	5	2	0	1	0	0
	18.51-25.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	25+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	0.75-3.50	3	7	13	11	18	16	7	8	4	7	5	7	4	3	0	3
	3.51-7.50	54	64	37	20	10	22	14	22	10	18	35	19	13	15	18	11
	7.51-12.50	22	10	0	0	0	0	2	6	8	12	21	7	1	5	5	9
	12.51-18.50	4	0	0	0	0	0	0	0	0	0	4	2	0	1	1	1
	18.51-25.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	25+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	0.75-3.50	47	97	115	98	110	79	79	56	51	46	50	45	37	29	21	23
	3.51-7.50	268	434	189	125	69	31	53	174	183	186	126	57	34	36	48	113
	7.51-12.50	153	219	8	1	0	0	0	27	96	68	55	19	9	13	9	59
	12.51-18.50	10	22	0	0	0	0	0	0	1	6	3	1	1	2	3	18
	18.51-25.00	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	25+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Attachment 4 Meteorological Data

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

Stability Class	Wind Speed (mph)	Hours of Occurrence															
		Sector															
		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
E	0.75-3.50	64	48	26	23	19	19	30	117	130	126	104	70	50	27	62	52
	3.51-7.50	66	7	2	3	1	3	4	70	86	97	85	33	22	23	47	141
	7.51-12.50	3	0	0	0	0	0	0	1	12	13	8	3	2	3	4	15
	12.51-18.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	18.51-25.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	25+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	0.75-3.50	34	7	7	4	2	4	7	48	59	49	32	23	29	46	34	68
	3.51-7.50	9	0	0	0	0	0	0	5	13	8	7	7	3	7	19	65
	7.51-12.50	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
	12.51-18.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	18.51-25.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	25+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0.75-3.50	44	9	0	1	0	1	10	17	29	28	14	26	27	20	62	111
	3.51-7.50	1	0	0	0	0	0	0	0	2	1	0	1	0	0	6	10
	7.51-12.50	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	12.51-18.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	18.51-25.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	25+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**Attachment 5
Unplanned Offsite Releases**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 5

Unplanned Offsite Releases

This attachment includes a summary of the unplanned offsite releases of gaseous and liquid radioactive effluents.

Attachment 5
Unplanned Offsite Releases

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

H.B. Robinson Steam Electric Plant did not experience any unplanned offsite effluent releases in 2015.

Attachment 6
Assessment of Radiation Dose from Radioactive Effluents to Members of the Public

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 6

Assessment of Radiation Dose from Radioactive Effluents to Members of the Public
(includes fuel cycle dose calculation results)

This attachment includes an assessment of radiation doses to the maximum exposed member of the public due to radioactive liquid and gaseous effluents released from the site for each calendar quarter for the calendar year of the report as well as the total dose for the calendar year.

This attachment also includes an assessment of radiation doses to the maximum exposed member of the public from all uranium fuel cycle sources within 8 km of the site for the calendar year of this report to show conformance with 40 CFR Part 190.

Methods for calculating the dose contribution from liquid and gaseous effluents are given in the Offsite Dose Calculation Manual (ODCM).

Attachment 6
Assessment of Radiation Dose from Radioactive Effluents to Members of the Public

H.B. Robinson Steam Electric Plant Unit 2
 Period 1/1/2015 - 12/31/2015

Gaseous Effluents Dose Summary

	<u>Units</u>	<u>Qtr 1</u>	<u>Qtr 2</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Year</u>
A. Noble Gases						
1. Maximum Gamma Air	mRAD	8.60E-04	7.26E-02	1.62E-03	3.78E-03	7.88E-02
(a) Limit	mRAD	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
(b) % of Limit		1.72E-02	1.45E+00	3.25E-02	7.56E-02	7.88E-01
2. Maximum Beta Air	mRAD	5.31E-04	2.56E-02	1.39E-03	7.57E-03	3.51E-02
(a) Limit	mRAD	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
(b) % of Limit		5.31E-03	2.56E-01	1.39E-02	7.57E-02	1.75E-01

Receptor Location **0.42 km SSE**

B. Iodine, H-3, & Particulates

1. Maximum Organ Dose	mREM	1.29E-01	1.31E-01	1.32E-01	1.32E-01	5.24E-01
(a) Limit	mREM	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
(b) % of Limit		1.72E+00	1.74E+00	1.76E+00	1.76E+00	3.49E+00

Receptor Location **0.42 km SSE**

Critical Age **CHILD**

Critical Organ **BONE**

Attachment 6
Assessment of Radiation Dose from Radioactive Effluents to Members of the Public

H.B. Robinson Steam Electric Plant Unit 2
 Period 1/1/2015 - 12/31/2015

Liquid Effluents Dose Summary

	<u>Units</u>	<u>Qtr 1</u>	<u>Qtr 2</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Year</u>
A. Batch & Continuous Mode						
1. Maximum Organ Dose	mREM	1.70E-04	4.88E-04	4.29E-06	5.38E-05	7.16E-04
(a) Limit	mREM	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
(b) % of Limit		3.41E-03	9.75E-03	8.58E-05	1.08E-03	7.16E-03
2. Maximum Total Body Dose	mREM	1.66E-04	1.64E-04	4.32E-06	5.39E-05	3.89E-04
(a) Limit	mREM	1.50E+00	1.50E+00	1.50E+00	1.50E+00	3.00E+00
(b) % of Limit		1.11E-02	1.10E-02	2.88E-04	3.59E-03	1.30E-02

Critical Age **ADULT**
Critical Organ **GI-LLI**

Attachment 6
Assessment of Radiation Dose from Radioactive Effluents to Members of the Public

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

40 CFR Part 190 Uranium Fuel Cycle Dose Calculation Results

In accordance with the requirements of 40 CFR Part 190, the annual dose commitment to any member of the general public shall be calculated to assure that doses are limited to 25 millirems to the total body or any organ with the exception of the thyroid which is limited to 75 millirems. The fuel cycle dose assessment for H.B. Robinson Steam Electric Plant includes liquid and gaseous effluent dose contributions from H.B. Robinson Steam Electric Plant and direct and air-scatter dose from the onsite ISFSI. No other direct or air-scatter source or uranium fuel cycle facility contributes significantly to the maximum exposed individual. Included on the gaseous effluent dose below is the estimated dose contributed by Carbon-14 (Ref. Attachment 2, Supplemental Information, of this report for further information). Also included is dose from evaporation of H-3 in Lake Robinson and H-3 in fish from Lake Robinson. The combined dose to a maximum exposed individual from effluent releases, combined with the additional dose pathways, is below 40 CFR Part 190 limits as shown by the following summary.

Note: The 40 CFR Part 190 effluent dose analysis to the maximum exposed individual from liquid and gas releases does not include the dose from noble gases (i.e., total body and skin) due to the low significance compared to other dose pathways.

40 CFR Part 190 Effluent Dose Summary

A. Gaseous Effluent Dose	
1. Location	0.42 km SSE
2. Critical Age	CHILD
3. Critical Organ	BONE
4. Organ Dose (mREM)	5.24E-01
5. Total Body Dose (mREM)	4.19E-01
B. Liquid Effluent Dose	
1. Location	6.76 km NE
2. Critical Age	ADULT
3. Critical Organ	GI-LLI
4. Organ Dose (mREM)	7.16E-04
5. Total Body Dose (mREM)	3.89E-04
C. Lake Robinson Evaporation H-3 Dose	
1. Location	6.38 km N
2. Critical Age	CHILD
3. Critical Organ	N/A
4. Organ Dose (mREM)	2.45E-01
5. Total Body Dose (mREM)	2.45E-01
D. H-3 in Fish from Lake Robinson	
1. Location	Lake
2. Critical Age	ADULT
3. Critical Organ	N/A
4. Organ Dose (mREM)	5.73E-03
5. Total Body Dose (mREM)	5.73E-03

Attachment 6

Assessment of Radiation Dose from Radioactive Effluents to Members of the Public

H.B. Robinson Steam Electric Plant Unit 2 **Period 1/1/2015 - 12/31/2015**

Dose contributions from Carbon-14 in gaseous effluents have been determined from ODCM 3.16, Methodology for Carbon-14 Dose. The maximum dose rate to the nearest real individual from the release of Carbon-14 in batch and continuous gaseous effluents is conservatively calculated to be less than 5.24E-01 mrem/yr based on 7.86 Curies released in 2015 (Ref. Attachment 2, Supplemental Information, of this report).

Dose contributions from evaporation of Tritium Lake Robinson have been determined from ODCM 2.5.3, Dose from Evaporation of Lake Robinson. The maximum dose rate to the nearest real individual from evaporation of Tritium in Lake Robinson is conservatively calculated to be less than 2.45E-01 mrem/yr based on 48.3 Curies released in 2015 (Ref. Attachment 2, Supplemental Information, of this report).

Dose contributions from Tritium in fish in Lake Robinson have been determined using NRC Regulatory Guide 1.109, Rev.1, October 1977, Equation A-1, and data from REMP location SW-40. This information was previously included in the H.B. Robinson Steam Electric Plant AREOR. DRR 02012901 was written to include the fish dose calculation methodology in the next ODCM revision, and report in the ARERR. The maximum dose rate to the nearest real individual from consuming the fish in Lake Robinson is conservatively calculated to be less than 5.73E-03 mrem/yr based on an average concentration of 2.60E+03 pCi/L consumed in 2015 (Ref. Attachment 2, Supplemental Information, of this report).

Direct and air-scatter radiation dose contributions from the onsite ISFSI at H.B. Robinson Steam Electric Plant have been calculated and documented in the ISFSI Safety Analysis Report. The dose rate to the maximum exposed individual from the ISFSI is conservatively calculated to be less than 5 mrem/yr.

The below excerpt from the H.B. Robinson Steam Electric Plant ISFSI Safety Analysis Report is provided to document the conclusion that the H.B. Robinson Steam Electric Plant ISFSI contributes less than 6 mrem/year to the maximum exposed individual.

7.6.2 ANALYSIS OF MULTIPLE CONTRIBUTION

The maximally exposed member of the public would receive approximately 1.6 mrem per year from an ISFSI made up of a three-unit HSM (reference Figure 7.6.1). An ISFSI consisting of an eight-unit HSM would contribute approximately 4.3 mrem per year. This is a result of external radiation only; there are no gaseous, particulate, or liquid effluents associated with the normal operation of the ISFSI. It can be concluded that the actual exposure contribution from the ISFSI along with the total of all other uranium fuel cycle activities is within the regulatory limits set forth in 40CFR190.

Assessment of the actual dose from direct radiation is performed as part of the H.B. Robinson Steam Electric Plant REMP and reported in the AREOR. During 2015, the assessment of dose from direct radiation, performed as part of the REMP, demonstrated no measurable contribution above background attributable to H.B. Robinson Steam Electric Plant operations.

Total dose from liquid and gaseous effluents from H.B. Robinson Steam Electric Plant and the additional pathways mentioned above is conservatively estimated to be less than 6 mrem/yr for total body and organ. It is recognized summing dose for different organs and age groups is not entirely accurate. However, the sum of the organ and age specific doses will always be less than the sum of the maximums of each. Therefore, summing the maximum values of each provides the most conservative value to ensure compliance with 40 CFR 190. The dose from all pathways related to operation of H.B. Robinson Steam Electric Plant meets the 40 CFR Part 190 requirements of an annual dose commitment to any member of the general public of less than 25 mrem total body or any organ and 75 mrem to the thyroid.

Attachment 7
Information to Support the NEI Ground Water Protection Initiative

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 7

Information to Support the NEI Ground Water Protection Initiative

This attachment includes a summary of voluntary reports made in accordance with the NEI Ground Water Protection Initiative and a summary of ground water well sample data.

Attachment 7
Information to Support the NEI Ground Water Protection Initiative

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

H.B. Robinson Steam Electric Plant has implemented a Ground Water Protection program in accordance with NEI 07-07. This initiative was developed to ensure timely and effective management of situations involving inadvertent releases of licensed material to ground water. As part of this program, H.B. Robinson Steam Electric Plant monitored 28 wells in 2015. 11 wells not sampled as part of the ODCM REMP are reported below. The remaining 17 wells are sampled in accordance with the ODCM REMP and reported in the AREOR.

Wells are sampled quarterly. Ground water samples are analyzed for tritium and gamma emitters. No gamma, other than naturally occurring radionuclides, were identified in well samples during 2015. There were no anomalous results identified in 2015.

Results from sampling during 2015 are shown in the table below.

No events meeting the criteria for voluntary notification per NEI 07-07, Industry Ground Water Protection Initiative, occurred at H.B. Robinson Steam Electric Plant in 2015. No special dose calculations were performed as part of the Ground Water Protection program.

Key to below table.

- NS - Not scheduled to be sampled, not sampled due to insufficient volume in well, or well inaccessible during outage.
- pCi/l - picocuries per liter.
- < MDA - less than minimum detectable activity, typically 250 pCi/l.
- 20,000 pCi/l - the Environmental Protection Agency drinking water standard for tritium. This standard applies only to water used for drinking.
- 1,000,000 pCi/l - the 10 CFR Part 20, Appendix B, Table 2, Column 2, Effluent Concentration Limit for tritium.

Well Name	Location / Description	Tritium Concentration (pCi/l)				# of Samples
		1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	
MW-1R	NPDES Ash	<MDA	<MDA	<MDA	<MDA	4
MW-2R	NPDES Ash	<MDA	<MDA	<MDA	<MDA	4
MW-3R	NPDES Ash	1.28E+03	1.27E+03	1.15E+03	1.12E+03	4
MW-4R	NPDES Ash	2.61E+02	<MDA	<MDA	<MDA	4
MW-5	NPDES Ash	7.33E+02	4.80E+02	4.91E+02	5.83E+02	4
MW-6	NPDES Ash	1.11E+03	9.37E+02	8.72E+02	8.06E+02	4
MW-7	NPDES Ash	4.75E+02	4.17E+02	2.59E+02	2.37E+02	4
P-1	North of Discharge Canal	1.51E+03	6.77E+02	4.80E+02	1.13E+03	4
P-2	South of Discharge Canal	<MDA	<MDA	<MDA	2.20E+02	4
PSW-04	West of Plant Site	<MDA	<MDA	<MDA	<MDA	4
PSW-05	SW Plant, Background Well	<MDA	<MDA	<MDA	1.82E+02	4

**Attachment 8
Inoperable Equipment**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 8

Inoperable Equipment

This attachment includes an explanation of inoperable instruments related to effluent monitoring in excess of allowed time defined by licensing bases and an explanation of permanent or temporary outside liquid storage tanks exceeding 10 Curies total activity (excluding tritium and dissolved or entrained noble gases).

**Attachment 8
Inoperable Equipment**

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

H.B. Robinson Steam Electric Plant did not experience inoperable equipment relevant to effluent monitoring in excess of ODCM limits during 2015.

H.B. Robinson Steam Electric Plant did not experience permanent or temporary outside liquid storage tanks not surrounded by liners, dikes, or walls, capable of holding the tank's contents and that does not have tank overflows and surrounding area drains connected to the Liquid Waste Disposal System exceeding 10 Curies total activity (excluding tritium and dissolved or entrained noble gases) during 2015.

Attachment 9
Summary of Changes to the Offsite Dose Calculation Manual

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 9

Summary of Changes to the Offsite Dose Calculation Manual Example

This attachment includes a summary of changes to the ODCM and Radiological Effluent Controls.

Attachment 9
Summary of Changes to the Offsite Dose Calculation Manual

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ODCM Revision 33

The H.B. Robinson Steam Electric Plant ODCM did not warrant revision during the period 1/1/2015 - 12/31/2015. Therefore, it was not revised in 2015. Revision 33, which was submitted along with the 2011 ARERR, continues to remain the most recent revision.

Attachment 10
Summary of Changes to the Process Control Program

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 10

Summary of Changes to the Process Control Program

This attachment includes a summary of changes to the PCP.

Attachment 10
Summary of Changes to the Process Control Program

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

The H.B. Robinson Steam Electric Plant PCP was not revised in 2015. The most recent revision is 6 and is provided on the following pages.

Attachment 10
Summary of Changes to the Process Control Program

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

PROGRESS ENERGY
H. B. ROBINSON - UNIT 2
PROCESS CONTROL PROGRAM
(PCP)
REVISION 6
DOCKET NO. 50-261

EFFECTIVE DATE: 01-07-10

REVIEWED AND ACCEPTED BY PNSC: Spaunders DATE: 01-07-10
PNSC CHAIRMAN

LIST OF EFFECTIVE PAGES

<u>EFFECTIVE PAGES</u>	<u>REVISION</u>
Cover Sheet	6
LEP	6
3 through 6	6

SUMMARY OF CHANGES

Revised Section 2.0 to specify dewatering and solidification may be performed by qualified vendor or qualified Progress Energy personnel in accordance with a qualified PCP or a program approved by the NRC or burial site facility.

Revised Section 3.1.2 to include review of both vendor and RNP operating procedures, retention of both vendor and RNP completed records, and monitoring of both vendor and RNP operations for compliance with TRMS 3.22 requirements.

Revised Section 3.1.3 to include RC Supervisor (with accountability for radioactive waste processing) responsibility for advising the RC Superintendent on the adequacy of both vendor and RNP operating procedures.

Revised Section 3.2 to clarify that specified vendor requirements apply to vendors who supply both solidification and dewatering services to RNP.

H.B. ROBINSON

PROCESS CONTROL PROGRAM

1.0 SCOPE

This program established the management systems and controls that the Robinson Nuclear Plant (RNP) uses to ensure safe and effective solidification and dewatering of various low-level radioactive waste liquids and slurries for offsite disposal.

2.0 OBJECTIVE

It is the objective of this program that solidification and/or dewatering of various low-level radioactive waste liquids and slurries (including oily wastes) for offsite disposal will be performed by either qualified vendors or qualified Progress Energy personnel, in accordance with a qualified PCP or a program approved by the NRC or burial site facility. The quality of the solidified and/or dewatered product shall meet or exceed regulatory requirements and the disposal site criteria prior to release from the RNP site for shallow disposal.

3.0 MANAGEMENT PROGRAM

3.1 Responsibilities

- 3.1.1 The Plant General Manager is responsible for ensuring that waste is shipped in accordance with the appropriate state and federal regulations.
- 3.1.2 The Superintendent – Radiation Control (RC) or designee is responsible for:
 - a. Advising the Plant General Manager on the appropriate technical standards, regulations and requirements as related to solidification, dewatering and shipping.
 - b. Ensuring changes to the vendor's Process Control Program (PCP), vendor and RNP operating procedures, and proposed contractual agreements are reviewed and advising the Plant General Manager as to their adequacy.
 - c. Retaining vendor – supplied documentation and completed RNP records for NRC inspection and review.

3.1 Responsibilities (continued)

d. Ensuring vendor and RNP operations are monitored for compliance with:

1. Section 3.22 Technical Requirements Manual (TRMS). The Solid Radwaste System shall be used in accordance with a PCP to process wet radioactive waste to meet shipping and burial ground requirements.
2. Section 3.22.A TRMS. With the provisions of the PCP not satisfied, immediately suspend shipments of defectively processed or defectively packaged solid radioactive waste from the site.
3. Section 3.22.B TRMS. If any test specimen, as required by the PCP, fails to verify solidification, the solidification of the batch under test shall be immediately suspended until such time as additional test specimens can be obtained, alternative solidification parameters can be determined in accordance with Section 5.5.17 of the TRMS. Solidification of the batch may then be resumed using alternative solidification parameters as determined by the PCP.
4. Section 3.22.1 TRMS. The PCP shall be used to verify the solidification of one representative test specimen from every tenth batch of wet radioactive waste.

3.1 Responsibilities (continued)

Note: The following step is only required to be met if the initial test specimen from a batch of waste fails to verify solidification and continues until at least three consecutive initial test specimens demonstrate solidification.

5. Section 3.22.2 TRMS. Collect and test representative test specimens of every consecutive batch of the same type of wet radioactive waste to verify solidification in accordance with the PCP.

3.1.3 The RC Supervisor with accountability for radioactive waste processing is responsible for advising the Superintendent-RC on:

- a. The appropriate technical standards, regulations and requirements as related to solidification, dewatering and shipping.
- b. The adequacy of the vendor's PCP, vendor and RNP operating procedures, and proposed contractual agreements.

3.2 Specification of Vendors

The qualified solidification and/or dewatering vendor will:

3.2.1 Provide a qualified PCP or a program approved by:

- a. NRC
- b. Disposal site licensee

3.2.2 The vendor will perform the tests described in the PCP.

3.2.3 The vendor will supply the Superintendent – RC with all documentation required to demonstrate compliance with dewatering and/or solidification requirements.

3.2.4 The Superintendent – RC will retain documentation required to demonstrate compliance with solidification requirements and standards.

4.0 MANAGEMENT/CONTRACTOR INTERACTIONS

- 4.1 The vendor is accountable to the Superintendent – RC for the solidification and/or dewatering of liquid wastes.
- 4.2 The RC Supervisor with accountability for radioactive waste processing handles the shipping of solidified and dewatering wastes and maintains required documentation. The vendor and the RC Supervisor may communicate on the matters as necessary.

5.0 ATTACHMENTS

- 5.1 None Applicable

Attachment 11
Summary of Major Modifications to the Radioactive Waste Treatment Systems

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 11

Summary of Major Modifications to the Radioactive Waste Treatment Systems

This attachment includes a description of major modifications to the radioactive waste treatment systems that are anticipated to affect effluent releases.

Attachment 11
Summary of Major Modifications to the Radioactive Waste Treatment Systems

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

No major modifications to liquid, gaseous, solid, or mobile radioactive waste treatment systems occurred at H.B. Robinson Steam Electric Plant in 2015.

Attachment 12
Errata to a Previous Year's ARERR Example

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

ATTACHMENT 12

Errata to a Previous Year's ARERR

This attachment includes any amended pages from a previous year's ARERR.

Attachment 12
Errata to a Previous Year's ARERR Example

H.B. Robinson Steam Electric Plant Unit 2
Period 1/1/2015 - 12/31/2015

There are no changes to a previous year's ARERR.