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DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
2014 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Enclosed is the Kewaunee Power Station (KPS) 2014 Annual Radioactive Effluent Release Report for January through December 2014. This report is submitted to meet the requirements of KPS Technical Specification 5.6.2 and 10 CFR 50.36a(a)(2).

If you have questions or require additional information, please feel free to contact Mr. Richard Repshas at 920-388-8217.

Sincerely,

Timothy P. Olson
Technical Support Manager, Kewaunee Power Station

Commitments made by this letter: NONE

IE48
NRR

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2014 Annual Radioactive Effluent Release Report

Kewaunee Power Station

Dominion Energy Kewaunee, Inc.

DOCKET 50-305

KEWAUNEE POWER STATION

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

January 1 - December 31, 2014

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Table of Contents

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0.0 SUMMARY

On October 22, 2012, Dominion made known the decision to permanently shut down the Kewaunee Power Station (KPS). On February 25, 2013, Dominion Energy Kewaunee (DEK) submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2).

During 2014 all solid, liquid, and gaseous radioactive effluents from the Kewaunee Power Station were well below regulatory limits. For individual effluent streams, the quarterly limit most closely approached was:

GASEOUS:	Ingestion Pathway-Organ	Total Body	
	Quarterly Limit (mRem)	7.5	
	Actual Dose (mRem)	4.10E-04	(1st Quarter)
	% of Specification	5.47E-03	
LIQUID:	Ingestion Pathway-Organ	Bone	
	Quarterly Limit (mRem)	5.0	
	Actual Dose (mRem)	3.41E-01	(1st Quarter)
	% of Limit	6.82E+00	
SOLID:	No upper limit for solid radioactive waste applies.		
	Cubic Meters Shipped	0.00E+00 m^3 (0.00+00 ft^3)	

1.0 INTRODUCTION

This report is being submitted in accordance with the requirements of Kewaunee Technical Specifications, Section 5.6.2 and the Offsite Dose Calculation Manual, Section 15.2. It includes data from all effluent releases made from January 1 - December 31, 2014. The report contains summaries of the gaseous and liquid releases made to the environment including the quantity, characterization, time duration and calculated radiation dose at the site boundary resulting from these releases. The report also includes a summation of solid radioactive waste disposal, revisions to the Process Control Program and the Offsite Dose Calculation Manual, major changes to the radioactive liquid and gaseous waste treatment systems, and addresses the cumulative meteorological data. Values indicated as 0 (zero) in this report refer to actual values less than the detection limits. A table of these less than detectable (LLD) values is identified in sections 2.1 and 3.1.

1.1 Effluent Dose Limits

Specifications are set to ensure that offsite doses are maintained as low as reasonably achievable while still allowing for practical and dependable operation at the Kewaunee Power Station.

The Kewaunee Offsite Dose Calculation Manual (ODCM) describes the methodology and parameters used in:

1.) The calculation of radioactive liquid and gaseous effluent monitoring instrumentation alarm/trip set points.

2.) The calculation of radioactive liquid and gaseous concentrations, dose rates and cumulative quarterly and annual doses. The ODCM methodology is acceptable for use in demonstrating compliance with 10 CFR 20.1301/1302; 10 CFR 50, Appendix I; and 40 CFR 190.

2.0 <u>GASEOUS EFFLUENTS</u>

2.1 Lower Limits of Detection (LLD) for Gaseous Effluents

Gaseous radioactive effluents are released in both the continuous mode and the batch mode. The auxiliary building stack is sampled continuously for particulates, halogens and Strontium by an "off-line" sample train. This stack is also grab-sampled weekly for gaseous gamma emitters. Batch releases are sampled prior to release for principal gaseous and particulate gamma emitters, halogens and tritium.

The LLD's for gaseous radio-analyses, as listed in Table 13.2.1-1 of the Kewaunee ODCM are:

Analysis	LLD (µCi/ml)
Gaseous Gamma Emitters	1.00E-04
Iodine 131	3.00E-12
Particulate Gamma Emitters	1.00E-11
Particulate Gross Alpha	1.00E-11
Strontium 89, 90	1.00E-11
Noble Gases, Gross Beta or Gamma	1.00E-06
Tritium (H-3)	1.00E-06

The nominal "a priori" LLD values are shown below.

Isotope	a priori LLD (µCi/ml)
a. Gaseous emissions:	
Kr-87	5.61E-08
Kr-88	1.02E-07
Xe-133	6.68E-08
Xe-133m	2.75E-07
Xe-135	2.99E-08
Xe-138	1.13E-07

b. Particulate emissions:

Mn-54	1.11E-13
Fe-59	2.27E-13
Co-58	2.28E-13
Co-60	3.57E-13
Zn-65	1.68E-13
Mo-99	2.73E-13
Cs-134	4.69E-13
Cs-137	1.68E-13
Ce-141	2.08E-13
Ce-144	1.24E-12

c. Other identifiable gamma emitters:

Ar-41	3.97E-10
Kr-85	8.63E-05
Kr-85m	4.62E-08
Kr-89	2.04E-06
Xe-127	4.20E-08
Xe-131m	1.82E-06
Xe-135m	1.90E-08
Xe-137	2.88E-07
I-131	1.32E-13

d. Composite particulate samples:

Sr-89	1.00E-14
Sr-90	1.00E-14
Gross Alpha	1.00E-14

These "a priori" LLDs represent the capabilities of the counting systems in use, not an after the fact "a posteriori" limit for a particular measurement.

2.2 Gaseous Batch Release Statistics

The following is a summation of all gaseous batch releases made during 2014.

Number of batch releases....................................0

Total time for all batch releases (min)..............0.0

Maximum time for a batch release (min)..........0.0

Average time for a batch release (min).............0.0

Minimum time for a batch release (min)...........0.0

2.3 Gaseous Effluent Data

Table 2.1 presents a quarterly summation of the total activity released and average release rates of gaseous effluents. Table 2.2 lists the quarterly sums of individual gaseous radionuclide released by continuous mode. Table 2.3 lists the quarterly sums of individual gaseous radionuclide released by batch mode. Table 2.4 presents the dose limits for gaseous effluents, and the calculated doses this year from gaseous effluents.

Table 2.1
Gaseous Effluents - Summation of all Releases

Fission and Activation Gases	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Release Rate (µCi/sec)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Release Rate (µCi/sec)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Release Rate (µCi/sec)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium					
Total Activity Released (Ci)	1.55E+01	5.97E+00	5.94E+00	7.58E+00	3.50E+01
Average Release Rate (µCi/sec)	1.99E+00	7.59E-01	7.47E-01	9.54E-01	1.11E+00
Gross Alpha Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon-14					
Total Annual Activity Released (Ci)					0.00E+00

Table 2.2
Gaseous Effluents - Ground Level - Nuclides Released (Ci)
Continuous Mode

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
Fission Gases					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium	1.55E+01	5.97E+00	5.94E+00	7.58E+00	3.50E+01

Table 2.3
Gaseous Effluents - Ground Level - Nuclides Released (Ci)
Batch Mode (1)

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
Fission Gases					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

1 - There were no gaseous batch discharges in 2014.

Table 2.4
Dose from Gaseous Effluents

The offsite dose limits from radioactive materials in gaseous effluents are specified in Section 13.2.2 and 13.2.3 of the Kewaunee ODCM and can be summarized as follows:

Limit	Air Dose Gamma	Air Dose Beta	Organ
Quarterly	5.0 mrad	10.0 mrad	7.5 mrem
Annual	10.0 mrad	20.0 mrad	15.0 mrem

The total releases of gaseous effluents during 2014 for each quarter and for the year were within limits. The following offsite doses were calculated using equations 2.7, 2.8, and 2.11 from the Kewaunee ODCM. Calculated offsite doses versus quarterly and annual limits are shown below:

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
1. Gamma- Air Dose					
Specification (mrad)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
Actual Dose (mrad)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Beta- Air Dose					
Specification (mrad)	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
Actual Dose (mrad)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Organ Dose					
Specification (mrem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
Total Body					
Actual Dose (mrem)	4.10E-04	1.58E-04	1.57E-04	2.01E-04	9.26E-04
% of Specification	5.47E-03	2.11E-03	2.10E-03	2.67E-03	6.17E-03
Bone					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 2.4 (continued)
Dose from Gaseous Effluents

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
Liver					
Actual Dose (mrem)	4.10E-04	1.58E-04	1.57E-04	2.01E-04	9.26E-04
% of Specification	5.47E-03	2.11E-03	2.10E-03	2.67E-03	6.17E-03
Thyroid					
Actual Dose (mrem)	4.10E-04	1.58E-04	1.57E-04	2.01E-04	9.26E-04
% of Specification	5.47E-03	2.11E-03	2.10E-03	2.67E-03	6.17E-03
Kidney					
Actual Dose (mrem)	4.10E-04	1.58E-04	1.57E-04	2.01E-04	9.26E-04
% of Specification	5.47E-03	2.11E-03	2.10E-03	2.67E-03	6.17E-03
Lung					
Actual Dose (mrem)	4.10E-04	1.58E-04	1.57E-04	2.01E-04	9.26E-04
% of Specification	5.47E-03	2.11E-03	2.10E-03	2.67E-03	6.17E-03
GI-LLI					
Actual Dose (mrem)	4.10E-04	1.58E-04	1.57E-04	2.01E-04	9.26E-04
% of Specification	5.47E-03	2.11E-03	2.10E-03	2.67E-03	6.17E-03

2.4 Estimation of Carbon-14 in Gaseous Releases

Due to permanent plant shutdown on May 7, 2013, there were no releases of Carbon-14 from the site.

3.0 LIQUID EFFLUENTS

3.1 Lower Limits of Detection (LLD) for Liquid Effluents

Liquid radioactive effluents are released as both batch releases and continuous releases. Each batch is sampled prior to release and analyzed for gamma emitters and tritium. A fraction of each sample is retained for a monthly proportional composite which is then analyzed for Gross Alpha, Strontium 89, Strontium 90, Iron 55 and Nickel 63.

The LLD's for liquid batch release radio-analyses, as listed in Table 13.1.1-1 of the Kewaunee ODCM are:

Analysis	LLD (μCi/ml)
Principal Gamma Emitters	1.00 E-06
Iodine 131	1.00 E-06
Tritium (H-3)	1.00 E-05
Gross Alpha	5.00 E-07
Strontium 89, 90	5.00 E-08
Iron 55	1.00 E-06

The actual obtained "a priori" LLD values for batch releases are shown below.

Isotope	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average a priori LLD (μCi/ml)
Mn-54	9.53E-08	1.68E-08	9.53E-08	9.74E-08	7.62E-08
Fe-59	3.78E-08	2.14E-07	2.14E-07	3.89E-08	1.26E-07
Co-58	9.35E-08	1.65E-08	3.81E-08	9.54E-08	6.09E-08
Co-60	2.26E-08	1.71E-07	1.42E-07	2.33E-08	8.97E-08
Zn-65	3.23E-07	4.26E-08	4.26E-08	4.39E-08	1.13E-07
Mo-99	6.70E-07	1.18E-07	6.70E-07	9.16E-07	5.94E-07
Cs-134	1.30E-08	9.83E-08	9.83E-08	1.93E-08	5.72E-08
Cs-137	1.22E-07	1.66E-07	9.12E-08	1.64E-08	9.89E-08
Ce-141	1.24E-07	1.31E-07	9.99E-08	1.27E-07	1.20E-07
Ce-144	4.85E-07	6.15E-07	5.54E-07	5.33E-07	5.47E-07
I-131	7.42E-08	8.87E-08	7.42E-08	1.15E-07	8.80E-08
H-3	2.80E-06	3.48E-06	3.07E-06	2.78E-06	3.03E-06
Sr-89	1.60E-08	2.29E-08	NA	8.93E-09	1.59E-08
Sr-90	9.63E-09	7.26E-09	NA	6.43E-09	7.77E-09
Gross Alpha	5.72E-09	4.95E-09	NA	4.51E-09	5.06E-09
Fe-55	7.60E-07	6.55E-07	NA	6.86E-07	7.00E-07
Ni-63	1.17E-07	1.05E-07	NA	1.14E-07	1.12E-07

Continuous liquid releases are grab-sampled weekly and analyzed for principal gamma emitters. A fraction of each weekly sample is retained for a monthly proportional composite which is then analyzed for Gross Alpha, Strontium 89, Strontium 90, Iron 55 and Nickel 63.

The LLD's for liquid continuous release radioanalyses, as listed in Table 13.1.1-1 of the Kewaunee ODCM are:

Analysis	LLD (µCi/ml)
Principal Gamma Emitters	5.00 E-07
Iodine 131	1.00 E-06
Tritium (H-3)	1.00 E-05
Gross Alpha	5.00 E-07
Strontium 89, 90	5.00 E-08
Iron 55	1.00 E-06

The actual obtained "a priori" LLD values for continuous releases are shown below.

Isotope	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average a priori LLD (µCi/ml)
Mn-54	1.03E-08	1.03E-08	8.06E-09	1.20E-08	1.02E-08
Fe-59	2.61E-08	2.74E-08	2.47E-08	2.15E-08	2.49E-08
Co-58	1.20E-08	1.08E-08	6.95E-09	1.06E-08	1.01E-08
Co-60	6.52E-09	1.38E-08	1.04E-08	1.16E-08	1.06E-08
Zn-65	2.61E-08	1.78E-08	2.02E-08	2.01E-08	2.11E-08
Mo-99	7.32E-08	9.43E-08	6.87E-08	6.72E-08	7.59E-08
Cs-134	9.02E-09	1.07E-08	9.56E-09	9.76E-09	9.76E-09
Cs-137	1.38E-08	8.52E-09	1.07E-08	1.16E-08	1.12E-08
Ce-141	1.70E-08	1.54E-08	6.96E-08	1.56E-08	2.94E-08
Ce-144	7.05E-08	6.52E-08	2.62E-08	6.45E-08	5.66E-08
I-131	9.89E-09	8.78E-09	9.38E-09	1.13E-08	9.84E-09
H-3	2.80E-06	3.48E-06	3.07E-06	2.78E-06	3.03E-06
Sr-89	1.91E-08	2.06E-08	1.93E-08	8.48E-09	1.69E-08
Sr-90	7.89E-09	6.84E-09	6.44E-09	5.15E-09	6.58E-09
Gross Alpha	4.33E-09	5.18E-09	5.01E-09	3.95E-09	4.62E-09
Fe-55	7.60E-07	6.28E-07	6.77E-07	6.82E-07	6.87E-07
Ni-63	1.18E-07	1.23E-07	1.20E-07	1.06E-07	1.17E-07

3.2 Liquid Batch Release Statistics

The following is a summation of all liquid batch releases during 2014.

Number of batch releases..5

Total time for all batch releases (min).............10,300

Maximum time for a batch release (min)...........3,250

Minimum time for a batch release (min)...........1,540

Average time for a batch release (min)...............2,070

3.3 Liquid Effluent Data

The following Table 3.1 presents a quarterly summation of the total activity released and average concentration for all liquid effluents. It also presents the gross alpha activity released, volume of waste released and volume of dilution water used. Table 3.2 contains the quantity of the individual isotopes released to the unrestricted area for batch releases. Table 3.3 contains the quantity of the individual isotopes released to the unrestricted area for continuous releases. Table 3.4 presents the doses from liquid effluents for each quarter and the calculated doses this year from liquid effluents.

Table 3.1
Liquid Effluents - Summation of all Releases

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
<u>Fission and Activation Products</u>					
Total Release (Ci)	1.45E-02	7.80E-03	0.00E+00	9.73E-03	3.21E-02
Average Concentration (μCi/ml)	1.39E-08	1.38E-08	0.00E+00	2.14E-08	1.27E-08
<u>Tritium</u>					
Total Release (Ci)	4.10E+00	2.52E+00	0.00E+00	5.58E+00	1.22E+01
Average Concentration (μCi/ml)	3.91E-06	4.44E-06	0.00E+00	1.22E-05	4.82E-06
% of Tech. Spec. Limit(3.0E-3 μCi/ml)	1.30E-01	1.48E-01	0.00E+00	4.07E-01	1.61E-01
<u>Dissolved and Entrained Gases</u>					
Total Release (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Concentration (μCi/ml)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Tech. Spec. Limit(2.0E-4 μCi/ml)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Gross Alpha Activity</u>					
Total Release (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Volume of Waste Released</u>					
Total (liters)	3.08E+06	2.97E+06	3.97E+06	2.60E+06	1.26E+07
<u>Volume of Dilution Water</u>					
Total (liters)	1.05E+09	5.67E+08	4.68E+08	4.56E+08	2.53E+09

Table 3.2
Liquid Effluents – Nuclides Released (Ci)
Batch Mode

	1st Qtr	2nd Qtr	3rd Qtr*	4th Qtr	Total
Fission and Activation Products					
Mn-54	0.00E+00	2.38E-05	NA	1.39E-05	3.77E-05
Fe-55	2.51E-03	3.62E-03	NA	2.52E-03	8.65E-03
Co-57	1.12E-05	1.81E-05	NA	1.11E-05	4.04E-05
Co-58	2.24E-04	1.90E-04	NA	5.40E-05	4.67E-04
Co-60	6.34E-04	4.64E-04	NA	6.61E-04	1.76E-03
Ni-63	1.09E-02	3.34E-03	NA	6.36E-03	2.06E-02
Ag-110m	1.70E-05	0.00E+00	NA	0.00E+00	1.70E-05
Sb-125	2.17E-04	1.46E-04	NA	1.04E-04	4.67E-04
Total Release	1.45E-02	7.80E-03	NA	9.73E-03	3.21E-02
Dissolved and Entrained Gases					
Total Release	0.00E+00	0.00E+00	NA	0.00E+00	0.00E+00
Tritium					
Total Release	4.10E+00	2.52E+00	NA	5.58E+00	1.22E+01
Gross Alpha Activity					
Total Release	0.00E+00	0.00E+00	NA	0.00E+00	0.00E+00

*There were no batch releases in the 3rd quarter.

Table 3.3
Liquid Effluents – Nuclides Released (Ci)
Continuous Mode

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
<u>'ission and Activation Products</u>					
'otal Release	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>)issolved and Entrained Gases</u>					
'otal Release	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>'ritium</u>					
'otal Release	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>}ross Alpha Activity</u>					
'otal Release	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 3.4
Dose from Liquid Effluents

The dose to a member of the public from total liquid radioactive releases for each quarter was below the Kewaunee ODCM limits of 1.5 mrem to the total body and less than or equal to 5 mrem to any organ. Additionally, the dose to a member of the public from total liquid radioactive releases for the year was below the Kewaunee ODCM limits of 3 mrem to the total body and less than or equal to 10 mrem to any organ.

Instantaneous release concentrations are limited by the individual radionuclide concentrations established in 10 CFR 20, Appendix B, for unrestricted areas. During the report period, none of the isotopes released exceed the concentrations specified in Appendix B. The following offsite doses were calculated using equation 1.7 from the Kewaunee ODCM.

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
Total Body					
Specification (mrem)	1.50E+00	1.50E+00	1.50E+00	1.50E+00	3.00E+00
Actual Dose (mrem)	1.33E-02	7.39E-03	0.00E+00	1.09E-02	3.16E-02
% of Specification	8.89E-01	4.93E-01	0.00E+00	7.24E-01	1.05E+00
Organs					
Specification (mrem)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
Bone					
Actual Dose (mrem)	3.41E-01	1.57E-01	0.00E+00	2.38E-01	7.36E-01
% of Specification	6.82E+00	3.13E+00	0.00E+00	4.76E+00	7.36E+00
Liver					
Actual Dose (mrem)	2.61E-02	1.46E-02	0.00E+00	2.02E-02	6.09E-02
% of Specification	5.23E-01	2.92E-01	0.00E+00	4.03E-01	6.09E-01
Thyroid					
Actual Dose (mrem)	1.27E-03	1.22E-03	0.00E+00	2.18E-03	4.68E-03
% of Specification	2.55E-02	2.44E-02	0.00E+00	4.37E-02	4.68E-02
Kidney					
Actual Dose (mrem)	1.27E-03	1.26E-03	0.00E+00	2.20E-03	4.74E-03
% of Specification	2.55E-02	2.53E-02	0.00E+00	4.41E-02	4.74E-02

Table 3.4 (continued)
Dose from Liquid Effluents

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
Lung					
Actual Dose (mrem)	1.91E-03	2.57E-03	0.00E+00	2.95E-03	7.43E-03
% of Specification	3.82E-02	5.15E-02	0.00E+00	5.89E-02	7.43E-02
GI-LLI					
Actual Dose (mrem)	1.04E-02	9.13E-03	0.00E+00	1.03E-02	2.98E-02
% of Specification	2.07E-01	1.83E-01	0.00E+00	2.07E-01	2.98E-01

3.4 Ground Water Monitoring

Sample Point Sample Date	Tritium pCi/L	Total Gamma Activity µCi/ml
AB-707		
01/04/14	1204	None Detected
03/10/14	1432	None Detected
05/22/14	1481	None Detected
09/03/14	1127	None Detected
10/27/14	1267	None Detected
AB-708		
01/04/14	856	None Detected
03/10/14	843	None Detected
05/22/14	1004	None Detected
09/03/14	690	None Detected
10/27/14	873	None Detected
AB-709		
01/10/14	904	None Detected
03/11/14	594	None Detected
05/22/14	725	None Detected
09/04/14	742	None Detected
10/29/14	906	None Detected
AB-710		
01/04/14	877	None Detected
03/10/14	954	None Detected
05/22/14	1157	None Detected
09/03/14	1330	None Detected
10/27/14	1070	None Detected
AB-711		
01/04/14	1060	None Detected
03/10/14	859	None Detected
05/22/14	704	None Detected
09/03/14	483	None Detected
10/27/14	810	None Detected
AB-712		
01/10/14	419	None Detected
03/11/14	276	None Detected
05/23/14	556	None Detected
09/04/14	690	None Detected
10/29/14	1246	None Detected

Sample Point Sample Date	Tritium pCi/L	Total Gamma Activity µCi/ml
AB-715		
01/04/14	553	None Detected
03/10/14	524	None Detected
05/22/14	498	None Detected
09/04/14	721	None Detected
10/29/14	578	None Detected
AB-717		
01/10/14	<253	None Detected
03/11/14	<247	None Detected
05/28/14	<228	None Detected
09/09/14	273	None Detected
10/28/14	<274	None Detected
MW-701		
03/27/14	<232	None Detected
05/23/14	<234	None Detected
09/09/14	<231	None Detected
10/29/14	<237	None Detected
MW-702		
03/27/14	<232	None Detected
05/29/14	<234	None Detected
09/11/14	<237	None Detected
10/30/14	<237	None Detected
MW-703		
03/27/14	<232	None Detected
05/29/14	<234	None Detected
09/11/14	<237	None Detected
10/30/14	<237	None Detected
MW-704		
03/27/14	<232	None Detected
05/29/14	<234	None Detected
09/10/14	<231	None Detected
10/30/14	<237	None Detected
MW-705		
03/27/14	<232	None Detected
05/28/14	<234	None Detected
09/09/14	<231	None Detected
10/28/14	<237	None Detected
MW-706		
03/27/14	<232	None Detected
05/29/14	<234	None Detected
09/09/14	<231	None Detected
10/28/14	<237	None Detected

4.0 METEOROLOGICAL DATA

See Appendix A for missing meteorological data and the joint frequency distribution tables for the report period.

5.0 SOLID WASTE DISPOSAL

Table 5.1 is a summation of solid radioactive waste shipped during 2014. Presented are the types of waste, major nuclide composition, disposition of the waste and shipping containers used. Table 5.1 als(contains the radionuclide content (curies) and percent abundance for each type of waste.

There was no solid radioactive waste shipped in 2014.

Table 5.1
Solid Waste and Irradiated Fuel Shipments

A. Solid Radioactive Waste Shipped Off-Site for Burial or Disposal

1. Type of Waste with Estimate of Major Nuclide Composition

Resins, Filters, and Evaporator Bottoms	Volume		Curies Shipped
Waste Class	ft^3	m^3	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Estimate of Major Nuclides for Resins, Filters, and Evaporator Bottoms:

Nuclide	% Abundance	Curies
None	NA	NA

Dry Active Waste	Volume		Curies Shipped
Waste Class	ft^3	m^3	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Estimate of Major Nuclides for Dry Active Waste:

Nuclide	% Abundance	Curies
None	NA	NA

Table 5.1 (continued)
Solid Waste and Irradiated Fuel Shipments

Irradiated Components	Volume		Curies Shipped
Waste Class	ft^3	m^3	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Estimate of Major Nuclides for Irradiated Components:

Nuclide	% Abundance	Curies
None	NA	NA

Other Waste (DAW-Asbestos)	Volume		Curies Shipped
Waste Class	ft^3	m^3	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Estimate of Major Nuclides for Other Waste:

Nuclide	% Abundance	Curies
None	NA	NA

Sum of All Low-Level Waste	Volume		Curies Shipped
Waste Class	ft^3	m^3	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Estimate of Major Nuclides for All Low-Level Waste:

Nuclide	% Abundance	Curies
None	NA	NA

Table 5.1 (continued)
Solid Waste and Irradiated Fuel Shipments

2. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
None	NA	NA

B. Irradiated Fuel Shipments

Number of Shipments	Mode of Transportation	Destination
None	NA	NA

No irradiated fuel shipments were made from the Kewaunee Power Station during 2014.

6.0 SUPPLEMENTAL INFORMATION

6.1 Abnormal Releases or Abnormal Discharges

No abnormal releases or abnormal discharges were made from the Kewaunee Power Station during the report period.

6.2 Non-routine Planned Discharges

No non-routine planned discharges were made from the Kewaunee Power Station during the reporting period.

6.3 Program Revisions

In accordance with Technical Specification 5.6.2, the revisions to the Process Control Program, Offsite Dose Calculation Manual, Radiological Environmental Monitoring Program and radioactive waste treatment systems are listed below.

6.3.1 Process Control Program

There were no revisions made to the Process Control Program.

6.3.2 Offsite Dose Calculation Manual

The Kewaunee Power Station Offsite Dose Calculation Manual (ODCM) was revised once during this report period. Appendix B is a copy of the Kewaunee Power Station ODCM Revision 17, September 25, 2014.

6.3.3 Radiological Environmental Monitoring Manual

The Kewaunee Power Station Radiological Environmental Monitoring Manual (REMM) was not revised during this report period.

6.4 Major Changes to the Radioactive Liquid, Gaseous and Solid Waste Treatment Systems

The following changes were made to the radioactive waste systems (liquid, gaseous or solids):

a) System abandonment evaluations were performed using procedure OP-KW-DEC-SYC-001, System Evaluation and Categorization, and documented on Attachment B, SSC Category Determination Document. The following is a summary from the applicable Attachment B for the changes made to the following radioactive waste treatment systems:

- 17 – Auxiliary Ventilation System
- 32A – Waste Disposal Liquid System
- 32D – Solid Radwaste System

Modification DC-000-KW-02008, Disable R-13/R-14 Trip of Aux Bldg Exhaust Fans, was an additional change to system 17 – Auxiliary Ventilation System.

On February 25, 2013, DEK submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(10(ii). Therefore, the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2).

Auxiliary Ventilation System

A partial abandonment of this system was implemented to reduce the redundancy of fan coil units and fans in the auxiliary building, and remove charcoal from the Spent Fuel Pool Exhaust Fans. Also, a modification was implemented that disabled the R-13/R-14 high radiation trip of the Auxiliary Building Exhaust Fans in order to maintain cooling of spent fuel in the spent fuel pool if the fuel becomes uncovered.

Waste Disposal Liquid System

A partial abandonment of this system was implemented to reduce redundant equipment that is no longer required for liquid waste disposal.

Solid Radwaste System

A partial abandonment of this system was implemented for those components of the system no longer required to collect, prepare, and package solid radioactive waste for shipment.

b) Refer to Attachment C, Documentation for Major Changes to Radioactive Waste Treatment Systems in 2014, for information to support the reason for the changes, including a description of the equipment, components, and processes involved and interfaces with other plant systems.

c) The changes described in Attachment C either reduced or eliminated the release paths of radioactive effluents from the specified systems. Therefore, as can be substantiated by comparing the 2013 and 2014 Annual Radiological Effluent Release Reports, the amount of radioactive material released will decrease or reach a statistical equilibrium, and subsequently the exposure to individuals in the UNRESTRICTED AREA and to the general population will decrease or reach a statistical equilibrium.

d) There is no exposure expected by plant personnel as a result of the changes to these waste treatment systems.

e) Refer to Attachment C, Documentation for Major Changes to Radioactive Waste Treatment Systems in 2014, for FSRC review and approval documentation of these changes to the radioactive waste treatment systems.

6.5 Effluent Monitoring System Inoperability

6.5.1 There were no effluent radiation monitors inoperable for the consecutive time period listed in the ODCM for this report period.

6.6 Corrections to Previous Reports

6.6.1 None.

6.7 Other

6.7.1 R-20, Service Water System Monitor, functional test did not respond.

R-20 was declared non-functional on 12/29/2014 due to detector failure. Contingency sampling was implemented as required by the ODCM. The detector was replaced and R-20 was returned tc service on 12/31/2014. CR568319.

Appendix A

Kewaunee Power Station

2014 Meteorological Data

Missing Data

First Quarter: 3.75 hours
Second Quarter: 9.00 hours
Third Quarter: 0.00 hours
Fourth Quarter: 5.75 hours

Note: A total of 18.50 hours of data is missing or otherwise unavailable. This represents the availability of 99.79% of the data for the year.

APPENDIX A
Kewaunee Power Station 2014 Meteorological Data

First Quarter 2014

Stability Class A

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.25	3.75	31.25	21.5	2.5	0	59.25
NNE	0	0	2.75	14.5	10.5	2.75	0.5	31
NE	0	0	7.75	15	4	0	0	26.75
ENE	0	0	4.5	4.75	0	0	0	9.25
E	0	0	3	4.25	1	0.75	0	9
ESE	0	0	1	2	3.75	1	0	7.75
SE	0	0	1.25	4	4.25	3.5	1.25	14.25
SSE	0	0	0.75	4	31.25	15	8.5	59.5
S	0	0	4.75	27	21.5	8	0	61.25
SSW	0	0.75	24	37	7.5	1.75	0	71
SW	0	1	14.5	17	7	4.5	0	44
WSW	0	0.25	9.5	20.75	13	7.5	2.5	53.5
W	0	0.75	27	37	30.75	0.25	0	95.75
WNW	0	0.25	19	25.75	12.75	0	0	57.75
NW	0	0.25	10.75	39.75	9.25	1.5	0	61.5
NNW	0	0.5	11.75	53.5	13	0	0	78.75
TOTAL	0	4	146	337.5	191	49	12.75	740.25

Stability Class B

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	2.75	14.75	8	2	1	28.5
NNE	0	0	1.25	2	0	0	0	3.25
NE	0	0	0.5	1.75	0.25	0	0	2.5
ENE	0	0.25	0.25	0.5	0	0	0	1
E	0	0.5	0	0.25	0.5	0	0	1.25
ESE	0	0	0.25	0	0	0.25	0	0.5
SE	0	0	0.5	0	0	0.75	0	1.25
SSE	0.25	0.5	0.75	0.5	3.25	1.25	0	6.5
S	0	0	1.75	4.75	2.75	0.25	0	9.5
SSW	0	0.25	12	7.75	2	0	0	22
SW	0	0.25	5	2.25	3	0	0	10.5
WSW	0	0.75	5	2.25	1.75	0	0	9.75
W	0	0.5	1.5	5.75	2	0	0	9.75
WNW	0	0.75	5.25	6.75	1.25	0	0	14
NW	0	0.25	3.5	9	3.5	1.5	0	17.75
NNW	0	1	6.5	17.5	9.75	1.75	0	36.5
TOTAL	0.25	5	46.75	75.75	38	7.75	1	174.5

Stability Class C

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.5	3	5	0.5	0	0.5	9.5
NNE	0	0.25	1.25	1.5	0	0	0	3
NE	0	0	0.5	3.75	0	0	0	4.25
ENE	0	0.25	0.5	0.25	0	0	0	1
E	0	0.5	0	0	0	0	0	0.5
ESE	0	0	0.25	0	0	0	0	0.25
SE	0	0.25	0.25	0.25	0	0	0	0.75
SSE	0	0	1.5	1.75	2.75	0.5	0	6.5
S	0	0.5	0.75	2.5	2.75	0	0	6.5
SSW	0	0	5.75	5.25	3	0.25	0	14.25
SW	0	1.75	3	3.25	2.5	0.75	0	11.25
WSW	0	1.25	5.25	4	6.5	0.25	0	17.25
W	0	0.75	2.25	7.5	4.75	0	0	15.25
WNW	0	0.5	5.25	10.75	1	0	0	17.5
NW	0	1.25	3	7.5	5.25	0.25	0	17.25
NNW	0	0.5	5.25	10.5	4.5	0.5	0	21.25
TOTAL	0	8.25	37.75	63.75	33.5	2.5	0.5	146.25

Stability Class D

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.25	5	15.75	0.75	0	0	21.75
NNE	0	0.75	3	5	0.25	0	0	9
NE	0	0	2.75	4.25	0	0	0	7
ENE	0	0	0.5	1	0	0	0	1.5
E	0.5	0.25	0	0	0.75	0.25	0	1.75
ESE	0	0.5	1.25	0.75	0.5	0.25	0.5	3.75
SE	0	0.5	3.25	0.5	1.5	0.5	0.5	6.75
SSE	0.25	0.75	3.25	3	6.75	0.75	0	14.75
S	0	0.75	8.25	4.5	2.5	1	0	17
SSW	0.5	1	15	17.5	7	0	0	41
SW	0	0.75	11.5	7.25	4.75	0.25	0	24.5
WSW	0	2.25	9.5	17.25	10.5	4.75	0.75	45
W	0	4.25	13.75	47.25	38.25	0.5	0	104
WNW	0	5	13.25	40.25	6.75	0	0	65.25
NW	0	3	8.25	12.25	16.5	0.75	0	40.75
NNW	0	1.75	8.75	15.5	16.25	0	0	42.25
TOTAL	1.25	21.75	107.25	192	113	9	1.75	446

Stability Class E

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1	2.25	5.75	0	0	0	[illegible].5
NNE	0	0.5	0.25	0.25	0	0	0	25
NE	0	0	1.75	1.75	0	0	0	375
ENE	0	0.25	0.5	0.75	0	0	0	[illegible].5
E	0.25	0.5	1	1.75	0.5	0.25	0	4.[illegible]5
ESE	0.5	0.25	1.5	0	0	0	0	2.[illegible]5
SE	0	0.75	0.25	0.25	0	0	0.5	1.75
SSE	0	0.25	2.75	1.5	5.25	0.25	0.25	10.275
S	0.25	2.5	8.75	2.25	1	0.25	0	[illegible]47
SSW	0	4.5	19	3.75	0	0	0	27.229
SW	0	3.75	9.5	3	0	0	0	16.217
WSW	0	1	15.5	20	0.5	0	0	325
W	0	3.25	27.25	28.75	0.5	0	0	59.775
WNW	0	1.75	26.75	20.75	0.25	0	0	4925
NW	0.25	3.5	9.25	11.5	2.25	0	0	26.725
NNW	0	2.25	7.25	5.5	1	0	0	1[illegible].5
TOTAL	1.25	26	133.5	107.5	11.25	0.75	0.75	2875

Stability Class F

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.25	0.75	0.25	0	0	0	1.27
NNE	0	0	0.5	0.5	0.75	0	0	1.75
NE	0.25	0	0.5	0.75	0	0	0	1.[illegible]5
ENE	0	0	0.5	0	0	0	0	0.[illegible]5
E	0	0.25	0.25	0	0	0	0	0.[illegible]5
ESE	0.5	0.25	0.5	0	0	0	0	1.25
SE	0	0.75	0	0	0	0	0	0.75
SSE	0	0.25	0	0.25	1.25	0	0	1.75
S	0	1.75	0.5	0.25	0	0	0	2.[illegible]5
SSW	0.25	4.25	8.75	0	0	0	0	13.25
SW	0.25	4.5	11	3	0	0	0	18.75
WSW	0	2	18	8	0.5	0	0	28.[illegible]5
W	0	1.5	20.5	7.25	0	0	0	29.25
WNW	0.75	3.25	8.25	8.5	0	0	0	20.758
NW	0	3	13	5.25	0	0	0	21.25
NNW	0	1	5	1	0	0	0	75
TOTAL	2	23	88	35	2.5	0	0	150.55

APPENDIX A
Kewaunee Power Station 2014 Meteorological Data

Stability Class G

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.25	1.75	0	0	0	0	2
NNE	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0
ESE	0	0	0.25	0	0	0	0	0.25
SE	0	0	0	0	0	0	0	0
SSE	0	0.25	0	0.25	1.5	0.25	0	2.25
S	0	0	0	0	0	0	0	0
SSW	0	2.75	6.5	0	0	0	0	9.25
SW	0	3	18.25	0.25	0	0	0	21.5
WSW	0	7	32.25	1.25	0	0	0	40.5
W	0	7.25	52	11.5	0	0	0	70.75
WNW	0	5	14.75	3.5	0	0	0	23.25
NW	0	3.75	25	12.25	0	0	0	41
NNW	0	0	6.5	0.5	0	0	0	7
TOTAL	0	29.25	157.25	29.5	1.5	0.25	0	217.75

Second Quarter 2014

Stability Class A

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	6.5	15	5	1.5	0.25	28.25
NNE	0	0	12.25	38.25	33.25	7	0	90.75
NE	0	0.75	22.5	23.75	4.25	0	0	51.25
ENE	0	1	13	7.5	0.25	0	0	21.75
E	0	2.5	7.5	6.25	1.5	0	0	17.75
ESE	0	1	4.75	0.75	0	0	0	6.5
SE	0	0.75	6.5	1.5	2.25	0.75	0	11.75
SSE	0	0.5	5	5.5	11	3.25	0.25	25.5
S	0	1.5	5	9.25	7.75	0.25	0	23.75
SSW	0	0.75	6	1.75	0.25	0	0	8.75
SW	0	0.5	2.75	6	1.25	0	0	10.5
WSW	0	0.75	6.25	10.75	9.5	0.25	0	27.5
W	0	0.5	5.75	15.25	6.5	0.25	0	28.25
WNW	0	0.25	7	15.25	6.5	0	0	29
NW	0	0	4	7.75	4.75	0	0	16.5
NNW	0	0	10	13.75	12.5	3.5	0.5	40.25
TOTAL	0	10.75	124.75	178.25	106.5	16.75	1	438

Stability Class B

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0.75	1	0.25	0.25	0	2.25
NNE	0	0.25	2.5	12.25	3.5	2	1.25	21.75
NE	0	0.5	4.5	1.75	0	0	0	6.75
ENE	0	0.25	2	1.75	0	0	0	4
E	0	1	3.25	0.25	0.5	0	0	5
ESE	0	0.5	0.75	0	0	0	0	1.25
SE	0	0.75	1.25	0.25	0.5	0	0	2.75
SSE	0	0	1	0.5	1.25	0.25	0	3
S	0	0.25	0.75	3.25	0.75	0	0	5
SSW	0	0.25	3	0.25	0	0	0	3.5
SW	0	0	0.5	1.25	0.25	0	0	2
WSW	0	0	1	1	1	0	0	3
W	0	0.25	0.75	8.25	1.5	0	0	10.75
WNW	0	0	0.75	3.5	1.25	0	0	5.5
NW	0	0	0.25	3.25	1	0	0	4.5
NNW	0	0	2.25	3.25	0	0	0.25	5.75
TOTAL	0	4	25.25	41.75	11.75	2.5	1.5	86.75

APPENDIX A

Kewaunee Power Station 2014 Meteorological Data

Stability Class C

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0.5	1.5	0	0	0	2
NNE	0	0	1.75	10.75	4.5	0.25	0	17.25
NE	0	0	2.75	3.5	0	0	0	6.25
ENE	0	0.25	2	1.75	0	0	0	4
E	0	0.5	4.5	0.75	0.5	0	0	6.25
ESE	0	1.25	1.5	0	0	0	0	2.75
SE	0	0.25	1.5	0.5	1	0	0	3.25
SSE	0	0	1	0.75	1.25	0.25	0	3.25
S	0	0.25	1	1	0.25	0.25	0	2.75
SSW	0	0.75	2.75	2	0.25	0	0	5.75
SW	0	0.25	0.25	1.5	0.25	0	0	2.25
WSW	0	0	1.5	1.75	3.5	0.25	0	7
W	0	0.25	1	6.5	3.5	0	0	11.25
WNW	0	0	0.75	3.75	4.5	0.25	0	9.25
NW	0	0	0.5	4.75	3.75	0	0	9
NNW	0	0.25	1.5	3.75	2.25	0	0	7.75
TOTAL	0	4	24.75	44.5	25.5	1.25	0	100

Stability Class D

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.25	0.75	5	4	1.75	0	0	11.75
NNE	0	1.75	17.75	33.75	19.25	0	0	72.5
NE	0	1.5	10.75	6.5	0	0	0	18.75
ENE	0	4	6.5	1.5	0	0	0	12
E	0	5	5.5	3	0.5	0	0	14
ESE	0	4.25	3	1	0	0	0	8.25
SE	0	2.75	5.25	0.25	3.25	0.5	0	12
SSE	0	1	5.25	8	4.25	0.25	0	18.75
S	0	1.25	6.25	8.75	2	0	0.25	18.5
SSW	0	1	6.75	10	0	0	0	17.75
SW	0	2.5	1.25	2.5	0.5	0	0	6.75
WSW	0	0.25	2.75	1.5	0.5	0.5	0	5.5
W	0	0.5	5	8.25	1.75	0	0	15.5
WNW	0	0.25	4.5	10.75	0.75	0	0	16.25
NW	0	0.5	4.25	7.5	9.5	1.25	0	23
NNW	0	0.25	3.5	12.5	4.5	0	0.75	21.5
TOTAL	0.25	27.5	93.25	119.75	48.5	2.5	1	292.75

APPENDIX A
Kewaunee Power Station 2014 Meteorological Data

Stability Class E

Wind Direction	Wind Speed CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	3.25	6.25	3	0	0	0	12.5
NNE	0	3	26.25	48.25	5.5	0	0	83
NE	0	7.25	17.75	8	0.5	0	0	33.5
ENE	0.25	5.5	6.5	2.25	0.25	0	0	14.75
E	0	7.25	2.5	0.75	2	0	0	12.5
ESE	0.25	8.25	3.25	1.75	1.75	0.5	0	15.75
SE	0	4.5	7.5	1.25	3.5	0.25	0	17
SSE	0	4	10	6.25	1	0.25	0	21.5
S	0	3.5	16.25	16	3	0.75	0	39.5
SSW	0.25	2.5	17.5	7	0	0	0	27.25
SW	0.25	1.75	6.75	4.75	4.25	0.5	0	18.25
WSW	0.25	2.25	3.75	6.25	2.25	0	0	14.75
W	0.25	1.75	11.25	6	1.5	0	0	20.75
WNW	0	2.5	9.25	4.75	0	0	0	16.5
NW	0	3.75	4	7.5	0.25	0	0	15.5
NNW	0.25	3	4.25	1	0	0	0	8.5
TOTAL	1.75	64	153	124.75	25.75	2.25	0	371.5

Stability Class F

Wind Direction	Wind Speed CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	3.25	8.5	0	0	0	0	11.75
NNE	0	3.25	11.5	12.25	0.5	0	0	27.5
NE	0.25	7.25	13	4.25	0	0	0	24.75
ENE	0.25	6.5	7.5	3	0.25	0	0	17.5
E	0.25	5.75	5.75	0.75	2.5	0	0	15
ESE	0	5.5	5	1.75	1.25	0.75	0	14.25
SE	0	8.5	8.75	1	0	0.25	0	18.5
SSE	0	5.25	13.5	6.25	2	0.25	0	27.25
S	0	2.5	16.75	11.75	0.5	0.25	0	31.75
SSW	0	5.5	12.75	3	0.25	0	0	21.5
SW	0	3.25	6.25	3	0.5	0	0	13
WSW	0	2.5	6.25	4.25	0	0	0	13
W	0	3	2.25	0.75	0	0	0	6
WNW	0	2.25	5.75	0.5	0	0	0	8.5
NW	0	1.25	3	0	0	0	0	4.25
NNW	0	3	6	0.25	0	0	0	9.25
TOTAL	0.75	68.5	132.5	52.75	7.75	1.5	0	263.75

APPENDIX A

Kewaunee Power Station 2014 Meteorological Data

Stability Class G

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	7.25	5.75	0	0	0	0	13
NNE	0	6.5	7	3.25	0.75	0	0	17.5
NE	0.25	10.75	27.5	5.75	0	0	0	44.25
ENE	0.25	7.5	14	3.25	0	0	0	25
E	1	12	11.75	1.75	0	0	0	26.5
ESE	0.5	13.25	8.25	2	0.5	0	0	24.5
SE	0.25	12.25	16.75	0	0.5	0	0	29.75
SSE	0.5	12	65.25	68.25	8.25	0.25	0	154.5
S	0.75	13.75	56.25	39.25	1	0	0	111
SSW	0.5	15	20	2	0	0	0	37.5
SW	0.25	11.75	21	1.25	0	0	0	34.25
WSW	0	5.75	24.75	6.25	0	0	0	36.75
W	0.75	5	16.5	0.5	0	0	0	22.75
WNW	0.25	7.5	9.75	0.25	0	0	0	17.75
NW	0.5	7	7.75	0.5	0	0	0	15.75
NNW	0.5	8	3	0	0	0	0	11.5
TOTAL	6.25	155.25	315.25	134.25	11	0.25	0	622.25

Third Quarter 2014

Stability Class A

Wind Speed

Wind Direction

	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	10.5	19	2	0	0	31.5
NNE	0	0.25	15.75	28.75	5.5	2.25	0	52.5
NE	0	3	15.5	1.5	0	0	0	20
ENE	0	5.5	10.25	0.5	0	0	0	16.25
E	0	12.5	10	0	0	0	0	22.5
ESE	0	2.75	10.5	0	0	0	0	13.25
SE	0	2.25	12.75	5.25	0	0	0	20.25
SSE	0	0.5	7.25	11.75	6.25	0	0	25.75
S	0	0.25	4.75	8.25	0.75	0.25	0	14.25
SSW	0	0.5	4.75	5.75	0	0	0	11
SW	0	0.25	5.25	3	0	0	0	8.5
WSW	0	1	18.75	20.75	0	0	0	40.5
W	0	2.5	19.5	15.75	0	0	0	37.75
WNW	0	0.25	22.75	10.75	0.75	0	0	34.5
NW	0	0	13.75	11	0.75	0	0	25.5
NNW	0	0.5	16	19.25	4.75	0	0	40.5
TOTAL	0	32	198	161.25	20.75	2.5	0	414.5

Stability Class B

Wind Speed

Wind Direction

	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.5	3.75	3	0	0	0	7.25
NNE	0	0	1.5	4.5	1.25	0	0	7.25
NE	0	0.5	1.75	0.5	0	0	0	2.75
ENE	0	0.75	1.25	0	0	0	0	2
E	0	0.5	0.5	0	0	0	0	1
ESE	0	1.25	3.25	0	0	0	0	4.5
SE	0	0.75	1.5	1	0	0	0	3.25
SSE	0	0.25	2.75	0.5	0.75	0	0	4.25
S	0	0	1.5	0.5	2	0	0	4
SSW	0	0	0.75	0	0	0	0	0.75
SW	0	0	0.5	0.5	0	0	0	1
WSW	0	0	2.75	1.5	0	0	0	4.25
W	0	0.5	3.25	0.5	0	0	0	4.25
WNW	0	0	3.75	0.75	0	0	0	4.5
NW	0	0	2.5	0.5	0	0	0	3
NNW	0	0	1	3	1.75	0	0	5.75
TOTAL	0	5	32.25	16.75	5.75	0	0	59.75

APPENDIX A
Kewaunee Power Station 2014 Meteorological Data

Stability Class C

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.25	1	2.5	0	0	0	3.75
NNE	0	0	3.75	6.25	0	0	0	10
NE	0	1	3.25	0.25	0	0	0	4.5
ENE	0	0	3.25	0	0	0	0	3.25
E	0	0.5	6.5	0	0	0	0	7
ESE	0	3	7.25	0	0	0	0	10.25
SE	0	2.25	1.25	1.5	0	0	0	5
SSE	0	0.25	1.5	0.5	0.25	0	0	2.5
S	0	1	0.5	0.25	1.5	0	0	3.25
SSW	0	0	0.75	0	0	0	0	0.75
SW	0	0	0	0.75	0	0	0	0.75
WSW	0	0.25	1.5	1.25	0	0	0	3
W	0	0.5	1.5	0.75	0	0	0	2.75
WNW	0	0.25	4	0.75	0	0	0	5
NW	0	0	2	1	1.25	0	0	4.25
NNW	0	0	0.5	7	3	0	0	10.5
TOTAL	0	9.25	38.5	22.75	6	0	0	76.5

Stability Class D

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1.75	4	10.5	1	0	0	17.25
NNE	0	0.75	11	12.25	0.75	0	0	24.75
NE	0	2.75	4.75	0	0	0	0	7.5
ENE	0	1.75	0.5	0	0	0	0	2.25
E	0	3.25	3.75	0	0	0	0	7
ESE	0	4	7.25	0	0	0	0	11.25
SE	0	2	11	2.25	0	0	0	15.25
SSE	0	0.25	6	2.25	0.25	0	0	8.75
S	0	2.5	9.25	3.75	3.25	0	0	18.75
SSW	0	1.5	7.5	5	0	0	0	14
SW	0	1	3	5.75	0	0	0	9.75
WSW	0.25	1.5	5.5	7.75	0	0	0	15
W	0	2	8.5	2	0.25	0	0	12.75
WNW	0	3.25	12.25	0.5	0	0	0	16
NW	0	0.75	11.25	2.25	3.75	0	0	18
NNW	0	1.75	5.25	13	10.25	0.25	0	30.5
TOTAL	0.25	30.75	110.75	67.25	19.5	0.25	0	228.75

Stability Class E

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	2.75	11	1.75	0	0	0	15[illegible]9
NNE	0	4	18.25	4.5	0.5	0	0	27.[illegible]1
NE	0	5.5	6.75	0.5	0	0	0	12.[illegible].5
ENE	0	5.25	4.25	0	0	0	0	9[illegible].5
E	0	7.25	4.25	0	0	0	0	11[illegible]25
ESE	0	8.5	6.5	0	0	0	0	[illegible]25
SE	0	7	10.25	3.5	0	0	0	20.75
SSE	0	6.25	10.75	5.25	2.5	0	0	24.25
S	0	3	28	15.25	0.75	0	0	[illegible]5
SSW	0	5.25	21.75	2	0	0	0	[illegible]25
SW	0	3.5	10.5	3	0	0	0	[illegible]25
WSW	0	3.75	14.75	6.25	0.5	0	0	25.37
W	0	2.25	15	1.5	0	0	0	18.75
WNW	0	3.25	17	4.5	0.25	0	0	[illegible].5
NW	0	6.5	20	0.5	3.25	0	0	30.25
NNW	0	3.75	14.75	2.75	0.25	0	0	21[illegible]6
TOTAL	0	77.75	213.75	51.25	8	0	0	350.[illegible]1

Stability Class F

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	5	1.75	0	0.25	0	0	[illegible]5
NNE	0	3.25	1	1.25	0	0	0	5.5
NE	0	6.5	3.75	0	0	0	0	10.25
ENE	0	2.75	2	0	0	0	0	4.75
E	0	1	3.5	0.25	0	0	0	4.75
ESE	0	2.5	5.75	0	0	0	0	8.25
SE	0	2.5	13.75	0	0	0	0	16.25
SSE	0	4.25	19	2.5	1.75	0	0	27.5
S	0	5	40.5	11.75	0.25	0	0	57.5
SSW	0	8.25	36	1.25	0	0	0	45.5
SW	0	6.75	12	0.5	0	0	0	19.25
WSW	0	3	18.75	2.75	0	0	0	24.5
W	0	4	16.75	0.5	0	0	0	21.25
WNW	0	5.25	22	0.75	0	0	0	2[illegible]5
NW	0	4	8.25	0	0	0	0	12.25
NNW	0	9	7.25	0.5	0	0	0	16.77
TOTAL	0	73	212	22	2.25	0	0	309.25

Stability Class G

Wind Speed

Wind Direction

	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.75	9.25	2	0	0	0	0	12
NNE	0.5	5	2	1.25	0	0	0	8.75
NE	0.25	1.5	2.75	0.75	0	0	0	5.25
ENE	0	2	2.25	0	0	0	0	4.25
E	0	3.5	1.5	0	0	0	0	5
ESE	0	6.25	4	0	0	0	0	10.25
SE	0	6.75	14	2.25	0.75	0	0	23.75
SSE	0	12	77.5	42.5	0.75	0	0	132.75
S	0.5	20.75	101	67.5	2	0.5	0.25	192.5
SSW	0.25	28.5	28	0.75	0	0	0	57.5
SW	0.25	26.75	16.5	0.25	0	0	0	43.75
WSW	0.5	30	32	0	0	0	0	62.5
W	0	25.75	72.5	0.25	0	0	0	98.5
WNW	0	16.25	25.5	0.25	0	0	0	42
NW	0	34	9	0.25	0	0	0	43.25
NNW	0	20.75	5.75	0	0	0	0	26.5
TOTAL	3	249	396.25	116	3.5	0.5	0.25	768.5

APPENDIX A
Kewaunee Power Station 2014 Meteorological Data

Fourth Quarter 2014

Stability Class A

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	2.75	21.75	15.75	5.25	0	45.5
NNE	0	0.75	1.25	2	5.75	1	2.5	13.25
NE	0	0.75	3.5	3	0	0	0	7.25
ENE	0	0.5	3.5	0.5	0.25	0	0	4.75
E	0	1.5	1.75	6.75	2.25	0	0	12.25
ESE	0	2.75	5	4.5	2.5	0	0	14.75
SE	0	1.25	4.5	13.75	8	0	0	27.5
SSE	0	1.75	5	13.5	28.75	3.5	0	52.5
S	0	2	5	26.75	8	1	0	42.75
SSW	0	2.25	8	13.25	0	0	0	23.5
SW	0	2.75	8.5	27.5	5.75	0	0	44.5
WSW	0	5.25	30.75	28	3.5	0	0	67.5
W	0	2.75	29.75	74.75	20	0	0	127.25
WNW	0	0.25	17	55	9.75	0	0.25	82.25
NW	0	1	17.25	23.25	8.75	0	0	50.25
NNW	0	0	19	44.75	13	3.25	0	80
TOTAL	0	25.5	162.5	359	132	14	2.75	695.75

Stability Class B

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.5	4.75	9.5	2	2.5	0.5	19.75
NNE	0	1	0.75	0.5	1.5	1.25	0	5
NE	0	0.25	0	0.25	0	0	0	0.5
ENE	0	0.75	0.75	1.5	0	0	0	3
E	0	1.25	0.25	1.25	0.25	0	0	3
ESE	0	1.25	0	0.25	1.25	0	0	2.75
SE	0	0.25	1	1.5	0.5	0	0	3.25
SSE	0	0.25	0.25	1.5	1.5	0	0	3.5
S	0	0.25	0.75	7.75	0.5	0	0	9.25
SSW	0	0.25	2.25	8	0	0	0	10.5
SW	0	0.75	1.5	1.75	0.25	0	0	4.25
WSW	0	2.25	3.75	5	1.75	0	0	12.75
W	0	1	7.5	10.75	17	0	0	36.25
WNW	0	1.75	1.75	16.25	1.5	0	0	21.25
NW	0	1.25	4.5	2.25	5	0	0	13
NNW	0	1.5	4.5	10.25	2.25	0.25	0	18.75
TOTAL	0	14.5	34.25	78.25	35.25	4	0.5	166.75

APPENDIX A

Kewaunee Power Station 2014 Meteorological Data

Stability Class C

Wind Direction	Wind Speed CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	1.5	5.75	1.75	2.5	0	11.5
NNE	0	0	0	0.5	1.5	0.5	0	2.5
NE	0	0	0.25	0	0.5	0	0	0.75
ENE	0	0	0	3.25	0.25	0	0	3.5
E	0	0	0.5	0.5	0.5	0	0	1.5
ESE	0	0	1.25	0	0.75	0.5	0	2.5
SE	0	0.25	1	2	0	0	0	3.25
SSE	0	0.5	1.75	1	1.25	0	0	4.5
S	0	0.25	4.75	12	0.5	0	0	17.5
SSW	0	0	4	5.75	0.75	0	0	10.5
SW	0	0.75	4	2.5	0	0	0	7.25
WSW	0	0.25	10	9.25	6.5	0	0	26
W	0	0.25	4.75	11.25	10.25	0	0	26.5
WNW	0	0	2.75	15.75	4	0	0	22.5
NW	0	0.75	3.25	4	7	0	0	15
NNW	0	1.25	4.25	6	2	0	0	13.5
TOTAL	0	4.25	44	79.5	37.5	3.5	0	168.75

Stability Class D

Wind Direction	Wind Speed CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1.5	5	10.25	4	1.25	0	22
NNE	0	0.5	5.5	5.25	4	1.5	0	16.75
NE	0	0	1	0.25	0	0	0	1.25
ENE	0	1	0.25	3.75	0	0	0	5
E	0	1.75	2.25	1.25	0	0	0	5.25
ESE	0	1.5	3.5	6	3.75	0	0	14.75
SE	0	0.75	2	0.25	2.5	0	0	5.5
SSE	0	0.5	8	6.25	1.25	0	0	16
S	0	4.25	17.5	7.25	0.25	0	0	29.25
SSW	0	3.75	25	10.75	0	0	0	39.5
SW	0	6.25	18	8	0	0	0	32.25
WSW	0	4	16	8.5	4	0	0	32.5
W	0	3.25	25.75	33.5	1.25	0	0	63.75
WNW	0	5.5	15.25	33.75	0.75	0	0	55.25
NW	0	4.25	15.75	17.75	4.5	0	0	42.25
NNW	0	2.5	17	21.25	4.25	0	0	45
TOTAL	0	41.25	177.75	174	30.5	2.75	0	426.25

APPENDIX A

Kewaunee Power Station 2014 Meteorological Data

Stability Class E

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	3.25	4.25	0.75	1.25	0	0	9.5
NNE	0	1	5.25	6.25	4.5	1	0	18
NE	0	1.75	3.75	0.25	0	0	0	5.75
ENE	0	1.75	1.75	0	0	0	0	3.5
E	0	1.5	0.75	0	0	0	0	2.25
ESE	0	4.25	4.5	0	0	0	0	8.75
SE	0	2.75	0.75	0.25	0	0	0	3.75
SSE	0	1.75	7	3	2	0	0	13.75
S	0	7.5	41.5	12.75	0.25	0	0	62
SSW	0	7.75	49.25	5.25	0	0	0	62.25
SW	0	4.25	18.25	5.75	0	0	0	28.25
WSW	0	2.25	38.25	11.75	0	0	0	52.25
W	0	6	30.75	17	2.75	0	0	56.5
WNW	0	12	34.25	24.25	0	0	0.5	71
NW	0	6.75	15.5	2.75	0.25	0	0	25.25
NNW	0	2.75	10.25	3.75	3	0	0	19.75
TOTAL	0	67.25	266	93.75	14	1	0.5	442.5

Stability Class F

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1.75	1.75	0	0	0	0	3.5
NNE	0	1	0.75	0	0	0	0	1.75
NE	0	1.75	0.25	0	0	0	0	2
ENE	0	0.75	0.5	0	0	0	0	1.25
E	0	0.75	1	0	0	0	0	1.75
ESE	0	1.5	0.75	0	0	0	0	2.25
SE	0	1.75	2	0	0	0	0	3.75
SSE	0	3.25	5.5	5.25	0	0	0	14
S	0	9	5	3.5	0	0	0	17.5
SSW	0	8.75	16	0.5	0	0	0	25.25
SW	0	6.75	9.25	2.25	0	0	0	18.25
WSW	0	6.25	11.5	0.75	0	0	0	18.5
W	0	4	18.25	2.5	0	0	0	24.75
WNW	0	2.75	13.5	3.25	0	0	0	19.5
NW	0	2.25	8.5	0.25	0	0	0	11
NNW	0	2.5	5.75	2.5	0	0	0	10.75
TOTAL	0	54.75	100.25	20.75	0	0	0	175.75

APPENDIX A
Kewaunee Power Station 2014 Meteorological Data

Stability Class G

Wind Direction	Wind Speed CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	2.5	0	0	0	0	2.5
NNE	0	0.25	0	0	0	0	0	0.25
NE	0	0	0	0	0	0	0	0
ENE	0	0.25	0.25	0	0	0	0	0.5
E	0	0.25	0	0	0	0	0	0.25
ESE	0	0.5	0	0	0	0	0	0.5
SE	0	0.25	0.75	0	0	0	0	1
SSE	0	1.25	0.75	1	0	0	0	3
S	0	2.25	1	1	0	0	0	4.25
SSW	0	1	12.75	0	0	0	0	13.75
SW	0	2.25	25.25	0	0	0	0	27.5
WSW	0	1.75	12.75	0	0	0	0	14.5
W	0	2	20.5	1.75	0	0	0	24.25
WNW	0	1.25	18.75	0.25	0	0	0	20.25
NW	0	0.5	10.25	0	0	0	0	10.75
NNW	0	0	3.25	0	0	0	0	3.25
TOTAL	0	13.75	108.75	4	0	0	0	126.5

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Appendix B

Kewaunee Power Station

Offsite Dose Calculation Manual (ODCM)

Revision 17
September 25, 2014

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Dominion Energy Kewaunee, Inc.

Kewaunee Power Station

OFFSITE DOSE CALCULATION MANUAL (ODCM)

Revision 17
DATE: September 25, 2014

Approved By:	James M. Hale Manager - Radiological Protection and Chemistry	09/25/2014 Date
Approved By:	Richard P. Repshas Manager - Regulatory Affairs	09/25/2014 Date
Reviewed By:	Jeffrey T. Stafford Facility Safety Review Committee	09/25/2014 Date
Approved By:	A. J. Jordan Site Vice President	09/25/2014 Date

TABLE OF CONTENTS PAGE

PART II CALCULATIONAL METHODOLOGIES

APPENDICES

LIST OF TABLES PAGE

PART I – RADIOLOGICAL EFFLUENT CONTROLS

PART II CALCULATIONAL METHODOLOGIES

LIST OF FIGURES PAGE

Kewaunee Power Station

Offsite Dose Calculation Manual

PART I - RADIOACTIVE EFFLUENT CONTROLS

11.0 INTRODUCTION

The Kewaunee OFFSITE DOSE CALCULATION MANUAL (ODCM) is established and maintained pursuant to Technical Specifications Section 5.5.1. The ODCM consists of two parts: Radiological Effluent Controls, Part I, and Calculational Methodologies, Part II.

Part I, Radiological Effluent Controls, includes: (1) The Radioactive Effluent Control Specifications (RECS) and Radiological Environmental Monitoring Programs (REMP) required by Technical Specification 5.5.1 and (2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Radioactive Effluent Release Reports required by Technical Specifications 5.6.1 and 5.6.2 respectively.

Part II, Calculational Methodologies: provides the methodology to manually calculate radiation dose rates and doses to individual persons in UNRESTRICTED AREAS due to the routine release of gaseous and liquid effluents. Long term cumulative effects are usually calculated through computer programs employing approved methodology, often using real-time meteorology in the case of gaseous effluents. Other computer programs are utilized to routinely estimate the doses due to radioactivity in liquid effluents. Manual dose calculations are performed when computerized calculations are not available.

The methodology stated in this manual is acceptable for use in demonstrating compliance with 10CFR20.1302; 10CFR50, Appendix I; and 40CFR190.

More conservative calculational methods and/or conditions (e.g., location and/or exposure pathways) expected to yield higher computed doses than appropriate for the maximally exposed person may be assumed in the dose evaluations.

The ODCM will be maintained at the station for use as a reference guide and training document of accepted methodologies and calculations. Changes will be made to the ODCM calculational methodologies and parameters as is deemed necessary to assure reasonable conservatism in keeping with the principles of 10CFR50.36a and Appendix I for demonstrating radioactive effluents are ALARA.

11.1 Change Process

Instructions for defining the responsibilities and requirements for revision and control of both the ODCM and the RADIOLOGICAL ENVIRONMENTAL MONITORING MANUAL (REMM) are located in approved station procedure for Revision and Control of the REMM and ODCM.

13.0 USE AND APPLICATION

13.0.1 Definitions

---------------------------------NOTE---------------------------------
Terms defined in both Kewaunee Technical Specifications and the OFFSITE DOSE CALCULATION MANUAL appear in capitalized type and are applicable throughout the Radiological Effluent Controls Normal Conditions and Bases and the Calculational Methodologies.

Term	Definition
ACTION	Action shall be that part of a Normal Condition which prescribes remedial measures required under designated conditions.
CHANNEL CHECK	CHANNEL CHECK is a qualitative determination of acceptable FUNCTIONALITY by observation of channel behavior during operation. This determination shall include, where possible, comparison of the channel indication with other indications derived from independent channels measuring the same variable.
CHANNEL FUNCTIONAL TEST	A CHANNEL FUNCTIONAL TEST consists of injecting a simulated signal into the channel as close to the primary sensor as practicable to verify that it is FUNCTIONAL, including alarm and/or trip initiating action.
CHANNEL CALIBRATION	CHANNEL CALIBRATION consists of the adjustment of channel output as necessary, such that it responds with acceptable range and accuracy to known values of the parameter that the channel monitors. Calibration shall encompass the entire channel, including alarm and/or trip, and shall be deemed to include the CHANNEL FUNCTIONAL TEST.
FUNCTIONAL/ FUNCTIONALITY	As defined in the Technical Requirements Manual
GASEOUS RADWASTE TREATMENT SYSTEM	A GASEOUS RADWASTE TREATMENT SYSTEM is any system designed and installed to reduce radioactive gaseous effluents by collecting off-gases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity released to the environment.
MEMBER(S) OF THE PUBLIC	MEMBER(S) OF THE PUBLIC means any individual except when that individual is receiving an OCCUPATIONAL DOSE.

OCCUPATIONAL DOSE

OCCUPATIONAL DOSE means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation or to radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person. OCCUPATIONAL DOSE does not include doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released under 10 CFR 35.75, from voluntary participation in medical research programs, or as a MEMBER OF THE PUBLIC.

OFFSITE DOSE CALCULATION MANUAL

The OFFSITE DOSE CALCULATION MANUAL shall contain the current methodology and parameters used in the calculation of offsite doses due to radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm/trip setpoints, in the conduct of the Radiological Environmental Monitoring Program. Shall also contain the Radioactive Effluent Controls and Radiological Environmental Operating and Radioactive Effluent Release Reports required by TS 5.6.1 and TS 5.6.2.

ODCM NORMAL CONDITIONS (DNC)

Specify minimum requirements for ensuring safe operation of the facility. The Contingency Measures associated with a DNC state Nonconformances that typically describe the ways in which the requirements of the DNC can fail to be met. Specified with each stated Nonconformance are Contingency Measures and Restoration Time(s).

ODCM VERIFICATION REQUIREMENTS (DVR)

Verification requirements are requirements relating to test, calibration, or inspection to assure that the necessary FUNCTIONALITY of systems and components are maintained, that facility operation will be maintained within the current licensing basis, and that the ODCM Normal Condition (DNC) for operation will be met.

PROCESS CONTROL PROGRAM

The PROCESS CONTROL PROGRAM shall contain the current formulae, sampling, analyses, tests, and determinations to be made to ensure that the processing and packaging of solid radioactive wastes, based on demonstrated processing of actual or simulated wet solid wastes, will be accomplished in such a way as to ensure compliance with 10 CFR Part 20, 10 CFR Part 61, 10 CFR Part 71, Federal and State regulations, burial ground requirements, and other requirements governing the disposal of the radioactive waste.

Licensee initiated changes to the PCP, which was approved by the Commission prior to implementation:

1. Shall be documented and records of reviews performed shall be retained as required by the quality assurance program. The documentation shall contain:
    a. Sufficient information to support the change together with the appropriate analyses or evaluations justifying the change(s).
    b. A determination that the change will maintain the overall conformance of the solidified waste product to existing requirements of Federal, State, or other applicable regulations.
2. Shall become effective upon review and acceptance by the FSRC.

PUBLIC DOSE	PUBLIC DOSE means the dose received by a MEMBER OF THE PUBLIC from exposure to radiation or to radioactive material released by a licensee, or to any other source of radiation under the control of a licensee. PUBLIC DOSE does not include OCCUPATIONAL DOSE or doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released under 10 CFR 35.75, or from voluntary participation in medical research programs.
PURGE - PURGING	PURGE or PURGING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is required to purify the confinement.
RADIOLOGICAL ENVIRONMENTAL MONITORING MANUAL (REMM)	The REMM shall contain the current methodology and parameters used in the conduct of the radiological environmental monitoring program.
SITE BOUNDARY	The SITE BOUNDARY shall be that line beyond which the land is neither owned, leased, nor otherwise controlled by the licensee.
SOURCE CHECK	A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity.
UNRESTRICTED AREA	An UNRESTRICTED AREA shall be any area at or beyond the SITE BOUNDARY, access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, or any area within the SITE BOUNDARY used for residential quarters or for industrial, commercial, institutional, and/or recreational purposes. (See Plant Drawing A-408)
VENTILATION EXHAUST TREATMENT SYSTEM	A VENTILATION EXHAUST TREATMENT SYSTEM is any system designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in effluents by passing ventilation or vent exhaust gases through charcoal and/or HEPA filters for the purpose of removing iodines or particulates from the gaseous exhaust stream prior to the release to the environment. Such a system is not considered to have any effect on noble gas effluents. Engineered Safety Feature atmospheric cleanup systems (i.e., Auxiliary Building special ventilation, Shield Building ventilation, spent fuel pool ventilation) are not considered to be VENTILATION EXHAUST TREATMENT SYSTEM components.
VENTING	VENTING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is not provided or required during venting. Vent, used in system names, does not imply a VENTING process.

13.0 USE AND APPLICATION

13.0.2 Logical Connectors

Logical Connectors are discussed in Section 1.2 of the Technical Specifications and are applicable throughout the OFFSITE DOSE CALCULATION MANUAL and Bases.

13.0 USE AND APPLICATION

13.0.3 Restoration Times

Restoration Times are the same as Completion Times as discussed in Section 1.3 of the Technical Specifications and are applicable throughout the OFFSITE DOSE CALCULATION MANUAL and Bases.

When "Immediately" is used as a Restoration Time, the Contingency Measure should be pursued without delay in a controlled manner.

13.0 USE AND APPLICATION

13.0.4 Frequency

Frequency is discussed in Section 1.4 of the Technical Specifications and is applicable throughout the OFFSITE DOSE CALCULATION MANUAL and Bases

13.0 USE AND APPLICATION

13.0.5 ODCM Normal Condition (DNC) Applicability

DNC 13.0.5.1 DNCs shall be met during the specified conditions in the Applicability.

DNC 13.0.5.2 Upon discovery of a failure to meet the DNC, the Contingency Measures of the associated Nonconformance shall be met, except as provided in DNC 13.0.5.4.

DNC 13.0.5.3 When it is discovered that a DNC has not been met and the associated contingency measures are not satisfied within the specified restoration time (or an associated contingency measure is not provided), the equipment subject to the DNC is in a nonconforming condition. In this situation, appropriate actions shall be taken as necessary to provide assurance of continued safe plant operations. In addition a Condition Report shall be initiated and assessment of reasonable assurance of safety shall be conducted. Items to be considered for this assessment include the following:

- Availability of redundant or backup equipment;
- Compensatory measures, including limited administrative controls;
- Safety function and events protected against;
- Probability of needing the safety function; and
- Conservatism and margins.

If this assessment concludes that safety is sufficiently assured, the facility may continue to operate while prompt corrective action is taken.

DNC 13.0.5.4 Equipment removed from service or declared nonfunctional to comply with Contingency Measures may be returned to service under administrative control solely to perform testing required to demonstrate its FUNCTIONALITY or the FUNCTIONALITY of other equipment. This is an exception to DNC 13.0.5.2 for the system returned to service under administrative control to perform the testing required to demonstrate FUNCTIONALITY.

13.0 USE AND APPLICATION

13.0.6 ODCM VERIFICATION REQUIREMENTS (DVR) Applicability

DVR 13.0.6.1 DVRs shall be met during the specified conditions in the Applicability for individual DNCs, unless otherwise stated in the DVR. Failure to meet a DVR, whether such failure is experienced during the performance of the DVR or between performances of the DVR, shall be failure to meet the DNC. Failure to perform a DVR within the specified Frequency shall be failure to meet the DNC except as provided in DVR 13.0.6.3. DVR's do not have to be performed on nonfunctional equipment or variables outside specified limits

DVR 13.0.6.2 Each Verification Requirement shall be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the specified DVR frequency.

DVR 13.0.6.3 When it is discovered that a DVR frequency (including the 1.25 times extension) has not been met, the equipment subject to the DVR is in a nonconforming condition. In this situation, a Condition Report shall be initiated and, if indicated, determination to evaluate the impact on plant safety shall be performed in a timely fashion and in accordance with plant procedures.

Actions should be taken to restore conformance with the DNCs / DVRs in a timely fashion.

13.1 RADIOACTIVE LIQUID EFFLUENTS

13.1.1 Liquid Effluents Concentration

DNC 13.1.1 The concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS (Figure 14.1-1) shall be limited to:

a. 10 times the concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases; and

b. 2×10^{-4} μCi/ml total activity concentration for dissolved or entrained noble gases.

APPLICABILITY: During release via the monitored pathway.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS exceeds limits.	A.1 Initiate ACTION to restore concentration to within limits.	Immediately
B. CONTINGENCY MEASURES <u>OR</u> RESTORATION TIME not met.	B.1 Initiate a CR	In accordance with Corrective Action Program
	<u>AND</u>	
	B.2 Explain in the next Radioactive Effluent Release Report why the CONTINGENCY MEASURE was not met in a timely manner.	In accordance with Radioactive Effluent Release Report

VERIFICATION REQUIREMENTS

VERIFICATION		FREQUENCY
DVR 13.1.1.1	Perform radioactive liquid waste sampling and activity analysis.	In accordance with Table 13.1.1-1

----------NOTE---------- In this DVR the results of DVR 13.1.1.1 shall be used in accordance with the methodology and parameters of the ODCM.		In accordance with Table 13.1.1-1
DVR 13.1.1.2	Verify the results of the DVR 13.1.1.1 analyses to assure that the concentrations at the point of release are maintained within the limits of DNC 13.1.1.	

Table 13.1.1-1 (Page 1 of 2)
Radioactive Liquid Waste Sampling and Analysis

LIQUID RELEASE TYPE		TYPE OF ACTIVITY ANALYSIS	SAMPLE TYPE	SAMPLE FREQUENCY	MINIMUM ANALYSIS FREQUENCY	LOWER LIMIT OF DETECTION (LLD) (a)
1. Batch Waste Release Tanks (b)						
	a.	Principal Gamma Emitters(c)	Grab Sample	Each Batch (g)	Each Batch (g)	1×10^{-6} µCi/ml
	b.	I-131	Grab Sample	Each Batch (g)	Each Batch (g)	1×10^{-6} µCi/ml
	c.	Dissolved and Entrained Gases (gamma emitters)	Grab Sample	Each Batch (g)	31 days	1×10^{-5} µCi/ml
	d.	H-3	Composite (d)	Each Batch (g)	31 days	1×10^{-5} µCi/ml
	e.	Gross Alpha	Composite (d)	Each Batch (g)	31 days	5×10^{-7} µCi/ml
	f.	Sr-89	Composite (d)	Each Batch (g)	92 days	5×10^{-8} µCi/ml
	g.	Sr-90	Composite (d)	Each Batch (g)	92 days	5×10^{-8} µCi/ml
	h.	Fe-55	Composite (d)	Each Batch (g)	92 days	1×10^{-6} µCi/ml
2. Continuous Releases (e) (TB Sump)						
	a.	Principal Gamma Emitters (c)	Grab Sample	7 days	7 days	5×10^{-7} µCi/ml
	b.	I-131	Grab Sample	7 days	7 days	1×10^{-6} µCi/ml
	c.	Dissolved and Entrained Gases (gamma emitters)	Grab Sample	7 days	7 days	1×10^{-5} µCi/ml
	d.	H-3	Grab Sample	7 days	31 days(f)	1×10^{-5} µCi/ml
	e.	Gross Alpha	Composite (f)	7 days	31 days(f)	5×10^{-7} µCi/ml
	f.	Sr-89	Composite (f)	7 days	92 days(f)	5×10^{-8} µCi/ml
	g.	Sr-90	Composite (f)	7 days	92 days(f)	5×10^{-8} µCi/ml
	h.	Fe-55	Composite (f)	7 days	92 days(f)	1×10^{-6} µCi/ml

Table 13.1.1-1 (Page 2 of 2)
Radioactive Liquid Waste Sampling and Analysis

(a) The LLD is defined, for purposes of these DNC's, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 * S_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp^{(-\lambda \Delta t)}}$$

Where:

- LLD is the a priori lower limit of detection as defined above, as µCi per unit mass or volume,
- s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate, as counts per minute,
- E is the counting efficiency, as counts per disintegration,
- V is the sample size in units of mass or volume,
- 2.22×10^6 is the number of disintegrations per minute per microcurie,
- Y is the fractional radiochemical yield, when applicable,
- λ is the radioactive decay constant for the particular radionuclide, and
- Δt for plant effluents is the elapsed time between the midpoint of sample collection and time of counting.
- Typical values of E, V, Y and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement..

(b) A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed to assure representative sampling.

(c) The principal gamma emitters for which the LLD requirement applies, includes the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identified, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report pursuant to DNC 15.2.

(d) A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen that is representative of the liquids released.

(e) A continuous release is the discharge of liquid wastes of a nondiscrete volume, e.g., from a volume of a system that has an input flow during the continuous release.

(f) As a minimum, the monthly and quarterly composite samples shall be compromised of weekly grab samples.

(g) Complete prior to each release.

BASES

This DNC is provided to ensure that the concentration of radioactive materials released in liquid waste effluents to UNRESTRICTED AREAS will be less than ten times the concentration levels specified in 10 CFR Part 20, Appendix B, Table 2, Column 2. This limitation provides additional assurance that the levels of radioactive materials in bodies of water in UNRESTRICTED AREAS will result in exposures within (1) the Section II.A design objectives of Appendix I, 10 CFR Part 50, to a MEMBER OF THE PUBLIC and (2) the limits of 10 CFR Part 20.1301 to the population. The concentration limit for dissolved or entrained noble gases is based upon the assumption that Xe-135 is the controlling radioisotope and its concentration limit in air (submersion) was converted to an equivalent concentration in water using the methods described in International Commission on Radiological Protection (ICRP) Publication 2.

The required detection capabilities for radioactive materials in liquid waste samples are tabulated in terms of the lower limits of detection (LLDs). Detailed discussion of the LLD, and other detection limits can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L.A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry," Anal. Chem. 40, 586-93 (1968), and Hartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

13.1 RADIOACTIVE LIQUID EFFLUENTS

13.1.2 Liquid Effluents Dose

DNC 13.1.2 The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials released in liquid effluents released to UNRESTRICTED AREAS shall be limited to:

a. ≤ 1.5 mrem to the total body and ≤ 5 mrem to any organ during any calendar quarter; and

b. ≤ 3 mrem to the total body and ≤ 10 mrem to any organ during any calendar year.

APPLICABILITY: At all times.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Calculated dose to a MEMBER OF THE PUBLIC from the release of radioactive materials in liquid effluents to UNRESTRICTED AREAS exceeds limits.	A.1 Prepare and submit to the NRC, pursuant to DNC 15.3, a Special Report that (1) Identifies the cause(s) for exceeding the limit(s) and; (2) Defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with DNC 13.1.2.	30 days

ACTIONS (continued)

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
B. Calculated dose to a MEMBER OF THE PUBLIC from the release of radioactive materials in liquid effluents exceeds 2 times the limits.	B.1 Calculate the annual dose to a MEMBER OF THE PUBLIC which includes contributions from direct radiation from the facility (including outside storage tanks, etc.). AND B.2 Verify that the limits of DNC 13.4 have not been exceeded.	Immediately Immediately
C. CONTINGENCY MEASURE B.2 and Associated RESTORATION TIME not met.	C.1 Prepare and submit to the NRC, pursuant to DNC 15.3, a Special Report, as defined in 10 CFR 20.2203 (a)(4), of CONTINGENCY MEASURE A.1 shall also include the following: (1) The corrective action(s) to be taken to prevent recurrence of exceeding the limits of DNC 13.4 and the schedule for achieving conformance, (2) An analysis that estimates the dose to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s), and (3) Describes the levels of radiation and concentrations of radioactive material involved and the cause of the exposure levels or concentrations.	30 days

VERIFICATION REQUIREMENTS

VERIFICATION		FREQUENCY
DVR 13.1.2.1	Determine cumulative dose contributions from liquid effluents for the current calendar quarter and the current calendar year in accordance with the methodology and parameters in the ODCM.	31 days

BASES

This DNC is provided to implement the requirements of Sections II.A, III.A and IV.A of Appendix I, 10 CFR 50. The DNC implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." The dose calculation methodology and parameters in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated.

The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

13.1 RADIOACTIVE LIQUID EFFLUENTS

13.1.3 Liquid Radwaste Treatment System

DNC 13.1.3 The Liquid Radwaste Treatment System, as described in the ODCM, shall be used to reduce the radioactive material in liquid wastes prior to their discharge when the projected dose, due to the liquid effluent, to UNRESTRICTED AREAS would exceed in a 31 day period:

a. > 0.06 mrem to the total body; or

b. > 0.2 mrem to any organ.

APPLICABILITY: At all times, except for the parts of the system taken permanently out of service.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Radioactive liquid waste being discharged without treatment and in excess of the above limits.	A.1 Prepare and submit to the NRC, pursuant to DNC 15.3, a Special Report that includes: (1) An explanation of why liquid radwaste was being discharged without treatment, identification of any non-functional / inoperable equipment or subsystems, and the reason for the non-functional / inoperability, (2) ACTION(s) taken to restore the non-functional / inoperable equipment to FUNCTIONAL / OPERABLE status, and (3) Summary description of ACTION(s) taken to prevent a recurrence.	30 days

VERIFICATION REQUIREMENTS

VERIFICATION		FREQUENCY
DVR 13.1.3.1	Project the doses due to liquid effluents from the facility to UNRESTRICTED AREAS in accordance with the methodology and parameters specified in the ODCM.	31 days

BASES

The requirement that the appropriate portions of this system be used, when specified, provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable."

This DNC implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and the design objective given in Section II.D of Appendix I to 10 CFR Part 50.

The specified limits governing the use of appropriate portions of the liquid radwaste treatment system were specified as a suitable fraction of the dose design objectives set forth in Section II.A of Appendix I, 10 CFR Part 50, for liquid effluents.

13.1 LIQUID EFFLUENTS

13.1.4 Liquid Holdup Tanks

DNC 13.1.4 The quantity of radioactivity contained in unprotected outdoor liquid storage tanks shall be limited to less than the amount that would result in concentrations less than the limits in 10 CFR20, Appendix B, Table II, Column 2, at the nearest potable water supply and surface water supply in an UNRESTRICTED AREA, excluding tritium and dissolved or entrained gases.

APPLICABILITY: At all times.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Level of radioactivity exceeds the limits in any listed tank.	A.1 Suspend addition of radioactive material.	Immediately
	AND	
	A.2 Initiate measures to reduce content to within the limits.	48 hours
	AND	
	A.3 Describe the events leading to the condition in the Radioactive Effluent Release Report.	Prior to submittal of next Radioactive Effluent Release Report

VERIFICATION REQUIREMENTS

VERIFICATION		FREQUENCY
DVR 13.1.4.1	Sample and analyze radioactive liquid located in unprotected outdoor liquid storage tanks for level of radioactivity.	31 days during addition of radioactive liquid to the tanks

13.1 LIQUID EFFLUENTS

13.1.4 Liquid Holdup Tanks

BASES

The tanks listed in this Normal Condition include outdoor tanks that are not surrounded by liners, dikes or walls capable of holding the tank contents and do not have tank overflows and surrounding area drains connected to the radwaste treatment system.

Technical Specification 5.5.10.c requires a program to ensure that the quantity of radioactive material contained in the specified tanks provides assurance that, in the event of an uncontrolled release of any such tank's contents, the resulting concentration would be less than the limits of 10 CFR 20, Appendix B Table II, Column 2 at the nearest potable water supply and the nearest surface water supply in an UNRESTRECTED AREA. Tank quantities shall be determined in accordance with Standard Review Plan, Section 15.7.3, "Postulated Radioactive Release due to Tank Failures."

13.2 RADIOACTIVE GASEOUS EFFLUENTS

13.2.1 Gaseous Effluents Dose Rate

DNC 13.2.1 The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY shall be limited to the following:

a. For noble gases, ≤ 500 mrem/yr to the total body and ≤ 3000 mrem/yr to the skin and

b. For I-131, I-133, tritium and for all radionuclides in particulate form with half-lives > 8 days, ≤ 1500 mrem/yr to any organ.

APPLICABILITY: At all times.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. The dose rate(s) at or beyond the SITE BOUNDARY due to radioactive gaseous effluents exceeds limits.	A.1 Restore the release rate to within the limit.	Immediately
B. CONTINGENCY MEASURES <u>OR</u> RESTORATION TIME not met.	B.1 Initiate a CR	In accordance with Corrective Action Program
	<u>AND</u>	
	B.2 Explain in the next Radioactive Effluent Release Report why the CONTINGENCY MEASURE was not met in a timely manner.	In accordance with Radioactive Effluent Release Report

VERIFICATION REQUIREMENTS

VERIFICATION		FREQUENCY
DVR 13.2.1.1	The dose rate due to noble gases in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters in the ODCM.	In accordance with Table 13.2.1-1
DVR 13.2.1.2	The dose rate due to I-131, I-133, tritium and all radionuclides in particulate form with half-lives > 8 days in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters in the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 13.2.1-1	In accordance with Table 13.2.1-1

Table 13.2.1-1 (Page 1 of 2)
Radioactive Gaseous Waste Sampling and Analysis

GASEOUS RELEASE TYPE	TYPE OF ACTIVITY ANALYSIS	SAMPLE TYPE	SAMPLE FREQUENCY	MINIMUM ANALYSIS FREQUENCY	LOWER LIMIT OF DETECTION (LLD) (a)
1. Waste Gas Storage Tank and Chemical and Volume Control System Holdup Tank	Principal Gamma Emitters (b)	Grab Sample	Each Tank (d)	Each Tank (d)	1×10^{-4} µCi/ml
2. Containment Purge	Principal Gamma Emitters (b)	Grab Sample	Each Purge (d)	Each Purge (d)	1×10^{-4} µCi/ml
3. Auxiliary Building and Containment Building Vent	Principal Gamma Emitters (b)	Grab Sample	31 days	31 days	1×10^{-4} µCi/ml
a.	H-3	Silica Gel, Grab Sample	31 days	31 days	1×10^{-6} µCi/ml
b.	I-131	Charcoal Sample	Continuous (c)	7 days	3×10^{-12} µCi/ml
c.	Principal Gamma Emitters (b) (I-131, Others)	Particulate Sample	Continuous (c)	7 days	1×10^{-11} µCi/ml
d.	Gross Alpha	Composite Particulate Sample	Continuous (c)	31 days	1×10^{-11} µCi/ml
e.	Sr-89, Sr-90	Composite Particulate Sample	Continuous (c)	92 days	1×10^{-11} µCi/ml
f.	Noble Gases Gross Beta or Gamma	Noble Gas Monitor	Continuous (c)	Continuous (c)	1×10^{-6} µCi/ml

Table 13.2.1-1 (Page 2 of 2)
Radioactive Gaseous Waste Sampling and Analysis

(a) The LLD is defined, for purposes of these DNC's, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 * S_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp^{(-\lambda\Delta t)}}$$

Where:

- LLD is the a priori lower limit of detection as defined above, as µCi per unit mass or volume,
- s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate, as counts per minute,
- E is the counting efficiency, as counts per disintegration,
- V is the sample size in units of mass or volume,
- 2.22×10^6 is the number of disintegrations per minute per microcurie,
- Y is the fractional radiochemical yield, when applicable,
- λ is the radioactive decay constant for the particular radionuclide, and
- Δt for plant effluents is the elapsed time between the midpoint of sample collection and time of counting.
- Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

(b) The principal gamma emitters for which the LLD requirement applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report pursuant to ODCM 15.2.

(c) The ratio of the sample flow rate to the sampled flow stream flow rate shall be known (based on sampler and ventilation system flow measuring devices or periodic flow estimates) for the time period covered by each dose or dose rate calculation made in accordance with ODCM DNC 13.2.1, 13.2.2, and 13.2.3.

(d) Complete prior to each release.

BASES

This DNC is provided to ensure that the dose rates at any time to a MEMBER OF THE PUBLIC at or beyond the SITE BOUNDARY are less than or equal to 500 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin. This also restricts releases, at all times, for the corresponding thyroid dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrem/yr. These dose rate limits provide additional assurance that radioactive material discharged in gaseous effluents will be maintained ALARA, and coupled with the requirements of ODCM DNC 13.2.2, ensure that the exposures of MEMBERS OF THE PUBLIC in an UNRESTRICTED AREA, either within or outside the SITE BOUNDARY, will not exceed the annual average concentrations specified in Appendix B, Table 2, Column 1 of 10 CFR 20. For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of that MEMBER OF THE PUBLIC will usually be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the SITE BOUNDARY.

The required detection capabilities for radioactive materials in gaseous waste samples are tabulated in terms of the lower limits of detection (LLDs). Detailed discussion of the LLD, and other detection limits can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L.A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry," Anal. Chem. 40, 586-93 (1968), and Hartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

13.2 RADIOACTIVE GASEOUS EFFLUENTS

13.2.2 Gaseous Effluent Dose - Noble Gas

DNC 13.2.2 The air dose due to noble gases released in gaseous effluents from the facility to areas at or beyond the SITE BOUNDARY (Plant Drawing A-408) shall be limited to the following:

a. ≤ 5 mrad for gamma radiation and ≤ 10 mrad for beta radiation during any calendar quarter, and

b. ≤ 10 mrad for gamma radiation and ≤ 20 mrad for beta radiation during any calendar year.

APPLICABILITY: At all times.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. The calculated air dose at or beyond the SITE BOUNDARY due to noble gases released in gaseous effluents exceeds limits.	A.1 Prepare and submit to the NRC, pursuant to DNC 15.3, a Special Report that (1) Identifies the cause(s) for exceeding the limit(s) and; (2) Defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with DNC 13.2.2.	30 days

ACTIONS (continued)

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
B. Calculated dose to a MEMBER OF THE PUBLIC from the release of radioactive materials in liquid effluents exceeds 2 times the limits.	B.1 Calculate the annual dose to a MEMBER OF THE PUBLIC which includes contributions from direct radiation from the facility (including outside storage tanks, etc.). AND B.2 Verify that the limits of DNC 13.4 have not been exceeded.	Immediately Immediately
C. CONTINGENCY MEASURE B.2 and Associated RESTORATION TIME not met.	C.1 Prepare and submit to the NRC, pursuant to DNC 15.3, a Special Report, as defined in 10 CFR 20.2203 (a)(4), of CONTINGENCY MEASURE A.1 shall also include the following: (1) The corrective action(s) to be taken to prevent recurrence of exceeding the limits of DNC 13.4 and the schedule for achieving conformance, (2) An analysis that estimates the dose to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s), and (3) Describes the levels of radiation and concentrations of radioactive material involved and the cause of the exposure levels or concentrations.	30 days

VERIFICATION REQUIREMENTS

VERIFICATION		FREQUENCY
DVR 13.2.2.1	Determine cumulative dose contributions for the current calendar quarter and current calendar year in accordance with the methodology and parameters in the ODCM.	31 days

BASES

This DNC is provided to implement the requirements of Sections II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. The DNC implements the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." The VERIFICATION REQUIREMENTS implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated.

The dose calculation methodology and parameters established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," Revision 1, July 1977. The ODCM equations provided for determining the air doses at and beyond the SITE BOUNDARY are based upon the historical average atmospheric conditions.

13.2 RADIOACTIVE GASEOUS EFFLUENTS

13.2.3 Gaseous Effluent Dose – Iodine, Tritium and Particulate

DNC 13.2.3 The dose to a MEMBER OF THE PUBLIC from I-131, I-133, tritium, and all radionuclides in particulate form with half-lives > 8 days, in gaseous effluents, released to areas at or beyond the SITE BOUNDARY (Plant Drawing A-408) shall be limited to the following:

a. ≤ 7.5 mrem to any organ during any calendar quarter, and

b. ≤ 15 mrem to any organ during any calendar year.

APPLICABILITY: At all times.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. The calculated dose from the release of I-131, I-133, tritium, and radionuclides in particulate form with half-lives > 8 days released in gaseous effluents at or beyond the SITE BOUNDARY exceeds limits.	A.1 Prepare and submit to the NRC, pursuant to DNC 15.3, a Special Report that (1) Identifies the cause(s) for exceeding the limit(s) and; (2) Defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with DNC 13.2.3.	30 days

ACTIONS (continued)

NON-CONFORMANCE	CONTINGENCY MEASURES		RESTORATION TIME
B. Calculated dose to a MEMBER OF THE PUBLIC from the release of radioactive materials in liquid effluents exceeds 2 times the limits.	B.1	Calculate the annual dose to a MEMBER OF THE PUBLIC which includes contributions from direct radiation from the facility (including outside storage tanks, etc.).	Immediately
	AND		
	B.2	Verify that the limits of DNC 13.4 have not been exceeded.	Immediately
C. CONTINGENCY MEASURE B.2 and Associated RESTORATION TIME not met.	C.1	Prepare and submit to the NRC, pursuant to DNC 15.3, a Special Report, as defined in 10 CFR 20.2203 (a)(4), of CONTINGENCY MEASURE A.1 shall also include the following: (1) The corrective action(s) to be taken to prevent recurrence of exceeding the limits of DNC 13.4 and the schedule for achieving conformance, (2) An analysis that estimates the dose to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s), and (3) Describes the levels of radiation and concentrations of radioactive material involved and the cause of the exposure levels or concentrations.	30 days

VERIFICATION REQUIREMENTS

VERIFICATION		FREQUENCY
DVR 13.2.3.1	Determine cumulative dose contributions for the current calendar quarter and current calendar year for I-131, I-133, tritium, and radionuclides in particulate form with half-lives > 8 days in accordance with the methodology and parameters in the ODCM.	31 days

BASES

This DNC is provided to implement the requirements of Sections II.C, III.A and IV.A of Appendix I, 10 CFR Part 50. The DNC's are the guides set forth in Section II.C of Appendix I. The contingency measures provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable."

The ODCM calculational methods specified in the DVR's implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methodology and parameters for calculating the doses due to the actual release rates of the subject materials are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors," Revision 1, July 1977.

These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate limitations for iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days are dependent upon the existing radionuclide pathways to man, in areas at and beyond the SITE BOUNDARY. The pathways that were examined in the development of these calculations were: 1) individual inhalation of airborne radionuclides, 2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, 3) deposition onto grassy areas where milk animals and meat producing animals graze with consumption of the milk and meat by man, and 4) deposition on the ground with subsequent exposure of man.

13.2 RADIOACTIVE GASEOUS EFFLUENTS

13.2.4 GASEOUS RADWASTE TREATMENT SYSTEM

DNC 13.2.4 The GASEOUS RADWASTE TREATMENT SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected gaseous effluent air doses due to gaseous effluent releases to areas at and beyond the SITE BOUNDARY (Plant Drawing A-408) would be:

a. > 0.2 mrad for gamma radiation; or

b. > 0.4 mrad for beta radiation; or

c. > 0.3 mrem to any organ in 31 day period. (Ventilation Exhaust Treatment System only)

APPLICABILITY: At all times, except for the parts of the system taken permanently out of service.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Radioactive gaseous waste is being discharged without treatment. AND Projected doses due to the gaseous effluent, from the facility, at and beyond the SITE BOUNDARY would exceed limits.	A.1 Prepare and submit to the NRC, pursuant to DNC 15.3, a Special Report that includes the following: (1) Explanation of why gaseous radwaste was being discharged without treatment, (2) Identification of any non-functional / inoperable equipment or subsystems and the reason for the non-functional / inoperability, (3) ACTION(s) taken to restore the non-functional / inoperable equipment to FUNCTIONAL / OPERABLE status, and (4) Summary description of ACTION(s) taken to prevent a recurrence.	30 days

VERIFICATION REQUIREMENTS

VERIFICATION		FREQUENCY
DVR 13.2.4.1	Project the doses due to gaseous effluents from each facility at and beyond the SITE BOUNDARY in accordance with the methodology and parameters in the ODCM.	31 days

BASES

The requirement that the appropriate portions of these systems be used, when specified, provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable."

This DNC implements the requirements of 10 CFR 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and the design objectives given in section II.D of Appendix I to 10 CFR Part 50.

The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the dose design objectives set forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents.

13.2 GASEOUS EFFLUENTS

13.2.5 Gas Storage Tanks

DNC 13.2.5 The radioactivity contained in each gas storage tank shall be limited to $\leq$ 52,000 Curies of noble gas. (Considered as Xe-133)

APPLICABILITY: At all times, except when the tank is taken permanently out of service.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Level of radioactivity exceeds the limits.	A.1 Suspend addition of radioactive material.	Immediately
	AND	
	A.2 Reduce tank contents to within the limits.	48 hours

VERIFICATION REQUIREMENTS

VERIFICATION		FREQUENCY
DVR 13.2.5.1	Verify quantity of radioactive material contained in each gas storage tank is ≤ 52,000 curies of noble gases (considered as Xe-133).	31 days <u>AND</u> ---------NOTE------- Not required to be performed if the most recent Reactor Coolant System specific activity DOSE EQUIVALENT I-131 is ≤ 1.0 μCi/gm ----------------------- Once per 24 hours when radioactive materials are being added to the tank

BASES

This verification implements the requirement of Technical Specification 5.5.10.b. which requires a program to ensure that the quantity of radioactivity contained in each gas storage tank and fed into the offgas treatment system is less than the amount that would result in a whole body exposure of > 0.5 rem to any individual in an UNRESTRICTED AREA, in the event of an uncontrolled release of the tanks contents. Contents of the tank quantities shall be determined following the methodology in Branch Technical Position (BTP) ETSB 11-5, "Postulated Radioactive Release due to Waste Gas System Leak or Failure."

Radiological analysis for a waste gas decay tank rupture assumes the activity in a gas decay tank is taken to be the maximum amount that could accumulate from operation with cladding defects in 1 percent of the fuel elements. This is at least ten times the expected number of defective fuel elements. The maximum activity is obtained by assuming the noble gases, xenon and krypton, are accumulated with no release over a full core cycle. The gas decay tank inventory is calculated assuming nuclide decay, degassing of the reactor coolant with letdown at the maximum rate, and periodic purging to the gas decay tank. The maximum inventory for each nuclide during the degas and PURGE cycle is given in Appendix D, Table D.7-1. (reference 1)

The resultant dose consequence for this accident is 0.1 rem whole body at the SITE BOUNDARY. Summing the activities in USAR Table D.7-1 (reference 4) results in 42,792.74 curies. Using the noble gas dose conversion factors (DCF) contained in USAR Table D.8-1 (reference 5) referenced to Xe-133 results in a curie content of 52,000 curies when considered as Xe-133. Kewaunee Power Station does not have a calculation correcting the waste gas decay tank activity to a SITE BOUNDARY consequence of ≤ 0.5 rem, therefore by limiting the activity in a waste gas decay tank to that which results in 0.1 rem at the SITE BOUNDARY, the 0.5 rem limit will not be exceeded.

DVR 13.2.5 frequency is modified by a note that restricts performing the verification when additions are made to a tank to only when the reactor coolant system DOSE EQUIVALENT Iodine 131 (DEI-131) activity is greater than 1.0 μCi/gm (microcurie per gram). A calculation has shown that when a 1% failed fuel assumption is used the resultant RCS DOSE EQUIVALENT XE-133 activity would be 595 μCi/gm (reference 2). Engineering experience is that with 1.0 μCi/gm DEI-131 RCS activity, the associated DEX-133 activity is approximately 200 μCi/gm. If with an assumption of 1% failed fuel calculations results are 595 μCi/gm DEX-133, and the dose consequences calculation also yields a 0.1 rem whole body at the SITE BOUNDARY by calculation then a gas decay tank on fill cannot exceed the activity limits of this requirement and the once per 31 day frequency is adequate.

Reference

1. USAR Section 14.2.3, Accidental Release-Waste Gas
2. Calculation C11833, Kewaunee Power Station RCS Specific Activity Dose Equivalent Xenon -133 Indicator
3. Calculation CN-CRA-99-46, Revision 3, Kewaunee GDT Rupture and VCT Rupture Radiation Dose Analysis for the 7.4% Power Uprate Program.
4. USAR Table D.7-1 Inventory of Gas Decay Tank After Shutdown and Degassing of the RCS (Based on 1 percent of Fuel Defects)
5. USAR Table D.8-1, Nuclide Parameters

13.3 INSTRUMENTATION

13.3.1 Radioactive Liquid Effluent Monitoring Instrumentation

DNC 13.3.1 The radioactive liquid effluent monitoring instrumentation channels shown in Table 13.3.1-1 shall be FUNCTIONAL with:

a. The minimum FUNCTIONAL channel(s) in service.

b. The alarm/trip setpoints set to ensure that the limits of DNC 13.1.1 are not exceeded.

APPLICABILITY: During release via the monitored pathway.

ACTIONS

---NOTE---
Separate NON-CONFORMANCE entry is allowed for each channel.

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required.	A.1 Suspend the release of radioactive liquid effluents monitored by the affected channel.	Immediately
	<u>OR</u>	
	A.2 Declare the channel non-functional.	Immediately
	<u>OR</u>	
	A.3 Change the setpoint so it is acceptably conservative.	Immediately

ACTIONS (continued)

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
B. One or more required channels non-functional.	B.1 Restore non-functional channel(s) to FUNCTIONAL status.	30 days
C. Liquid Radwaste Effluent Line (R-18) non-functional prior to or during effluent releases.	-----------NOTE---------------- Prior to initiating an effluent release, complete sections C.1.1 and C.1.2 ----------------------------------	
	C.1.1 Analyze at least 2 independent samples in accordance with Table 13.1.1-1.	Prior to initiating a release
	AND	
	C.1.2 -----------NOTE---------------- Verification ACTION will be performed by at least 2 separate technically qualified members of the facility staff. ----------------------------------	
	Independently verify the release rate calculations and discharge line valving.	Prior to initiating a release
	OR	
	C.2 Suspend release of radioactive effluents via this pathway	Immediately

ACTIONS (continued)

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
	------------------NOTE------------------ Failure to complete sampling and analysis prior to 12 hours after the monitor is declared non-functional is a violation of this DNC. --	
D. Service Water System Effluent Line (R-20) non-functional prior to or during effluent releases	D.1 Collect and analyze grab samples for gross radioactivity (beta or gamma) at a lower limit of detection of at least 1×10^{-6} µCi/ml.	Once per 12 hours
E. CONTINGENCY MEASURES <u>OR</u> RESTORATION TIME of A, B, C, or D not met.	E.1 Initiate a CR	In accordance with Corrective Action Program
	<u>AND</u>	
	E.2 Explain in the next Radioactive Effluent Release Report why the CONTINGENY MEASURE was not met in a timely manner.	In accordance with Radioactive Effluent Release Report

VERIFICATION REQUIREMENTS

NOTE
Refer to Table 13.3.1-1 to determine which DVRs apply for each function.

VERIFICATION		FREQUENCY
DVR 13.3.1.1	Perform CHANNEL CHECK.	24 hours
DVR 13.3.1.2	Perform SOURCE CHECK.	Prior to release
DVR 13.3.1.3	Perform SOURCE CHECK.	31 days
DVR 13.3.1.4	Perform CHANNEL FUNCTIONAL TEST	92 days
DVR 13.3.1.5	Perform CHANNEL CALIBRATION.	18 months

Table 13.3.1-1
Radioactive Liquid Effluent Monitoring Instrumentation

INSTRUMENT	REQUIRED CHANNELS PER INSTRUMENT	VERIFICATION REQUIREMENTS
1. Gross Radioactivity Monitors Providing Alarm and Automatic Termination of Release		
a. Liquid Radwaste Effluent Line (R-18)	1	DVR 13.3.1.1 DVR 13.3.1.2 DVR 13.3.1.4 DVR 13.3.1.5
2. Gross Beta or Gamma Radioactivity Monitors Providing Alarm but not Providing Automatic Termination of Release		
a. Service Water System Effluent Line (R-20)	1	DVR 13.3.1.1 DVR 13.3.1.3 DVR 13.3.1.4 DVR 13.3.1.5

BASES

The radioactive liquid effluent instrumentation, required FUNCTIONAL by this DNC, is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluent. The alarm/trip setpoints for these instruments shall be calculated and adjusted in accordance with methodology and parameters in the ODCM to ensure that the alarm/trip will occur prior to exceeding ten (10) times the values 10 CFR Part 20, Appendix B, Table 2, Column 2. The FUNCTIONALITY and use of this instrumentation is consistent with the appropriate requirements of General Design Criteria 60, 63 and 64 of Appendix A to 10 CFR Part 50.

13.3 INSTRUMENTATION

13.3.2 Radioactive Gaseous Effluent Monitoring Instrumentation

DNC 13.3.2 The radioactive gaseous effluent monitoring instrumentation channels shown in Table 13.3.2-1 shall be FUNCTIONAL with:

a. The minimum FUNCTIONAL channel(s) in service.

b. The alarm/trip setpoints set to ensure that the limits of DNC 13.2.1 are not exceeded, with the exception of the R-13 and R-14 trip setpoints, which have been removed by Design Change KW-14-02008.

APPLICABILITY: During release via the monitored pathway.

ACTIONS

------------------------------ NOTE ------------------------------
Separate NON-CONFORMANCE entry is allowed for each channel.

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Gaseous effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required, with the exception of the R-13 and R-14 trip setpoints	A.1 Suspend the release of radioactive gaseous effluents monitored by the affected channel.	Immediately
	<u>OR</u>	
	A.2 Declare the channel non-functional.	Immediately
	<u>OR</u>	
	A.3 Change the setpoint so it is acceptably conservative.	Immediately
B. Less than the minimum number of channels FUNCTIONAL.	B.1 Restore non-functional channel(s) to FUNCTIONAL status.	30 days.

ACTIONS (continued)

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
C. Noble Gas Activity effluent monitoring for the Waste Gas Holdup System and Chemical and Volume Control System Holdup Tanks non-functional prior to or during releases	-----------NOTE--------------- Prior to initiating an effluent release, complete sections C.1.1 and C.1.2. --------------------------------	Prior to initiating a release
	C.1.1 Analyze at least 2 independent samples in accordance with Table 13.2.1-1.	
	AND	
	C.1.2 -----------NOTE--------------- Verification ACTION will be performed by at least 2 technically qualified members of the facility staff. -------------------------------- Independently verify the release rate calculations and discharge line valving.	Prior to initiating a release
	OR	
	C.2 Suspend release of radioactive effluents via this pathway	Immediately
D. Noble Gas Activity effluent monitoring for the Auxiliary Building Ventilation System and the Condenser Evacuation System non-functional prior to or during releases	D.1 Take grab samples.	12 hours AND Once per 12 hours thereafter
	AND	
	D.2 Analyze samples for gross activity.	24 hours from time of sampling completion

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
E. Noble Gas Activity effluent monitoring for the Containment Purge System, 2" line and 36" duct (auto-isolation) non-functional prior to or during releases	E.1 Suspend PURGING of Radioactive effluents via this pathway.	Immediately
F. Sampler Flow rate Measuring Devices (for the Auxiliary Building Ventilation or Containment Building Ventilation Sampler) non-functional prior to or during releases	F.1 Estimate the flow rate for the non-functional channel(s).	4 hours <u>AND</u> Once per 4 hours thereafter
G. Radioiodine and Particulate Samplers (for the Auxiliary Building Ventilation or Containment Building Ventilation system) non-functional prior to or during releases	G.1 Continuously collect samples using auxiliary sampling equipment as required in Table 13.2.1-1.	12 hours
H. CONTINGENCY MEASURES <u>OR</u> RESTORATION TIME A, B, C, D, E, F, or G not met.	H.1 Initiate a CR <u>AND</u> H.2 Explain in the next Radioactive Effluent Release Report why the CONTINGENCY MEASURE was not met in a timely manner.	In accordance with Corrective Action Program In accordance with Radioactive Effluent Release Report

VERIFICATION REQUIREMENTS

VERIFICATION		FREQUENCY
DVR 13.3.2.1	Perform CHANNEL CHECK.	Prior to release
DVR 13.3.2.2	Perform CHANNEL CHECK.	24 hours
DVR 13.3.2.3	Perform CHANNEL CHECK.	7 days
DVR 13.3.2.4	Perform SOURCE CHECK.	Prior to release
DVR 13.3.2.5	Perform SOURCE CHECK.	31 days
DVR 13.3.2.6	Perform CHANNEL FUNCTIONAL TEST.	92 days
DVR 13.3.2.7	Perform CHANNEL CALIBRATION.	18 months

Table 13.3.2-1
Radioactive Gaseous Effluent Monitoring Instrumentation

INSTRUMENT	REQUIRED CHANNELS PER INSTRUMENT	NON-CONFORMANCE	VERIFICATION REQUIREMENTS
1. Waste Gas Holdup System			DVR 13.3.2.1 DVR 13.3.2.4
a. Noble Gas Activity Monitor (R-13 or R-14)	1	C	DVR 13.3.2.6 DVR 13.3.2.7
2. Condenser Evacuation System			DVR 13.3.2.2 DVR 13.3.2.5
a. Noble Gas Activity (R-15)	1	D	DVR 13.3.2.6 DVR 13.3.2.7
3. Auxiliary Building Vent			
a. Noble Gas Activity Monitor (R-13 or R-14)	1	D	DVR 13.3.2.2 DVR 13.3.2.5 DVR 13.3.2.6 DVR 13.3.2.7
b. Radioiodine and Particulate Sampler (R-13 or R-14)	1	G	DVR 13.3.2.3
c. Sample Flow-Rate Monitor (R-13 or R-14)	1	F	DVR 13.3.2.2 DVR 13.3.2.6 DVR 13.3.2.7
4. Containment Building Vent			
a. Radioiodine and Particulate Sampler (R-21)	1	G	DVR 13.3.2.3
b. Sample Flow-Rate Monitor (R-21)	1	F	DVR 13.3.2.2 DVR 13.3.2.6 DVR 13.3.2.7
5. Containment Purge 2" line			DVR 13.3.2.2
a. Noble Gas Activity Monitor (R-13 or R-14)	1	E	DVR 13.3.2.5 DVR 13.3.2.6 DVR 13.3.2.7
6. Containment Purge 36" line			DVR 13.3.2.2 DVR 13.3.2.4
a. Noble Gas Activity Monitor (R-12 or R-21)	1	E	DVR 13.3.2.6 DVR 13.3.2.7

BASES

The radioactive gaseous effluent instrumentation, required FUNCTIONAL by this DNC, is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip (with the exception of the R-13 and R-14 trip setpoints, which have been removed by Design Change KW-14-02008) will occur prior to exceeding the dose rate limits of ODCM DNC 13.2.1. The FUNCTIONALITY and use of this instrumentation is consistent with the requirements of General Design criteria 60, 63 and 64 in Appendix A to 10 CFR Part 50.

13.4 RADIOACTIVE EFFLUENTS TOTAL DOSE

13.4.1 Radioactive Effluents Total Dose

DNC 13.4.1 The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to ≤ 25 mrem to the total body or any organ, except the thyroid, which shall be limited to ≤ 75 mrem.

APPLICABILITY: At all times.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Estimated dose or dose commitment due to direct radiation and the release of radioactive materials in liquid or gaseous effluents exceeds the limits.	A.1 Verify the condition resulting in doses exceeding these limits has been corrected.	Immediately
B. CONTINGENCY MEASURES A.1 and RESTORATION TIME not met.	B.1 --------------NOTE------------- This is the Special Report required by DNC 13.1.2, 13.2.2, or 13.2.3 supplemented with the following. ---------------------------------- Submit a Special Report, pursuant to DNC 15.3, including a request for a variance in accordance with the provisions of 40 CFR 190. This submission is considered a timely request, and a variance is granted until staff ACTION on the request is complete.	30 days

VERIFICATION REQUIREMENTS

VERIFICATION		FREQUENCY
DVR 13.4.1.1	Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with VERIFICATION REQUIREMENTS 13.1.2.1, 13.2.2.1, and 13.2.3.1 in accordance with the methodology and parameters in the ODCM.	12 months
DVR 13.4.1.2	Cumulative dose contributions from direct radiation from the facility shall be determined in accordance with the methodology and parameters in the ODCM. This requirement is applicable only under conditions set forth in ODCM DNC 13.4.1.A.	12 months

BASES

This normal condition is provided to meet the dose limitations of 40 CFR Part 190 that have been incorporated into 10 CFR Part 20 by 46 FR 18525. The DNC requires the preparation and submittal of a Special Report whenever the calculated doses from plant generated radioactive effluents and direct radiation exceed 25 mrem to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem. It is highly unlikely that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR Part 190 if the facility remains within twice the dose design objectives of Appendix I, and if direct radiation doses from the facility are kept small.

The Special Report will describe a course of ACTION that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR Part 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the MEMBER OF THE PUBLIC from other uranium fuel cycle sources is negligible. If the dose to any MEMBER OF THE PUBLIC is estimated to exceed the requirements of 40 CFR Part 190, the Special Report with a request for a variance (provided the release conditions resulting in violation of 40 CFR Part 190 have not already been corrected), in accordance with the provisions of 40 CFR 190.11 and 10 CFR 20.2203, is considered to be a timely request and fulfills the requirements of 40 CFR Part 190 until NRC staff ACTION is completed. The variance only relates to the limits of 40 CFR Part 190, and does not apply in any way to the other requirements for dose limitation of 10 CFR Part 20, as addressed in ODCM Normal Condition 13.3.1 and 13.4.1. An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle.

13.5 RADIOLOGICAL ENVIRONMENTAL MONITORING

13.5.1 Monitoring Program

This Kewaunee Program is established by the RADIOLOGICAL ENVIRONMENTAL MONITORING MANUAL (REMM) and implemented by approved station procedures. This program is required by Technical Specification 5.5.1.a, ODCM.

The radiological environmental monitoring program required by this DNC provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from the station operation. This monitoring program implements Section IV.B.2 of Appendix I to 10 CFR Part 50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring.

13.5 RADIOLOGICAL ENVIRONMENTAL MONITORING

13.5.2 Land Use Census Program

This Kewaunee Land Use Census Program is implemented by the RADIOLOGICAL ENVIRONMENTAL MONITORING MANUAL (REMM) and Land Use Census Program procedure.

BA[illegible]

[illegible]NC is [illegible]vided to ensure that changes in the use of areas at and beyond the SITE [illegible]UNDA[illegible] [illegible] identified and that modifications to the radiological envi[illegible] [illegible]l monitoring program [illegible] made if required by the resu[illegible]s of this census. The best in[illegible] from the door-to-[illegible]oor [illegible]vey, from aerial survey or f[illegible] consulting with local agricu[illegible]ural au[illegible]orities shall be [illegible]. T[illegible] cens[illegible] [illegible]atisfi[illegible] [illegible]ements of Section IV.B.3 of Appendix I [illegible] 10 CFR Part 50. [illegible]estri[illegible]g th[illegible] [illegible]sus to gard[illegible] [illegible]r gre[illegible] than 50 m^2 provides assurance [illegible] [illegible]gnificant exp[illegible] e p[illegible] [illegible]ays via le[illegible] [illegible]tables [illegible] be identified and monitored sin[illegible] [illegible]den of this [illegible] the [illegible]mum [illegible] pro[illegible] [illegible]e quantity (26 kg/year) [illegible] [illegible]es assumed [illegible] [illegible] for con[illegible]on by a child. To dete[illegible] [illegible] garden size, the fo[illegible]ing assumptions were ma[illegible] [illegible]) 20% of the garden w[illegible] used [illegible] broad leaf [illegible] (i.e., similar to lett[illegible] [illegible]abbage), and (2) a vegetation yi[illegible] [illegible] kg/m^2.

13.5 RADIOLOGICAL ENVIRONMENTAL MONITORING

13.5.3 Interlaboratory Comparison Program

This Kewaunee Interlaboratory Comparison Program is implemented by the RADIOLOGICAL ENVIRONMENTAL MONITORING MANUAL (REMM) and approved station procedures.

BASES

The requirement for participation in an approved Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring (developed using the guidance in Regulatory Guide 1.21, Revision 1, April 1974 and Regulatory Guide 4.1, Revision 1, April 1975) in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

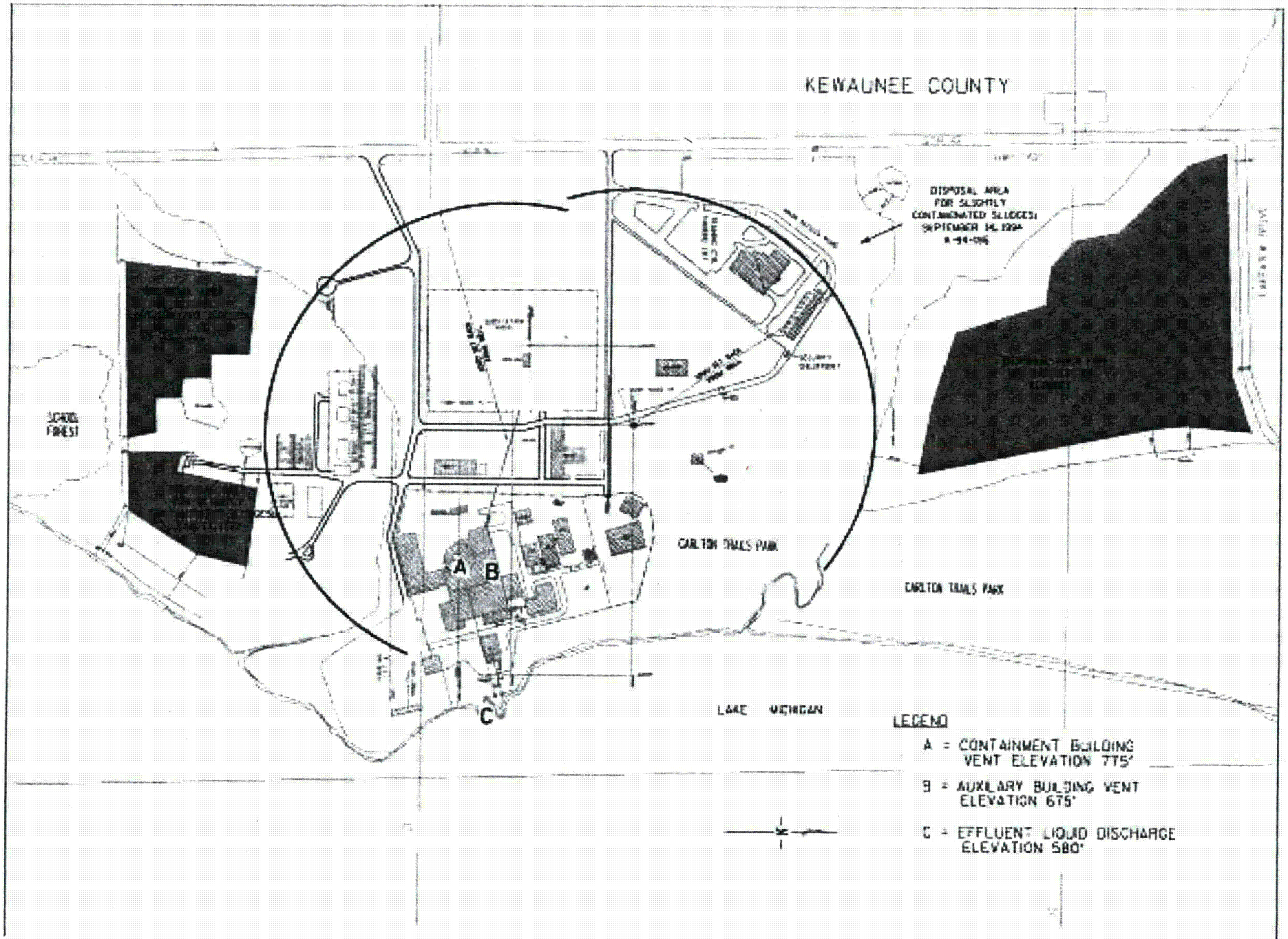
14.0 DESIGN FEATURES

14.1 GASEOUS AND LIQUID EFFLUENT RELEASE POINTS

14.1.1 Plant drawing A-408, "Radiological Survey Site Map" depicts the site area by illustrating the SITE BOUNDARY and the restricted areas. Plant drawing A-449, "Plan of Plant Area, Fence, Lighting, and CCTV Support Structure" shows the layout of the site buildings. MEMBERS OF THE PUBLIC are restricted from access to all areas of the Owner Controlled Area (OCA).

14.1.2 Figure 14.1-1 presents the locations of radioactive effluent release points at the plant. The plant drawings referenced above are not included as part of the ODCM but can be found in the plant drawing system.

FIGURE 14.1-1


KEWAUNEE COUNTY
DISPOSAL AREA
FOR SLIGHTLY
CONTAMINATED SLUDGES
SEPTEMBER 14, 1994
CARLTON TRAILS PARK
CARLTON TRAILS PARK
LAKE MICHIGAN
A
B
C
LEGEND
A = CONTAINMENT BUILDING
VENT ELEVATION 775'
B = AUXILARY BUILDING VENT
ELEVATION 675'
C = EFFLUENT LIQUID DISCHARGE
ELEVATION 580'

15.0 ADMINISTRATIVE CONTROLS

15.1 Major Changes to Radioactive Waste Systems[1]

Licensee initiated major changes to the radioactive waste systems (liquid, gaseous and solid) shall be reported to the Commission in the Radioactive Effluent Release Report for the period in which the evaluation was reviewed by FSRC. The discussion of each change shall contain:

a. A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR Part 50.59,

b. Sufficient information to totally support the reason for the change without benefit of additional or supplemental information,

c. A description of the equipment, components and processes involved and the interfaces with other plant systems,

d An evaluation of the change, which shows the predicted releases of radioactive materials in liquid and gaseous effluents and/or quantity of solid waste that differ from those previously predicted in the license application and amendments thereto,

e. An evaluation of the change, which shows the expected maximum exposures to individuals in the UNRESTRICTED AREA and to the general population that differ from those previously estimated in the license application and amendments thereto,

f. A comparison of the predicted releases of radioactive materials in liquid and gaseous effluents and in solid waste to the actual releases for the period in which the changes are to be made;

g. An estimate of the exposure to plant operating personnel as a result of the change, and

h. Documentation of the fact that the change was reviewed and found acceptable by the FSRC.

Changes shall become effective upon review and acceptance by the FSRC.

[1]Licensees may choose to submit the information called for in this requirement as part of the periodic USAR update.

15.0 ADMINISTRATIVE CONTROLS

15.2 Radioactive Effluent Release Report

The Radioactive Effluent Release Report to be submitted by May 1 of each year shall include:

a. A summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the facility following the format of Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," Revision 1, June 1974.

b. An annual summary of hourly meteorological data collected over the previous year. This annual summary may be either in the form of an hour-by-hour listing on magnetic tape of wind speed, wind direction, atmospheric stability, and precipitation (if measured), or in the form of joint frequency distribution of wind speed, wind direction, and atmospheric stability. In lieu of submission with the Radioactive Effluent Release Report, the licensee has the option of retaining this summary of required meteorological data onsite in a file that shall be provided to the NRC upon request.

c. An assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the facility during the previous calendar year.

d. An assessment of radiation doses to the likely most exposed MEMBER OF THE PUBLIC from facility releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, the previous calendar year to show conformance with 40 CFR Part 190, Environmental Radiation Protection Standards for Nuclear Power Operation.

   All assumptions used in making these assessments, i.e., specific activity, exposure time and location, shall be included in these reports. The assessment of radiation doses shall be performed in accordance with the methodology and parameters in the OFFSITE DOSE CALCULATION MANUAL (ODCM).

e. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the facility. The material provided shall be consistent with the objectives outlined in the ODCM and the PCP, and in conformance with 10 CFR 50.36a and Section IV.B.1 of Appendix I to 10 CFR Part 50.

f. A list and description of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

g. Any changes made during the reporting period to the PROCESS CONTROL PROGRAM (PCP) and to the OFFSITE DOSE CALCULATION MANUAL (ODCM), as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to DNC 13.5.2.

15.0 ADMINISTRATIVE CONTROLS

15.3 Special Reports

Special reports may be required covering inspections, tests, and maintenance activities. These special reports are determined on an individual basis. Their preparation and submittal are designated in the ODCM Contingency Measures for each Normal Condition.

Special reports shall be submitted to the Director of the NRC Regional Office listed in Appendix D, 10 CFR Part 20, with a copy to the Director, Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington D.C. 20555 within the time period specified for each report.

These Special Report(s) are in lieu of a Licensee Event Report

Kewaunee Power Station

Offsite Dose Calculation Manual

PART II - CALCULATIONAL METHODOLOGIES

1.0 LIQUID EFFLUENTS METHODOLOGY

1.1 Radiation Monitoring Instrumentation and Controls

The liquid effluent monitoring instrumentation and controls installed at Kewaunee for controlling and monitoring normal radioactive material releases in accordance with 10 CFR 50, Appendix A, Criteria 60 and 64, are summarized as follows:

1) Alarm (and Automatic Termination) – R-18 provides this function on the liquid radwaste effluent line.

2) Alarm (only) – R-20 provides this function for the Service Water discharges.

3) Composite Samples – Samples are collected weekly from the Turbine Building Sump and analyzed by gamma spectroscopy. The weekly samples are composited for monthly tritium and gross alpha analyses and for quarterly Sr-89, Sr-90, and Fe-55 analyses.

4) Liquid Tank Controls – All radioactive liquid tanks are located inside the Auxiliary Building and contain the suitable confinement systems and drains to prevent direct, unmonitored release to the environment. A liquid radioactive waste flow diagram with the applicable, associated radiation monitoring instrumentation and controls is presented as Figure 1.

1.2 Liquid Effluent Monitor Setpoint Determination

Per the requirements of Technical Specification 5.5.3.b and ODCM Normal Condition 13.3.1, alarm setpoints shall be established for the liquid effluent monitoring instrumentation to ensure that the release concentration limits of ODCM Normal Condition 13.1.1 are met (i.e., the concentration of radioactive material released in liquid effluents to UNRESTRICTED AREA shall be limited to ten times the concentrations specified in 10 CFR 20, Appendix B, Table 2, Column 2, for radionuclides and 2.0E-04 μ Ci/ml for dissolved or entrained noble gases). The following equation[1] must be satisified to meet the liquid effluent restrictions:

$$c \le \frac{10 \times C(F+f)}{f} \qquad (1.1)$$

[1] Adapted from NUREG-0133 to include the application of 10 times the Effluent Concentration (EC) of 10 CFR 20, Appendix B, Table 2, Column 2.

where:

$10 \times C$ = ten times the effluent concentration limit of 10 CFR 20, Appendix B, Table 2, Column 2, in µCi/ml. For dissolved and entrained noble gases equals 2×10^{-4} µCi/ml.

c = the setpoint, in µCi/ml, of the radioactivity monitor measuring the radioactivity concentration in the effluent line prior to dilution and subsequent release; the setpoint, which is inversely proportional to the volumetric flow of the effluent line and proportional to the volumetric flow of the dilution stream plus the effluent stream, represents a value which, if exceeded, would result in concentrations exceeding the limits of ODCM Normal Condition 13.1.1.

f = the flow rate at the radiation monitor location in volume per unit time, but in the same units as F, below.

F = the dilution water flow rate as measured prior to the release point, in volume per unit time.

[Note that if no dilution is provided, $c \leq C$. Also, note that when (F) is large compared to (f), then $(F + f) \approx F$.]

1.2.1 Liquid Effluent Monitors (Radwaste and Service Water)

The setpoints for the liquid effluent monitors at the Kewaunee Power Station are determined by the following equations:

$$SP \leq \frac{SW \times \sum (C_i \times SEN_i)}{\sum \frac{C_i}{10 \times EC_i} \times RR} + bkg \qquad (1.2)$$

where:

SP = alarm setpoint corresponding to the maximum allowable release rate (cpm)

C_i = the concentration of radionuclide "i" in the liquid effluent (µCi), to include gamma emitters only

$10 \times EC_i$ = ten times the EC value corresponding to radionuclide "i" from 10 CFR 20, Appendix B, Table 2, Column 2 (µCi/ml)

SEN_i = the sensitivity value to which the monitor is calibrated for radionuclide "i" (cpm per µCi/ml). The default calibration value from Table 1.1 may be used for gamma emitting radionuclides in lieu of nuclide specific values.

SW = the service water flow rate (dilution water flow) at the time of release (gal/min)

RR = the liquid effluent release rate (gal/min)

bkg = the background of the monitor (cpm)

The radioactivity monitor setpoint equation (1.2) remains valid during periods when the service water dilution is at its lowest. Reduction of the waste stream flow (RR) may be necessary during these periods to meet the discharge criteria. At its lowest value, SW will equal RR and equation (1.2) reverts to the following equation:

$$SP \leq \frac{\sum (C_i \times SEN_i)}{\sum \frac{C_i}{(10 \times EC_i)}} + bkg \qquad (1.3)$$

1.2.2 Conservative Default Values

Non-gamma emitting radionuclides (H-3, Fe-55, Sr-89/90) are not detected by the effluent monitor and, therefore, are not directly included in the above setpoint equation. These non-gamma radionuclides can, however, contribute a sizable fraction of the total EC limit (refer to Appendix C). The method specified below for establishing default setpoints provides conservatism to account for these non-gamma emitters and ensures that the setpoint meets the requirements of ODCM Normal Condition 13.3.1 including all radionuclides. Refer to Appendix C for further discussion.

Conservative alarm setpoints have been determined through the use of generic, default parameters. Table 1.1 summarizes all current default values in use for Kewaunee. They are based upon the following:

a) substitution of the default effective EC (EC_e) value of 1.0E-06 µCi /ml (refer to Appendix C for justification),

where:

$$EC_e = \frac{\sum C_i}{\sum \frac{C_i}{(EC_i)}} \qquad (1.4)$$

b) substitution of the lowest operational service water flow, in gal/min; and,

c) substitution of the highest effluent release rate, in gal/min,

d) substitution of the default monitor sensitivity.

The default setpoint equation is provided below:

$$SP \leq \frac{EC_e \times 10 \times SEN \times SW}{RR} + bkg \qquad (1.5)$$

1.3 Liquid Effluent Concentration Limits – 10 CFR 20

ODCM Normal Condition 13.1.1 limits the concentration of radioactive material in liquid effluents (after dilution in the Service Water System) to less than ten times the concentrations as specified in 10 CFR 20, Appendix B, Table 2, Column 2 for radionuclides other than noble gases. Noble gases are limited to a diluted concentration of 2E-04 μCi/ml. Release rates are controlled and radiation monitor alarm setpoints are established to ensure that these concentration limits are not exceeded. In the event any liquid release results in an alarm setpoint being exceeded, an evaluation of compliance with the concentration limits of ODCM Normal Condition 13.1.1 may be performed using the following equation:

where:

$$\sum[(C_i \div (10 \times EC_i)) \times (RR \div SW)] \leq 1 \qquad (1.6)$$

C_i = concentration of radionuclide "i" in the undiluted liquid effluent (μCi/ml)

$10 \times EC_i$ = ten times the EC value corresponding to radionuclide "i" from 10 CFR 20, Appendix B, Table 2, Column 2 (μCi/ml)

= 2E-04 μCi/ml for dissolved or entrained noble gases

RR = the liquid effluent release rate (gal/min)

SW = the service water flow rate (dilution water flow) at the time of the release (gal/min)

1.4 Liquid Effluent Dose Calculation – 10 CFR 50

ODCM Normal Condition 13.1.2 limits the dose or dose commitment to MEMBERS OF THE PUBLIC from radioactive materials in liquid effluents from the Kewaunee Power Station to:

- during any calendar quarter;

  ≤ 1.5 mrem to total body

  ≤ 5.0 mrem to any organ

- during any calendar year;

  ≤ 3.0 mrem to total body

  ≤ 10.0 mrem to any organ.

Per Verification Requirement 13.1.2.1, the following calculational methods may be used for determining the dose or dose commitment due to the liquid radioactive effluents from Kewaunee.

$$D_o = \frac{1.67E-02 \times VOL}{SW} \times \sum (C_i \times A_{io}) \qquad (1.7)$$

where:

D_o	=	dose or dose commitment to organ "o", including total body (mrem)
A_{io}	=	site-related ingestion dose commitment factor to the total body or any organ "o" for radionuclide "i" (mrem/hr per μCi/ml) (Table 1.2)
C_i	=	average concentration of radionuclide "i", in undiluted liquid effluent representative of the volume VOL (μCi/ml)
VOL	=	volume of liquid effluent released (gal)
SW	=	average service water discharge rate during release period (gal/min)
1.67E-02	=	conversion factor (hr/min)

The site-related ingestion doses/dose commitment factors (A_{io}) are presented in Table 1.2 and have been derived in accordance with guidance of NUREG-0133 by the equation:

$$A_{io} = 1.14E+05[(U_w \div D_w) + (U_F \times BF_i)]DF_i \qquad (1.8)$$

where:

A_{io}	=	composite dose parameter for the total body or critical organ "o" of an adult for radionuclide "i", for the fish ingestion and water consumption pathways (mrem/hr per µCi/ml)
1.14E+05	=	conversion factor (pCi/µCi × ml/kg ÷hr/yr)
U_w	=	adult water consumption (730 kg/yr)
D_w	=	dilution factor from the near field area within ¼ mile of the release point to the nearest potable water intake for the adult water consumption (84[2], unitless)
U_F	=	adult fish consumption (21 kg/yr)
BF_i	=	bioaccumulation factor for radionuclide "i" in fish from Table 1.3 (pCi/kg per pCi/1)
DF_i	=	dose conversion factor for radionuclide "i" for adults in pre-selected organ "o", from Table E-11 of Regulatory Guide 1.109, 1977 and NUREG 0172, 1977 (mrem/pCi)

The radionuclides included in the periodic dose assessment per the requirements of ODCM Normal Condition 13.1.2 and Verification Requirement 13.1.2.1 are those as identified by gamma spectral analysis of the liquid waste samples collected and analyzed per Verification Requirement 13.1.1.1, Table 13.1.1-1.

Radionuclides requiring radiochemical analysis (e.g., Sr-89 and Sr-90) will be added to the dose analysis at a frequency consistent with the required minimum analysis frequency of Table 13.1.1-1.

[2] Adapted from the Kewaunee Final Environmental Statement, Section V.

1.5 Liquid Effluent Dose Projections

ODCM Normal Condition 13.1.3 requires that the liquid radioactive waste processing system be used to reduce the radioactive material levels in the liquid waste prior to release when the 31 day projected doses exceed:

- 0.06 mrem to the total body, or
- 0.2 mrem to any organ.

The applicable liquid waste streams and processing systems are as delineated in Figure 1.

Dose projections are made at least once per 31 days by the following equations:

$$D_{tbp} = D_{tb}(31 \div d) \tag{1.9}$$

$$D_{maxp} = D_{max}(31 \div d) \tag{1.10}$$

where:

D_{tbp}	=	the total body dose projection for current 31 day period (mrem)
D_{tb}	=	the total body dose to date for current 31 day period as determined by equation (1.7) (mrem)
D_{maxp}	=	the maximum organ dose projection for current 31 day period (mrem)
D_{max}	=	the maximum organ dose to date for current 31 day period as determined by equation (1.7) (mrem)
d	=	the number of days to date for current 31 day period
31	=	the number of days in a 31 day period

1.6 Onsite Disposal of Low-Level Radioactively Contaminated Waste Streams

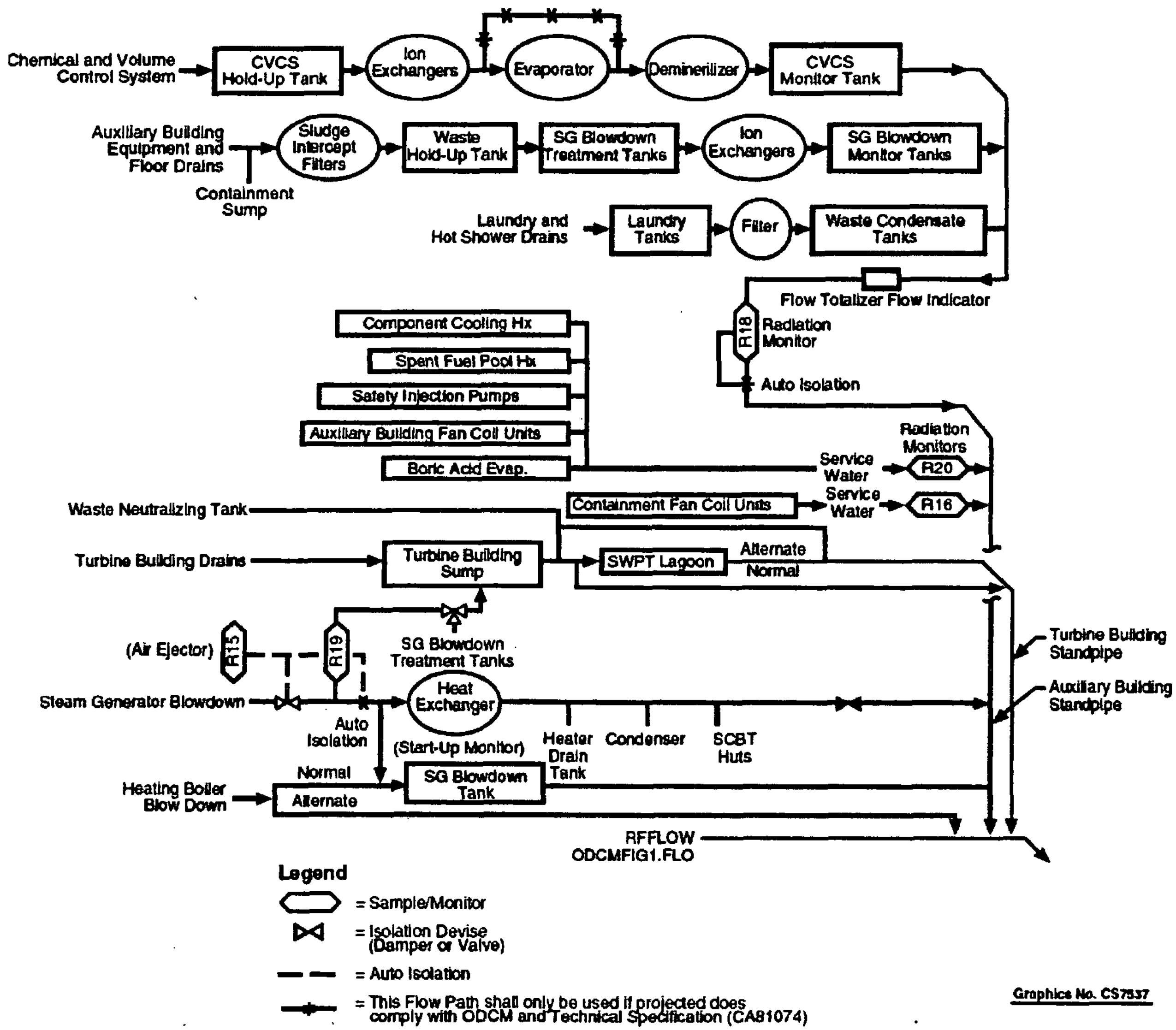
During the normal operation of Kewaunee, the potential exists for in-plant process streams, which are not normally radioactive to become contaminated with very low levels of radioactive materials. These waste streams are normally separated from the radioactive streams. However, due mainly to infrequent, minor system leaks, and anticipated operation occurrences, the potential exists for these systems to become slightly contaminated. At Kewaunee, the secondary system demineralizer resins, the service water pretreatment system sludges, the make-up water system resins, and the sewage treatment plant sludges are waste streams that have the potential to become contaminated at very low levels. During the yearly testing of a batch of pre-treatment sludge, it was found approximately 15,000 cubic feet of sludge had been contaminated with Cs-137 and Co-60.

The potential radiation doses to MEMBERS OF THE PUBLIC from these onsite disposal methods are well below 1 mrem per year. This dose is in keeping with the guidelines of the National Council on Radiation Protection (NCRP) in their Report No. 91, in which the NCRP established a "negligible individual risk level" at a dose rate of 1 mrem per year.

It is for these type wastes that the NRC acknowledged in Information Notice No. 83-05 and 88-22 that the levels of radioactive material are so low that control and disposal as a radwaste are not warranted. The potential risks to man are negligible and the disposal costs as a radwaste are unwarranted and costly.

This waste material will be monitored and evaluated prior to disposal to ensure its radioactive material content is negligible. It shall then be disposed of in a normal conventional manner with records being maintained of all materials disposed of using these methods.

Approvals for specific alternate disposal methods are listed in Appendix D. Currently, only service water pretreatment (SWPT) facility lagoon sludge and sewage treatment plant sludge have been approved for disposal by land spreading.



ODCM FIGURE 1
LIQUID RADIOACTIVE EFFLUENT FLOW DIAGRAM

Table 1.1
Parameters for Liquid Alarm Setpoint Determinations

Parameter	Actual Value	Default Value	Units	Comments
EC_e**	calculated	1.0E-06	µCi/ml	Calculate for each batch to be released
C_i	measured	N/A	µCi/ml	Taken from gamma spectral analysis of liquid effluent
EC_i	as determined	N/A	µCi/ml	Taken from 10 CFR 20, Appendix B, Table 2, Col. 2
Sensitivity (SEN) R-18 R-20	 as determined as determined	 1.0E+08 1.0E+08	 cpm per µCi/ml	 Radwaste effluent Service Water
Release Rate (RR) R-18 R-20***	 as determined as determined	 8.0E+01 8.0E+02	gpm	Determined prior to release; release rate can be adjusted for ODCM limit compliance Service Water
Background (bkg) R-18 R-20	 as determined as determined	 2.0E+03 6.0E+01	cpm	Nominal values only; actual values may be used in lieu of these reference values
Setpoint* (SP) R-18**** R-20	 calculated calculated	 6.25E+04+bkg 1.00E+03+bkg	cpm	Default alarm setpoints; more conservative values may be used as deem appropriate and desirable for assuring regulatory compliance and for maintaining releases ALARA.

* Refer to Calculation # C10690 Rev. 2 Addendum B for the default setpoint calculation.
** Refer to Appendix C for derivation.
*** Actual SW flow is determined using OP-KW-NOP-SW-001, Service Water System, Attachment B, Service Water Pump Curves.
**** The alarm setpoint for R-18 cannot exceed the linear calibration range of the radiation monitor in accordance with CAP 37265 and DCR 26981 (5.00E+05+bkg cpm).

Table 1.2 (Page 1 of 2)
Site Related Ingestion Dose Commitment Factors
(mrem/hr per µCi/ml)

Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
H-3	-	3.30E-1	3.30E-1	3.30E-1	3.30E-1	3.30E-1	3.30E-1
C-14	3.13E+4	6.26E+3	6.26E+3	6.26E+3	6.26E+3	6.26E+3	6.26E+3
Na-24	4.09E+2	4.09E+2	4.09E+2	4.09E+2	4.09E+2	4.09E+2	4.09E+2
P-32	1.39E+6	8.62E+4	5.36E+4	-	-	-	1.56E+5
Cr-51	-	-	1.28E+0	7.63E-1	2.81E-1	1.69E+0	3.21E+2
Mn-54	-	4.38E+3	8.36E+2	-	1.30E+3	-	1.34E+4
Mn-56	-	1.10E+2	1.96E+1	-	1.40E+2	-	3.52E+3
Fe-55	6.61E+2	4.57E+2	1.06E+2	-	-	2.55E+2	2.62E+2
Fe-59	1.04E+3	2.45E+3	9.40E+2	-	-	6.85E+2	8.17E+3
Co-57	-	2.11E+1	3.51E+1	-	-	-	5.36E+2
Co-58	-	8.99E+1	2.02E+2	-	-	-	1.82E+3
Co-60	-	2.58E+2	5.70E+2	-	-	-	4.85E+3
Ni-63	3.13E+4	2.17E+3	1.05E+3	-	-	-	4.52E+2
Ni-65	1.27E+2	1.65E+1	7.52E+0	-	-	-	4.18E+2
Cu-64	-	1.01E+1	4.72E+0	-	2.53E+1	-	8.57E+2
Zn-65	2.32E+4	7.38E+4	3.33E+4	-	4.93E+4	-	4.65E+4
Zn-69	4.93E+1	9.43E+1	6.56E+0	-	6.13E+1	-	1.42E+1
Br-82	-	-	2.27E+3	-	-	-	2.61E+3
Br-83	-	-	4.05E+1	-	-	-	5.83E+1
Br-84	-	-	5.24E+1	-	-	-	4.12E-4
Br-85	-	-	2.15E+0	-	-	-	-
Rb-86	-	1.01E+5	4.71E+4	-	-	-	1.99E+4
Rb-88	-	2.90E+2	1.54E+2	-	-	-	4.00E-9
Rb-89	-	1.92E+2	1.35E+2	-	-	-	-
Sr-89	2.24E+4	-	6.44E+2	-	-	-	3.60E+3
Sr-90	5.52E+5	-	1.35E+5	-	-	-	1.59E+4
Sr-91	4.13E+2	-	1.67E+1	-	-	-	1.97E+3
Sr-92	1.57E+2	-	6.77E+0	-	-	-	3.10E+3
Y-90	5.85E-1	-	1.57E-2	-	-	-	6.21E+3
Y-91m	5.53E-3	-	2.14E-4	-	-	-	1.62E-2
Y-91	8.58E+0	-	2.29E-1	-	-	-	4.72E+3
Y-92	5.14E-2	-	1.50E-3	-	-	-	9.00E+2
Y-93	1.63E-1	-	4.50E-3	-	-	-	5.17E+3
Zr-95	2.70E-1	8.67E-2	5.87E-2	-	1.36E-1	-	2.75E+2
Zr-97	1.49E-2	3.01E-3	1.38E-3	-	4.55E-3	-	9.34E+2
Nb-95	4.47E+2	2.49E+2	1.34E+2	-	2.46E+2	-	1.51E+6
Nb-97	3.75E+0	9.48E-1	3.46E-1	-	1.11E+0	-	3.50E+3
Mo-99	-	1.07E+2	2.04E+1	-	2.43E+2	-	2.49E+2
Tc-99m	9.11E-3	2.58E-2	3.28E-1	-	3.91E-1	1.26E-2	1.52E+1
Tc-101	9.37E-3	1.35E-2	1.32E-1	-	2.43E-1	6.90E-3	-
Ru-103	4.61E+0	-	1.99E+0	-	1.76E+1	-	5.39E+2
Ru-105	3.84E-1	-	1.52E-1	-	4.96E+0	-	2.35E+2
Ru-106	6.86E+1	-	8.68E+0	-	1.32E+2	-	4.44E+3
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-

Table 1.2 (Page 2 of 2)
Site Related Ingestion Dose Commitment Factors
(mrem/hr per µCi/ml)

Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
Ag-110m	1.04E+0	9.62E-1	5.71E-1	-	1.89E+0	-	3.92E+2
Sb-124	9.48E+0	1.79E-1	3.76E+0	2.30E-2	-	7.38E+0	2.69E+2
Sb-125	6.06E+0	6.77E-2	1.44E+0	6.16E-3	-	4.67E+0	6.67E+1
Te-125m	2.57E+3	9.31E+2	3.44E+2	7.73E+2	1.04E+4	-	1.03E+4
Te-127m	6.49E+3	2.32E+3	7.91E+2	1.66E+3	2.64E+4	-	2.18E+4
Te-127	1.05E+2	3.79E+1	2.28E+1	7.81E+1	4.29E+2	-	8.32E+3
Te-129m	1.10E+4	4.11E+3	1.74E+3	3.79E+3	4.60E+4	-	5.55E+4
Te-129	3.01E+1	1.13E+1	7.33E+0	2.31E+1	1.27E+2	-	2.27E+1
Te-131m	1.66E+3	8.11E+2	6.76E+2	1.28E+3	8.22E+3	-	8.05E+4
Te-131	1.89E+1	7.89E+0	5.96E+0	1.55E+1	8.27E+1	-	2.67E+0
Te-132	2.42E+3	1.56E+3	1.47E+3	1.73E+3	1.50E+4	-	7.39E+4
I-130	2.79E+1	8.23E+1	3.25E+1	6.97E+3	1.28E+2	-	7.08E+1
I-131	1.54E+2	2.20E+2	1.26E+2	7.20E+4	3.76E+2	-	5.79E+1
I-132	7.49E+0	2.00E+1	7.01E+0	7.01E+2	3.19E+1	-	3.76E+0
I-133	5.24E+1	9.11E+1	2.78E+1	1.34E+4	1.59E+2	-	8.19E+1
I-134	3.91E+0	1.06E+1	3.80E+0	1.84E+2	1.69E+1	-	9.26E-3
I-135	1.63E+1	4.28E+1	1.58E+1	2.82E+3	6.86E+1	-	4.83E+1
Cs-134	2.98E+5	7.09E+5	5.79E+5	-	2.29E+5	7.61E+4	1.24E+4
Cs-136	3.12E+4	1.23E+5	8.86E+4	-	6.85E+4	9.39E+3	1.40E+4
Cs-137	3.82E+5	5.22E+5	3.42E+5	-	1.77E+5	5.89E+4	1.01E+4
Cs-138	2.64E+2	5.22E+2	2.59E+2	-	3.84E+2	3.79E+1	2.23E-3
Ba-139	1.02E+0	7.30E-4	3.00E-2	-	6.83E-4	4.14E-4	1.82E+0
Ba-140	2.15E+2	2.69E-1	1.41E+1	-	9.16E-2	1.54E-1	4.42E+2
Ba-141	4.98E-1	3.76E-4	1.68E-2	-	3.50E-4	2.13E-4	-
Ba-142	2.25E-1	2.31E-4	1.42E-2	-	1.95E-4	1.31E-4	-
La-140	1.52E-1	7.67E-2	2.03E-2	-	-	-	5.63E+3
La-142	7.79E-3	3.54E-3	8.82E-4	-	-	-	2.59E+1
Ce-141	3.17E-2	2.14E-2	2.43E-3	-	9.95E-3	-	8.19E+1
Ce-143	5.58E-3	4.13E+0	4.57E-4	-	1.82E-3	-	1.54E+2
Ce-144	1.65E+0	6.90E-1	8.87E-2	-	4.10E-1	-	5.58E+2
Pr-143	5.60E-1	2.25E-1	2.77E-2	-	1.30E-1	-	2.45E+3
Pr-144	1.83E-3	7.61E-4	9.31E-5	-	4.29E-4	-	-
Nd-147	3.83E-1	4.42E-1	2.65E-2	-	2.59E-1	-	2.12E+3
W-187	2.96E+2	2.47E+2	8.65E+1	-	-	-	8.10E+4
Np-239	2.97E-2	2.92E-3	1.61E-3	-	9.10E-3	-	5.98E+2

Table 1.3
Bioaccumulation Factors (BFi)
(pCi/kg per pCi/liter)*

Element	Freshwater Fish
H	9.0E-01
C	4.6E+03
Na	1.0E+02
P	3.0E+03
Cr	2.0E+02
Mn	4.0E+02
Fe	1.0E+02
Co	5.0E+01
Ni	1.0E+02
Cu	5.0E+01
Zn	2.0E+03
Br	4.2E+02
Rb	2.0E+03
Sr	3.0E+01
Y	2.5E+01
Zr	3.3E+00
Nb	3.0E+04
Mo	1.0E+01
Tc	1.5E+01
Ru	1.0E+01
Rh	1.0E+01
Ag	2.3E+00
Sb	1.0E+00
Te	4.0E+02
I	1.5E+01
Cs	2.0E+03
Ba	4.0E+00
La	2.5E+01
Ce	1.0E+00
Pr	2.5E+01
Nd	2.5E+01
W	1.2E+03
Np	1.0E+01

* Values in this Table are taken from Regulatory Guide 1.109 except for phosphorus which is adapted from NUREG/CR-1336 and silver and antimony which are taken from UCRL 50564, Rev. 1, October 1972.

2.0 Gaseous Effluents Methodology

2.1 Radiation Monitoring Instrumentation and Controls

The gaseous effluent monitoring instrumentation and controls at Kewaunee for controlling and monitoring normal radioactive material releases in accordance with 10 CFR 50, Appendix A, Criteria 60 and 64, are summarized as follows:

2.1.1 Waste Gas Holdup System

The vent header gases are collected by the Waste Gas Holdup System. Gases may be recycled to provide cover gas for the Chemical and Volume Control System Hold-Up Tanks (CVCS HUTs) or held in the Waste Gas Decay Tanks (WGDTs) for decay prior to release. Waste Gas Decay Tanks are batch released after sampling and analysis. The tanks are discharged via the Auxiliary Building vent. R-13 and/or R-14 provide noble gas monitoring and automatic isolation.

In some cases, the gas in the CVC HUTs will not be able to be completely depressurized to the WGDTs. CVCs HUTs will be isolated and discharged via the Auxiliary Building Vent. R-13 and/or R-14 provide noble gas monitoring, and additional administrative controls are required in lieu of automatic isolation.

During a planned release, the administrative controls include the presence of an operator in the Aux Building if R-13/R-14 levels are below 5,000 cpm. If levels are above 5,000 but below 10,000 cpm, an operator will be present at the valve MG(R)-519A, B, or C area, in communication with the Control Room, and will be directed to manually shut the valve if levels exceed 10,000 cpm.

2.1.2 Condenser Evacuation System

The air ejector discharge is monitored by R-15. Releases from this system are normally via the Auxiliary Building vent and are monitored by R-13 and/or R-14.

2.1.3 Containment Purge

Containment purge and ventilation is via the containment stack for the 36-inch RBV system but via the auxiliary building stack for the 2-inch vent and mini-purge blower system. The stack radiation monitoring system consists of:

- a noble gas activity monitor providing alarm and automatic termination of release (R-12 and R-21),
- an iodine sampler, and
- a particulate sampler.

Effluent flow rates are determined empirically as a function of fan operation (fan curves). Sampler flow rates are determined by flow rate instrumentation.

2.1.4 Auxiliary Building Vent

The Auxiliary Building vent receives discharges from the waste gas holdup system, condenser evacuation system, fuel storage area ventilation, Auxiliary Building radwaste processing area ventilation, 2-inch containment pressure relief purge/vent system, and Auxiliary Building general area. All effluents pass through the R-13 and/or R-14 channels which contain:

- a noble gas monitor
- an iodine sampler, and
- a particulate sampler.

The noble gas monitor provides auto isolation of any waste gas decay tank release. Effluent flow rates are determined by installed flow measurement equipment or as a function of fan operation (fan curves). Sampler flow rates are determined by flow rate instrumentation.

2.1.5 Containment Mini-Purge/Vent System

Slight pressure buildup in containment is a recurring event resulting from normal operation of the plant. Prior to exceeding 2 psig in containment, this excess pressure is vented off. Air from containment is routed to the Auxiliary Building ventilation system, via the post-LOCA hydrogen recombiner piping and then out through the Auxiliary Building vent stack. The system is also designed to allow a continuous supply of fresh air to be introduced into containment via a mini-blower to purge gases. An alarm of the Auxiliary Building vent stack monitor (R-13 or R-14) or the containment building airborne radioactivity monitors (R-11, R-12) provides automatic isolation.

2.1.6 Non-routine Discharge Locations

Periodically, non-routine breaches are made in the Auxiliary and Containment buildings that might allow the release of the atmosphere, which contains some levels of radioactivity. These breaches include, but are not limited to, opening the Containment equipment hatch during outages, holes cut in walls or ceilings to allow for moving equipment in or out of the Radiologically Controlled Areas (RCAs). All efforts to maintain these areas at negative pressure will be made. IF negative pressure cannot be maintained (i.e., more exhaust than supply fan volume), THEN supply ventilation to the area must be secured. Criteria for determining if and when a release occurs from these areas is provided in implementing procedures. As possible, the effects of these possible releases shall be evaluated beforehand. Any actual releases shall be documented and included in the monthly, quarterly and annual reports as appropriate.

A gaseous radioactive waste flow diagram with the applicable, associated radiation monitoring instrumentation and controls is presented as Figure 2.

2.2 Gaseous Effluent Monitor Setpoint Determination

2.2.1 Containment and Auxiliary Building Vent Monitor

Per the requirements of ODCM Normal Condition 13.3.2, alarm setpoints shall be established for the gaseous effluent monitoring instrumentation to ensure that the release rate of noble gases does not exceed corresponding dose rate at the SITE BOUNDARY of 500 mrem/year to the total body or 3000 mrem/year to the skin. Based on a grab sample analysis of the applicable release (i.e., grab sample of the Containment vent or Auxiliary Building vent), the radiation monitoring alarm setpoints may be established by the following calculational method:

$$FRAC_{tb} = \left[4.72E+02 \times \chi/Q \times VF \times \sum (C_i \times K_i)\right] \div 500 \qquad (2.1)$$

$$FRAC_{skin} = \left[4.72E+02 \times \chi/Q \times VF \times \sum (C_i \times (L_i + 1.1M_i))\right] \div 3000 \qquad (2.2)$$

where:

$FRAC_{tb}$	=	fraction of the allowable release rate for the total body based on the identified radionuclide concentrations and the release flow rate
$FRAC_{skin}$	=	fraction of the allowable release rate for skin based on the identified radionuclide concentrations and the release flow rate
χ/Q	=	annual average meteorological dispersion for direct exposure to noble gas at the controlling SITE BOUNDARY location (sec/m^3, from Table 2.3)
VF	=	ventilation system flow rate for the applicable release point and monitor (ft^3/min, from Table 2.2)
C_i	=	concentration of noble gas radionuclide "i" as determined by radioanalysis of grab sample (μCi/cm^3)
K_i	=	total body dose conversion factor for noble gas radionuclide "i" (mrem/yr per μCi/m^3, from Table 2.1)
L_i	=	beta skin dose conversion factor for noble gas radionuclide "i" (mrem/yr per μCi/m^3, from Table 2.1)
M_i	=	gamma air dose conversion factor for noble gas radionuclide "i" (mrad/yr per μCi/m^3, from Table 2.1)
1.1	=	mrem skin dose per mrad gamma air dose (mrem/mrad)
4.72E+02	=	conversion factor (cm^3/ft^3 x min/sec)
500	=	total body dose rate limit (mrem/yr)
3000	=	skin dose rate limit (mrem/yr)

Based on the more limiting FRAC (i.e., higher value) as determined above, the alarm setpoint for the Containment and Auxiliary Building vent monitors at Kewaunee may be calculated:

$$SP = \left[\sum (C_i \times SEN_i) \div FRAC\right] + bkg \qquad (2.3)$$

where:

SP	=	alarm setpoint corresponding to the maximum allowable release rate (cpm)
SEN_i	=	the sensitivity value to which the monitor is calibrated for radionuclide "i" (cpm per µCi/cm³), use the default value from Table 2.2 if radionuclide specific sensitivities are not available
bkg	=	background of the monitor (cpm)

2.2.2 Conservative Default Values

A conservative alarm setpoint can be established, in lieu of the individual radionuclide evaluation based on the grab sample analysis, to eliminate the potential of periodically having to adjust the setpoint to reflect minor changes in radionuclide distribution and variations in release flow rate. The alarm setpoint may be conservatively determined by the default values presented in Table 2.2. These values are based upon:

a) substitution of the maximum ventilation flow rate,

b) substitution of a radionuclide distribution[1] comprised of 95% Xe-133, 2% Xe-135, 1% Xe-133m, 1% Kr-88 and 1% Kr-85; and,

c) application of an administrative multiplier of 0.5 to conservatively assure that any simultaneous releases do not exceed the maximum allowable release rate.

For this radionuclide distribution, the alarm setpoint based on the total body dose rate is more restrictive than the corresponding setpoint based on the skin dose rate. The resulting conservative, default setpoints are presented in Table 2.2.

[1] Adopted from ANSI N237-1976/ANS-18.1, Source Term Specifications, Table 6.

2.3 Gaseous Effluent Instantaneous Dose Rate Calculations - 10 CFR 20

2.3.1 SITE BOUNDARY Dose Rate - Noble Gases.

ODCM Normal Condition 13.2.1.a limits the dose rate at the SITE BOUNDARY due to noble gas releases to ≤ 500 mrem/yr to the total body, and ≤ 3000 mrem/yr to the skin. Radiation monitor alarm setpoints are established to ensure that these release limits are not exceeded. In the event any gaseous releases from the station results in the alarm setpoints being exceeded, an evaluation of the UNRESTRICTED AREA dose rate resulting from the release may be performed using the following equations:

$$\dot{D}_{tb} = \chi/Q \times \sum \left(K_i \times \dot{Q}_i \right) \tag{2.4}$$

and

$$\dot{D}_s = \chi/Q \times \sum \left((L_i + 1.1 M_i) \times \dot{Q}_i \right) \tag{2.5}$$

where:

$\dot{D}_{tb}$ = total body dose rate (mrem/yr)

$\dot{D}_s$ = skin dose rate (mrem/yr)

χ/Q = atmospheric dispersion for direct exposure to noble gas at the controlling SITE BOUNDARY (sec/m³, from Table 2.3)

$\dot{Q}_i$ = average release rate of radionuclide "i" over the release period under evaluation (µCi/sec)

K_i = total body dose conversion factor for noble gas radionuclide "i" (mrem/yr per µCi/m³, from Table 2.1)

L_i = beta skin dose conversion factor for noble gas radionuclide "i" (mrem/yr per µCi/m³, from Table 2.1)

M_i = gamma air dose conversion factor for noble gas radionuclide "i" (mrad/yr per µCi/m³, from Table 2.1)

1.1 = mrem skin dose per mrad gamma air dose (mrem/mrad)

Actual meteorological conditions concurrent with the release period or the default, annual average dispersion parameters as presented in Table 2.3 may be used for evaluating the gaseous effluent dose rate.

2.3.2 SITE BOUNDARY Dose Rate - Radioiodine and Particulates

ODCM Normal Condition 13.2.1.b limits the dose rate to ≤ 1500 mrem/yr to any organ for I-131, I-133, tritium and particulates with half-lives greater than 8 days. To demonstrate compliance with this limit, an evaluation is performed at a frequency no greater than that corresponding to the sampling and analysis time period for continuous releases (e.g., nominally once per 7 days) and for batch releases on the time period over which any batch release is to occur. The following equation may be used for the dose rate evaluation:

$$\dot{D}_o = \chi/Q \times \sum \left(R_i \times \dot{Q}_i \right) \tag{2.6}$$

where:

$\dot{D}_o$ = average organ dose rate over the sampling time period (mrem/yr)

χ/Q = atmospheric dispersion to the controlling SITE BOUNDARY for the inhalation pathway (sec/m³, from Table 2.3)

R_i = dose parameter for radionuclide "i", (mrem/yr per µCi/m³) for the child inhalation pathway from Table 2.6

$\dot{Q}_i$ = average release rate over the appropriate sampling period and analysis frequency for radionuclide "i", I-131, I-133, tritium or other radionuclide in particulate form with half-life greater than 8 days (µCi/sec)

By substituting 1500 mrem/yr for $\dot{D}_o$ solving for $\dot{Q}_i$, an allowable release rate for I-131 can be determined. Based on the annual average meteorological dispersion (see Table 2.3) and the most limiting potential pathway, age group and organ (inhalation pathway, child thyroid – R_i = 1.62E+07 mrem/yr per µCi/m³) the allowable release rate for I-131 is 6.43 µCi/sec. An added conservatism factor of 0.25 has been included in this calculation to account for any potential dose contribution from other radioactive particulate material. For a 7-day period, which is the nominal sampling and analysis frequency for I-131, the cumulative allowable release is 3.9 Ci. Therefore, as long as the I-131 releases in any 7-day period do not exceed 3.9 Ci, no additional analyses are needed to verify compliance with the ODCM Normal Condition 13.2.1.b limits on allowable release rate.

2.4 Gaseous Effluent Dose Calculations - 10 CFR 50

2.4.1 UNRESTRICTED AREA Dose - Noble Gases

ODCM Normal Condition 13.2.2 requires a periodic assessment of releases of noble gases to evaluate compliance with the quarterly dose limits of (≤ 5 mrad, gamma-air and ≤ 10 mrad, beta-air) and the calendar year limits (≤ 10 mrad, gamma-air and ≤ 20 mrad, beta-air). The following equations may be used to calculate the gamma-air and beta-air doses:

$$D_\gamma = 3.17E\text{-}08 \times \chi/Q \times \sum (M_i \times Q_i) \tag{2.7}$$

and

$$D_\beta = 3.17E\text{-}08 \times \chi/Q \times \sum (N_i \times Q_i) \tag{2.8}$$

where:

D_γ	=	air dose due to gamma emissions for noble gas radionuclides (mrad)
D_β	=	air dose due to beta emissions for noble gas radionuclides (mrad)
χ/Q	=	atmospheric dispersion to the controlling SITE BOUNDARY (sec/m³, from Table 2.3)
Q_i	=	cumulative release of noble gas radionuclide "i" over the period of interest (µCi)
M_i	=	air dose factor due to gamma emissions from noble gas radionuclide "i" (mrad/yr per µCi/m³ from Table 2.1)
N_i	=	air dose factor due to beta emissions from noble gas radionuclide "i" (mrad/yr per µCi/m³, Table 2.1)
3.17E-08	=	conversion factor (yr/sec)

In lieu of the individual noble gas radionuclide dose assessment as presented above, the following simplified dose calculational equation may be used for verifying compliance with the dose limits of ODCM Normal Condition 13.2.2. (Refer to Appendix B for the derivation and justification for this simplified method.)

$$D_\gamma = \frac{3.17E\text{-}08}{0.50} \times \chi/Q \times M_{eff} \times \sum Q_i \tag{2.9}$$

and

$$D_\beta = \frac{3.17E\text{-}08}{0.50} \times \chi/Q \times N_{eff} \times \sum Q_i \tag{2.10}$$

where:

M_{eff}	=	5.3E+02 effective gamma-air dose factor (mrad/yr per $\mu Ci/m^3$)
N_{eff}	=	1.1E+03 effective beta-air dose factor (mrad/yr per $\mu Ci/m^3$)
0.50	=	conservatism factor

Actual meteorological conditions concurrent with the release period or the default, annual average dispersion parameters as presented in Table 2.3, may be used for the evaluation of the gamma-air and beta-air doses.

2.4.2 UNRESTRICTED AREA Dose - Radioiodine and Particulates

Per the requirements of ODCM Normal Condition 13.2.3, a periodic assessment shall be performed to evaluate compliance with the quarterly dose limit (≤ 7.5 mrem) and calendar year limit (≤ 15 mrem) to any organ. The following equation may be used to evaluate the maximum organ dose due to releases of I-131, I-133, tritium and particulates with half-lives greater than 8 days:

$$D_{aop} = 3.17E-08 \times W \times SF_p \times \sum (R_i \times Q_i) \quad (2.11)$$

where:

D_{aop}	=	dose or dose commitment for age group "a" to organ "o", including the total body, via pathway "p" from I-131, I-133, tritium and radionuclides in particulate form with half-life greater than eight days (mrem)
W	=	atmospheric dispersion parameter to the controlling location(s) as identified in Table 2.3
χ/Q	=	atmospheric dispersion for inhalation pathway and H-3 dose contribution via other pathways (sec/m^3)
D/Q	=	atmospheric deposition for vegetation, milk and ground plane exposure pathways (l/m^2)
R_i	=	dose factor for radionuclide "i", (mrem/yr per $\mu Ci/m^3$) or (m^2 - mrem/yr per μCi/sec) from Table 2.4 through 2.15 for each age group "a" and the applicable pathway "p" as identified in Table 2.3. Values for R_i were derived in accordance with the methods described in NUREG-0133.
Q_i	=	cumulative release over the period of interest for radionuclide "i" -- I-131 or radioactive material in particulate form with half-life greater than 8 days (μCi).

SF_p = seasonal correction factor to account for the fraction of the period that the applicable exposure pathway does exist.

1) For milk and vegetation exposure pathways:

$$= \frac{\#\ of\ months\ in\ the\ period\ that\ grazing\ occurs}{total\ \#\ of\ months\ in\ period}$$

= 0.5 for annual calculations

2) For inhalation and ground plane exposure pathways: = 1.0

In lieu of the individual radionuclide (I-131 and particulates) dose assessment as presented above, the following simplified dose calculational equation may be used for verifying compliance with the dose limits of ODCM Normal Condition 13.2.3.

$$D_{max} = 3.17E-08 \times W \times SF_p \times R_{I-131} \times \sum Q_i \qquad (2.12)$$

where:

D_{max} = maximum organ dose (mrem)

R_{I-131} = I-131 dose parameter for the thyroid for the identified controlling pathway

= 1.05E+12, infant thyroid dose parameter with the grass-cow-milk pathway controlling (m^2 - mrem/yr per µCi/sec)

The ground plane exposure and inhalation pathways need not be considered when the above-simplified calculational method is used because of the overall negligible contribution of these pathways to the total thyroid dose. It is recognized that for some particulate radionuclides (e.g., Co-60 and Cs-137), the ground plane exposure pathway may represent a higher dose contribution than either the vegetation or grass-cow-milk pathway. However, use of the I-131 thyroid dose parameter for all radionuclides will maximize the organ dose calculation, especially considering that no other radionuclide has a higher dose parameter for any organ via any pathway than I-131 for the thyroid via the grass-cow-milk pathway.

The location of exposure pathways and the maximum organ dose calculation may be based on the available pathways in the surrounding environment of Kewaunee as identified by the annual land-use census. Otherwise, the dose will be evaluated based on the predetermined controlling pathways as identified in Table 2.3.

2.5 Gaseous Effluent Dose Projection

ODCM Normal Condition 13.2.4 requires that the VENTILATION EXHAUST TREATMENT SYSTEM be used to reduce radioactive material levels prior to discharge when projected doses exceed one-half the annual design objective rate in any 31 days, i.e., exceeding:

- 0.2 mrad, gamma air,
- 0.4 mrad, beta air, or
- 0.3 mrem, maximum organ.

The applicable gaseous release sources and processing systems are as delineated in Figure 2.

Dose projections are performed at least once per 31 days by the following equations:

$$D_{\gamma p} = D_{\gamma} \times (31 \div d) \tag{2.13}$$

$$D_{\beta p} = D_{\beta} \times (31 \div d) \tag{2.14}$$

$$D_{maxp} = D_{max} \times (31 \div d) \tag{2.15}$$

where:

$D_{\gamma p}$	=	gamma air dose projection for current 31 day period (mrad)
D_{γ}	=	gamma air dose to date for current 31 day period as determined by equation (2.7) or (2.9) (mrad)
$D_{\beta p}$	=	beta air dose projection for current 31 day period (mrad)
D_{β}	=	beta air dose to date for current 31 day period as determined by equation (2.8) or (2.10) (mrad)
D_{maxp}	=	maximum organ dose projection for current 31 day period (mrem)
D_{max}	=	maximum organ dose to date for current 31 day period as determined by equation (2.11) or (2.12) (mrem)
d	=	number of days to date in current 31 day period
31	=	number of days in a 31 day period

2.6 Environmental Radiation Protection Standards 40 CFR 190

For the purpose of implementing ODCM Normal Condition 13.4.1 on the EPA environmental radiation protection standard and Technical Specification 5.6.2 on reporting requirements, dose calculations may be performed using the above equations with the substitution of average or actual meteorological parameters for the period of interest and actual applicable pathways. Any exposure attributable to on-site sources will be evaluated based on the results of the environmental monitoring program (TLD measurements) or by calculational methods. NUREG-0543 describes acceptable methods for demonstrating compliance with 40 CFR Part 190 when radioactive effluents exceed the Appendix I portion of the specifications.

2.7 Incineration of Radioactively Contaminated Oil

During plant operation, radioactively contaminated oils are generated from various pieces of equipment operating in the plant. The largest source of contaminated oil is the reactor coolant pump lubricating oil, which is periodically changed for preventive maintenance reasons. 10 CFR Part 20 allows licensees to incinerate radioactively contaminated oils on site provided that the total radioactive effluents from the facility conform to the requirements of 10 CFR Part 50, Appendix I.

Radioactively contaminated oil, which is designated for incineration, will be collected in containers, which are uniquely serialized such that the contents can be identified and tracked. Each container will be sampled and analyzed for radioactivity. The isotopic concentrations will be recorded for each container.

The heating boiler will be utilized to incinerate the radioactively contaminated oil collected on site. A gaseous radwaste effluent dose calculation, as prescribed in Section 2.3 of the ODCM, will be performed to ensure that the limits established by ODCM Normal Condition 13.2.1, 13.2.2 and 13.2.3 are not exceeded. Release of the activity is assumed to occur at the time the contaminated oil is transferred into the heating boiler fuel oil storage tank and will be accounted for using established plant procedures. This will be valid for an assumed release from the fuel oil storage tank vent, fill piping, or from the boiler exhaust stack. See Figure 3 for a description of the heating boiler fuel oil system.

2.8 Total Dose

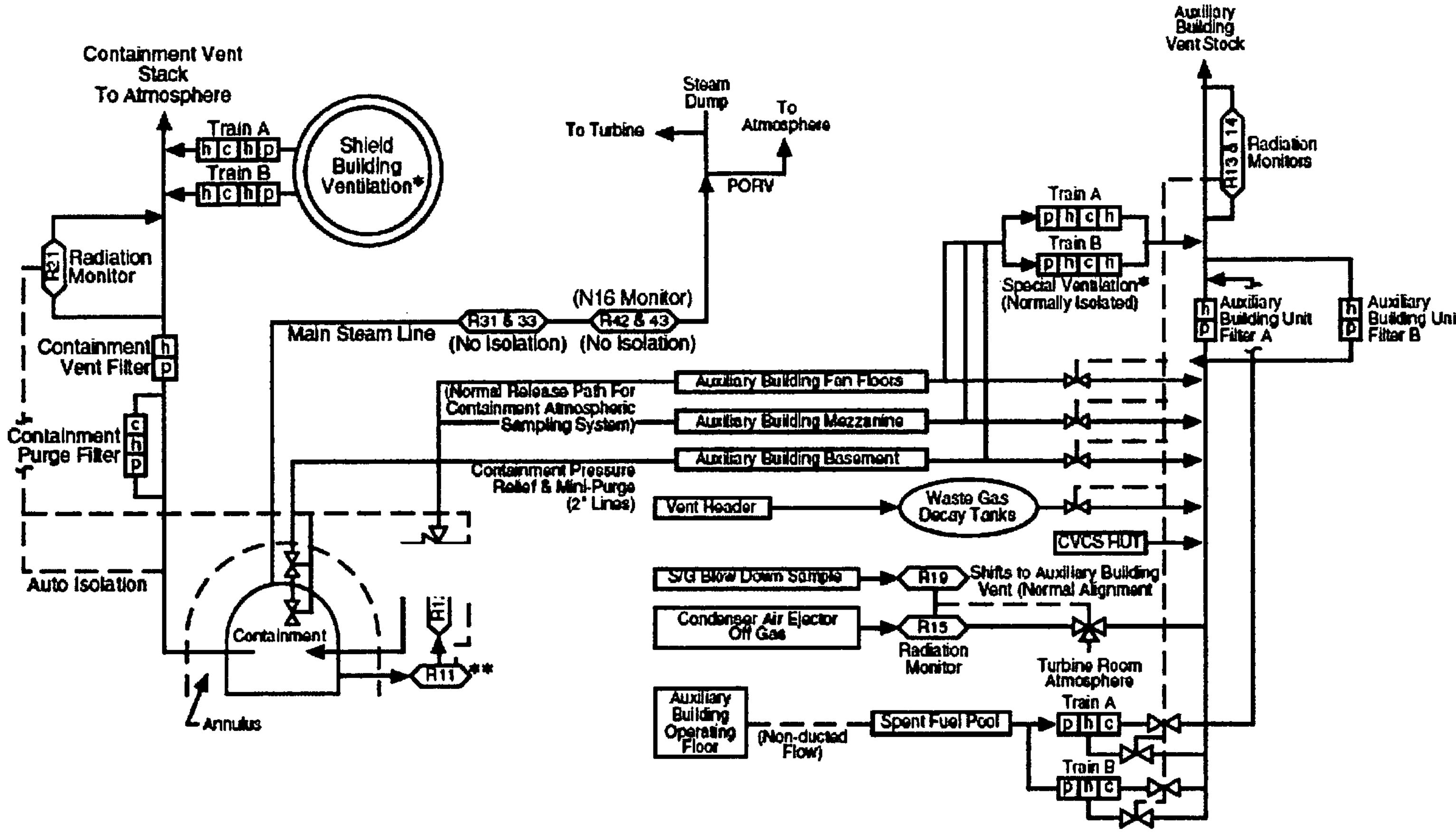
The purpose of this section is to describe the method used to calculate the cumulative dose contributions from liquid and gaseous effluents in accordance with KPS Technical Specifications for total dose. This method can also be used to demonstrate compliance with the Environmental Protection Agency (EPA) 40CFR190, "Environmental Standards for the Uranium Fuel Cycle".

Compliance with the KPS Technical Specification dose objectives for the maximum individual demonstrates compliance with the EPA limits to any MEMBER OF THE PUBLIC, since the design dose objectives from 10CFR50, Appendix I are much lower than the 40CFR190 dose limits to the general public. With the calculated doses from the releases of radioactive materials in liquid or gaseous effluents exceeding twice the limits outlined in ODCM DNC 13.1.2, 13.2.2, and 13.2.3, a special analysis shall be performed. The purpose of this analysis is to demonstrate if the total dose to any MEMBER OF THE PUBLIC (real individual) from all uranium fuel cycle sources (including direct radiation contributions from the facility, from outside storage areas and from all real pathways) is limited to less than or equal to 25 mrem per year to the total body or any organ, except the thyroid, which is limited to 75 mrem per year.

If required, the total dose to a MEMBER OF THE PUBLIC will be calculated for all significant effluent release points for all real pathways including direct radiation. Effluent releases from Point Beach Nuclear Plant must also be considered due to its proximity. Calculations will be based on the equations in Sections 1.4, 2.4.1, and 2.4.2, with the exception that usage factors and other site specific parameters may be modified using more realistic assumptions, where appropriate.

The direct radiation component from the facility can be determined using environmental TLD results. These results will be corrected for natural background and for actual occupancy time of any areas accessible to the general public at the location of maximum direct radiation. It is recognized that by including the results from the environmental TLDs into the sum of total dose component, the direct radiation dose may be overestimated. The TLD measurements may include the exposure from noble gases, ground plane deposition, and shoreline deposition, which have already been included in the summation of the significant dose pathways to the general public. However, this conservative method can be used, if required, as well as any other method for estimating the direct radiation dose from contained radioactive sources within the facility. The methodology used to incorporate the direct radiation component into total dose estimates will be outlined whenever total doses are reported.

Therefore, the total dose will be determined based on the most realistic site specific data and parameters to assess the real dose to any MEMBER OF THE PUBLIC.



Legend

= Sample/Monitor
= Isolation Devise (Damper or Valve)
= 3 Was Valve
= Auto Isolation

p = Prefilter
h = HEPA Filter
c = Charcoal Filter

* The shield building ventilation and special ventilation are ESF systems and are not part of the normal effluent processing system. They are included for completeness only.

** The containment air sampler (R11 and radiation monitor (R12) can also be aligned as needed for sampling containment vent.

Graphics No. CS7336

ODCM FIGURE 2
GASEOUS RADIOACTIVE EFFLUENT FLOW DIAGRAM

Figure 3
Simplified Heating Boiler Fuel Oil Piping System

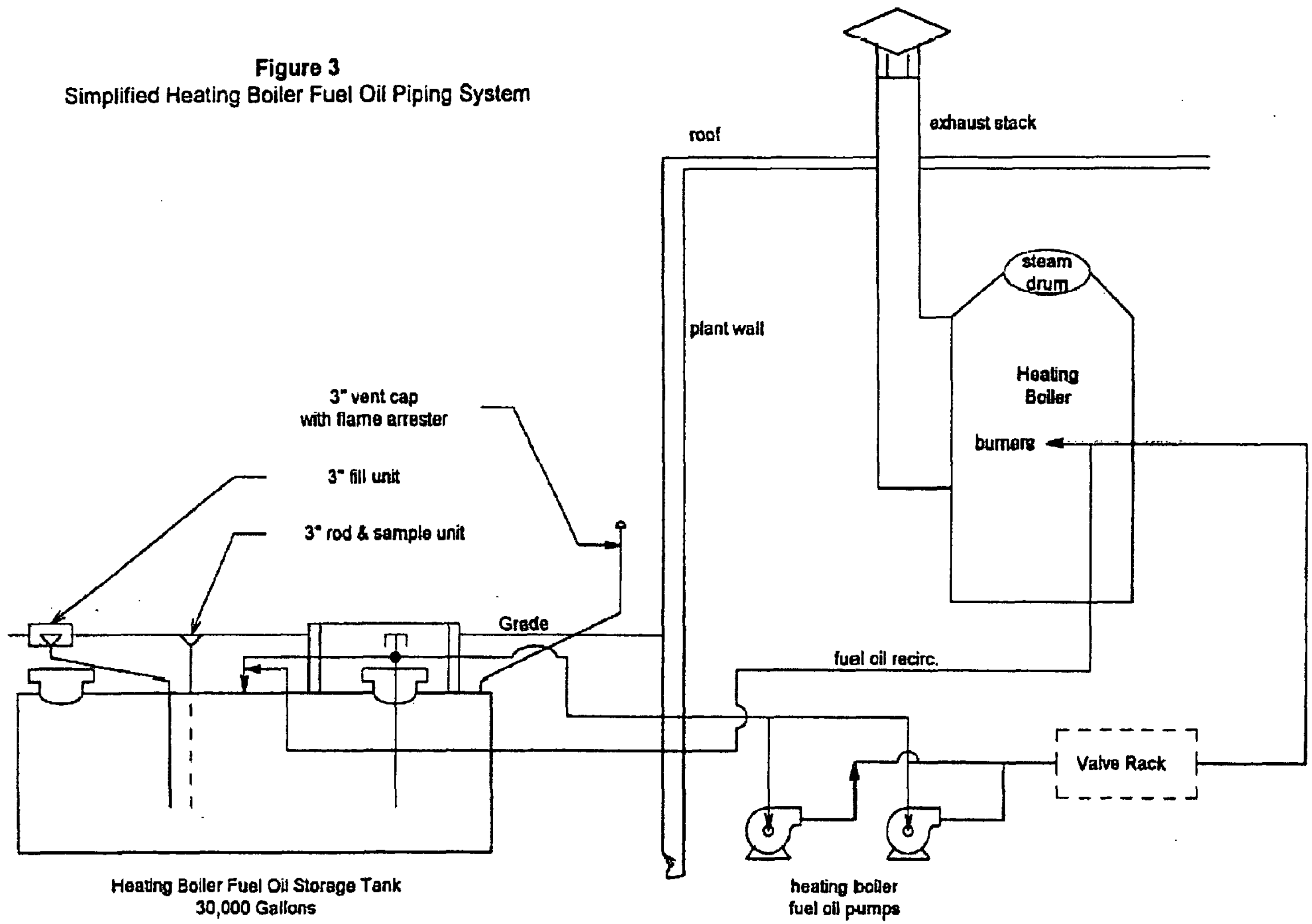


Table 2.1

Dose Factors for Noble Gases

Radionuclide	Total Body Dose Factor K_i (mrem/yr per µCi/m³)	Skin Dose Factor L_i (mrem/yr per µCi/m³)	Gamma Air Dose Factor M_i (mrad/yr per µCi/m³)	Beta Air Dose Factor N_i (mrad/yr per µCi/m³)
Kr-83m	7.56E-02	-	1.93E+01	2.88E+02
Kr-85m	1.17E+03	1.46E+03	1.23E+03	1.97E+03
Kr-85	1.61E+01	1.34E+03	1.72E+01	1.95E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03	1.03E+04
Kr-88	1.47E+04	2.37E+03	1.52E+04	2.93E+03
Kr-89	1.66E+04	1.01E+04	1.73E+04	1.06E+04
Kr-90	1.56E+04	7.29E+03	1.63E+04	7.83E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	1.11E+03
Xe-133m	2.51E+02	9.94E+02	3.27E+02	1.48E+03
Xe-133	2.94E+02	3.06E+02	3.53E+02	1.05E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03	7.39E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03	2.46E+03
Xe-137	1.42E+03	1.22E+04	1.51E+03	1.27E+04
Xe-138	8.83E+03	4.13E+03	9.21E+03	4.75E+03
Ar-41	8.84E+03	2.69E+03	9.30E+03	3.28E+03

Table 2.2

Parameters for Gaseous Alarm Setpoint Determinations

Parameter	Actual Value	Default Value*	Units	Comments
χ/Q	calculated	3.6E-06	sec/m^3	Licensing technical specification value
VF	fan curves	26,000 54,000	cfm	Containment – normal plus purge modes Auxiliary Building – normal operation
C_i	measured	N/A	µCi/m^3	
K_i	nuclide specific	N/A	mrem/yr per µCi/m^3	Values from Table 2.1
L_i	nuclide specific	N/A	mrem/yr per µCi/m^3	Values from Table 2.1
M_i	nuclide specific	N/A	mrem/yr per µCi/m^3	Values from Table 2.1
Sensitivity** (SEN) R-12 R-21 R-13 R-14	as determined	2.32E+07 2.32E+07 2.32E+07 2.32E+07	cpm per µCi/cm^3	Containment Containment Auxiliary Building Auxiliary Building
Background (bkg) R-12 R-21 R-13 R-14	as determined	4.0E+02 4.0E+01 6.0E+02 9.0E+02	cpm	Nominal values only; actual values may be used in lieu of these reference values.
Setpoint* (SP) R-12 R-21 R-13 R-14	calculated calculated calculated calculated	2.8E+05+bkg 2.8E+05+bkg 1.3E+05+bkg 1.3E+05+bkg	cpm	Default alarm setpoints; more conservative values may be used as deemed appropriate and desirable for ensuring regulatory compliance and for maintaining releases ALARA.

* Refer to Calculation # C10690 for the default setpoint calculation.
** Conservatively based on Xe-133 sensitivity.

Table 2.3

Controlling Locations, Pathways and

Atmospheric Dispersion for Dose Calculations

ODCM Normal Condition	Location	Pathways	Atmospheric Dispersion	
			χ/Q (sec/m^3)	D/Q (1/m^2)
13.2.1.a	Site Boundary (0.81 mile, NNW)	Noble gases Direct exposure	7.44E-07	N/A
13.2.1.b	Site Boundary (0.81 mile, NNW)	Inhalation, Ground Plane	7.44E-07	N/A
13.2.2	Site Boundary (0.81 mile, NNW)	Gamma Air Beta Air	7.44E-07	N/A
13.2.3	Residence/dairy (1.3 mile SW)	Inhalation, Vegetation, Milk and Ground Plane	3.95E-08	1.86E-09

Table 2.4 (Page 1 of 2)

R_i Inhalation Pathway Dose Factors – ADULT

(mrem/yr per μCi/m_3)

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
H-3	-	1.26E+3	1.26E+3	1.26E+3	1.26E+3	1.26E+3	1.26E+3
C-14	1.82E+4	3.41E+3	3.41E+3	3.41E+3	3.41E+3	3.41E+3	3.41E+3
Na-24	1.02E+4	1.02E+4	1.02E+4	1.02E+4	1.02E+4	1.02E+4	1.02E+4
P-32	1.32E+6	7.71E+4	-	-	-	8.64E+4	5.01E+4
Cr-51	-	-	5.95E+1	2.28E+1	1.44E+4	3.32E+3	1.00E+2
Mn-54	-	3.96E+4	-	9.84E+3	1.40E+6	7.74E+4	6.30E+3
Mn-56	-	1.24E+0	-	1.30E+0	9.44E+3	2.02E+4	1.83E-1
Fe-55	2.46E+4	1.70E+4	-	-	7.21E+4	6.03E+3	3.94E+3
Fe-59	1.18E+4	2.78E+4	-	-	1.02E+6	1.88E+5	1.06E+4
Co-57	-	6.92E+2	-	-	3.70E+5	3.14E+4	6.71E+2
Co-58	-	1.58E+3	-	-	9.28E+5	1.06E+5	2.07E+3
Co-60	-	1.15E+4	-	-	5.97E+6	2.85E+5	1.48E+4
Ni-63	4.32E+5	3.14E+4	-	-	1.78E+5	1.34E+4	1.45E+4
Ni-65	1.54E+0	2.10E-1	-	-	5.60E+3	1.23E+4	9.12E-2
Cu-64	-	1.46E+0	-	4.62E+0	6.78E+3	4.90E+4	6.15E-1
Zn-65	3.24E+4	1.03E+5	-	6.90E+4	8.64E+5	5.34E+4	4.66E+4
Zn-69	3.38E-2	6.51E-2	-	4.22E-2	9.20E+2	1.63E+1	4.52E-3
Br-82	-	-	-	-	-	1.04E+4	1.35E+4
Br-83	-	-	-	-	-	2.32E+2	2.41E+2
Br-84	-	-	-	-	-	1.64E-3	3.13E+2
Br-85	-	-	-	-	-	-	1.28E+1
Rb-86	-	1.35E+5	-	-	-	1.66E+4	5.90E+4
Rb-88	-	3.87E+2	-	-	-	3.34E-9	1.93E+2
Rb-89	-	2.56E+2	-	-	-	-	1.70E+2
Sr-89	3.04E+5	-	-	-	1.40E+6	3.50E+5	8.72E+3
Sr-90	9.92E+7	-	-	-	9.60E+6	7.22E+5	6.10E+6
Sr-91	6.19E+1	-	-	-	3.65E+4	1.91E+5	2.50E+0
Sr-92	6.74E+0	-	-	-	1.65E+4	4.30E+4	2.91E-1
Y-90	2.09E+3	-	-	-	1.70E+5	5.06E+5	5.61E+1
Y-91m	2.61E-1	-	-	-	1.92E+3	1.33E+0	1.02E-2
Y-91	4.62E+5	-	-	-	1.70E+6	3.85E+5	1.24E+4
Y-92	1.03E+1	-	-	-	1.57E+4	7.35E+4	3.02E-1
Y-93	9.44E+1	-	-	-	4.85E+4	4.22E+5	2.61E+0
Zr-95	1.07E+5	3.44E+4	-	5.42E+4	1.77E+6	1.50E+5	2.33E+4
Zr-97	9.68E+1	1.96E+1	-	2.97E+1	7.87E+4	5.23E+5	9.04E+0
Nb-95	1.41E+4	7.82E+3	-	7.74E+3	5.05E+5	1.04E+5	4.21E+3
Nb-97	2.22E-1	5.62E-2	-	6.54E-2	2.40E+3	2.42E+2	2.05E-2
Mo-99	-	1.21E+2	-	2.91E+2	9.12E+4	2.48E+5	2.30E+1
Tc-99m	1.03E-3	2.91E-3	-	4.42E-2	7.64E+2	4.16E+3	3.70E-2
Tc-101	4.18E-5	6.02E-5	-	1.08E-3	3.99E+2	-	5.90E-4

Table 2.4 (Page 2 of 2)

R_i Inhalation Pathway Dose Factors – ADULT

(mrem/yr per $\mu Ci/m^3$)

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
Ru-103	1.53E+3	-	-	5.83E+3	5.05E+5	1.10E+5	6.58E+2
Ru-105	7.90E-1	-	-	1.02E+0	1.10E+4	4.82E+4	3.11E-1
Ru-106	6.91E+4	-	-	1.34E+5	9.36E+6	9.12E+5	8.72E+3
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-
Ag-110m	1.08E+4	1.00E+4	-	1.97E+4	4.63E+6	3.02E+5	5.94E+3
Sb-124	3.12E+4	5.89E+2	7.55E+1	-	2.48E+6	4.06E+5	1.24E+4
Sb-125	5.34E+4	5.95E+2	5.40E+1	-	1.74E+6	1.01E+5	1.26E+4
Te-125m	3.42E+3	1.58E+3	1.05E+3	1.24E+4	3.14E+5	7.06E+4	4.67E+2
Te-127m	1.26E+4	5.77E+3	3.29E+3	4.58E+4	9.60E+5	1.50E+5	1.57E+3
Te-127	1.40E+0	6.42E-1	1.06E+0	5.10E+0	6.51E+3	5.74E+4	3.10E-1
Te-129m	9.76E+3	4.67E+3	3.44E+3	3.66E+4	1.16E+6	3.83E+5	1.58E+3
Te-129	4.98E-2	2.39E-2	3.90E-2	1.87E-1	1.94E+3	1.57E+2	1.24E-2
Te-131m	6.99E+1	4.36E+1	5.50E+1	3.09E+2	1.46E+5	5.56E+5	2.90E+1
Te-131	1.11E-2	5.95E-3	9.36E-3	4.37E-2	1.39E+3	1.84E+1	3.59E-3
Te-132	2.60E+2	2.15E+2	1.90E+2	1.46E+3	2.88E+5	5.10E+5	1.62E+2
I-130	4.58E+3	1.34E+4	1.14E+6	2.09E+4	-	7.69E+3	5.28E+3
I-131	2.52E+4	3.58E+4	1.19E+7	6.13E+4	-	6.28E+3	2.05E+4
I-132	1.16E+3	3.26E+3	1.14E+5	5.18E+3	-	4.06E+2	1.16E+3
I-133	8.64E+3	1.48E+4	2.15E+6	2.58E+4	-	8.88E+3	4.52E+3
I-134	6.44E+2	1.73E+3	2.98E+4	2.75E+3	-	1.01E+0	6.15E+2
I-135	2.68E+3	6.98E+3	4.48E+5	1.11E+4	-	5.25E+3	2.57E+3
Cs-134	3.73E+5	8.48E+5	-	2.87E+5	9.76E+4	1.04E+4	7.28E+5
Cs-136	3.90E+4	1.46E+5	-	8.56E+4	1.20E+4	1.17E+4	1.10E+5
Cs-137	4.78E+5	6.21E+5	-	2.22E+5	7.52E+4	8.40E+3	4.28E+5
Cs-138	3.31E+2	6.21E+2	-	4.80E+2	4.86E+1	1.86E-3	3.24E+2
Ba-139	9.36E-1	6.66E-4	-	6.22E-4	3.76E+3	8.96E+2	2.74E-2
Ba-140	3.90E+4	4.90E+1	-	1.67E+1	1.27E+6	2.18E+5	2.57E+3
Ba-141	1.00E-1	7.53E-5	-	7.00E-5	1.94E+3	1.16E-7	3.36E-3
Ba-142	2.63E-2	2.70E-5	-	2.29E-5	1.19E+3	-	1.66E-3
La-140	3.44E+2	1.74E+2	-	-	1.36E+5	4.58E+5	4.58E+1
La-142	6.83E-1	3.10E-1	-	-	6.33E+3	2.11E+3	7.72E-2
Ce-141	1.99E+4	1.35E+4	-	6.26E+3	3.62E+5	1.20E+5	1.53E+3
Ce-143	1.86E+2	1.38E+2	-	6.08E+1	7.98E+4	2.26E+5	1.53E+1
Ce-144	3.43E+6	1.43E+6	-	8.48E+5	7.78E+6	8.16E+5	1.84E+5
Pr-143	9.36E+3	3.75E+3	-	2.16E+3	2.81E+5	2.00E+5	4.64E+2
Pr-144	3.01E-2	1.25E-2	-	7.05E-3	1.02E+3	2.15E-8	1.53E-3
Nd-147	5.27E+3	6.10E+3	-	3.56E+3	2.21E+5	1.73E+5	3.65E+2
W-187	8.48E+0	7.08E+0	-	-	2.90E+4	1.55E+5	2.48E+0
Np-239	2.30E+2	2.26E+1	-	7.00E+1	3.76E+4	1.19E+5	1.24E+1

Table 2.5 (Page 1 of 2)

R_i Inhalation Pathway Dose Factors – TEEN

(mrem/yr per μCi/m³)

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
H-3	-	1.27E+3	1.27E+3	1.27E+3	1.27E+3	1.27E+3	1.27E+3
C-14	2.60E+4	4.87E+3	4.87E+3	4.87E+3	4.87E+3	4.87E+3	4.87E+3
Na-24	1.38E+4	1.38E+4	1.38E+4	1.38E+4	1.38E+4	1.38E+4	1.38E+4
P-32	1.89E+6	1.10E+5	-	-	-	9.28E+4	7.16E+4
Cr-51	-	-	7.50E+1	3.07E+1	2.10E+4	3.00E+3	1.35E+2
Mn-54	-	5.11E+4	-	1.27E+4	1.98E+6	6.68E+4	8.40E+3
Mn-56	-	1.70E+0	-	1.79E+0	1.52E+4	5.74E+4	2.52E-1
Fe-55	3.34E+4	2.38E+4	-	-	1.24E+5	6.39E+3	5.54E+3
Fe-59	1.59E+4	3.70E+4	-	-	1.53E+6	1.78E+5	1.43E+4
Co-57	-	6.92E+2	-	-	5.86E+5	3.14E+4	9.20E+2
Co-58	-	2.07E+3	-	-	1.34E+6	9.52E+4	2.78E+3
Co-60	-	1.51E+4	-	-	8.72E+6	2.59E+5	1.98E+4
Ni-63	5.80E+5	4.34E+4	-	-	3.07E+5	1.42E+4	1.98E+4
Ni-65	2.18E+0	2.93E-1	-	-	9.36E+3	3.67E+4	1.27E-1
Cu-64	-	2.03E+0	-	6.41E+0	1.11E+4	6.14E+4	8.48E-1
Zn-65	3.86E+4	1.34E+5	-	8.64E+4	1.24E+6	4.66E+4	6.24E+4
Zn-69	4.83E-2	9.20E-2	-	6.02E-2	1.58E+3	2.85E+2	6.46E-3
Br-82	-	-	-	-	-	-	1.82E+4
Br-83	-	-	-	-	-	-	3.44E+2
Br-84	-	-	-	-	-	-	4.33E+2
Br-85	-	-	-	-	-	-	1.83E+1
Rb-86	-	1.90E+5	-	-	-	1.77E+4	8.40E+4
Rb-88	-	5.46E+2	-	-	-	2.92E-5	2.72E+2
Rb-89	-	3.52E+2	-	-	-	3.38E-7	2.33E+2
Sr-89	4.34E+5	-	-	-	2.42E+6	3.71E+5	1.25E+4
Sr-90	1.08E+8	-	-	-	1.65E+7	7.65E+5	6.68E+6
Sr-91	8.80E+1	-	-	-	6.07E+4	2.59E+5	3.51E+0
Sr-92	9.52E+0	-	-	-	2.74E+4	1.19E+5	4.06E-1
Y-90	2.98E+3	-	-	-	2.93E+5	5.59E+5	8.00E+1
Y-91m	3.70E-1	-	-	-	3.20E+3	3.02E+1	1.42E-2
Y-91	6.61E+5	-	-	-	2.94E+6	4.09E+5	1.77E+4
Y-92	1.47E+1	-	-	-	2.68E+4	1.65E+5	4.29E-1
Y-93	1.35E+2	-	-	-	8.32E+4	5.79E+5	3.72E+0
Zr-95	1.46E+5	4.58E+4	-	6.74E+4	2.69E+6	1.49E+5	3.15E+4
Zr-97	1.38E+2	2.72E+1	-	4.12E+1	1.30E+5	6.30E+5	1.26E+1
Nb-95	1.86E+4	1.03E+4	-	1.00E+4	7.51E+5	9.68E+4	5.66E+3
Nb-97	3.14E-1	7.78E-2	-	9.12E-2	3.93E+3	2.17E+3	2.84E-2
Mo-99	-	1.69E+2	-	4.11E+2	1.54E+5	2.69E+5	3.22E+1
Tc-99m	1.38E-3	3.86E-3	-	5.76E-2	1.15E+3	6.13E+3	4.99E-2
Tc-101	5.92E-5	8.40E-5	-	1.52E-3	6.67E+2	8.72E-7	8.24E-4

Table 2.5 (Page 2 of 2)

R_i Inhalation Pathway Dose Factors – TEEN

(mrem/yr per µCi/m^3)

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
Ru-103	2.10E+3	-	-	7.43E+3	7.83E+5	1.09E+5	8.96E+2
Ru-105	1.12E+0	-	-	1.41E+0	1.82E+4	9.04E+4	4.34E-1
Ru-106	9.84E+4	-	-	1.90E+5	1.61E+7	9.60E+5	1.24E+4
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-
Ag-110m	1.38E+4	1.31E+4	-	2.50E+4	6.75E+6	2.73E+5	7.99E+3
Sb-124	4.30E+4	7.94E+2	9.76E+1	-	3.85E+6	3.98E+5	1.68E+4
Sb-125	7.38E+4	8.08E+2	7.04E+1	-	2.74E+6	9.92E+4	1.72E+4
Te-125m	4.88E+3	2.24E+3	1.40E+3	-	5.36E+5	7.50E+4	6.67E+2
Te-127m	1.80E+4	8.16E+3	4.38E+3	6.54E+4	1.66E+6	1.59E+5	2.18E+3
Te-127	2.01E+0	9.12E-1	1.42E+0	7.28E+0	1.12E+4	8.08E+4	4.42E-1
Te-129m	1.39E+4	6.58E+3	4.58E+3	5.19E+4	1.98E+6	4.05E+5	2.25E+3
Te-129	7.10E-2	3.38E-2	5.18E-2	2.66E-1	3.30E+3	1.62E+3	1.76E-2
Te-131m	9.84E+1	6.01E+1	7.25E+1	4.39E+2	2.38E+5	6.21E+5	4.02E+1
Te-131	1.58E-2	8.32E-3	1.24E-2	6.18E-2	2.34E+3	1.51E+1	5.04E-3
Te-132	3.60E+2	2.90E+2	2.46E+2	1.95E+3	4.49E+5	4.63E+5	2.19E+2
I-130	6.24E+3	1.79E+4	1.49E+6	2.75E+4	-	9.12E+3	7.17E+3
I-131	3.54E+4	4.91E+4	1.46E+7	8.40E+4	-	6.49E+3	2.64E+4
I-132	1.59E+3	4.38E+3	1.51E+5	6.92E+3	-	1.27E+3	1.58E+3
I-133	1.22E+4	2.05E+4	2.92E+6	3.59E+4	-	1.03E+4	6.22E+3
I-134	8.88E+2	2.32E+3	3.95E+4	3.66E+3	-	2.04E+1	8.40E+2
I-135	3.70E+3	9.44E+3	6.21E+5	1.49E+4	-	6.95E+3	3.49E+3
Cs-134	5.02E+5	1.13E+6	-	3.75E+5	1.46E+5	9.76E+3	5.49E+5
Cs-136	5.15E+4	1.94E+5	-	1.10E+5	1.78E+4	1.09E+4	1.37E+5
Cs-137	6.70E+5	8.48E+5	-	3.04E+5	1.21E+5	8.48E+3	3.11E+5
Cs-138	4.66E+2	8.56E+2	-	6.62E+2	7.87E+1	2.70E-1	4.46E+2
Ba-139	1.34E+0	9.44E-4	-	8.88E-4	6.46E+3	6.45E+3	3.90E-2
Ba-140	5.47E+4	6.70E+1	-	2.28E+1	2.03E+6	2.29E+5	3.52E+3
Ba-141	1.42E-1	1.06E-4	-	9.84E-5	3.29E+3	7.46E-4	4.74E-3
Ba-142	3.70E-2	3.70E-5	-	3.14E-5	1.91E+3	-	2.27E-3
La-140	4.79E+2	2.36E+2	-	-	2.14E+5	4.87E+5	6.26E+1
La-142	9.60E-1	4.25E-1	-	-	1.02E+4	1.20E+4	1.06E-1
Ce-141	2.84E+4	1.90E+4	-	8.88E+3	6.14E+5	1.26E+5	2.17E+3
Ce-143	2.66E+2	1.94E+2	-	8.64E+1	1.30E+5	2.55E+5	2.16E+1
Ce-144	4.89E+6	2.02E+6	-	1.21E+6	1.34E+7	8.64E+5	2.62E+5
Pr-143	1.34E+4	5.31E+3	-	3.09E+3	4.83E+5	2.14E+5	6.62E+2
Pr-144	4.30E-2	1.76E-2	-	1.01E-2	1.75E+3	2.35E-4	2.18E-3
Nd-147	7.86E+3	8.56E+3	-	5.02E+3	3.72E+5	1.82E+5	5.13E+2
W-187	1.20E+1	9.76E+0	-	-	4.74E+4	1.77E+5	3.43E+0
Np-239	3.38E+2	3.19E+1	-	1.00E+2	6.49E+4	1.32E+5	1.77E+1

Table 2.6 (Page 1 of 2)
R_i Inhalation Pathway Dose Factors - CHILD
(mrem/yr per μCi/m^3)

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
H-3	-	1.12E+3	1.12E+3	1.12E+3	1.12E+3	1.12E+3	1.12E+3
C-14	3.59E+4	6.73E+3	6.73E+3	6.73E+3	6.73E+3	6.73E+3	6.73E+3
Na-24	1.61E+4	1.61E+4	1.61E+4	1.61E+4	1.61E+4	1.61E+4	1.61E+4
P-32	2.60E+6	1.14E+5	-	-	-	4.22E+4	9.88E+4
Cr-51	-	-	8.55E+1	2.43E+1	1.70E+4	1.08E+3	1.54E+2
Mn-54	-	4.29E+4	-	1.00E+4	1.58E+6	2.29E+4	9.51E+3
Mn-56	-	1.66E+0	-	1.67E+0	1.31E+4	1.23E+5	3.12E-1
Fe-55	4.74E+4	2.52E+4	-	-	1.11E+5	2.87E+3	7.77E+3
Fe-59	2.07E+4	3.34E+4	-	-	1.27E+6	7.07E+4	1.67E+4
Co-57	-	9.03E+2	-	-	5.07E+5	1.32E+4	1.07E+3
Co-58	-	1.77E+3	-	-	1.11E+6	3.44E+4	3.16E+3
Co-60	-	1.31E+4	-	-	7.07E+6	9.62E+4	2.26E+4
Ni-63	8.21E+5	4.63E+4	-	-	2.75E+5	6.33E+3	2.80E+4
Ni-65	2.99E+0	2.96E-1	-	-	8.18E+3	8.40E+4	1.64E-1
Cu-64	-	1.99E+0	-	6.03E+0	9.58E+3	3.67E+4	1.07E+0
Zn-65	4.26E+4	1.13E+5	-	7.14E+4	9.95E+5	1.63E+4	7.03E+4
Zn-69	6.70E-2	9.66E-2	-	5.85E-2	1.42E+3	1.02E+4	8.92E-3
Br-82	-	-	-	-	-	-	2.09E+4
Br-83	-	-	-	-	-	-	4.74E+2
Br-84	-	-	-	-	-	-	5.48E+2
Br-85	-	-	-	-	-	-	2.53E+1
Rb-86	-	1.98E+5	-	-	-	7.99E+3	1.14E+5
Rb-88	-	5.62E+2	-	-	-	1.72E+1	3.66E+2
Rb-89	-	3.45E+2	-	-	-	1.89E+0	2.90E+2
Sr-89	5.99E+5	-	-	-	2.16E+6	1.67E+5	1.72E+4
Sr-90	1.01E+8	-	-	-	1.48E+7	3.43E+5	6.44E+6
Sr-91	1.21E+2	-	-	-	5.33E+4	1.74E+5	4.59E+0
Sr-92	1.31E+1	-	-	-	2.40E+4	2.42E+5	5.25E-1
Y-90	4.11E+3	-	-	-	2.62E+5	2.68E+5	1.11E+2
Y-91m	5.07E-1	-	-	-	2.81E+3	1.72E+3	1.84E-2
Y-91	9.14E+5	-	-	-	2.63E+6	1.84E+5	2.44E+4
Y-92	2.04E+1	-	-	-	2.39E+4	2.39E+5	5.81E-1
Y-93	1.86E+2	-	-	-	7.44E+4	3.89E+5	5.11E+0
Zr-95	1.90E+5	4.18E+4	-	5.96E+4	2.23E+6	6.11E+4	3.70E+4
Zr-97	1.88E+2	2.72E+1	-	3.89E+1	1.13E+5	3.51E+5	1.60E+1
Nb-95	2.35E+4	9.18E+3	-	8.62E+3	6.14E+5	3.70E+4	6.55E+3
Nb-97	4.29E-1	7.70E-2	-	8.55E-2	3.42E+3	2.78E+4	3.60E-2
Mo-99	-	1.72E+2	-	3.92E+2	1.35E+5	1.27E+5	4.26E+1
Tc-99m	1.78E-3	3.48E-3	-	5.07E-2	9.51E+2	4.81E+3	5.77E-2
Tc-101	8.10E-5	8.51E-5	-	1.45E-3	5.85E+2	1.63E+1	1.08E-3

Table 2.6 (Page 2 of 2)

R_i Inhalation Pathway Dose Factors - CHILD

(mrem/yr per µCi/m^3)

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
Ru-103	2.79E+3	-	-	7.03E+3	6.62E+5	4.48E+4	1.07E+3
Ru-105	1.53E+0	-	-	1.34E+0	1.59E+4	9.95E+4	5.55E-1
Ru-106	1.36E+5	-	-	1.84E+5	1.43E+7	4.29E+5	1.69E+4
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-
Ag-110m	1.69E+4	1.14E+4	-	2.12E+4	5.48E+6	1.00E+5	9.14E+3
Sb-124	5.74E+4	7.40E+2	1.26E+2	-	3.24E+6	1.64E+5	2.00E+4
Sb-125	9.84E+4	7.59E+2	9.10E+1	-	2.32E+6	4.03E+4	2.07E+4
Te-125m	6.73E+3	2.33E+3	1.92E+3	-	4.77E+5	3.38E+4	9.14E+2
Te-127m	2.49E+4	8.55E+3	6.07E+3	6.36E+4	1.48E+6	7.14E+4	3.02E+3
Te-127	2.77E+0	9.51E-1	1.96E+0	7.07E+0	1.00E+4	5.62E+4	6.11E-1
Te-129m	1.92E+4	6.85E+3	6.33E+3	5.03E+4	1.76E+6	1.82E+5	3.04E+3
Te-129	9.77E-2	3.50E-2	7.14E-2	2.57E-1	2.93E+3	2.55E+4	2.38E-2
Te-131m	1.34E+2	5.92E+1	9.77E+1	4.00E+2	2.06E+5	3.08E+5	5.07E+1
Te-131	2.17E-2	8.44E-3	1.70E-2	5.88E-2	2.05E+3	1.33E+3	6.59E-3
Te-132	4.81E+2	2.72E+2	3.17E+2	1.77E+3	3.77E+5	1.38E+5	2.63E+2
I-130	8.18E+3	1.64E+4	1.85E+6	2.45E+4	-	5.11E+3	8.44E+3
I-131	4.81E+4	4.81E+4	1.62E+7	7.88E+4	-	2.84E+3	2.73E+4
I-132	2.12E+3	4.07E+3	1.94E+5	6.25E+3	-	3.20E+3	1.88E+3
I-133	1.66E+4	2.03E+4	3.85E+6	3.38E+4	-	5.48E+3	7.70E+3
I-134	1.17E+3	2.16E+3	5.07E+4	3.30E+3	-	9.55E+2	9.95E+2
I-135	4.92E+3	8.73E+3	7.92E+5	1.34E+4	-	4.44E+3	4.14E+3
Cs-134	6.51E+5	1.01E+6	-	3.30E+5	1.21E+5	3.85E+3	2.25E+5
Cs-136	6.51E+4	1.71E+5	-	9.55E+4	1.45E+4	4.18E+3	1.16E+5
Cs-137	9.07E+5	8.25E+5	-	2.82E+5	1.04E+5	3.62E+3	1.28E+5
Cs-138	6.33E+2	8.40E+2	-	6.22E+2	6.81E+1	2.70E+2	5.55E+2
Ba-139	1.84E+0	9.84E-4	-	8.62E-4	5.77E+3	5.77E+4	5.37E-2
Ba-140	7.40E+4	6.48E+1	-	2.11E+1	1.74E+6	1.02E+5	4.33E+3
Ba-141	1.96E-1	1.09E-4	-	9.47E-5	2.92E+3	2.75E+2	6.36E-3
Ba-142	5.00E-2	3.60E-5	-	2.91E-5	1.64E+3	2.74E+0	2.79E-3
La-140	6.44E+2	2.25E+2	-	-	1.83E+5	2.26E+5	7.55E+1
La-142	1.30E+0	4.11E-1	-	-	8.70E+3	7.59E+4	1.29E-1
Ce-141	3.92E+4	1.95E+4	-	8.55E+3	5.44E+5	5.66E+4	2.90E+3
Ce-143	3.66E+2	1.99E+2	-	8.36E+1	1.15E+5	1.27E+5	2.87E+1
Ce-144	6.77E+6	2.12E+6	-	1.17E+6	1.20E+7	3.89E+5	3.61E+5
Pr-143	1.85E+4	5.55E+3	-	3.00E+3	4.33E+5	9.73E+4	9.14E+2
Pr-144	5.96E-2	1.85E-2	-	9.77E-3	1.57E+3	1.97E+2	3.00E-3
Nd-147	1.08E+4	8.73E+3	-	4.81E+3	3.28E+5	8.21E+4	6.81E+2
W-187	1.63E+1	9.66E+0	-	-	4.11E+4	9.10E+4	4.33E+0
Np-239	4.66E+2	3.34E+1	-	9.73E+1	5.81E+4	6.40E+4	2.35E+1

Table 2.7 (Page 1 of 2)

R_i Inhalation Pathway Dose Factors - INFANT

(mrem/yr per $\mu Ci/m^3$)

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
H-3	-	6.47E+2	6.47E+2	6.47E+2	6.47E+2	6.47E+2	6.47E+2
C-14	2.65E+4	5.31E+3	5.31E+3	5.31E+3	5.31E+3	5.31E+3	5.31E+3
Na-24	1.06E+4	1.06E+4	1.06E+4	1.06E+4	1.06E+4	1.06E+4	1.06E+4
P-32	2.03E+6	1.12E+5	-	-	-	1.61E+4	7.74E+4
Cr-51	-	-	5.75E+1	1.32E+1	1.28E+4	3.57E+2	8.95E+1
Mn-54	-	2.53E+4	-	4.98E+3	1.00E+6	7.06E+3	4.98E+3
Mn-56	-	1.54E+0	-	1.10E+0	1.25E+4	7.17E+4	2.21E-1
Fe-55	1.97E+4	1.17E+4	-	-	8.69E+4	1.09E+3	3.33E+3
Fe-59	1.36E+4	2.35E+4	-	-	1.02E+6	2.48E+4	9.48E+3
Co-57	-	6.51E+2	-	-	3.79E+5	4.86E+3	6.41E+2
Co-58	-	1.22E+3	-	-	7.77E+5	1.11E+4	1.82E+3
Co-60	-	8.02E+3	-	-	4.51E+6	3.19E+4	1.18E+4
Ni-63	3.39E+5	2.04E+4	-	-	2.09E+5	2.42E+3	1.16E+4
Ni-65	2.39E+0	2.84E-1	-	-	8.12E+3	5.01E+4	1.23E-1
Cu-64	-	1.88E+0	-	3.98E+0	9.30E+3	1.50E+4	7.74E-1
Zn-65	1.93E+4	6.26E+4	-	3.25E+4	6.47E+5	5.14E+4	3.11E+4
Zn-69	5.39E-2	9.67E-2	-	4.02E-2	1.47E+3	1.32E+4	7.18E-3
Br-82	-	-	-	-	-	-	1.33E+4
Br-83	-	-	-	-	-	-	3.81E+2
Br-84	-	-	-	-	-	-	4.00E+2
Br-85	-	-	-	-	-	-	2.04E+1
Rb-86	-	1.90E+5	-	-	-	3.04E+3	8.82E+4
Rb-88	-	5.57E+2	-	-	-	3.39E+2	2.87E+2
Rb-89	-	3.21E+2	-	-	-	6.82E+1	2.06E+2
Sr-89	3.98E+5	-	-	-	2.03E+6	6.40E+4	1.14E+4
Sr-90	4.09E+7	-	-	-	1.12E+7	1.31E+5	2.59E+6
Sr-91	9.56E+1	-	-	-	5.26E+4	7.34E+4	3.46E+0
Sr-92	1.05E+1	-	-	-	2.38E+4	1.40E+5	3.91E-1
Y-90	3.29E+3	-	-	-	2.69E+5	1.04E+5	8.82E+1
Y-91m	4.07E-1	-	-	-	2.79E+3	2.35E+3	1.39E-2
Y-91	5.88E+5	-	-	-	2.45E+6	7.03E+4	1.57E+4
Y-92	1.64E+1	-	-	-	2.45E+4	1.27E+5	4.61E-1
Y-93	1.50E+2	-	-	-	7.64E+4	1.67E+5	4.07E+0
Zr-95	1.15E+5	2.79E+4	-	3.11E+4	1.75E+6	2.17E+4	2.03E+4
Zr-97	1.50E+2	2.56E+1	-	2.59E+1	1.10E+5	1.40E+5	1.17E+1
Nb-95	1.57E+4	6.43E+3	-	4.72E+3	4.79E+5	1.27E+4	3.78E+3
Nb-97	3.42E-1	7.29E-2	-	5.70E-2	3.32E+3	2.69E+4	2.63E-2
Mo-99	-	1.65E+2	-	2.65E+2	1.35E+5	4.87E+4	3.23E+1
Tc-99m	1.40E-3	2.88E-3	-	3.11E-2	8.11E+2	2.03E+3	3.72E-2
Tc-101	6.51E-5	8.23E-5	-	9.79E-4	5.84E+2	8.44E+2	8.12E-4

Table 2.7 (Page 2 of 2)

R_i Inhalation Pathway Dose Factors - INFANT

(mrem/yr per $\mu Ci/m^3$)

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
Ru-103	2.02E+3	-	-	4.24E+3	5.52E+5	1.61E+4	6.79E+2
Ru-105	1.22E+0	-	-	8.99E-1	1.57E+4	4.84E+4	4.10E-1
Ru-106	8.68E+4	-	-	1.07E+5	1.16E+7	1.64E+5	1.09E+4
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-
Ag-110m	9.98E+3	7.22E+3	-	1.09E+4	3.67E+6	3.30E+4	5.00E+3
Sb-124	3.79E+4	5.56E+2	1.01E+2	-	2.65E+6	5.91E+4	1.20E+4
Sb-125	5.17E+4	4.77E+2	6.23E+1	-	1.64E+6	1.47E+4	1.09E+4
Te-125m	4.76E+3	1.99E+3	1.62E+3	-	4.47E+5	1.29E+4	6.58E+2
Te-127m	1.67E+4	6.90E+3	4.87E+3	3.75E+4	1.31E+6	2.73E+4	2.07E+3
Te-127	2.23E+0	9.53E-1	1.85E+0	4.86E+0	1.03E+4	2.44E+4	4.89E-1
Te-129m	1.41E+4	6.09E+3	5.47E+3	3.18E+4	1.68E+6	6.90E+4	2.23E+3
Te-129	7.88E-2	3.47E-2	6.75E-2	1.75E-1	3.00E+3	2.63E+4	1.88E-2
Te-131m	1.07E+2	5.50E+1	8.93E+1	2.65E+2	1.99E+5	1.19E+5	3.63E+1
Te-131	1.74E-2	8.22E-3	1.58E-2	3.99E-2	2.06E+3	8.22E+3	5.00E-3
Te-132	3.72E+2	2.37E+2	2.79E+2	1.03E+3	3.40E+5	4.41E+4	1.76E+2
I-130	6.36E+3	1.39E+4	1.60E+6	1.53E+4	-	1.99E+3	5.57E+3
I-131	3.79E+4	4.44E+4	1.48E+7	5.18E+4	-	1.06E+3	1.96E+4
I-132	1.69E+3	3.54E+3	1.69E+5	3.95E+3	-	1.90E+3	1.26E+3
I-133	1.32E+4	1.92E+4	3.56E+6	2.24E+4	-	2.16E+3	5.60E+3
I-134	9.21E+2	1.88E+3	4.45E+4	2.09E+3	-	1.29E+3	6.65E+2
I-135	3.86E+3	7.60E+3	6.96E+5	8.47E+3	-	1.83E+3	2.77E+3
Cs-134	3.96E+5	7.03E+5	-	1.90E+5	7.97E+4	1.33E+3	7.45E+4
Cs-136	4.83E+4	1.35E+5	-	5.64E+4	1.18E+4	1.43E+3	5.29E+4
Cs-137	5.49E+5	6.12E+5	-	1.72E+5	7.13E+4	1.33E+3	4.55E+4
Cs-138	5.05E+2	7.81E+2	-	4.10E+2	6.54E+1	8.76E+2	3.98E+2
Ba-139	1.48E+0	9.84E-4	-	5.92E-4	5.95E+3	5.10E+4	4.30E-2
Ba-140	5.60E+4	5.60E+1	-	1.34E+1	1.60E+6	3.84E+4	2.90E+3
Ba-141	1.57E-1	1.08E-4	-	6.50E-5	2.97E+3	4.75E+3	4.97E-3
Ba-142	3.98E-2	3.30E-5	-	1.90E-5	1.55E+3	6.93E+2	1.96E-3
La-140	5.05E+2	2.00E+2	-	-	1.68E+5	8.48E+4	5.15E+1
La-142	1.03E+0	3.77E-1	-	-	8.22E+3	5.95E+4	9.04E-2
Ce-141	2.77E+4	1.67E+4	-	5.25E+3	5.17E+5	2.16E+4	1.99E+3
Ce-143	2.93E+2	1.93E+2	-	5.64E+1	1.16E+5	4.97E+4	2.21E+1
Ce-144	3.19E+6	1.21E+6	-	5.38E+5	9.84E+6	1.48E+5	1.76E+5
Pr-143	1.40E+4	5.24E+3	-	1.97E+3	4.33E+5	3.72E+4	6.99E+2
Pr-144	4.79E-2	1.85E-2	-	6.72E-3	1.61E+3	4.28E+3	2.41E-3
Nd-147	7.94E+3	8.13E+3	-	3.15E+3	3.22E+5	3.12E+4	5.00E+2
W-187	1.30E+1	9.02E+0	-	-	3.96E+4	3.56E+4	3.12E+0
Np-239	3.71E+2	3.32E+1	-	6.62E+1	5.95E+4	2.49E+4	1.88E+1

Table 2.8 (Page 1 of 2)

R_i Vegetation Pathway Dose Factors - ADULT

(mrem/yr per μCi/m^3) for H-3 and C-14 (m^2 x mrem/yr μCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
H-3	-	2.26E+3	2.26E+3	2.26E+3	2.26E+3	2.26E+3	2.26E+3
C-14	8.97E+5	1.79E+5	1.79E+5	1.79E+5	1.79E+5	1.79E+5	1.79E+5
Na-24	2.76E+5	2.76E+5	2.76E+5	2.76E+5	2.76E+5	2.76E+5	2.76E+5
P-32	1.40E+9	8.73E+7	-	-	-	1.58E+8	5.42E+7
Cr-51	-	-	2.79E+4	1.03E+4	6.19E+4	1.17E+7	4.66E+4
Mn-54	-	3.11E+8	-	9.27E+7	-	9.54E+8	5.94E+7
Mn-56	-	1.61E+1	-	2.04E+1	-	5.13E+2	2.85E+0
Fe-55	2.09E+8	1.45E+8	-	-	8.06E+7	8.29E+7	3.37E+7
Fe-59	1.27E+8	2.99E+8	-	-	8.35E+7	9.96E+8	1.14E+8
Co-57	-	1.17E+7	-	-	-	2.97E+8	1.95E+7
Co-58	-	3.09E+7	-	-	-	6.26E+8	6.92E+7
Co-60	-	1.67E+8	-	-	-	3.14E+9	3.69E+8
Ni-63	1.04E+10	7.21E+8	-	-	-	1.50E+8	3.49E+8
Ni-65	6.15E+1	7.99E+0	-	-	-	2.03E+2	3.65E+0
Cu-64	-	9.27E+3	-	2.34E+4	-	7.90E+5	4.35E+3
Zn-65	3.17E+8	1.01E+9	-	6.75E+8	-	6.36E+8	4.56E+8
Zn-69	8.75E-6	1.67E-5	-	1.09E-5	-	2.51E-6	1.16E-6
Br-82	-	-	-	-	-	1.73E+6	1.51E+6
Br-83	-	-	-	-	-	4.63E+0	3.21E+0
Br-84	-	-	-	-	-	-	-
Br-85	-	-	-	-	-	-	-
Rb-86	-	2.19E+8	-	-	-	4.32E+7	1.02E+8
Rb-88	-	-	-	-	-	-	-
Rb-89	-	-	-	-	-	-	-
Sr-89	9.96E+9	-	-	-	-	1.60E+9	2.86E+8
Sr-90	6.05E+11	-	-	-	-	1.75E+10	1.48E+11
Sr-91	3.20E+5	-	-	-	-	1.52E+6	1.29E+4
Sr-92	4.27E+2	-	-	-	-	8.46E+3	1.85E+1
Y-90	1.33E+4	-	-	-	-	1.41E+8	3.56E+2
Y-91m	5.83E-9	-	-	-	-	1.71E-8	-
Y-91	5.13E+6	-	-	-	-	2.82E+9	1.37E+5
Y-92	9.01E-1	-	-	-	-	1.58E+4	2.63E-2
Y-93	1.74E+2	-	-	-	-	5.52E+6	4.80E+0
Zr-95	1.19E+6	3.81E+5	-	5.97E+5	-	1.21E+9	2.58E+5
Zr-97	3.33E+2	6.73E+1	-	1.02E+2	-	2.08E+7	3.08E+1
Nb-95	1.42E+5	7.91E+4	-	7.81E+4	-	4.80E+8	4.25E+4
Nb-97	2.90E-6	7.34E-7	-	8.56E-7	-	2.71E-3	2.68E-7
Mo-99	-	6.25E+6	-	1.41E+7	-	1.45E+7	1.19E+6
Tc-99m	3.06E+0	8.66E+0	-	1.32E+2	4.24E+0	5.12E+3	1.10E+2
Tc-101	-	-	-	-	-	-	-

Table 2.8 (Page 2 of 2)

R_i Vegetation Pathway Dose Factors - ADULT

(mrem/yr per μCi/m^3) for H-3 and C-14 (m^2 x mrem/yr μCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
Ru-103	4.80E+6	-	-	1.83E+7	-	5.61E+8	2.07E+6
Ru-105	5.39E+1	-	-	6.96E+2	-	3.30E+4	2.13E+1
Ru-106	1.93E+8	-	-	3.72E+8	-	1.25E+10	2.44E+7
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-
Ag-110m	1.06E+7	9.76E+6	-	1.92E+7	-	3.98E+9	5.80E+6
Sb-124	1.04E+8	1.96E+6	2.52E+5	-	8.08E+7	2.95E+9	4.11E+7
Sb-125	1.36E+8	1.52E+6	1.39E+5	-	1.05E+8	1.50E+9	3.25E+7
Te-125m	9.66E+7	3.50E+7	2.90E+7	3.93E+8	-	3.86E+8	1.29E+7
Te-127m	3.49E+8	1.25E+8	8.92E+7	1.42E+9	-	1.17E+9	4.26E+7
Te-127	5.76E+3	2.07E+3	4.27E+3	2.35E+4	-	4.54E+5	1.25E+3
Te-129m	2.55E+8	9.50E+7	8.75E+7	1.06E+9	-	1.28E+9	4.03E+7
Te-129	6.65E-4	2.50E-4	5.10E-4	2.79E-3	-	5.02E-4	1.62E-4
Te-131m	9.12E+5	4.46E+5	7.06E+5	4.52E+6	-	4.43E+7	3.72E+5
Te-131	-	-	-	-	-	-	-
Te-132	4.29E+6	2.77E+6	3.06E+6	2.67E+7	-	1.31E+8	2.60E+6
I-130	3.96E+5	1.17E+6	9.90E+7	1.82E+6	-	1.01E+6	4.61E+5
I-131	8.09E+7	1.16E+8	3.79E+10	1.98E+8	-	3.05E+7	6.63E+7
I-132	5.74E+1	1.54E+2	5.38E+3	2.45E+2	-	2.89E+1	5.38E+1
I-133	2.12E+6	3.69E+6	5.42E+8	6.44E+6	-	3.31E+6	1.12E+6
I-134	1.06E-4	2.88E-4	5.00E-3	4.59E-4	-	2.51E-7	1.03E-4
I-135	4.08E+4	1.07E+5	7.04E+6	1.71E+5	-	1.21E+5	3.94E+4
Cs-134	4.66E+9	1.11E+10	-	3.59E+9	1.19E+9	1.94E+8	9.07E+9
Cs-136	4.20E+7	1.66E+8	-	9.24E+7	1.27E+7	1.89E+7	1.19E+8
Cs-137	6.36E+9	8.70E+9	-	2.95E+9	9.81E+8	1.68E+8	5.70E+9
Cs-138	-	-	-	-	-	-	-
Ba-139	2.95E-2	2.10E-5	-	1.96E-5	1.19E-5	5.23E-2	8.64E-4
Ba-140	1.29E+8	1.62E+5	-	5.49E+4	9.25E+4	2.65E+8	8.43E+6
Ba-141	-	-	-	-	-	-	-
Ba-142	-	-	-	-	-	-	-
La-140	1.97E+3	9.92E+2	-	-	-	7.28E+7	2.62E+2
La-142	1.40E-4	6.35E-5	-	-	-	4.64E-1	1.58E-5
Ce-141	1.96E+5	1.33E+5	-	6.17E+4	-	5.08E+8	1.51E+4
Ce-143	1.00E+3	7.42E+5	-	3.26E+2	-	2.77E+7	8.21E+1
Ce-144	3.29E+7	1.38E+7	-	8.16E+6	-	1.11E+10	1.77E+6
Pr-143	6.34E+4	2.54E+4	-	1.47E+4	-	2.78E+8	3.14E+3
Pr-144	-	-	-	-	-	-	-
Nd-147	3.34E+4	3.86E+4	-	2.25E+4	-	1.85E+8	2.31E+3
W-187	3.82E+4	3.19E+4	-	-	-	1.05E+7	1.12E+4
Np-239	1.42E+3	1.40E+2	-	4.37E+2	-	2.87E+7	7.72E+1

Table 2.9 (Page 1 of 2)

R_i Vegetation Pathway Dose Factors - TEEN

(mrem/yr per µCi/m^3) for H-3 and C-14 (m^2 x mrem/yr µCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
H-3	-	2.59E+3	2.59E+3	2.59E+3	2.59E+3	2.59E+3	2.59E+3
C-14	1.45E+6	2.91E+5	2.91E+5	2.91E+5	2.91E+5	2.91E+5	2.91E+5
Na-24	2.45E+5	2.45E+5	2.45E+5	2.45E+5	2.45E+5	2.45E+5	2.45E+5
P-32	1.61E+9	9.96E+7	-	-	-	1.35E+8	6.23E+7
Cr-51	-	-	3.44E+4	1.36E+4	8.85E+4	1.04E+7	6.20E+4
Mn-54	-	4.52E+8	-	1.35E+8	-	9.27E+8	8.97E+7
Mn-56	-	1.45E+1	-	1.83E+1	-	9.54E+2	2.58E+0
Fe-55	3.25E+8	2.31E+8	-	-	1.46E+8	9.98E+7	5.38E+7
Fe-59	1.81E+8	4.22E+8	-	-	1.33E+8	9.98E+8	1.63E+8
Co-57	-	1.79E+7	-	-	-	3.34E+8	3.00E+7
Co-58	-	4.38E+7	-	-	-	6.04E+8	1.01E+8
Co-60	-	2.49E+8	-	-	-	3.24E+9	5.60E+8
Ni-63	1.61E+10	1.13E+9	-	-	-	1.81E+8	5.45E+8
Ni-65	5.73E+1	7.32E+0	-	-	-	3.97E+2	3.33E+0
Cu-64	-	8.40E+3	-	2.12E+4	-	6.51E+5	3.95E+3
Zn-65	4.24E+8	1.47E+9	-	9.41E+8	-	6.23E+8	6.86E+8
Zn-69	8.19E-6	1.56E-5	-	1.02E-5	-	2.88E-5	1.09E-6
Br-82	-	-	-	-	-	-	1.33E+6
Br-83	-	-	-	-	-	-	3.01E+0
Br-84	-	-	-	-	-	-	-
Br-85	-	-	-	-	-	-	-
Rb-86	-	2.73E+8	-	-	-	4.05E+7	1.28E+8
Rb-88	-	-	-	-	-	-	-
Rb-89	-	-	-	-	-	-	-
Sr-89	1.51E+10	-	-	-	-	1.80E+9	4.33E+8
Sr-90	7.51E+11	-	-	-	-	2.11E+10	1.85E+11
Sr-91	2.99E+5	-	-	-	-	1.36E+6	1.19E+4
Sr-92	3.97E+2	-	-	-	-	1.01E+4	1.69E+1
Y-90	1.24E+4	-	-	-	-	1.02E+8	3.34E+2
Y-91m	5.43E-9	-	-	-	-	2.56E-7	-
Y-91	7.87E+6	-	-	-	-	3.23E+9	2.11E+5
Y-92	8.47E-1	-	-	-	-	2.32E+4	2.45E-2
Y-93	1.63E+2	-	-	-	-	4.98E+6	4.47E+0
Zr-95	1.74E+6	5.49E+5	-	8.07E+5	-	1.27E+9	3.78E+5
Zr-97	3.09E+2	6.11E+1	-	9.26E+1	-	1.65E+7	2.81E+1
Nb-95	1.92E+5	1.06E+5	-	1.03E+5	-	4.55E+8	5.86E+4
Nb-97	2.69E-6	6.67E-7	-	7.80E-7	-	1.59E-2	2.44E-7
Mo-99	-	5.74E+6	-	1.31E+7	-	1.03E+7	1.09E+6
Tc-99m	2.70E+0	7.54E+0	-	1.12E+2	4.19E+0	4.95E+3	9.77E+1
Tc-101	-	-	-	-	-	-	-

Table 2.9 (Page 2 of 2)

R_i Vegetation Pathway Dose Factors - TEEN

(mrem/yr per μCi/m³) for H-3 and C-14 (m² x mrem/yr μCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
Ru-103	6.87E+6	-	-	2.42E+7	-	5.74E+8	2.94E+6
Ru-105	5.00E+1	-	-	6.31E+2	-	4.04E+4	1.94E+1
Ru-106	3.09E+8	-	-	5.97E+8	-	1.48E+10	3.90E+7
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-
Ag-110m	1.52E+7	1.44E+7	-	2.74E+7	-	4.04E+9	8.74E+6
Sb-124	1.55E+8	2.85E+6	3.51E+5	-	1.35E+8	3.11E+9	6.03E+7
Sb-125	2.14E+8	2.34E+6	2.04E+5	-	1.88E+8	1.66E+9	5.00E+7
Te-125m	1.48E+8	5.34E+7	4.14E+7	-	-	4.37E+8	1.98E+7
Te-127m	5.51E+8	1.96E+8	1.31E+8	2.24E+9	-	1.37E+9	6.56E+7
Te-127	5.43E+3	1.92E+3	3.74E+3	2.20E+4	-	4.19E+5	1.17E+3
Te-129m	3.67E+8	1.36E+8	1.18E+8	1.54E+9	-	1.38E+9	5.81E+7
Te-129	6.22E-4	2.32E-4	4.45E-4	2.61E-3	-	3.40E-3	1.51E-4
Te-131m	8.44E+5	4.05E+5	6.09E+5	4.22E+6	-	3.25E+7	3.38E+5
Te-131	-	-	-	-	-	-	-
Te-132	3.90E+6	2.47E+6	2.60E+6	2.37E+7	-	7.82E+7	2.32E+6
I-130	3.54E+5	1.02E+6	8.35E+7	1.58E+6	-	7.87E+5	4.09E+5
I-131	7.70E+7	1.08E+8	3.14E+10	1.85E+8	-	2.13E+7	5.79E+7
I-132	5.18E+1	1.36E+2	4.57E+3	2.14E+2	-	5.91E+1	4.87E+1
I-133	1.97E+6	3.34E+6	4.66E+8	5.86E+6	-	2.53E+6	1.02E+6
I-134	9.59E-5	2.54E-4	4.24E-3	4.01E-4	-	3.35E-6	9.13E-5
I-135	3.68E+4	9.48E+4	6.10E+6	1.50E+5	-	1.05E+5	3.52E+4
Cs-134	7.09E+9	1.67E+10	-	5.30E+9	2.02E+9	2.08E+8	7.74E+9
Cs-136	4.29E+7	1.69E+8	-	9.19E+7	1.45E+7	1.36E+7	1.13E+8
Cs-137	1.01E+10	1.35E+10	-	4.59E+9	1.78E+9	1.92E+8	4.69E+9
Cs-138	-	-	-	-	-	-	-
Ba-139	2.77E-2	1.95E-5	-	1.84E-5	1.34E-5	2.47E-1	8.08E-4
Ba-140	1.38E+8	1.69E+5	-	5.75E+4	1.14E+5	2.13E+8	8.91E+6
Ba-141	-	-	-	-	-	-	-
Ba-142	-	-	-	-	-	-	-
La-140	1.80E+3	8.84E+2	-	-	-	5.08E+7	2.35E+2
La-142	1.28E-4	5.69E-5	-	-	-	1.73E+0	1.42E-5
Ce-141	2.82E+5	1.88E+5	-	8.86E+4	-	5.38E+8	2.16E+4
Ce-143	9.37E+2	6.82E+5	-	3.06E+2	-	2.05E+7	7.62E+1
Ce-144	5.27E+7	2.18E+7	-	1.30E+7	-	1.33E+10	2.83E+6
Pr-143	7.12E+4	2.84E+4	-	1.65E+4	-	2.34E+8	3.55E+3
Pr-144	-	-	-	-	-	-	-
Nd-147	3.63E+4	3.94E+4	-	2.32E+4	-	1.42E+8	2.36E+3
W-187	3.55E+4	2.90E+4	-	-	-	7.84E+6	1.02E+4
Np-239	1.38E+3	1.30E+2	-	4.09E+2	-	2.10E+7	7.24E+1

Table 2.10 (Page 1 of 2)

R_i Vegetation Pathway Dose Factors - CHILD

(mrem/yr per μCi/m^3) for H-3 and C-14 (m^2 x mrem/yr μCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
H-3	-	4.01E+3	4.01E+3	4.01E+3	4.01E+3	4.01E+3	4.01E+3
C-14	3.50E+6	7.01E+5	7.01E+5	7.01E+5	7.01E+5	7.01E+5	7.01E+5
Na-24	3.83E+5	3.83E+5	3.83E+5	3.83E+5	3.83E+5	3.83E+5	3.83E+5
P-32	3.37E+9	1.58E+8	-	-	-	9.30E+7	1.30E+8
Cr-51	-	-	6.54E+4	1.79E+4	1.19E+5	6.25E+6	1.18E+5
Mn-54	-	6.61E+8	-	1.85E+8	-	5.55E+8	1.76E+8
Mn-56	-	1.90E+1	-	2.29E+1	-	2.75E+3	4.28E+0
Fe-55	8.00E+8	4.24E+8	-	-	2.40E+8	7.86E+7	1.31E+8
Fe-59	4.01E+8	6.49E+8	-	-	1.88E+8	6.76E+8	3.23E+8
Co-57	-	2.99E+7	-	-	-	2.45E+8	6.04E+7
Co-58	-	6.47E+7	-	-	-	3.77E+8	1.98E+8
Co-60	-	3.78E+8	-	-	-	2.10E+9	1.12E+9
Ni-63	3.95E+10	2.11E+9	-	-	-	1.42E+8	1.34E+9
Ni-65	1.05E+2	9.89E+0	-	-	-	1.21E+3	5.77E+0
Cu-64	-	1.11E+4	-	2.68E+4	-	5.20E+5	6.69E+3
Zn-65	8.12E+8	2.16E+9	-	1.36E+9	-	3.80E+8	1.35E+9
Zn-69	1.51E-5	2.18E-5	-	1.32E-5	-	1.38E-3	2.02E-6
Br-82	-	-	-	-	-	-	2.04E+6
Br-83	-	-	-	-	-	-	5.55E+0
Br-84	-	-	-	-	-	-	-
Br-85	-	-	-	-	-	-	-
Rb-86	-	4.52E+8	-	-	-	2.91E+7	2.78E+8
Rb-88	-	-	-	-	-	-	-
Rb-89	-	-	-	-	-	-	-
Sr-89	3.59E+10	-	-	-	-	1.39E+9	1.03E+9
Sr-90	1.24E+12	-	-	-	-	1.67E+10	3.15E+11
Sr-91	5.50E+5	-	-	-	-	1.21E+6	2.08E+4
Sr-92	7.28E+2	-	-	-	-	1.38E+4	2.92E+1
Y-90	2.30E+4	-	-	-	-	6.56E+7	6.17E+2
Y-91m	9.94E-9	-	-	-	-	1.95E-5	-
Y-91	1.87E+7	-	-	-	-	2.49E+9	5.01E+5
Y-92	1.56E+0	-	-	-	-	4.51E+4	4.46E-2
Y-93	3.01E+2	-	-	-	-	4.48E+6	8.25E+0
Zr-95	3.90E+6	8.58E+5	-	1.23E+6	-	8.95E+8	7.64E+5
Zr-97	5.64E+2	8.15E+1	-	1.17E+2	-	1.23E+7	4.81E+1
Nb-95	4.10E+5	1.59E+5	-	1.50E+5	-	2.95E+8	1.14E+5
Nb-97	4.90E-6	8.85E-7	-	9.82E-7	-	2.73E-1	4.13E-7
Mo-99	-	7.83E+6	-	1.67E+7	-	6.48E+6	1.94E+6
Tc-99m	4.65E+0	9.12E+0	-	1.33E+2	4.63E+0	5.19E+3	1.51E+2
Tc-101	-	-	-	-	-	-	-

Table 2.10 (Page 2 of 2)

R_i Vegetation Pathway Dose Factors - CHILD

(mrem/yr per μCi/m³) for H-3 and C-14 (m² x mrem/yr μCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
Ru-103	1.55E+7	-	-	3.89E+7	-	3.99E+8	5.94E+6
Ru-105	9.17E+1	-	-	8.06E+2	-	5.98E+4	3.33E+1
Ru-106	7.45E+8	-	-	1.01E+9	-	1.16E+10	9.30E+7
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-
Ag-110m	3.22E+7	2.17E+7	-	4.05E+7	-	2.58E+9	1.74E+7
Sb-124	3.52E+8	4.57E+6	7.78E+5	-	1.96E+8	2.20E+9	1.23E+8
Sb-125	4.99E+8	3.85E+6	4.62E+5	-	2.78E+8	1.19E+9	1.05E+8
Te-125m	3.51E+8	9.50E+7	9.84E+7	-	-	3.38E+8	4.67E+7
Te-127m	1.32E+9	3.56E+8	3.16E+8	3.77E+9	-	1.07E+9	1.57E+8
Te-127	1.00E+4	2.70E+3	6.93E+3	2.85E+4	-	3.91E+5	2.15E+3
Te-129m	8.54E+8	2.39E+8	2.75E+8	2.51E+9	-	1.04E+9	1.33E+8
Te-129	1.15E-3	3.22E-4	8.22E-4	3.37E-3	-	7.17E-2	2.74E-4
Te-131m	1.54E+6	5.33E+5	1.10E+6	5.16E+6	-	2.16E+7	5.68E+5
Te-131	-	-	-	-	-	-	-
Te-132	6.98E+6	3.09E+6	4.50E+6	2.87E+7	-	3.11E+7	3.73E+6
I-130	6.21E+5	1.26E+6	1.38E+8	1.88E+6	-	5.87E+5	6.47E+5
I-131	1.43E+8	1.44E+8	4.76E+10	2.36E+8	-	1.28E+7	8.18E+7
I-132	9.20E+1	1.69E+2	7.84E+3	2.59E+2	-	1.99E+2	7.77E+1
I-133	3.59E+6	4.44E+6	8.25E+8	7.40E+6	-	1.79E+6	1.68E+6
I-134	1.70E-4	3.16E-4	7.28E-3	4.84E-4	-	2.10E-4	1.46E-4
I-135	6.54E+4	1.18E+5	1.04E+7	1.81E+5	-	8.98E+4	5.57E+4
Cs-134	1.60E+10	2.63E+10	-	8.14E+9	2.92E+9	1.42E+8	5.54E+9
Cs-136	8.06E+7	2.22E+8	-	1.18E+8	1.76E+7	7.79E+6	1.43E+8
Cs-137	2.39E+10	2.29E+10	-	7.46E+9	2.68E+9	1.43E+8	3.38E+9
Cs-138	-	-	-	-	-	-	-
Ba-139	5.11E-2	2.73E-5	-	2.38E-5	1.61E-5	2.95E+0	1.48E-3
Ba-140	2.77E+8	2.43E+5	-	7.90E+4	1.45E+5	1.40E+8	1.62E+7
Ba-141	-	-	-	-	-	-	-
Ba-142	-	-	-	-	-	-	-
La-140	3.23E+3	1.13E+3	-	-	-	3.15E+7	3.81E+2
La-142	2.32E-4	7.40E-5	-	-	-	1.47E+1	2.32E-5
Ce-141	6.35E+5	3.26E+5	-	1.43E+5	-	4.07E+8	4.84E+4
Ce-143	1.73E+3	9.36E+5	-	3.93E+2	-	1.37E+7	1.36E+2
Ce-144	1.27E+8	3.98E+7	-	2.21E+7	-	1.04E+10	6.78E+6
Pr-143	1.48E+5	4.46E+4	-	2.41E+4	-	1.60E+8	7.37E+3
Pr-144	-	-	-	-	-	-	-
Nd-147	7.16E+4	5.80E+4	-	3.18E+4	-	9.18E+7	4.49E+3
W-187	6.47E+4	3.83E+4	-	-	-	5.38E+6	1.72E+4
Np-239	2.55E+3	1.83E+2	-	5.30E+2	-	1.36E+7	1.29E+2

Table 2.11 (Page 1 of 2)

R_i Grass-Cow-Milk Pathway Dose Factors - ADULT

(mrem/yr per $\mu Ci/m^3$) for H-3 and C-14 (m^2 x mrem/yr $\mu Ci/sec$) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
H-3	-	7.63E+2	7.63E+2	7.63E+2	7.63E+2	7.63E+2	7.63E+2
C-14	3.63E+5	7.26E+4	7.26E+4	7.26E+4	7.26E+4	7.26E+4	7.26E+4
Na-24	2.54E+6	2.54E+6	2.54E+6	2.54E+6	2.54E+6	2.54E+6	2.54E+6
P-32	1.71E+10	1.06E+9	-	-	-	1.92E+9	6.60E+8
Cr-51	-	-	1.71E+4	6.30E+3	3.80E+4	7.20E+6	2.86E+4
Mn-54	-	8.40E+6	-	2.50E+6	-	2.57E+7	1.60E+6
Mn-56	-	4.23E-3	-	5.38E-3	-	1.35E-1	7.51E-4
Fe-55	2.51E+7	1.73E+7	-	-	9.67E+6	9.95E+6	4.04E+6
Fe-59	2.98E+7	7.00E+7	-	-	1.95E+7	2.33E+8	2.68E+7
Co-57	-	1.28E+6	-	-	-	3.25E+7	2.13E+6
Co-58	-	4.72E+6	-	-	-	9.57E+7	1.06E+7
Co-60	-	1.64E+7	-	-	-	3.08E+8	3.62E+7
Ni-63	6.73E+9	4.66E+8	-	-	-	9.73E+7	2.26E+8
Ni-65	3.70E-1	4.81E-2	-	-	-	1.22E+0	2.19E-2
Cu-64	-	2.41E+4	-	6.08E+4	-	2.05E+6	1.13E+4
Zn-65	1.37E+9	4.36E+9	-	2.92E+9	-	2.75E+9	1.97E+9
Zn-69	-	-	-	-	-	-	-
Br-82	-	-	-	-	-	3.72E+7	3.25E+7
Br-83	-	-	-	-	-	1.49E-1	1.03E-1
Br-84	-	-	-	-	-	-	-
Br-85	-	-	-	-	-	-	-
Rb-86	-	2.59E+9	-	-	-	5.11E+8	1.21E+9
Rb-88	-	-	-	-	-	-	-
Rb-89	-	-	-	-	-	-	-
Sr-89	1.45E+9	-	-	-	-	2.33E+8	4.16E+7
Sr-90	4.68E+10	-	-	-	-	1.35E+9	1.15E+10
Sr-91	3.13E+4	-	-	-	-	1.49E+5	1.27E+3
Sr-92	4.89E-1	-	-	-	-	9.68E+0	2.11E-2
Y-90	7.07E+1	-	-	-	-	7.50E+5	1.90E+0
Y-91m	-	-	-	-	-	-	-
Y-91	8.60E+3	-	-	-	-	4.73E+6	2.30E+2
Y-92	5.42E-5	-	-	-	-	9.49E-1	1.58E-6
Y-93	2.33E-1	-	-	-	-	7.39E+3	6.43E-3
Zr-95	9.46E+2	3.03E+2	-	4.76E+2	-	9.62E+5	2.05E+2
Zr-97	4.26E-1	8.59E-2	-	1.30E-1	-	2.66E+4	3.93E-2
Nb-95	8.25E+4	4.59E+4	-	4.54E+4	-	2.79E+8	2.47E+4
Nb-97	-	-	-	-	-	5.47E-9	-
Mo-99	-	2.52E+7	-	5.72E+7	-	5.85E+7	4.80E+6
Tc-99m	3.25E+0	9.19E+0	-	1.40E+2	4.50E+0	5.44E+3	1.17E+2
Tc-101	-	-	-	-	-	-	-

Table 2.11 (Page 2 of 2)

R_i Grass-Cow-Milk Pathway Dose Factors - ADULT

(mrem/yr per µCi/m^3) for H-3 and C-14 (m^2 x mrem/yr µCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
Ru-103	1.02E+3	-	-	3.89E+3	-	1.19E+5	4.39E+2
Ru-105	8.57E-4	-	-	1.11E-2	-	5.24E-1	3.38E-4
Ru-106	2.04E+4	-	-	3.94E+4	-	1.32E+6	2.58E+3
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-
Ag-110m	5.83E+7	5.39E+7	-	1.06E+8	-	2.20E+10	3.20E+7
Sb-124	2.57E+7	4.86E+5	6.24E+4	-	2.00E+7	7.31E+8	1.02E+7
Sb-125	2.04E+7	2.28E+5	2.08E+4	-	1.58E+7	2.25E+8	4.86E+6
Te-125m	1.63E+7	5.90E+6	4.90E+6	6.63E+7	-	6.50E+7	2.18E+6
Te-127m	4.58E+7	1.64E+7	1.17E+7	1.86E+8	-	1.54E+8	5.58E+6
Te-127	6.72E+2	2.41E+2	4.98E+2	2.74E+3	-	5.30E+4	1.45E+2
Te-129m	6.04E+7	2.25E+7	2.08E+7	2.52E+8	-	3.04E+8	9.57E+6
Te-129	-	-	-	-	-	-	-
Te-131m	3.61E+5	1.77E+5	2.80E+5	1.79E+6	-	1.75E+7	1.47E+5
Te-131	-	-	-	-	-	-	-
Te-132	2.39E+6	1.55E+6	1.71E+6	1.49E+7	-	7.32E+7	1.45E+6
I-130	4.26E+5	1.26E+6	1.07E+8	1.96E+6	-	1.08E+6	4.96E+5
I-131	2.96E+8	4.24E+8	1.39E+11	7.27E+8	-	1.12E+8	2.43E+8
I-132	1.64E-1	4.37E-1	1.53E+1	6.97E-1	-	8.22E-2	1.53E-1
I-133	3.97E+6	6.90E+6	1.01E+9	1.20E+7	-	6.20E+6	2.10E+6
I-134	-	-	-	-	-	-	-
I-135	1.39E+4	3.63E+4	2.40E+6	5.83E+4	-	4.10E+4	1.34E+4
Cs-134	5.65E+9	1.34E+10	-	4.35E+9	1.44E+9	2.35E+8	1.10E+10
Cs-136	2.61E+8	1.03E+9	-	5.74E+8	7.87E+7	1.17E+8	7.42E+8
Cs-137	7.38E+9	1.01E+10	-	3.43E+9	1.14E+9	1.95E+8	6.61E+9
Cs-138	-	-	-	-	-	-	-
Ba-139	4.70E-8	-	-	-	-	8.34E-8	1.38E-9
Ba-140	2.69E+7	3.38E+4		1.15E+4	1.93E+4	5.54E+7	1.76E+6
Ba-141	-	-	-	-	-	-	-
Ba-142	-	-	-	-	-	-	-
La-140	4.49E+0	2.26E+0	-	-	-	1.66E+5	5.97E-1
La-142	-	-	-	-	-	3.03E-8	-
Ce-141	4.84E+3	3.27E+3	-	1.52E+3	-	1.25E+7	3.71E+2
Ce-143	4.19E+1	3.09E+4	-	1.36E+1	-	1.16E+6	3.42E+0
Ce-144	3.58E+5	1.50E+5	-	8.87E+4	-	1.21E+8	1.92E+4
Pr-143	1.59E+2	6.37E+1	-	3.68E+1	-	6.96E+5	7.88E+0
Pr-144	-	-	-	-	-	-	-
Nd-147	9.42E+1	1.09E+2	-	6.37E+1	-	5.23E+5	6.52E+0
W-187	6.56E+3	5.48E+3	-	-	-	1.80E+6	1.92E+3
Np-239	3.66E+0	3.60E-1	-	1.12E+0	-	7.39E+4	1.98E-1

Table 2.12 (Page 1 of 2)

R_i Grass-Cow-Milk Pathway Dose Factors - TEEN

(mrem/yr per µCi/m^3) for H-3 and C-14 (m^2 x mrem/yr µCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
H-3	-	9.94E+2	9.94E+2	9.94E+2	9.94E+2	9.94E+2	9.94E+2
C-14	6.70E+5	1.34E+5	1.34E+5	1.34E+5	1.34E+5	1.34E+5	1.34E+5
Na-24	4.44E+6	4.44E+6	4.44E+6	4.44E+6	4.44E+6	4.44E+6	4.44E+6
P-32	3.15E+10	1.95E+9	-	-	-	2.65E+9	1.22E+9
Cr-51	-	-	2.78E+4	1.10E+4	7.13E+4	8.40E+6	5.00E+4
Mn-54	-	1.40E+7	-	4.17E+6	-	2.87E+7	2.78E+6
Mn-56	-	7.51E-3	-	9.50E-3	-	4.94E-1	1.33E-3
Fe-55	4.45E+7	3.16E+7	-	-	2.00E+7	1.37E+7	7.36E+6
Fe-59	5.20E+7	1.21E+8	-	-	3.82E+7	2.87E+8	4.68E+7
Co-57	-	2.25E+6	-	-	-	4.19E+7	3.76E+6
Co-58	-	7.95E+6	-	-	-	1.10E+8	1.83E+7
Co-60	-	2.78E+7	-	-	-	3.62E+8	6.26E+7
Ni-63	1.18E+10	8.35E+8	-	-	-	1.33E+8	4.01E+8
Ni-65	6.78E-1	8.66E-2	-	-	-	4.70E+0	3.94E-2
Cu-64	-	4.29E+4	-	1.09E+5	-	3.33E+6	2.02E+4
Zn-65	2.11E+9	7.31E+9	-	4.68E+9	-	3.10E+9	3.41E+9
Zn-69	-	-	-	-	-	-	-
Br-82	-	-	-	-	-	-	5.64E+7
Br-83	-	-	-	-	-	-	1.91E-1
Br-84	-	-	-	-	-	-	-
Br-85	-	-	-	-	-	-	-
Rb-86	-	4.73E+9	-	-	-	7.00E+8	2.22E+9
Rb-88	-	-	-	-	-	-	-
Rb-89	-	-	-	-	-	-	-
Sr-89	2.67E+9	-	-	-	-	3.18E+8	7.66E+7
Sr-90	6.61E+10	-	-	-	-	1.86E+9	1.63E+10
Sr-91	5.75E+4	-	-	-	-	2.61E+5	2.29E+3
Sr-92	8.95E-1	-	-	-	-	2.28E+1	3.81E-2
Y-90	1.30E+2	-	-	-	-	1.07E+6	3.50E+0
Y-91m	-	-	-	-	-	-	-
Y-91	1.58E+4	-	-	-	-	6.48E+6	4.24E+2
Y-92	1.00E-4	-	-	-	-	2.75E+0	2.90E-6
Y-93	4.30E-1	-	-	-	-	1.31E+4	1.18E-2
Zr-95	1.65E+3	5.22E+2	-	7.67E+2	-	1.20E+6	3.59E+2
Zr-97	7.75E-1	1.53E-1	-	2.32E-1	-	4.15E+4	7.06E-2
Nb-95	1.41E+5	7.80E+4	-	7.57E+4	-	3.34E+8	4.30E+4
Nb-97	-	-	-	-	-	6.34E-8	-
Mo-99	-	4.56E+7	-	1.04E+8	-	8.16E+7	8.69E+6
Tc-99m	5.64E+0	1.57E+1	-	2.34E+2	8.73E+0	1.03E+4	2.04E+2
Tc-101	-	-	-	-	-	-	-

Table 2.12 (Page 2 of 2)

R_i Grass-Cow-Milk Pathway Dose Factors - TEEN

(mrem/yr per µCi/m^3) for H-3 and C-14 (m^2 x mrem/yr µCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
Ru-103	1.81E+3	-	-	6.40E+3	-	1.52E+5	7.75E+2
Ru-105	1.57E-3	-	-	1.97E-2	-	1.26E+0	6.08E-4
Ru-106	3.75E+4	-	-	7.23E+4	-	1.80E+6	4.73E+3
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-
Ag-110m	9.63E+7	9.11E+7	-	1.74E+8	-	2.56E+10	5.54E+7
Sb-124	4.59E+7	8.46E+5	1.04E+5	-	4.01E+7	9.25E+8	1.79E+7
Sb-125	3.65E+7	3.99E+5	3.49E+4	-	3.21E+7	2.84E+8	8.54E+6
Te-125m	3.00E+7	1.08E+7	8.39E+6	-	-	8.86E+7	4.02E+6
Te-127m	8.44E+7	2.99E+7	2.01E+7	3.42E+8	-	2.10E+8	1.00E+7
Te-127	1.24E+3	4.41E+2	8.59E+2	5.04E+3	-	9.61E+4	2.68E+2
Te-129m	1.11E+8	4.10E+7	3.57E+7	4.62E+8	-	4.15E+8	1.75E+7
Te-129	-	-	-	1.67E-9	-	2.18E-9	-
Te-131m	6.57E+5	3.15E+5	4.74E+5	3.29E+6	-	2.53E+7	2.63E+5
Te-131	-	-	-	-	-	-	-
Te-132	4.28E+6	2.71E+6	2.86E+6	2.60E+7	-	8.58E+7	2.55E+6
I-130	7.49E+5	2.17E+6	1.77E+8	3.34E+6	-	1.67E+6	8.66E+5
I-131	5.38E+8	7.53E+8	2.20E+11	1.30E+9	-	1.49E+8	4.04E+8
I-132	2.90E-1	7.59E-1	2.56E+1	1.20E+0	-	3.31E-1	2.72E-1
I-133	7.24E+6	1.23E+7	1.72E+9	2.15E+7	-	9.30E+6	3.75E+6
I-134	-	-	-	-	-	-	-
I-135	2.47E+4	6.35E+4	4.08E+6	1.00E+5		7.03E+4	2.35E+4
Cs-134	9.81E+9	2.31E+10	-	7.34E+9	2.80E+9	2.87E+8	1.07E+10
Cs-136	4.45E+8	1.75E+9	-	9.53E+8	1.50E+8	1.41E+8	1.18E+9
Cs-137	1.34E+10	1.78E+10	-	6.06E+9	2.35E+9	2.53E+8	6.20E+9
Cs-138	-	-	-	-	-	-	-
Ba-139	8.69E-8	-	-	-	-	7.75E-7	2.53E-9
Ba-140	4.85E+7	5.95E+4	-	2.02E+4	4.00E+4	7.49E+7	3.13E+6
Ba-141	-	-	-	-	-	-	-
Ba-142	-	-	-	-	-	-	-
La-140	8.06E+0	3.96E+0	-	-	-	2.27E+5	1.05E+0
La-142	-	-	-	-	-	2.23E-7	-
Ce-141	8.87E+3	5.92E+3	-	2.79E+3	-	1.69E+7	6.81E+2
Ce-143	7.69E+1	5.60E+4	-	2.51E+1	-	1.68E+6	6.25E+0
Ce-144	6.58E+5	2.72E+5	-	1.63E+5	-	1.66E+8	3.54E+4
Pr-143	2.92E+2	1.17E+2	-	6.77E+1	-	9.61E+5	1.45E+1
Pr-144	-	-	-	-	-	-	-
Nd-147	1.81E+2	1.97E+2	-	1.16E+2	-	7.11E+5	1.18E+1
W-187	1.20E+4	9.78E+3	-	-	-	2.65E+6	3.43E+3
Np-239	6.99E+0	6.59E-1	-	2.07E+0	-	1.06E+5	3.66E-1

Table 2.13 (Page 1 of 2)

R_i Grass-Cow-Milk Pathway Dose Factors - CHILD

(mrem/yr per µCi/m³) for H-3 and C-14 (m² x mrem/yr µCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
H-3	-	1.57E+3	1.57E+3	1.57E+3	1.57E+3	1.57E+3	1.57E+3
C-14	1.65E+6	3.29E+5	3.29E+5	3.29E+5	3.29E+5	3.29E+5	3.29E+5
Na-24	9.23E+6	9.23E+6	9.23E+6	9.23E+6	9.23E+6	9.23E+6	9.23E+6
P-32	7.77E+10	3.64E+9	-	-	-	2.15E+9	3.00E+9
Cr-51	-	-	5.66E+4	1.55E+4	1.03E+5	5.41E+6	1.02E+5
Mn-54	-	2.09E+7	-	5.87E+6	-	1.76E+7	5.58E+6
Mn-56	-	1.31E-2	-	1.58E-2	-	1.90E+0	2.95E-3
Fe-55	1.12E+8	5.93E+7	-	-	3.35E+7	1.10E+7	1.84E+7
Fe-59	1.20E+8	1.95E+8	-	-	5.65E+7	2.03E+8	9.71E+7
Co-57	-	3.84E+6	-	-	-	3.14E+7	7.77E+6
Co-58	-	1.21E+7	-	-	-	7.08E+7	3.72E+7
Co-60	-	4.32E+7	-	-	-	2.39E+8	1.27E+8
Ni-63	2.96E+10	1.59E+9	-	-	-	1.07E+8	1.01E+9
Ni-65	1.66E+0	1.56E-1	-	-	-	1.91E+1	9.11E-2
Cu-64	-	7.55E+4	-	1.82E+5	-	3.54E+6	4.56E+4
Zn-65	4.13E+9	1.10E+10	-	6.94E+9	-	1.93E+9	6.85E+9
Zn-69	-	-	-	-	-	2.14E-9	-
Br-82	-	-	-	-	-	-	1.15E+8
Br-83	-	-	-	-	-	-	4.69E-1
Br-84	-	-	-	-	-	-	-
Br-85	-	-	-	-	-	-	-
Rb-86	-	8.77E+9	-	-	-	5.64E+8	5.39E+9
Rb-88	-	-	-	-	-	-	-
Rb-89	-	-	-	-	-	-	-
Sr-89	6.62E+9	-	-	-	-	2.56E+8	1.89E+8
Sr-90	1.12E+11	-	-	-	-	1.51E+9	2.83E+10
Sr-91	1.41E+5	-	-	-	-	3.12E+5	5.33E+3
Sr-92	2.19E+0	-	-	-	-	4.14E+1	8.76E-2
Y-90	3.22E+2	-	-	-	-	9.15E+5	8.61E+0
Y-91m	-	-	-	-	-	-	-
Y-91	3.91E+4	-	-	-	-	5.21E+6	1.04E+3
Y-92	2.46E-4	-	-	-	-	7.10E+0	7.03E-6
Y-93	1.06E+0	-	-	-	-	1.57E+4	2.90E-2
Zr-95	3.84E+3	8.45E+2	-	1.21E+3	-	8.81E+5	7.52E+2
Zr-97	1.89E+0	2.72E-1	-	3.91E-1	-	4.13E+4	1.61E-1
Nb-95	3.18E+5	1.24E+5	-	1.16E+5	-	2.29E+8	8.84E+4
Nb-97	-	-	-	-	-	1.45E-6	-
Mo-99	-	8.29E+7	-	1.77E+8	-	6.86E+7	2.05E+7
Tc-99m	1.29E+1	2.54E+1	-	3.68E+2	1.29E+1	1.44E+4	4.20E+2
Tc-101	-	-	-	-	-	-	-

Table 2.13 (Page 2 of 2)

R_i Grass-Cow-Milk Pathway Dose Factors - CHILD

(mrem/yr per μCi/m^3) for H-3 and C-14 (m² x mrem/yr μCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
Ru-103	4.29E+3	-	-	1.08E+4	-	1.11E+5	1.65E+3
Ru-105	3.82E-3	-	-	3.36E-2	-	2.49E+0	1.39E-3
Ru-106	9.24E+4	-	-	1.25E+5	-	1.44E+6	1.15E+4
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-
Ag-110m	2.09E+8	1.41E+8	-	2.63E+8	-	1.68E+10	1.13E+8
Sb-124	1.09E+8	1.41E+8	2.40E+5	-	6.03E+7	6.79E+8	3.81E+7
Sb-125	8.70E+7	1.41E+6	8.06E+4	-	4.85E+7	2.08E+8	1.82E+7
Te-125m	7.38E+7	2.00E+7	2.07E+7	-	-	7.12E+7	9.84E+6
Te-127m	2.08E+8	5.60E+7	4.97E+7	5.93E+8	-	1.68E+8	2.47E+7
Te-127	3.06E+3	8.25E+2	2.12E+3	8.71E+3	-	1.20E+5	6.56E+2
Te-129m	2.72E+8	7.61E+7	8.78E+7	8.00E+8	-	3.32E+8	4.23E+7
Te-129	-	-	-	2.87E-9	-	6.12E-8	-
Te-131m	1.60E+6	5.53E+5	1.14E+6	5.35E+6	-	2.24E+7	5.89E+5
Te-131	-	-	-	-	-	-	-
Te-132	1.02E+7	4.52E+6	6.58E+6	4.20E+7	-	4.55E+7	5.46E+6
I-130	1.75E+6	3.54E+6	3.90E+8	5.29E+6	-	1.66E+6	1.82E+6
I-131	1.30E+9	1.31E+9	4.34E+11	2.15E+9	-	1.17E+8	7.46E+8
I-132	6.86E-1	1.26E+0	5.85E+1	1.93E+0	-	1.48E+0	5.80E-1
I-133	1.76E+7	2.18E+7	4.04E+9	3.63E+7	-	8.77E+6	8.23E+6
I-134	-	-	-	-	-	-	-
I-135	5.84E+4	1.05E+5	9.30E+6	1.61E+5	-	8.00E+4	4.97E+4
Cs-134	2.26E+10	3.71E+10	-	1.15E+10	4.13E+9	2.00E+8	7.83E+9
Cs-136	1.00E+9	2.76E+9	-	1.47E+9	2.19E+8	9.70E+7	1.79E+9
Cs-137	3.22E+10	3.09E+10	-	1.01E+10	3.62E+9	1.93E+8	4.55E+9
Cs-138	-	-	-	-	-	-	-
Ba-139	2.14E-7	-	-	-	-	1.23E-5	6.19E-9
Ba-140	1.17E+8	1.03E+5	-	3.34E+4	6.12E+4	5.94E+7	6.84E+6
Ba-141	-	-	-	-	-	-	-
Ba-142	-	-	-	-	-	-	-
La-140	1.93E+1	6.74E+0	-	-	-	1.88E+5	2.27E+0
La-142	-	-	-	-	-	2.51E-6	-
Ce-141	2.19E+4	1.09E+4	-	4.78E+3	-	1.36E+7	1.62E+3
Ce-143	1.89E+2	1.02E+5	-	4.29E+1	-	1.50E+6	1.48E+1
Ce-144	1.62E+6	5.09E+5	-	2.82E+5	-	1.33E+8	8.66E+4
Pr-143	7.23E+2	2.17E+2	-	1.17E+2	-	7.80E+5	3.59E+1
Pr-144	-	-	-	-	-	-	-
Nd-147	4.45E+2	3.60E+2	-	1.98E+2	-	5.71E+5	2.79E+1
W-187	2.91E+4	1.72E+4	-	-	-	2.42E+6	7.73E+3
Np-239	1.72E+1	1.23E+0	-	3.57E+0	-	9.14E+4	8.68E-1

Table 2.14 (Page 1 of 2)

R_i Grass-Cow-Milk Pathway Dose Factors - INFANT

(mrem/yr per µCi/m^3) for H-3 and C-14 (m^2 x mrem/yr µCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
H-3	-	2.38E+3	2.38E+3	2.38E+3	2.38E+3	2.38E+3	2.38E+3
C-14	3.23E+6	6.89E+5	6.89E+5	6.89E+5	6.89E+5	6.89E+5	6.89E+5
Na-24	1.61E+7	1.61E+7	1.61E+7	1.61E+7	1.61E+7	1.61E+7	1.61E+7
P-32	1.60E+11	9.42E+9	-	-	-	2.17E+9	6.21E+9
Cr-51	-	-	1.05E+5	2.30E+4	2.05E+5	4.71E+6	1.61E+5
Mn-54	-	3.89E+7	-	8.63E+6	-	1.43E+7	8.83E+6
Mn-56	-	3.21E-2	-	2.76E-2	-	2.91E+0	5.53E-3
Fe-55	1.35E+8	8.72E+7	-	-	4.27E+7	1.11E+7	2.33E+7
Fe-59	2.25E+8	3.93E+8	-	-	1.16E+8	1.88E+8	1.55E+8
Co-57	-	8.95E+6	-	-	-	3.05E+7	1.46E+7
Co-58	-	2.43E+7	-	-	-	6.05E+7	6.06E+7
Co-60	-	8.81E+7	-	-	-	2.10E+8	2.08E+8
Ni-63	3.49E+10	2.16E+9	-	-	-	1.07E+8	1.21E+9
Ni-65	3.51E+0	3.97E-1	-	-	-	3.02E+1	1.81E-1
Cu-64	-	1.88E+5	-	3.17E+5	-	3.85E+6	8.69E+4
Zn-65	5.55E+9	1.90E+10	-	9.23E+9	-	1.61E+10	8.78E+9
Zn-69	-	-	-	-	-	7.36E-9	-
Br-82	-	-	-	-	-	-	1.94E+8
Br-83	-	-	-	-	-	-	9.95E-1
Br-84	-	-	-	-	-	-	-
Br-85	-	-	-	-	-	-	-
Rb-86	-	2.22E+10	-	-	-	5.69E+8	1.10E+10
Rb-88	-	-	-	-	-	-	-
Rb-89	-	-	-	-	-	-	-
Sr-89	1.26E+10	-	-	-	-	2.59E+8	3.61E+8
Sr-90	1.22E+11	-	-	-	-	1.52E+9	3.10E+10
Sr-91	2.94E+5	-	-	-	-	3.48E+5	1.06E+4
Sr-92	4.65E+0	-	-	-	-	5.01E+1	1.73E-1
Y-90	6.80E+2	-	-	-	-	9.39E+5	1.82E+1
Y-91m	-	-	-	-	-	-	-
Y-91	7.33E+4	-	-	-	-	5.26E+6	1.95E+3
Y-92	5.22E-4	-	-	-	-	9.97E+0	1.47E-5
Y-93	2.25E+0	-	-	-	-	1.78E+4	6.13E-2
Zr-95	6.83E+3	1.66E+3	-	1.79E+3	-	8.28E+5	1.18E+3
Zr-97	3.99E+0	6.85E-1	-	6.91E-1	-	4.37E+4	3.13E-1
Nb-95	5.93E+5	2.44E+5	-	1.75E+5	-	2.06E+8	1.41E+5
Nb-97	-	-	-	-	-	3.70E-6	-
Mo-99	-	2.12E+8	-	3.17E+8	-	6.98E+7	4.13E+7
Tc-99m	2.69E+1	5.55E+1	-	5.97E+2	2.90E+1	1.61E+4	7.15E+2
Tc-101	-	-	-	-	-	-	-

Table 2.14 (Page 2 of 2)

R_i Grass-Cow-Milk Pathway Dose Factors - INFANT

(mrem/yr per μCi/m^3) for H-3 and C-14 (m^2 x mrem/yr μCi/sec) for others

Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	T.Body
Ru-103	8.69E+3	-	-	1.81E+4	-	1.06E+5	2.91E+3
Ru-105	8.06E-3	-	-	5.92E-2	-	3.21E+0	2.71E-3
Ru-106	1.90E+5	-	-	2.25E+5	-	1.44E+6	2.38E+4
Rh-103m	-	-	-	-	-	-	-
Rh-106	-	-	-	-	-	-	-
Ag-110m	3.86E+8	2.82E+8	-	4.03E+8	-	1.46E+10	1.86E+8
Sb-124	2.09E+8	3.08E+6	5.56E+5	-	1.31E+8	6.46E+8	6.49E+7
Sb-125	1.49E+8	1.45E+6	1.87E+5	-	9.38E+7	1.99E+8	3.07E+7
Te-125m	1.51E+8	5.04E+7	5.07E+7	-	-	7.18E+7	2.04E+7
Te-127m	4.21E+8	1.40E+8	1.22E+8	1.04E+9	-	1.70E+8	5.10E+7
Te-127	6.50E+3	2.18E+3	5.29E+3	1.59E+4	-	1.36E+5	1.40E+3
Te-129m	5.59E+8	1.92E+8	2.15E+8	1.40E+9	-	3.34E+8	8.62E+7
Te-129	2.08E-9	-	1.75E-9	5.18E-9	-	1.66E-7	-
Te-131m	3.38E+6	1.36E+6	2.76E+6	9.35E+6	-	2.29E+7	1.12E+6
Te-131	-	-	-	-	-	-	-
Te-132	2.10E+7	1.04E+7	1.54E+7	6.51E+7	-	3.85E+7	9.72E+6
I-130	3.60E+6	7.92E+6	8.88E+8	8.70E+6	-	1.70E+6	3.18E+6
I-131	2.72E+9	3.21E+9	1.05E+12	3.75E+9	-	1.15E+8	1.41E+9
I-132	1.42E+0	2.89E+0	1.35E+2	3.22E+0	-	2.34E+0	1.03E+0
I-133	3.72E+7	5.41E+7	9.84E+9	6.36E+7	-	9.16E+6	1.58E+7
I-134	-	-	1.01E-9	-	-	-	-
I-135	1.21E+5	2.41E+5	2.16E+7	2.69E+5	-	8.74E+4	8.80E+4
Cs-134	3.65E+10	6.80E+10	-	1.75E+10	7.18E+9	1.85E+8	6.87E+9
Cs-136	1.96E+9	5.77E+9	-	2.30E+9	4.70E+8	8.76E+7	2.15E+9
Cs-137	5.15E+10	6.02E+10	-	1.62E+10	6.55E+9	1.88E+8	4.27E+9
Cs-138	-	-	-	-	-	-	-
Ba-139	4.55E-7	-	-	-	-	2.88E-5	1.32E-8
Ba-140	2.41E+8	2.41E+5	-	5.73E+4	1.48E+5	5.92E+7	1.24E+7
Ba-141	-	-	-	-	-	-	-
Ba-142	-	-	-	-	-	-	-
La-140	4.03E+1	1.59E+1	-	-	-	1.87E+5	4.09E+0
La-142	-	-	-	-	-	5.21E-6	-
Ce-141	4.33E+4	2.64E+4	-	8.15E+3	-	1.37E+7	3.11E+3
Ce-143	4.00E+2	2.65E+5	-	7.72E+1	-	1.55E+6	3.02E+1
Ce-144	2.33E+6	9.52E+5	-	3.85E+5	-	1.33E+8	1.30E+5
Pr-143	1.49E+3	5.59E+2	-	2.08E+2	-	7.89E+5	7.41E+1
Pr-144	-	-	-	-	-	-	-
Nd-147	8.82E+2	9.06E+2	-	3.49E+2	-	5.74E+5	5.55E+1
W-187	6.12E+4	4.26E+4	-	-	-	2.50E+6	1.47E+4
Np-239	3.64E+1	3.25E+0	-	6.49E+0	-	9.40E+4	1.84E+0

Table 2.15 (Page 1 of 2)

R_i Ground Plane Pathway Dose Factors

(m^2 x mrem/yr per μCi/sec)

Nuclide	Any Organ
H-3	-
C-14	-
Na-24	1.21E+7
P-32	-
Cr-51	4.68E+6
Mn-54	1.34E+9
Mn-56	9.05E+5
Fe-55	-
Fe-59	2.75E+8
Co-57	4.37E+8
Co-58	3.82E+8
Co-60	2.16E+10
Ni-63	-
Ni-65	2.97E+5
Cu-64	6.09E+5
Zn-65	7.45E+8
Zn-69	-
Br-82	4.57E+7
Br-83	4.89E+3
Br-84	2.03E+5
Br-85	-
Rb-86	8.98E+6
Rb-88	3.29E+4
Rb-89	1.21E+5
Sr-89	2.16E+4
Sr-90	-
Sr-91	2.19E+6
Sr-92	7.77E+5
Y-90	4.48E+3
Y-91m	1.01E+5
Y-91	1.08E+6
Y-92	1.80E+5
Y-93	1.85E+5
Zr-95	2.48E+8
Zr-97	2.94E+6
Nb-95	1.36E+8
Nb-97	2.28E+6
Mo-99	4.05E+6
Tc-99m	1.83E+5
Tc-101	2.04E+4
Ru-103	1.09E+8

Table 2.15 (Page 2 of 2)

R_i Ground Plane Pathway Dose Factors

(m^2 x mrem/yr per μCi/sec)

Nuclide	Any Organ
Ru-105	6.36E+5
Ru-106	4.21E+8
Rh-103m	-
Rh-106	-
Ag-110m	3.47E+9
Sb-124	2.87E+9
Sb-125	6.49E+9
Te-125m	1.55E+6
Te-127m	9.17E+4
Te-127	3.00E+3
Te-129m	2.00E+7
Te-129	2.60E+4
Te-131m	8.03E+6
Te-131	2.93E+4
Te-132	4.22E+6
I-130	5.53E+6
I-131	1.72E+7
I-132	1.24E+6
I-133	2.47E+6
I-134	4.49E+5
I-135	2.56E+6
Cs-134	6.75E+9
Cs-136	1.49E+8
Cs-137	1.04E+10
Cs-138	3.59E+5
Ba-139	1.06E+5
Ba-140	2.05E+7
Ba-141	4.18E+4
Ba-142	4.49E+4
La-140	1.91E+7
La-142	7.36E+5
Ce-141	1.36E+7
Ce-143	2.32E+6
Ce-144	6.95E+7
Pr-143	-
Pr-144	1.83E+3
Nd-147	8.40E+6
W-187	2.36E+6
Np-239	1.71E+6

APPENDIX A

Content deleted. No longer being used.

APPENDIX B

TECHNICAL BASIS FOR EFFECTIVE DOSE FACTORS -

GASEOUS RADIOACTIVE EFFLUENTS

APPENDIX B

Technical Basis for Effective Dose Factors - Gaseous Radioactive Effluents

Overview

The evaluation of doses due to releases of radioactive material to the atmosphere can be simplified by the use of effective dose transfer factors instead of using dose factors, which are radionuclide specific. These effective factors, which can be based on typical radionuclide distributions of releases, can be applied to the total radioactivity released to approximate the dose in the environment (i.e., instead of having to perform individual radionuclide dose analyses only a single multiplication (K_{eff}, M_{eff} or N_{eff}) times the total quantity of radioactive material released would be needed). This approach provides a reasonable estimate of the actual dose while eliminating the need for a detailed calculational technique.

Determination of Effective Dose Factors

Effective dose transfer factors are calculated by the following equations:

$$K_{eff} = \sum (K_i \times f_i) \tag{B.1}$$

where:

K_{eff} = the effective total body dose factor due to gamma emissions from all noble gases released

K_i = the total body dose factor due to gamma emissions from each noble gas radionuclide "i" released

f_i = the fractional abundance of noble gas radionuclide "i" relative to the total noble gas activity

$$(L + 1.1M)_{eff} = \sum [(L_i + 1.1M_i) \times f_i] \tag{B.2}$$

where:

$(L + 1.1\,M)_{eff}$ = the effective skin dose factor due to beta and gamma emissions from all noble gases released

$(L_i + 1.1\,M_i)$ = the skin dose factor due to beta and gamma emissions from each noble gas radionuclide "i" released

$$M_{eff} = \sum (M_i \times f_i) \tag{B.3}$$

where:

M_{eff} = the effective air dose factor due to gamma emissions from all noble gases released

M_i = the air dose factor due to gamma emissions from each noble gas radionuclide "i" released

$$N_{eff} = \sum (N_i \times f_i) \tag{B.4}$$

where:

N_{eff} = the effective air dose factor due to beta emissions from all noble gases released

N_i = the air dose factor due to beta emissions from each noble gas radionuclide "i" released

Normally, it would be expected that past radioactive effluent data would be used for the determination of the effective dose factors. However, the noble gas releases from Kewaunee have been maintained to such negligible quantities that the inherent variability in the data makes any meaningful evaluations difficult. For the years of 2000, 2001 and 2002, the total noble gas releases have been limited to 2.54E-04 Ci for 2000, 1.37E-01 Ci for 2001, and 1.91E-02 Ci for 2002. Therefore, in order to provide a reasonable basis for the derivation of the effective noble gas dose factors, the primary coolant source term from ANSI N237-1976/ANS-18.1, "Source Term Specifications," has been used as representing a typical distribution. The effective dose factors as derived are presented in Table B-1.

Application

To provide an additional degree of conservatism, a factor of 0.50 is introduced into the dose calculational process when the effective dose transfer factor is used. This conservatism provides additional assurance that the evaluation of doses by the use of a single effective factor will not significantly underestimate any actual doses in the environment.

For evaluating compliance with the dose limits of ODCM Normal Condition 13.2.2, the following simplified equations may be used:

$$D_\gamma = \frac{3.17E-08}{0.50} \times \chi/Q \times M_{eff} \times \sum Q_i \tag{B.5}$$

$$D_\beta = \frac{3.17E-08}{0.50} \times \chi/Q \times N_{eff} \times \sum Q_i \tag{B.6}$$

where:

$D\gamma$	=	air dose due to gamma emissions for the cumulative release of all noble gases (mrad)
D_β	=	air dose due to beta emissions for the cumulative release of all noble gases (mrad)
χ/Q	=	atmospheric dispersion to the controlling SITE BOUNDARY (sec/m^3)
M_{eff}	=	5.3E+02, effective gamma-air dose factor (mrad/yr per μCi/m^3)
N_{eff}	=	1.1E+03, effective beta-air dose factor (mrad/yr per μCi/m^3)
$\Sigma\ Q_i$	=	cumulative release for all noble gas radionuclides (μCi)
3.17E-08	=	conversion factor (yr/sec)
0.50	=	conservatism factor to account for the variability in the effluent data

Combining the constants, the dose calculational equations simplify to:

$$D_\gamma = 3.5E-05 \times \chi/Q \times \sum Q_i \qquad \text{(B.7)}$$

and

$$D_\beta = 7.0E-05 \times \chi/Q \times \sum Q_i \qquad \text{(B.8)}$$

The effective dose factors are used on a very limited basis for the purpose of facilitating the timely assessment of radioactive effluent releases, particularly during periods of computer malfunction where a detailed dose assessment may be unavailable. Dose assessments using the detailed, radionuclide dependent calculation are performed at least annually for preparation of the Radioactive Effluent Reports. Comparisons can be performed at this time to assure that the use of the effective dose factors does not substantially underestimate actual doses.

Table B-1
Effective Dose Factors - Noble Gases

Radionuclide	f_i	Total Body Effective Dose Factor K_{eff} (mrem/yr per $\mu Ci/m^3$)	Skin Effective Dose Factor $(L+1.1\ M)_{eff}$ (mrem/yr per $\mu Ci/m^3$)
Noble Gases - Total Body and Skin			
Kr-85	0.01	--	1.4E+01
Kr-88	0.01	1.5E+02	1.9E+02
Xe-133m	0.01	2.5E+00	1.4E+01
Xe-133	0.9	3.0E+02	6.6E+02
Xe-135	0.02	3.6E+01	7.9E+01
TOTAL		4.8E+02	9.6E+02
Noble Gases - Air			
Radionuclide	**f_i**	**Gamma Air Effective Dose Factor M_{eff} (mrad/yr per $\mu Ci/m^3$)**	**Beta Air Effective Dose Factor N_{eff} (mrad/yr per $\mu Ci/m^3$)**
Kr-85	0.01	--	2.0E+01
Kr-88	0.01	1.5E+02	2.9E+01
Xe-133m	0.01	3.3E+00	1.5E+01
Xe-133	0.95	3.4E+02	1.0E+03
Xe-135	0.02	3.8E+01	4.9E+01
TOTAL		5.3E+02	1.1E+03

APPENDIX C

EVALUATION OF CONSERVATIVE, DEFAULT EFFECTIVE EC VALUE

FOR LIQUID EFFLUENTS

Appendix C

Evaluation of Conservative, Default Effective EC Value for Liquid Effluents

In accordance with the requirements of ODCM Normal Condition 13.3.1 the radioactive liquid effluent monitors shall be FUNCTIONAL with alarm setpoints established to ensure that the concentration of radioactive material at the discharge point does not exceed 10 times the value of 10 CFR 20, Appendix B, Table 2, Column 2 for all radionuclides other than noble gases and a value of $2E10^{-4}$ μCi/ml for noble gases. The determination of allowable radionuclide concentration and corresponding alarm setpoint is a function of the individual radionuclide distribution and corresponding EC values.

In order to limit the need for routinely having to reestablish the alarm setpoints as a function of changing radionuclide distributions, a default alarm setpoint can be established. This default setpoint can be conservatively based on an evaluation of the radionuclide distribution of the liquid effluents from Kewaunee and the EC_e value for this distribution.

The effective EC value for a radionuclide distribution can be calculated by the equation:

$$EC_e = \frac{\sum C_i}{\sum \frac{C_i}{EC_i}} \tag{C.1}$$

where:

EC_e = an effective EC value for a mixture of radionuclide (μCi/ml)

C_i = concentration of radionuclide "i" in the mixture

EC_i = the 10 CFR 20, Appendix B, Table 2, Column 2 EC value for radionuclide "i" (μCi/ml)

Based on the above equation and the radionuclide distribution in the effluents for past years from Kewaunee, an EC_e value can be determined. Effluent release data from 2000-2002 was used to generate the results presented in Table C-1. The most limiting effective EC (for gamma emitting radionuclides) was for the calendar year 2001, with a calculated value of 5.98E-06 μCi/ml. For conservatism in establishing the alarm setpoints, a default effective EC value of 1.0E-06 μCi/ml was selected. The overall conservatism of this value is reaffirmed for future releases considering that 1.0E-06 μCi/ml is as or more restrictive than the individual EC values for the principal fission and activation products of Co-58, Co-60 and Cs-137. Overall, use of this effective EC value provides a factor of six (6) conservatism based on the 2000-2002 radionuclide distribution for gamma emitters.

Being a non-gamma emitter, tritium is not detected by the effluent monitor. While tritium accounts for nearly all of the activity, it is not a significant contributor when determining the alarm setpoint for release rate evaluations. Examining releases over the years 2000-2002, the average, diluted H-3 contribution to its limiting concentration (i.e., fraction of concentration limit - 10 x EC) in liquid effluents was 0.004%. This contribution is not expected to change significantly over time, since the concentration of H-3 in effluents can be expected to remain fairly consistent in effluent releases regardless of fuel conditions, activation product releases, and waste processing.

Based on relative abundances, other non-gamma emitting radionuclides (Fe-55 and Sr-89/90) contributed up to 30% of the concentration limit (30% for CY 2001). It is reasonable to assume that the abundances of these non-gammas will remain the same relative to other fission and/or activation products under varying conditions. Therefore, under conditions of elevated effluent radionuclide levels, the gamma-emitting radionuclides can be expected to be the main contributors to limiting conditions on liquid effluent concentrations, as established in Technical Specification 5.5.3.b and ODCM Normal Condition 13.1.1. Note that including the non-gammas (excluding tritium) in the evaluation results in a higher effective EC value.

Therefore, under conditions of elevated effluent levels, the main contributor to the limiting conditions of the liquid effluent concentration would be the gamma-emitting radionuclides. The factor of six (6) conservatism in the effective EC determination (discussed above) provides adequate consideration for the contribution from non-gamma emitting radionuclides, and provides a conservative basis for establishing an alarm setpoint consistent with the requirements of Technical Specification 5.5.3.b and ODCM Normal Condition 13.1.1.

The Heating Boiler Blow Down and Turbine Building Sump are discharged to the lake with no installed radiation monitor. Using the default effective EC value of 1.0E-06 µCi/ml for increased monitoring is consistent with the ODCM methodology if an installed radiation monitor was available.

Table C-1
Calculation of Effective EC (EC_e)

Nuclide	EC (µCi/ml)	2000			2001			2002		
		Release (C_i)	C_i/EC_i	Frac.	Release (C_i)	C_i/EC_i	Frac.	Release (C_i)	C_i/EC_i	Frac.
Na-24	5.00E-05	1.03E-03	2.06E+01	4.89E-03	2.18E-04	4.35E+00	1.27E-03	0.00E+00	0.00E+00	0.00E+00
Cr-51	5.00E-04	1.44E-03	2.89E+00	6.85E-04	8.26E-04	1.65E+00	4.83E-04	0.00E+00	0.00E+00	0.00E+00
Mn-54	3.00E-05	1.49E-04	4.97E+00	1.18E-03	3.30E-04	1.10E+01	3.22E-03	6.41E-05	2.14E+00	9.83E-04
Fe-55	1.00E-04	4.81E-02	4.81E+02	1.14E-01	4.85E-02	4.85E+02	1.42E-01	3.69E-02	3.69E+02	1.70E-01
Co-57	6.00E-05	0.00E+00	0.00E+00	0.00E+00	2.42E-05	4.03E-01	1.18E-04	0.00E+00	0.00E+00	0.00E+00
Co-58	2.00E-05	8.07E-03	4.04E+02	9.59E-02	4.09E-03	2.05E+02	5.99E-02	4.94E-03	2.47E+02	1.14E-01
Fe-59	1.00E-05	2.77E-04	2.77E+01	6.57E-03	2.44E-04	2.44E+01	7.14E-03	1.65E-04	1.65E+01	7.61E-03
Co-60	3.00E-06	4.71E-03	1.57E+03	3.73E-01	4.31E-03	1.44E+03	4.21E-01	2.07E-03	6.89E+02	3.17E-01
Br-82	4.00E-05	4.94E-04	1.23E+01	2.93E-03	1.44E-04	3.59E+00	1.05E-03	0.00E+00	0.00E+00	0.00E+00
Sr-89	8.00E-06	3.42E-04	4.27E+01	1.01E-02	2.59E-04	3.24E+01	9.48E-03	5.98E-04	7.48E+01	3.44E-02
Sr-90	5.00E-07	2.25E-04	4.50E+02	1.07E-01	2.50E-04	5.00E+02	1.46E-01	9.76E-05	1.95E+02	8.98E-02
Zr-95	2.00E-05	1.16E-04	5.79E+00	1.38E-03	7.18E-05	3.59E+00	1.05E-03	5.24E-05	2.62E+00	1.20E-03
Nb-95	3.00E-05	3.41E-04	1.14E+01	2.70E-03	2.39E-04	7.95E+00	2.33E-03	2.45E-04	8.17E+00	3.76E-03
Ag-110m	6.00E-06	2.85E-03	4.74E+02	1.13E-01	1.63E-03	2.72E+02	7.97E-02	2.86E-03	4.76E+02	2.19E-01
Sn-113	3.00E-05	9.65E-05	3.22E+00	7.64E-04	5.08E-05	1.69E+00	4.95E-04	7.06E-05	2.35E+00	1.08E-03
Sb-124	7.00E-06	5.61E-04	8.01E+01	1.90E-02	1.81E-04	2.59E+01	7.59E-03	4.34E-05	6.20E+00	2.85E-03
Sb-125	3.00E-05	4.86E-03	1.62E+02	3.85E-02	1.02E-03	3.41E+01	9.99E-03	2.46E-03	8.18E+01	3.76E-02
I-132	1.00E-04	0.00E+00	0.00E+00	0.00E+00	7.75E-08	7.75E-04	2.27E-07	0.00E+00	0.00E+00	0.00E+00
I-133	7.00E-06	6.16E-04	8.80E+01	2.09E-02	6.32E-04	9.03E+01	2.65E-02	0.00E+00	0.00E+00	0.00E+00
I-135	3.00E-05	0.00E+00	0.00E+00	0.00E+00	4.61E-05	1.54E+00	4.50E-04	0.00E+00	0.00E+00	0.00E+00
Cs-137	1.00E-06	3.70E-04	3.70E+02	8.78E-02	2.74E-04	2.74E+02	8.02E-02	3.04E-06	3.04E+00	1.40E-03
	Total	7.46E-02	4.21E+03	1.00E+00	6.34E-02	3.42E+03	1.00E+00	5.06E-02	2.17E+03	1.00E+00
Non-Gamma Fraction				0.23			0.30			0.29
Gamma Fraction				0.77			0.70			0.71
EC_e (µCi/ml, total)		1.77E-05			1.86E-05			2.33E-05		
EC_e (µCi/ml, gammas)		8.03E-06			5.98E-06			8.44E-06		

APPENDIX D

On-site Disposal of Low-Level Radioactively

Contaminated Waste Streams

Appendix D consists of hard copies of the following reference documents:

DESCRIPTION	DATE	DOCKET NUMBER
Operating License DPR-43 Kewaunee Nuclear Power Plant Disposal of Low Level Radioactive Material	October 17, 1991	NRC-91-148 50-305
Proposed Disposal of Low Level Radioactive Waste Sludge Onsite at the Kewaunee Nuclear Power Plant (TAC No. M75047)	June 17, 1992	K92-119 50-305
Safety Evaluation For An Amendment To An Approved 10 CFR 20.302 Application For The Kewaunee Nuclear Plant (TAC No. M89719)	September 14, 1994	K-94-195 50-305
Alternate Disposal Of Contaminated Sewage Treatment Plant Sludge In Accordance With 10 CFR 20.2002 (TAC No. M93844)	November 13, 1995	K-95-172 50-305
Onsite Disposal Of Contaminated Sludge Pursuant To 10 CFR 20.2002 (TAC No. M97411)	April 9, 1997	K-97-64 50-305

Adapted from N

WPSC (414) 433-1598
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WISCONSIN PUBLIC SERVICE CORPORATION
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NRC 91-148
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S F Wozniak D2
QA Vault KNP
TJ Webb KNP

October 17, 1991

File

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Disposal of Low Level Radioactive Material

References:
1) Letter from K.H.Evers to Document Control Desk dated September 12, 1989
2) Letter from M.J.Davis to K.H.Evers dated February 13, 1990
3) Letter from L.Sridharon (WDNR) to M.Vandenbusch dated June 13, 1991

In reference 1, pursuant to the regulation of 10 CFR 20.302, Wisconsin Public Service Corporation (WPSC) requested authorization for the alternative disposal of very-low-level radioactive materials from the Kewaunee Nuclear Power Plant. In reference 2, the US NRC identified additional questions that needed to be addressed in order to complete their review. Attachment 1 provides our response to the questions.

WPSC requested the State of Wisconsin Department of Natural Resources (WDNR) to review the disposal options for the service water pretreatment lagoon sludges. In reference 3, the WDNR completed a review of the most appropriate on site disposal methods for the slightly contaminated service water pretreatment lagoon sludges. The two proposed methods that the WDNR evaluated included in-situ capping of the sludge in the wastewater treatment lagoon and on site landspreading. In Attachment 1, Appendix A, WPSC evaluated the on site landspreading

Document Control Desk
October 17, 1991
Page 2

application which is our preferred disposal method. WPSC does not intend to utilize the in-situ capping of the sludge in the lagoon at this time. However, in the letter the WDNR agreed that either disposal method was acceptable provided:

- if the material is to be left in the lagoon, it would be capped in accordance with Wisconsin State statutes.

- if the on site landspreading option is utilized, the material would be spread by either disking into the soil or by spiking into the ground.

WPSC will abide by the WDNR landspreading requirements which include locational and performance standards. Should there be any additional questions please feel free to contact a member of my staff.

Sincerely,

C A Schrock

C. A. Schrock
Manager - Nuclear Engineering

DJM/jms

Attach.

cc - US NRC - Region III
Mr. Patrick Castleman, US NRC

LIC\DJM\N492

ATTACHMENT 1

To

Letter from K. H. Evers (WPSC) to Document Control Desk (NRC)

Dated

October 17, 1991

Document Control Desk
October 17, 1991
Attachment 1, Page 1

References 1) Letter from K. H. Evers to Document Control Desk dated September 1, 1989.

NRC Question #1

On page 4 of your submittal, the average input to the Sewage Treatment System is approximately 11,000 gallons per day. In the Final Environmental Statement, this system is to be operated below its design capacity of 9,000 gallons per day. Discuss this deviation from the design capacity, and provide information to justify the higher output for this system.

WPSC Response

The original Sewage Treatment System installed at the Kewaunee Nuclear Power Plant (KNPP) was replaced in 1986 with a higher capacity system. The original system was designed for an onsite work force of around 150 people. It was a limited capacity aerobic treatment system which included the onsite lagoon for additional retention. Because of this limited capacity and more stringent conditions on system effluent to Lake Michigan, an aerobic digester system was installed, which has a higher capacity, and uses current technology.

The estimated input volume to the Sewage Treatment System used in the September 12, 1989 application was 11,000 gallons per day. This value was based on past operating data. The increase in influent from the original design basis included in the Final Environmental Statement is due mainly to an increase in the number of individuals and facilities (e.g., training and simulator building) located onsite. Design changes to the system were required to accommodate these new facilities.

Document Control Desk
October 17, 1991
Attachment 1, Page 2

The current volumes of sewage sludge were used as the basis for the potential dose analysis and corresponding radionuclide concentration limits. This increase has no significant effect on the dose modeling. (Refer to the response to NRC Question #2, below.)

NRC Question #2

Provide information regarding how the disposal plan assures that the annual dose to any exposed individual will be kept below 1 mrem per year.

WPSC Response

The dose pathway modeling used for determining the radioactive material concentration limits was based on NRC modeling. The computer code IMPACTS-BRC was used as the basis for calculating the potential doses from the alternative disposal methods. This modeling includes reasonable conservative exposure pathway scenarios for the various disposal methods.

Administrative controls will be established to ensure that the actual disposal of any slightly contaminated materials from KNPP are within the bounds of the evaluation. Samples from each of the waste streams will be collected and analyzed by gamma spectroscopy prior to release for disposal. A system lower limit of detection (LLD) of 5E-07 μCi/ml for the principal gamma emitting radionuclides will be required. This LLD ensures the identification of any contaminated materials at a fraction of the allowable concentration limits for the alternative disposal.

The results of these analyses will be used to ensure that any detectable levels of radioactive material are within the limits for alternative disposal. Any materials with levels of radioactive material above the concentration limits (and of plant origin) will be treated as a radioactive waste and appropriately controlled.

Records will be maintained to ensure that the cumulative disposal of any contaminated materials are maintained within the bounds of the evaluation. In addition to a comparison of the individual radionuclide concentration limits, a record of the total amount of radioactive material disposed of will be maintained. Cumulative totals will be maintained to ensure that the total activity does not exceed the quantity assumed in the derivation of the limits.

In developing the concentration limits presented in Table 1 of reference 1, it was assumed the total annual design basis volume of 27,000 ft^3 would be contaminated at the derived limit. The dose commitment from each radionuclide was individually evaluated as if it were the only radioactive material present. To determine if a mixture of radionuclides meets the limit, the sum-of-the-fractions rule should be applied (i.e., the sum of each radionuclide's concentration divided by its limiting concentration must be less than one).

The concentration limits of Table 1 of reference 1 also have an implied total activity limit. This limit is determined by multiplying the individual radionuclide concentration limit by the total estimated waste volume of 27,000 ft^3. These total activity limits are presented in Table A of this response, for each radionuclide individually. For a mixture of radionuclides, a total annual activity limit may be determined by normalizing the concentrations so that the sum-of-the-fractions for the mixture equals one (1). These resultant adjusted concentrations may be multiplied by the 27,000 ft^3 waste volume to determine the corresponding total activity limit of the mixture.

Document Control Desk
October 17, 1991
Attachment 1, Page 4

A Disposal Log will be maintained on a calendar year basis for all disposals of any very-low-level radioactive materials. The log will contain as a minimum the following information:

- Disposal location
- Description of waste
- Shipment/disposal date
- Waste volume
- Radionuclide concentrations (gamma emitters)
- Year-to-date radionuclide activity
- Year-to-date waste volume

In addition to the above Disposal Log, a record file will be kept for each individual disposal. This file will contain, as a minimum, the following information:

- Waste identification
- Sample gamma spectroscopy results
- Identified radionuclide concentrations and total activity

NRC Question #3

Revise Appendix B, Section A of your submittal, "Radiation Exposure During Transport," by adding the cumulative dose to the exposed population per reactor year for both the transportation worker and the general public (onlookers along route).

WPSC Response

The potential exposure to the general public (onlookers along route) is modeled by the IMPACTS-BRC code. As addressed in NUREG/CR-3585, this modeling is based on an integration of the source strength, an assumed population density along route and vehicular speed. For a conservative evaluation of the potential exposure to the general public from the transport of the KNPP waste, a population density of 610 persons/mi^2 was assumed. This value is conservative for the KNPP site area where the average population density is less than 53 persons/mi^2. A transport distance of 45 miles was assumed. The IMPACTS-BRC modeling assumes five (5) tons of material are transported per shipment. For the assumed KNPP waste volume, this shipment weight translates into a total of 167 shipments per year. With a vehicular speed of 20 miles per hour, the resultant total population exposure time is 375 person-hours per year. At the concentration limits established for the alternative disposal, the potential onlooker doses during transport will be less than 0.01 person-rem per year. For the modeling of the exposure to the transport worker, the IMPACTS-BRC model assumes two drivers per vehicle. As presented in the September 12, 1989 submittal, the maximum dose to the driver is less than 1 mrem per year (<0.001 rem/yr). Therefore, the total collective dose to the transport workers will be twice the individual dose, i.e., less than 0.002 person-rem. Including the population dose of <0.01 person-rem per year, the total collective dose to both the transport workers and the population is less than 0.02 person-rem (0.002 person-rem + 0.01 person-rem < 0.02 person-rem).

For the disposal of the existing 15,000 ft^3 of contaminated sludges, the population dose due to the transportation of the waste is calculated to be 0.0002 person-rem. The estimated collective exposure to the transport worker is 0.00007 person-rem. The total collective dose due to transport of the waste is 0.00027 person-rem.

Document Control Desk
October 17, 1991
Attachment 1, Page 6

Additional Potential Disposal Method

The Wisconsin Department of Natural Resources has requested Wisconsin Public Service to examine the feasibility of land application of the lagoon sludges in lieu of disposal in the Kewaunee County Landfill. Land application is also an option for the disposal of the sewage sludges. Therefore, WPS requests that the option for onsite disposal at the KNPP site by land application be included in the alternative disposal methods which was determined to be acceptable in our September 12, 1989 submittal.

The potential pathways of exposure as evaluated in the September 12, 1989 submittal conservatively bound any additional pathways of exposure that would result from onsite land spreading of the waste. Attachment A to this response provides an overview of the land spreading disposal method. Also, the pathways of exposure applicable to the onsite land application are evaluated; and a comparison to the controlling pathways and radionuclide concentrations as presented in the September 12, 1989 submittal are discussed. From a modeling standpoint, the two exposure scenarios , "Radiation Exposure During Transport" and "Radiation Exposure to Landfill Operator," appropriately characterize any potential exposure to workers involved with the land spreading of the waste. The other post-disposal exposure scenarios, "Intruder Scenario", "Intruder Well", and "Exposed Waste Scenario," as described in NUREG/CR-3585 (and as discussed in Appendix C of the submittal) reasonably bound any potential exposures from either ground waste migration or post-release from the Kewaunee site. In no case is there a higher potential for exposure from land application than the pathways and potential exposures that were used for the derivation of the limits for alternative disposal. Therefore, no revisions are needed to the radionuclide concentration limits proposed in the September 12, 1989 submittal to include the option for disposal by onsite land spreading of the waste.

Document Control Desk
October 17, 1991
Attachment 1, Page 7

Table A

Radionuclide Quantity Limits

for Alternative Disposal

Nuclide	Limiting Concentration (μCi/ml)	Limiting Annual Quantity (Ci)
H-3	9.65E-04	0.7382
C-14	4.55E-05	0.0348
Cr-51	3.13E-04	0.2394
Mn-54	1.14E-05	0.0087
Fe-55	1.00E-02	7.6500
Fe-59	7.90E-06	0.0060
Co-58	1.16E-05	0.0089
Co-60	3.74E-06	0.0029
Ni-63	1.00E-02	7.6500
Sr-90	3.45E-03	2.6393
Zr-95	6.28E-06	0.0048
Nb-95	1.23E-05	0.0094
Mo-99	6.73E-05	0.0515
Tc-99	2.70E-04	0.2066
I-129	2.50E-06	0.0019
I-131	2.68E-05	0.0205
Cs-134	6.16E-06	0.0047
Cs-137	1.71E-05	0.0131
Ba-140	5.52E-05	0.0422
La-140	4.17E-06	0.0032
Transuranics		
TRU ($T\frac{1}{2}$ > 5 yrs)	8.91E-05	0.0682
Pu-241	2.85E-03	2.1803
Cm-242	1.00E-02	7.6500

Assumes annual quantity of KNPP wastes is 27,000 ft^3 or 7.65E8 mls.

Document Control Desk
October 17, 1991
Attachment 1, Page 8

Appendix A
Evaluation of Onsite Land Application for Alternative Disposal of Very-Low-Level Contaminated Materials

Overview

Land spreading of lagoon sludges onsite at the Kewaunee Nuclear Power Plant has been recommended by personnel from the Wisconsin Department of Natural Resources (DNR) as a desirable alternative to the use of the Kewaunee County Landfill for disposal. This method of disposal is also a recommended practice for disposing of sewage treatment facility sludges. Therefore, WPS requests that this disposal method be included in the options available for the alternative disposal of very-low-level radioactively contaminated materials from KNPP.

Description of Disposal Method

The disposal of KNPP sludges will be performed by beneficial land application to a dedicated disposal area located onsite at the Kewaunee Nuclear Power Plant. Typical methods of land spreading will be employed. KNPP sludges will be loaded onto appropriate vehicles (e.g., tanker truck, sludge spreader, etc.) and applied to the dedicated disposal area. The dedicated disposal area will be periodically plowed to a depth of 6 inches.

Onsite disposal of water treatment and sewage sludges are allowed by EPA and State of Wisconsin Department of Natural Resources with the criteria and limits for land spreading being specified by the potential use of the land. The two land use criteria are 1) Agricultural land that covers any lands upon which food crops are grown or animals are grazed for human consumption, and 2) Non-Agricultural land that covers lands which do not represent ingestion pathways to man. To be conservative, the Agricultural Land Application limits of sludge contaminants will be applied to the KNPP wastes even though the less restrictive Non-Agricultural Land Application sludge contamination limits are allowed. Therefore, no more than 50 metric tons of sludge per hectare will be applied to the dedicated disposal site. This limit will ensure that any land application will not exceed the bounds of the dose analysis as

Document Control Desk
October 17, 1991
Attachment 1, Page 9

performed previously. In addition, other limitations as applied to land application by the State of Wisconsin Department of Natural Resources will be followed (e.g., control of runoff/erosion, proximity to wells/residences/surface water, etc.).

Applicable Pathways of Exposure

The pathways of exposure applicable for land spreading are not appreciably different from the pathways evaluated for the disposal methods at the Kewaunee County Landfill or the Green Bay Metropolitan Sewerage District facilities. The major exposure pathways are discussed below:

Direct Exposure to Workers

Any potential exposures to workers involved in the removal, transport and land spreading of the sludges are reasonably bound by the evaluation of the exposure to the transport worker in the September 12, 1989 submittal. The transport worker has been assumed to be exposed for 460 hours per year at one (1) meter from unshielded waste. For the land spreading of these wastes, it is estimated that the total exposure time for the removal and disposal of the lagoon sludges will require no longer than a three week period per year (i.e., 120 hours).

The potential exposure to a worker onsite after land spreading, has been estimated at no more that 100 hours per year. Such an individual would be involved in land maintenance activities, such as plowing and mowing. As modeled in the September 12, 1989 submittal, an exposure of 2000 hours per year to the landfill operator has been assumed. For this exposure, the KNPP materials are mixed with other landfill waste: a 1:13 mixing of KNPP materials to other waste is assumed. This mixing is not significantly different from the type of mixing that will occur in the field with the sludges being

Document Control Desk
October 17, 1991
Attachment 1, Page 10

plowed into the soil to a depth of six (6) inches. With a land spreading of 50 metric tons per hectare per year, a mixing ratio of 1:30 will be achieved. Therefore, the resultant dose to the exposed worker would be less than the 1 mrem per year dose to the transport worker as evaluated in the September 12, 1989 submittal.

Post Disposal Exposure - Intruder Scenario

The IMPACTS-BRC model, as applied to the disposal of the KNPP waste, assumes a loss of institutional controls 10 years after closure of the site (See Appendix B of the September 12, 1989 submittal). An individual is assumed to reside in a house built on the disposal area. This individual receives a direct exposure (from the uncovered waste), an inhalation exposure (from resuspension), and an ingestion exposure (from growing ½ of his food crops). For modeling purposes, it is assumed that the waste is mixed at a ratio of 1:13 with other soils during the resident's construction process.

The onsite land application of KNPP waste will be limited by the Agricultural Land Application sludge concentrations even though the less restrictive Non-Agricultural Land Application sludge concentrations are applicable since a "dedicated land disposal" site will be used (i.e., no crops will be grown on the disposal site). Therefore, provided the KNPP waste does not exceed the Non-Agricultural maximum sludge concentrations for heavy metal or organic chemicals, unlimited application of waste to the dedicated land disposal site is allowed. However, to be conservative, the land application of KNPP wastes will be limited to 5 metric tons per hectare per year. The intruder scenario as evaluated in the September 12, 1989 submittal conservatively bounds this exposure pathway for the on-site land spreading.

Document Control Desk
October 17, 1991
Attachment 1, Page 11

Post Disposal - Intruder Well

The intruder well pathway for onsite land disposal is essentially the same as the intruder well pathway as evaluated by the IMPACTS-BRC model. It is conservatively assumed that the well is located at the edge of the disposal site. As modeled, locating the well at the disposal site edge in "downstream flow" direction maximizes the calculated hypothetical dose. (Additional discussion of this modeling is presented in NUREG/CR-3585, Volume 2).

The potential dose for the intruder well scenario for the land spreading disposal would be less than 0.001 mrem per year. The modeling as presented in the September 12, 1989 submittal reasonably bounds any hypothetical well water exposure pathway.

In summary, the modeling of the exposure scenarios, as presented in the September 12, 1989 submittal, conservatively bounds the hypothetically exposures for the on-site land spreading. In no case is it likely that any individual, either on-site or off-site, will receive a dose in excess of 1 mrem per year from the disposal of the slightly contaminated materials.

K 92-119
Received
6-22-92

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

June 17, 1992

Docket No. 50-305

Mr. C. A. Schrock
Manager - Nuclear Engineering
Wisconsin Public Service
Corporation
P. O. Box 19002
Green Bay, Wisconsin 54037-9002

Dear Mr. Schrock:

SUBJECT: PROPOSED DISPOSAL OF LOW LEVEL RADIOACTIVE WASTE SLUDGE ONSITE AT THE KEWAUNEE NUCLEAR POWER PLANT (TAC NO. M75047)

By letters dated September 12, 1989, and October 17, 1991, you submitted a request pursuant to 10 CFR 20.302 for the disposal of waste sludge onsite at the Kewaunee Nuclear Power Plant. We have completed our review of the request and find your procedures, including documented commitments, to be acceptable.

This approval is granted provided that the enclosed safety evaluation is permanently incorporated into your Offsite Dose Calculation Manual (ODCM) as an Appendix, and that future modifications of these commitments are reported to the NRC.

Issuance of this safety evaluation completes all effort on TAC No. M75047.

Sincerely,

Allen G. Hansen, Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc w/enclosure:
See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO ONSITE DISPOSAL OF LOW-LEVEL RADIOACTIVELY

CONTAMINATED WASTE SLUDGE

AT THE KEWAUNEE NUCLEAR POWER PLANT

WISCONSIN PUBLIC SERVICE CORPORATION
WISCONSIN POWER AND LIGHT COMPANY
MADISON GAS AND ELECTRIC COMPANY

DOCKET NO. 50-305

1.0 INTRODUCTION

In reference 1, Wisconsin Public Service Corporation (WPSC) requested approval pursuant to Section 20.302 of Title 10 of the Code of Federal Regulations (CFR) for the disposal of licensed material not previously considered in the Kewaunee Final Environmental Statement (FES) dated December 1972. Additional related material from the licensee, from the State of Wisconsin, and from the staff are contained in references 2 through 5.

The WPSC request contains a detailed description of the licensed material (i.e., contaminated sludge) subject to this 10 CFR 20.302 request, based on radioactivity absorbed from liquid discharges of licensed material. The 15,000 cubic feet of contaminated sludge identified in the request contains a total radionuclide inventory of 0.17 mCi of Cesium-137 and Cobalt-60.

In its submittal, the licensee addressed specific information requested in accordance with 10 CFR 20.302(a), provided a detailed description of the licensed material, thoroughly analyzed and evaluated the information pertinent to the effects on the environment of the proposed disposal of licensed material, and committed to follow specific procedures to minimize the risk of unexpected exposures.

2.0 DESCRIPTION OF WASTE

During the normal operation of Kewaunee, the potential exists for in-plant process streams which are not normally radioactive to become contaminated with very low levels of radioactive materials. These waste streams are normally separated from the radioactive streams. However, due mainly to infrequent, minor system leaks, and anticipated operational occurrences, the potential exists for these systems to become slightly contaminated. At Kewaunee, the secondary system demineralizer resins, the service water pre-treatment system sludges, the make-up water system resins, and the sewage treatment plant sludges are waste streams that have the potential to become contaminated at very low levels.

During the yearly testing of a batch of pre-treatment sludge, it was found that approximately 15,000 cubic feet of sludge had been contaminated with Cs-137 and Co-60.

3.0 PROPOSED DISPOSAL METHOD

WPSC plans to dispose of the 15,000 cubic feet of contaminated sludge onsite pursuant to 10 CFR 20.302. The sludge is currently contained in an onsite lagoon at the KNPP sewage treatment facility. The disposal of the sludge will be by land application to an area located onsite at KNPP, as shown in Figure 1. The area will be periodically plowed to a depth of 6 inches.

Table 1 lists the principal nuclides identified in the sludge. The activity is based on measurements made in 1989. The radionuclide half-lives, which are dominated by 30-year Cs-137, meet the staff's 10 CFR 20.302 guidelines (reference 6), which apply to radionuclides with half-lives less than 35 years.

Table 1

Nuclide	Total Activity (mCi)
Co-60	0.076
Cs-137	0.094

	0.170

4.0 RADIOLOGICAL IMPACTS

The licensee has evaluated the following potential exposure pathways to members of the general public from the radionuclides in the sludge: (1) external exposure caused by groundshine from the disposal site; (2) internal exposure from inhalation of re-suspended radionuclides; and (3) internal exposure from ingesting ground water. The staff has reviewed the licensee's calculational methods and assumptions and finds that they are consistent with NRC Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977. The staff finds the assessment methodology acceptable.

Table 2 lists the doses calculated by the licensee for the maximally exposed member of the public based on a total activity of 0.170 mCi disposed of in the current year, as well as the cumulative impact of similar disposals during subsequent years. For any repetitive disposals, the licensee must reapply to the NRC when a particular disposal would exceed the following boundary conditions: (1) the annual disposal must be less than a total activity of 0.2 mCi; (2) the whole body dose to the hypothetical maximally exposed individual must be less than 0.1 mrem/year; and (3) the disposal must be at the same site as described in Figure 1.

- 3 -

TABLE 2

Pathway	Whole Body Dose Received by Maximally Exposed Individual (mrem/year)
Groundshine	0.034
Inhalation	0.008
Groundwater Ingestion	0.007
TOTAL	0.049

As shown in Table 2, the annual dose is expected to be on the order of 0.1 mrem or less. Such a dose is a small fraction of the 300 mrem received annually by members of the general public from sources of natural background radiation.

The guidelines used by the NRC staff for onsite disposal of licensed material are presented in Table 3, along with the staff's evaluation of how each guideline has been satisfied.

The licensee's procedures and commitments as documented in the submittal are acceptable, provided that they are permanently incorporated into the licensee's Offsite Dose Calculation Manual (ODCM) as an Appendix, and that future modifications be reported to NRC in accordance with the applicable ODCM change protocol.

Based on the above findings, the staff finds the licensee's proposal to dispose of the low level radioactive waste sludge onsite in the manner described in the WPSC letter dated September 12, 1989, to be acceptable. The State of Wisconsin has also approved these procedures (reference 5).

TABLE 3

20.302 Guideline for Onsite Disposal	Staff's Evaluation
1. The radioactive material should be disposed of in a manner that it is unlikely that the material would be recycled.	1. Due to the nature of the disposed material, recycling to the general public is not considered likely.
2. Doses to the total body and any body organ of a maximally exposed individual (a member of the general public or a non-occupationally exposed worker) from the probable pathways of exposure to the disposed material should be less than 1 mrem/year.	2. This guideline is addressed in Table 2.
3. Doses to the total body and any body organ of an inadvertent intruder from the probable pathways of exposure should be less than 5 mrem/year.	3. Because the material will be land-spread, the staff considers the maximally exposed individual scenario to also address the intruder scenario.
4. Doses to the total body and any body organ of an individual from assumed recycling of the disposed material at the time the disposal site is released from regulatory control from all likely pathways of exposure should be less than 1 mrem.	4. Even if recycling were to occur after release from regulatory control, the dose to the maximally exposed member of the public is not expected to exceed 1 mrem/year, based on the exposure scenarios considered in this analysis.

REFERENCES

(1) WPSC letter from K. H. Evers to NRC Document Control Desk, September 12, 1989.

(2) Memorandum from L. J. Cunningham, DREP, to J. N. Hannon, "Request For Additional Information," December 11, 1989.

(3) NRC letter from M. J. Davis to K. H. Evers of WPSC dated February 13, 1990.

(4) WPSC letter from K. H. Evers to NRC Document Control Desk, October 17, 1991.

(5) Letter from L. Sridharon of the State of Wisconsin Department of Natural Resources to M. Vandenbusch of WPSC, dated June 13, 1991.

(6) E. F. Branagan Jr. and F. J. Congel, "Disposal of Contaminated Radioactive Wastes from Nuclear Power Plants," presented at the Health Physics Society's midyear Symposium on Health Physics Considerations in Decontamination/Decommissioning, Knoxville, TN, February 1986 (CONF-860203).

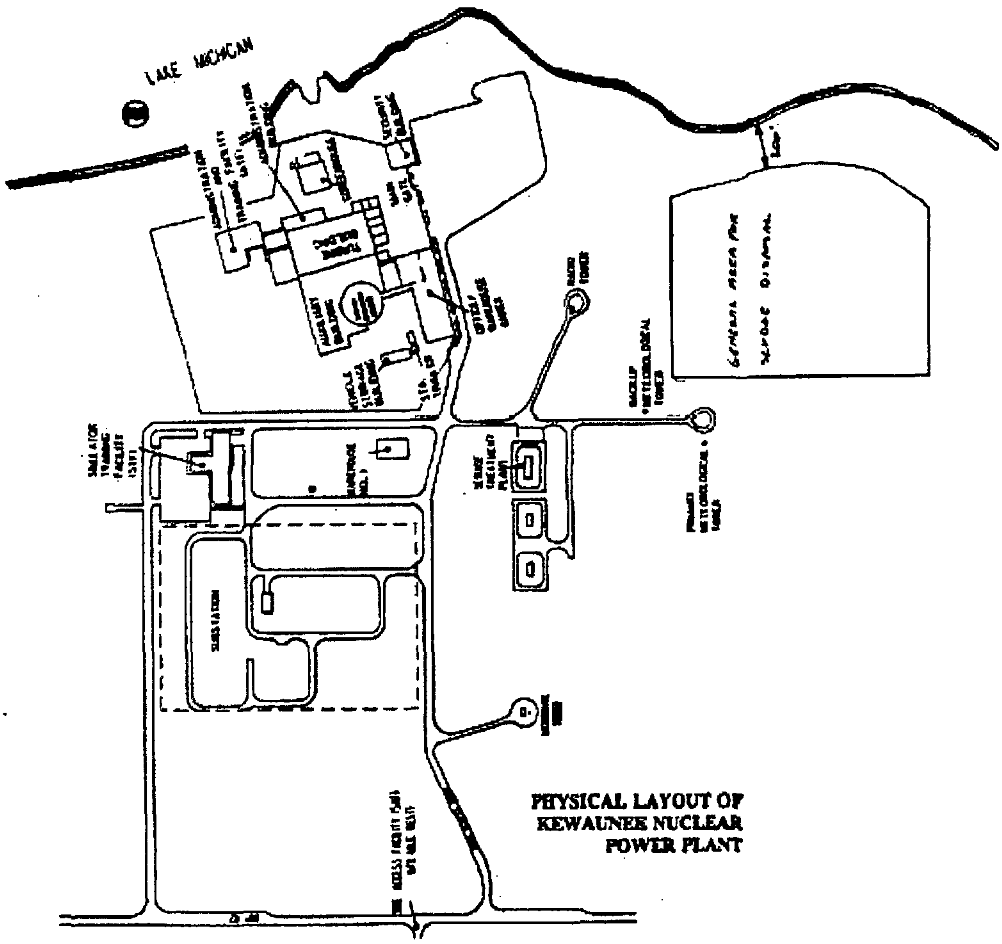
Principal Contributor: J. Minns

Date: June 17, 1992

- 6 -

Figure 1

Kewaunee Nuclear Power Plant Site Area Map



K-94-195
9/21/94

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 14, 1994

Mr. C. A. Schrock
Manager - Nuclear Engineering
Wisconsin Public Service Corporation
Post Office Box 19002
Green Bay, WI 54307-9002

SUBJECT: SAFETY EVALUATION FOR AN AMENDMENT TO AN APPROVED 10 CFR 20.302 APPLICATION FOR THE KEWAUNEE NUCLEAR PLANT (TAC NO. M89719)

Dear Mr. Schrock:

By letter dated June 23, 1994, as supplemented June 29, 1994, you requested approval to use another onsite area for the disposal of contaminated waste sludge in addition to the location approved by the NRC on June 17, 1992. The staff has completed its review of your request and finds that your proposal meets the radiological boundary conditions approved in the June 17, 1992, Safety Evaluation, and is therefore acceptable. The staff also finds that your proposal is in accordance with 10 CFR 20.2002 which replaced 20.302 on January 1, 1994.

This approval is granted provided that the enclosed Safety Evaluation is permanently incorporated into your Offsite Dose Calculation Manual (ODCM) as an Appendix, and that future modifications of these commitments are reported to the NRC.

Sincerely,

Richard J. Laufer

Richard J. Laufer, Acting Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket No. 50-305

Enclosure:
Safety Evaluation

cc w/enclosure:
see next page

T A Hanson (MGRE)
M W Seitz (WPL)
Larry Nielson (ANFC)
D A Bollom G6
D E Cole KNP
K H Evers KNP
J P Giesler KNP
K A Hoops KNP
M L Marchi KNP
D L Masarik KNP
J N Morrison D1
L A Nuthals (NSRAC)
R P Pulec D2 (2)
C A Schrock D2
C S Smoker KNP
C R Steinhardt D2
C A Stanitky KNP
T J Webb KNP
S F Wozniak D2
QA Vault KNP

Wisconsin Public Service Corporation   Kewaunee Nuclear Power Plant

cc:

Foley & Lardner
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Mr. Harold Reckelberg, Chairman
Kewaunee County Board
Kewaunee County Courthouse
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Mr. Robert S. Cullen
Chief Engineer
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Madison, Wisconsin 53707

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO ONSITE DISPOSAL OF LOW-LEVEL RADIOACTIVELY

CONTAMINATED WASTE SLUDGE

AT THE KEWAUNEE NUCLEAR POWER PLANT

WISCONSIN PUBLIC SERVICE CORPORATION
WISCONSIN POWER AND LIGHT COMPANY
MADISON GAS AND ELECTRIC COMPANY

DOCKET NO. 50-305

1.0 INTRODUCTION

By letter dated June 23, 1994, and as supplemented on June 29, 1994, Wisconsin Public Service Corporation (the licensee) requested approval to use another onsite area for the disposal of contaminated waste sludge in addition to the location approved by the NRC on June 17, 1992.

2.0 EVALUATION

A Safety Evaluation (SE) dated June 17, 1992, approved the licensee's request pursuant to 10 CFR 20.302 for the disposal of 15,000 cubic feet of contaminated waste sludge by land application at the Kewaunee Nuclear Power Plant (KNPP) at a specific onsite location. The SE imposed the following boundary conditions:

1. The annual disposal must be less than a total activity of 0.2 mCi.
2. The whole body dose to the hypothetical maximally exposed individual must be less than 0.1 mrem/year.
3. The disposal must be the same site.

The site designated in the SE was an unused area adjacent to the onsite lagoon at the KNPP sewage treatment facility. In 1993, approximately 7500 cubic feet of the original 15,000 cubic feet of contaminated sludge was spread on that location. The licensee has now proposed to dispose of the remaining contaminated sludge at another onsite location northwest of the plant (see Attachment). The licensee has committed that the new disposal location will meet all the radiological boundary conditions contained in the SE for the 10 CFR 20.302 application approved on June 17, 1992. Additionally, the licensee has stated that this additional disposal site will meet all applicable Wisconsin Department of Natural Resources (WDNR) application requirements (i.e., sludge application rate and frequency of spreading rate), in addition to WDNR landspreading requirements regarding location and performance standards that were required at the original disposal site.

3.0 CONCLUSION

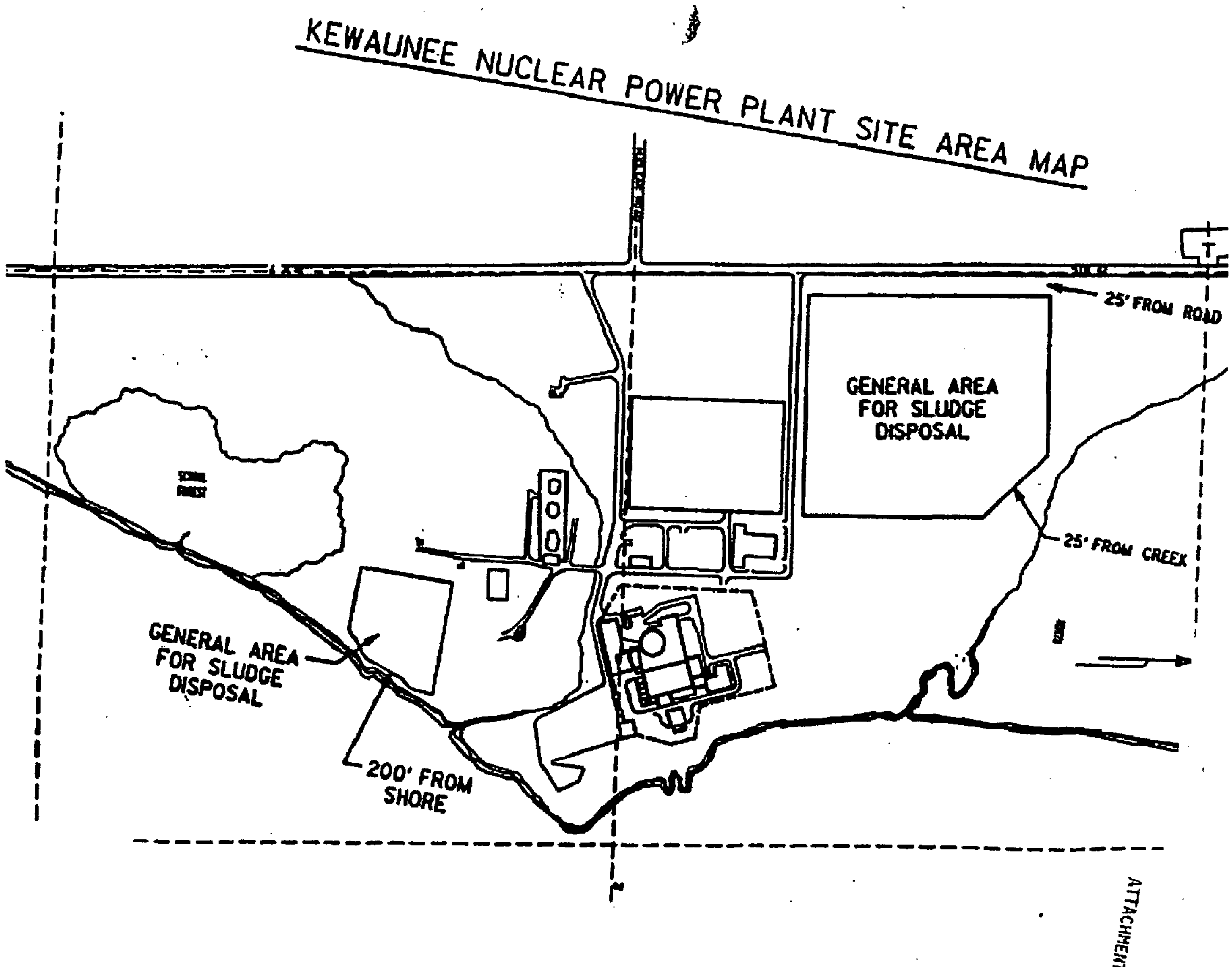
The staff finds the licensee's proposal to dispose of the low-level radioactive waste sludge in the additional onsite location to be within the radiological boundary conditions approved in the June 17, 1992, SE and is therefore acceptable. The staff also finds that your proposal is in accordance with 10 CFR 20.2002 which replaced 20.302 on January 1, 1994.

As stated in the NRC's June 17, 1992, approval of the licensee's 10 CFR 20.302 application, the licensee is required to permanently incorporate this modification into the Offsite Dose Calculation Manual as an Appendix, and that future modification of this commitment be reported to the NRC.

Principal Contributor: S. Klementowicz

Date: September 14, 1994

Attachment: KNPP Site Area Map


KEWAUNEE NUCLEAR POWER PLANT SITE AREA MAP
GENERAL AREA FOR SLUDGE DISPOSAL
25' FROM ROAD
25' FROM CREEK
GENERAL AREA FOR SLUDGE DISPOSAL
200' FROM SHORE
ATTACHMENT

K-95-172
Rec'd. 11-20-95

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 13, 1995

Mr. M. L. Marchi
Manager - Nuclear Business Group
Wisconsin Public Service Corporation
Post Office Box 19002
Green Bay, WI 54307-9002

SUBJECT: ALTERNATE DISPOSAL OF CONTAMINATED SEWAGE TREATMENT PLANT SLUDGE IN ACCORDANCE WITH 10 CFR 20.2002 (TAC NO. M93844)

Dear Mr. Marchi:

By letter dated October 17, 1995, as supplemented on November 3, 1995, you requested approval for the onsite disposal of contaminated sewage treatment sludge in accordance with 10 CFR 20.2002. This request was similar to a previous disposal request that was approved by the NRC on June 17, 1992.

The staff has completed its review of your request and finds that your proposal meets the radiological boundary conditions approved in the June 17, 1992, Safety Evaluation, and is therefore acceptable.

This approval is granted provided that the enclosed safety evaluation is permanently incorporated into you Offsite Dose Calculation Manual (ODCM) as an Appendix, and that future modifications of these commitments are reported to the NRC.

Sincerely,

Richard J. Laufer

Richard J. Laufer, Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket No. 50-305

Enclosure: Safety Evaluation

cc: See next page

NRC to WPSC LETTER DISTRIBUTION

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M W Seitz (WPL)	M L Marchi D2	C R Steinhardt D2
Larry Nielsen (ANFC)	J K Jubin (NSRAC)	CA Sternitzky KNP(Lic)
D A Bollom G6	R P Pulec KNP (3)	S F Wozniak D2
D E Day D1	C A Schrock KNP	BJ Domnick KNP (Com)

Mr. M. L. Marchi
Wisconsin Public Service Corporation   Kewaunee Nuclear Power Plant

cc:

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO ONSITE DISPOSAL OF LOW-LEVEL RADIOACTIVELY

CONTAMINATED SEWAGE TREATMENT SLUDGE

AT THE KEWAUNEE NUCLEAR POWER PLANT

WISCONSIN PUBLIC SERVICE CORPORATION
WISCONSIN POWER AND LIGHT COMPANY
MADISON GAS AND ELECTRIC COMPANY

DOCKET NO. 50-305

1.0 INTRODUCTION

By letter dated October 17, 1995, as supplemented on November 3, 1995, Wisconsin Public Service Corporation (the licensee) requested approval for the onsite disposal of contaminated sewage sludge similar to a previous disposal request that was approved by the NRC on June 17, 1992.

2.0 BACKGROUND

In a letter dated September 12, 1989, the licensee requested authorization for the alternate disposal of very-low-level radioactive material. In a Safety Evaluation (SE) dated June 17, 1992, the NRC approved the licensee's request pursuant to 10 CFR 20.302 (new 10 CFR 20.2002) for the disposal of 15,000 cubic feet of contaminated waste sludge by land application at the Kewaunee Nuclear Power Plant (KNPP) location. The SE imposed the following boundary conditions:

1. The annual disposal must be less than a total activity of 0.2 mCi.
2. The whole body dose to the hypothetical maximally exposed individual must be less than 0.1 mrem/year.
3. The disposal must be at the same site.

The licensee completed the disposal of the contaminated waste sludge discussed in the SE dated June 17, 1992. The licensee is now requesting authorization to dispose of additional contaminated waste sludge within the boundary conditions of the previously approved disposal.

3.0 EVALUATION

The licensee has proposed to dispose of approximately 6000 gallons (800 cubic feet) of sewage sludge similar to the material approved for disposal in the SE dated June 17, 1992. The principal radionuclides identified in the waste sludge and their activity based on measurements in May 1995 are: Co-58, 0.0009 mCi; Co-60, 0.0008 mCi; and Cr-51, 0.0006 mCi. The total combined activity is 0.0023 mCi. This activity is well below the boundary value of 0.2 mCi. Additionally, Cr-51 with it short half-life (27.7 day) will have undergone significant decay from its initial value of 0.0006 mCi.

The licensee has committed that the new disposal will meet all the radiological boundary conditions, on a cumulative basis, contained in the SE for the 10 CFR 20.302 application approved on June 17, 1992. Additionally, the licensee has stated that all applicable permits for this disposal have been obtained from the Wisconsin Department of Natural Resources.

4.0 CONCLUSION

The staff finds the licensee's proposal to dispose of the low-level radioactive waste sludge pursuant to 10 CFR 20.2002, on the licensee's site (see Attachment), is within the radiological boundary conditions approved in the June 17, 1992, SER and is therefore acceptable.

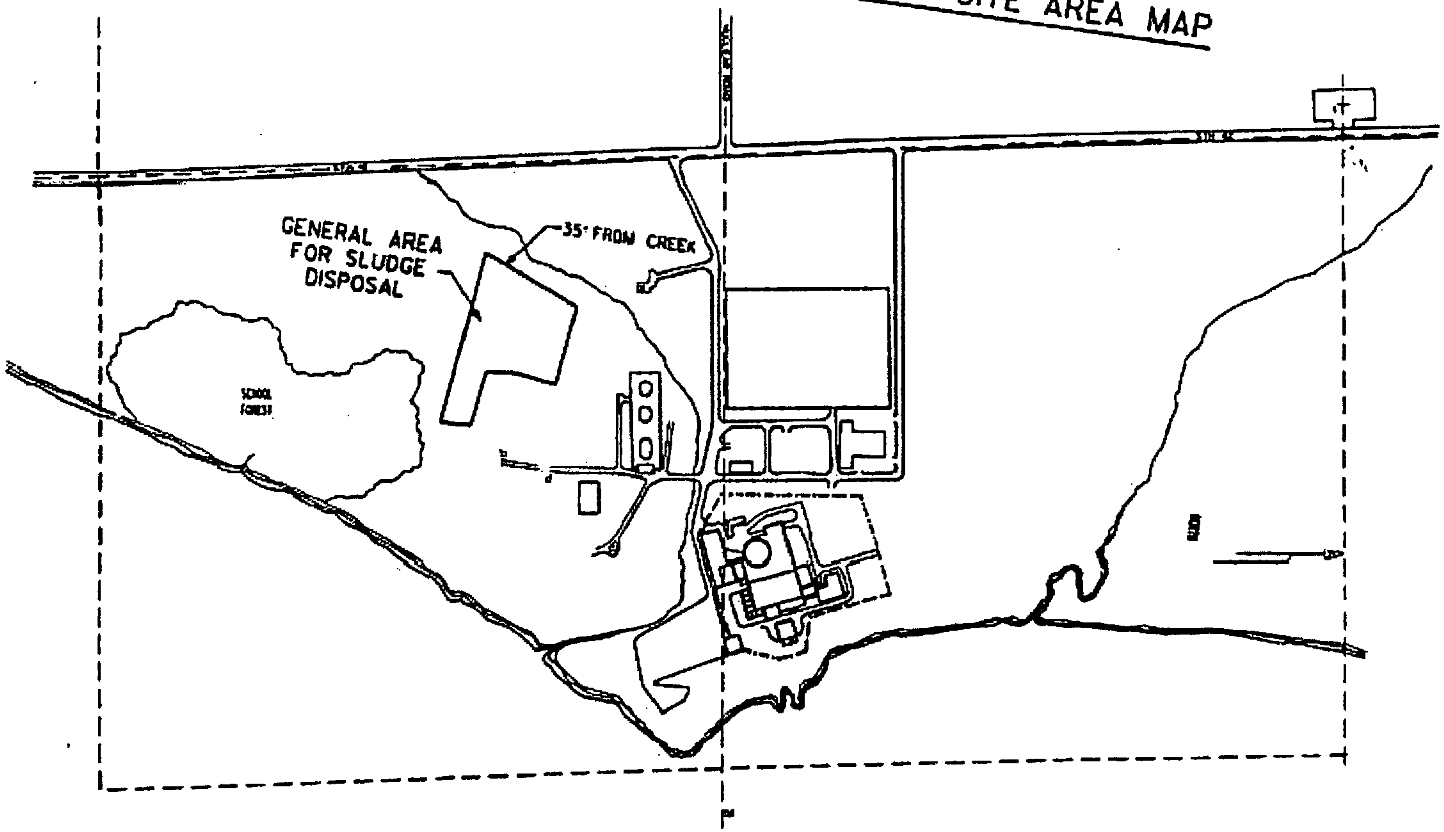
The licensee is required to permanently incorporate this modification into the Offsite Dose Calculation Manual as an Appendix, and to ensure that future modifications of these commitments are reported to the NRC.

Principal Contributor: S. Klementowicz

Date: November 13, 1995

Attachment: KNPP Site Area Map

KEWAUNEE NUCLEAR POWER PLANT SITE AREA MAP



K-97-64
Rec'd 4-14-9

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 9, 1997

Mr. M. L. Marchi
Manager - Nuclear Business Group
Wisconsin Public Service Corporation
Post Office Box 19002
Green Bay, WI 54307-9002

SUBJECT: ONSITE DISPOSAL OF CONTAMINATED SLUDGE PURSUANT TO 10 CFR 20.2002 (TAC NO. M97411)

Dear Mr. Marchi:

By letter dated December 10, 1996, you requested that the U.S. Nuclear Regulatory Commission (NRC) review the applicability of a 10 CFR 20.203 (now 20.2002) application approved on June 17, 1992, for additional disposals of a similar nature.

The staff has completed its review of your request and agrees with your determination that the 10 CFR 20.203 application for onsite disposal of sludge contaminated with licensed radioactive material, which was approved on June 17, 1992, contains bounding conditions that are applicable for additional onsite disposals of a similar nature. A copy of the Safety Evaluation is enclosed.

Sincerely,

Richard J. Laufer

Richard J. Laufer, Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket No. 50-305

Enclosure: Safety Evaluation

cc: See next page

NRC to WPSC LETTER DISTRIBUTION

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M W Seitz (WPL)
H D Curet (SPC)
D A Bollom G6
D E Day D1

K H Evers KNP
M L Marchi D2
JBennett KNP (NSRAC)
R P Pulec KNP (3)
C A Schrock KNP

C S Smoker KNP
C R Steinhardt D2
G A Swanson KNP(Lic)
S F Wozniak D2
BJDomnick/PRRoschesko KNP (Com/USAR)

Mr. M. L. Marchi
Wisconsin Public Service Corporation

Kewaunee Nuclear Power Plant

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Regional Administrator - Region III
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801 Warrenville Road
Lisle, Illinois 60532-4531

Mr. Robert S. Cullen
Chief Engineer
Wisconsin Public Service Commission
610 N. Whitney Way
Madison, Wisconsin 53705-2829

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO ONSITE DISPOSAL OF CONTAMINATED SLUDGE

AT THE KEWAUNEE NUCLEAR POWER PLANT

WISCONSIN PUBLIC SERVICE CORPORATION
WISCONSIN POWER AND LIGHT COMPANY
MADISON GAS AND ELECTRIC COMPANY

DOCKET NO. 50-305

1.0 INTRODUCTION

By letter dated December 10, 1996, Wisconsin Public Service Corporation (the licensee) requested that the U.S. Nuclear Regulatory Commission (NRC) review its determination that NRC approval, pursuant to 10 CFR 20.2002, for the onsite disposal of contaminated sludge at the Kewaunee Nuclear Power Plant (KNPP) is not required, provided such disposals are conducted within the limits and bounding conditions approved by the NRC in its June 17, 1992, Safety Evaluation (SE).

2.0 BACKGROUND

In a letter dated September 12, 1989, the licensee requested authorization for the alternate disposal of sludge contaminated with licensed radioactive material. In an SE dated June 17, 1992, the NRC approved the licensee's request pursuant to 10 CFR 20.302 (new 10 CFR 20.2002) for the disposal of 15,000 cubic feet of contaminated waste sludge by land application at the KNPP location. The SE imposed boundary conditions as follows:

1. The annual disposal must be less than a total activity of 0.2 mCi;
2. The whole body dose to the hypothetical maximally exposed individual must be less than 0.1 mrem/year; and
3. The disposal must be at the same site.

The SE also stated that for any repetitive disposals, the licensee must reapply to the NRC when a particular disposal would exceed the boundary conditions.

3.0 EVALUATION

The licensee has determined that NRC approval for future onsite disposals of sludge contaminated with licensed radioactive material is not required provided the disposals comply with the limits and conditions of the SE issued on June 17, 1992. The licensee has also developed a sludge sampling and analysis procedure that implements the guidance contained in NRC Information

Notice 88-22. Specifically, the licensee's procedure will require the analysis of sludge samples using a detection system design and operating characteristics that yield a lower limit of detection for Co-58, Co-60, Cs-134, and Cs-137 consistent with measurements of environmental samples. The licensee has provided a site map (attached) that specifies the acceptable onsite disposal areas for the contaminated sludge.

4.0 CONCLUSION

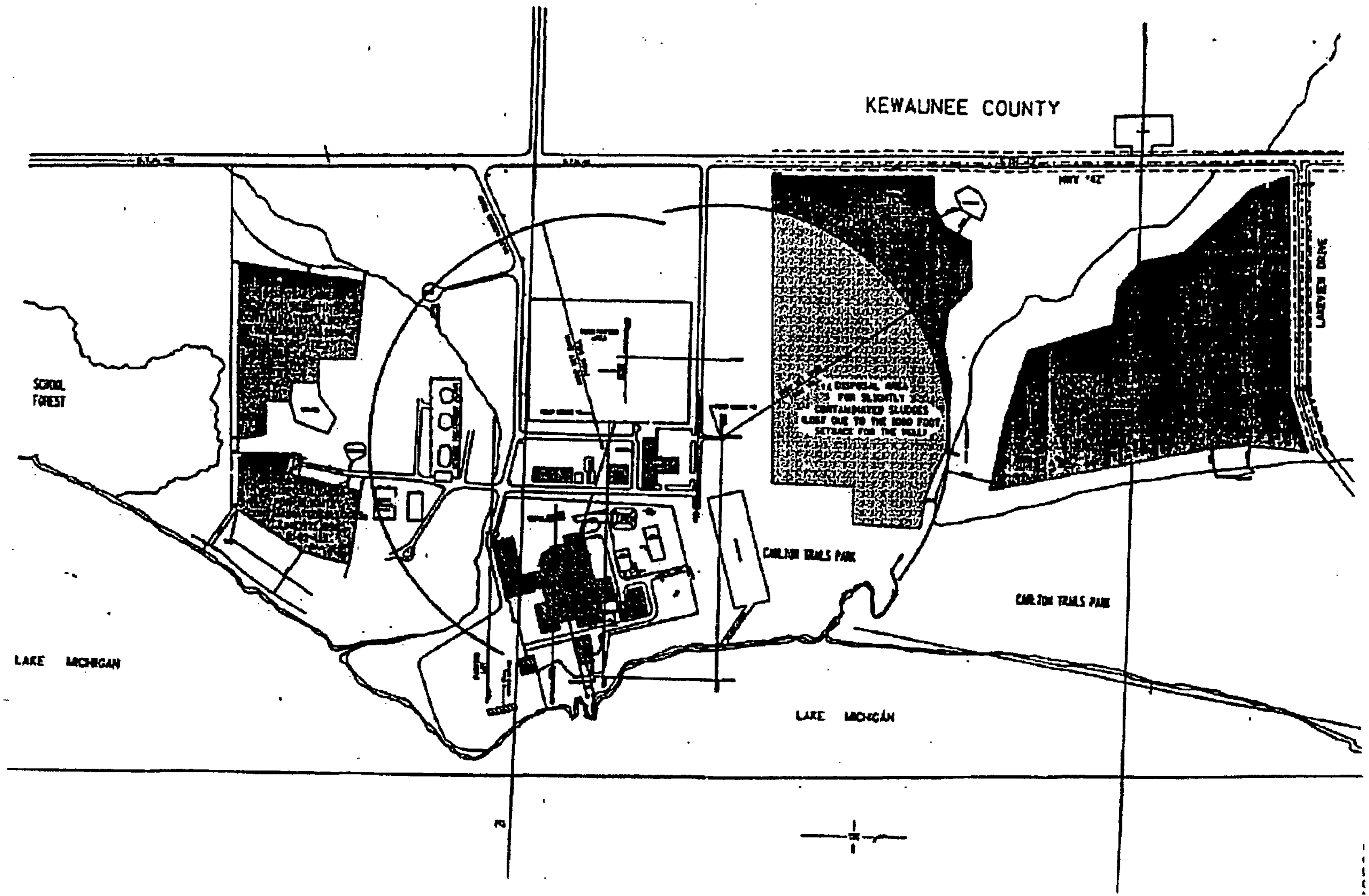
The staff agrees with the licensee's determination that additional onsite disposals of contaminated sludge, which are conducted within the bounding limits and conditions contained in the June 17, 1992, SE and within the areas specified in the attached site map, do not require specific NRC approval.

The licensee should permanently incorporate this Safety Evaluation into the Offsite Dose Calculation Manual as an Appendix.

Principal Contributor: S. Klementowicz

Date: April 9, 1997

Attachment: KNPP Site Map


KEWAUNEE COUNTY
SCHOOL FOREST
LAKE MICHIGAN
CARLTON TRAILS PARK
CARLTON TRAILS PARK
LAKE MICHIGAN

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Appendix C

Kewaunee Power Station

Documentation for Major Changes to Radioactive Waste Treatment Systems in 2014

System abandonment evaluations per procedure OP-KW-DEC-SYC-001, System Evaluation and Categorization Attachment B - SSC Category Determination Document

And

DC-000-KW-14-02008, Disable R-13/R-14 Trip of Aux Bldg Exhaust Fans

And

FSRC Review and Approval Documentation

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1.0 NOTIFICATION

SSC: SYS-17-DSERT, Auxiliary Building Ventilation System

A change in SSC categorization has been made from Available to Partially Abandoned

2.0 DISTRIBUTION

The following documents will be distributed for this SSC category determination:

- ☒ OP-KW-DEC-SYC-001, System Evaluation and Categorization (Attachment B, SSC Category Determination Document)
- ☐ 10 CFR 50.59 Safety Screening and Evaluation, if required
- ☒ Miscellaneous Station Drawing Update Request

3.0 RECOMMENDATIONS

- **REVIEW** the justification and basis provided in OP-KW-DEC-SYC-001 (Attachment B, SSC Category Determination Document) for the change in SSC categorization.
- **REVIEW** your department procedures, processes, and programs for potential changes and **MAKE** the appropriate modifications.

> **NOTE:** The notification to responsible departments is intended to be a list of processes and programs that may need modification and is NOT intended to be all encompassing.

Notification to Responsible Departments						
E-Plan	**Fire Protection**	**Operations**	**Engineering**	**Licensing**	**Maintenance**	**RP**
Abandoned Instrumentation	Hazards removed NEIL Updates	Procedures and Programs	Procedures and Programs	Procedures and Programs	Procedures and Programs	Modified Waste Processing Systems
		Corrective Action	Corrective Action	Corrective Action	Corrective Action	
		Work Orders	Work Orders	SAR Updated	Work Orders	
		Safety Tags	Safety Tags	Regulatory Relief of Commitments	Surveillance Tracking	
		OMs	PMMS Coding	Review of 10 CFR 50.59		
		Technical Specifications	Controlled Documents	Surveillance Tracking		
		Operability Determination	Surveillance Tracking			
		Subsystem and Support Systems Modified	WI Registered Pressure Vessel List			

Dominion

DSERT SSC Release to Decommissioning Director

TO: Decommissioning Director

FROM: Decommission System Evaluation Re-categorization Team (DSERT)

RE: SSC Release from DSERT

System Name: Auxiliary Building Ventilation Revision: 0

System Number: SYS-17-DSERT

FSRC Meeting: NA Date: 7/24/2014

This SSC has been Abandoned and is ready for release to the Decommissioning Director. The following list represents the status of associated OPEN ITEMS.

1. OP-KW-DEC-SYC-001, SSC Evaluation Open Items: a. USAR requires update
   b. Charcoal has been removed and FP isolated to units. Fire Plan requires revision

2. OP-KW-DEC-CM-001, Walkdown Open Items: None

3. OP-KW-DEC-CM-002, Abandoned Plan Open Items: None

The release of this SSC is done under the following conditions:

1. DSERT will continue to coordinate activities to resolve the above Open Items to closure.
2. DSERT will continue to maintain control of abandoned system boundaries until the plant reaches the Cold and Dark condition.

William Swanson [signature] 7/31/2014

DSERT Coordinator (Print/Sign) Date

WF Zipp [signature] 10/9/14

Decommissioning Director (Print/Sign) Date

ATTACHMENT B
System Transition Documentation
(Page 1 of 2)

1.0 SYSTEM RELEASE TO DSERT COORDINATOR

SYSTEM NAME: Auxiliary Building Ventilation

SYSTEM NUMBER: SYS-17-DSERT

SSC: Partial Abandonment

System catagorization as ABANDONED using OP-KW-DEC-SYC-001	William Swanson [signature] 3/10/14 DSERT Coordinator Print/Sign/Date
Authorization for release of the Abandoned SSC	BJ McMahon [signature] 3-10-14 Operations Manager Print/Sign/Date
Assumptions and Open Items listed on OP-KW-DEC-SYC-001 for the appropriate SSC have been reviewed. Resolution is being coordinated with the responsible groups.	William Swanson [signature] 3/10/14 DSERT Coordinator Print/Sign/Date

2.0 SYSTEM ASSESSMENT

• SSC has been flushed (if required) and drained. • Abandoned SSC boundaries have been tagged using OP-AA-200 or equivalent.	[signature] 5-29-14 Shift Manager Print/Sign/Date
Final system walkdown, using ATTACHMENT C, has been performed. Findings have been resolved or are attached for reconciliation by DSERT Coordinator.	[signature] 5-29-14 Shift Manager Print/Sign/Date
Maintenance has been notified of the Work Orders within the SSC boundary associated with Safety Tagging orders that may be dispositioned.	[signature] 5-31-14 Shift Manager Print/Sign/Date
Safety Tags within the SSC boundary have been cleared.	[signature] 5-29-14 Shift Manager Print/Sign/Date
Final system alignments been performed. Incorporate the final alignment in this package.	[signature] 5-29-14 Shift Manager Print/Sign/Date

ATTACHMENT B
System Transition Documentation
(Page 2 of 2)

3.0 SYSTEM TRANSITION TO DECOMMISSIONED STATUS

ENSURE Tagging Clearance is appropriate.	William Swanson Will S. 7/9/14 DSERT Coordinator Print/Sign/Date
Controlled Prints are updated and ready for distribution.	William Swanson Will S. 7/9/14 DSERT Coordinator Print/Sign/Date
Original SSC Categorization documents of OP-KW-DEC-SYC-001 and OP-KW-DEC-CM-001 are incorporated in the package.	William Swanson Will S. 7/9/14 DSERT Coordinator Print/Sign/Date
Final SSC walkdown reviewed with Operations including justification for accepting open items.	WG Swanson Will S. 7/17/14 Rick Single [illegible] 7.7.14 DSERT Coordinator Print/Sign/Date
Concurrence to transition the SSC to Decommissioned Status.	BJ McMclam [illegible] 7-17-14 Operations Manager Print/Sign/Date

ATTACHMENT A
SSC Abandonment Plan
(Page 1 of 2)

PHASE I: PLAN DEVELOPMENT

SYSTEM NAME: Auxiliary Building Ventilation FSRC APPROVAL DATE: 2/19/14
SYSTEM NUMBER: SYS - 17 - DSERT
SSC STATUS (Category A or X): AX FSRC MEETING NUMBER: 14-004

The attached Abandonment Plan outlines the process that will be used to place the SSC in the lowest energy state and remove internal hazards in preparation for transfer of the SSC from DSERT to the Decommissioning Director. The forms indicated below comprise the Abandonment Plan for the SSC indicated above.

- [x] SSC Abandonment Plan Phase II: Plan Implementation Form, OP-KW-DEC-CM-002, ATTACHMENT A
- [ ] Boundary Clearance Number for the SSC
- [x] Drain Plan, OP-KW-DEC-CM-002, ATTACHMENT B
- [ ] Drain Permit
- [ ] Abandoned SSC Valve Alignment, OP-KW-DEC-CM-002, ATTACHMENT C
- [ ] Drilled Vent and Drain Hole Locations, OP-KW-DEC-CM-002, ATTACHMENT D
- [x] Hazard Removal Plan, OP-KW-DEC-CM-002, ATTACHMENT E
- [x] Other Activities Plan, OP-KW-DEC-CM-002, ATTACHMENT F
- [ ] SER/Annunciator Disabled, OP-KW-DEC-CM-002, ATTACHMENT G
- [x] Recommended "Abandoned" Label Location, OP-KW-DEC-CM-002, ATTACHMENT H
- [x] Recommended Work Order Closure List, OP-KW-DEC-CM-002, ATTACHMENT I
- [x] Recommended Clearance Closure List, OP-KW-DEC-CM-002, ATTACHMENT J
- [ ] Job Hazard Analysis for the Abandonment Plan
- [ ] Computer Points Disabled, OP-KW-DEC-CM-002, ATTACHMENT K
- [ ] Foxboro/NUS Module Power Supply Removal, OP-KW-DEC-CM-002, ATTACHMENT L

PREPARED BY: William Swanson [signature] DATE: 3/4/14
Print/Sign

REVIEWED BY: GARY AHRENS [signature] DATE: 3/5/14
Print/Sign

APPROVED BY: Rick Smylie [signature] DATE: 3/5/14
Print/Sign

ATTACHMENT A
SSC Abandonment Plan
(Page 2 of 2)

PHASE II: PLAN IMPLEMENTATION

PLAN IMPLEMENTATION STATUS	NAME (Print/Sign)	DATE
1. Abandonment Plan approved:	[illegible] Ahrens	3/11/14
2. Pre-job Brief conducted: (ALARA, Job Hazards Analysis, Applicable Permits, Personnel Access, Other Information, Other work in progress)	[illegible] Ahrens	3/11/14
3. Clearance implemented:	N/A	
4. Drain Plan completed: (Abandoned SSC valves aligned per ATTACHMENT C, Drain Permit, Vent and Drain valves aligned per the Clearance, Drilled Vent and Drain Holes as required on ATTACHMENT D, other drain actions completed)	[illegible] Ahrens	5/14/14
5. Hazard Removal Plan completed: (Hazards removed per applicable permits, and inappropriate storage locations/containers as identified on ATTACHMENT E, arrangements made for final offsite disposal through appropriate responsibility, other hazard removal actions completed)	[illegible] Ahrens	5/14/14
6. Other Activities Plan completed:	[illegible] Ahrens	5/14/14
7. Walk-down completed:	[illegible] / Goldsmith	5/21/14
8. SER Points disabled:	N/A	
9. Abandoned labels installed:	[illegible] Ahrens	5/19/14
10. Open Items recorded:	[illegible]	5-29-14
11. Health Physics notified:	[illegible]	3-31-14
12. Work Orders closed:	[illegible] / Daniel [illegible]	3/19/14
13. Clearances have been consolidated or closed:	[illegible] / Daniel [illegible]	4/10/14
14. Computer Points disabled:	N/A	
15. Foxboro/NUS module power removed:	N/A	
Abandonment Plan Complete:	[illegible]	5-29-14

INFORMATION USE

1.0 Doc Type: Report Revision No.: 0 Date: 12/2/2013
Sub Type: DEC
Document Number (ID): SYS-17-DSERT
Title: ABV-Auxiliary Building Ventilation System

1.1 Brief description or reason for revision: Partial abandonment to reduce redundancy of FCUs and fans in Aux Bldg, and remove charcoal from SFP Exhaust Fans. See Section 2 for additional details.

2.0 System Category (Check Appropriate):

NOTE:	*A SSC may be divided and have more than one category determination depending upon its functional requirements.*

☒ Available (Category A) ☒ Abandoned (Category X)

Describe the assessed boundaries: This is a partial abandonment of System 17, Auxiliary Building Ventilation (ABV) including fans, fan coil units, associated ductwork, dampers, and instrumentation.

The following equipment shall remain available:

1B Aux Building Supply Fan
1A Aux Building Exhaust Fan
1B Aux Building Exhaust Fan
1A SFP Exhaust Fan
1B SFP Exhaust Fan
SFP Supply Fan
Electric Shop Exhaust/Supply Fan Motor
1D Aux Basement FCU
1B Aux Mezz FCU
1A Fan Floor FCU
Heating Boiler Roof Vent Fan
Aux Building Recirc Fan
Toilet and Locker Room Exhaust Fan
132-476 Welding Fume Exhaust Fan
All Fire Dampers,
Along with the associated dampers ductwork and controls

The following equipment shall be abandoned:

1A Aux Building Supply Fan
1A Aux Building Basement FCU
1B Aux Building Basement FCU

1C Aux Building Basement FCU
1A Aux Building Mezz FCU
1B Aux Building Fan Floor FCU
1A CRDM Room FCU
1B CRDM Room FCU
Charging Pump Room FCU
CCW Pump Room FCU
1A RHR Pit FCU
1B RHR Pit FCU
HRSR Exhaust Fan
HRSR Sampling Room Air Handling Unit
HRSR Condensing unit
Decon Room Exhaust Fan
Decon Room Ceiling Fan
132-477 Weld Shop Room exhaust fan

The following Instrumentation shall be abandoned:

FE27175, FI18363, DPI11688, DPS16445, DPI11686, DPI11687, FI18361, FE27173, FI18360, FE27172, FE27176, FI18364, FE27174, FI18362, 16574, 16392, 16353, 16354, 16391, HD26341, HD26351, TE14172, TE14173, TE14152, TE14153, TE14148, TE14149, TE14150, TE14151, TE14178, TE14179, TE14180, TE14181, PI 17046, TE14158, TE14159, TE14182, TE14183, POS37053, POS37054, PS16147, TC20200, T22040, PS16147, TS16243, TS16244, PI11263,

Motor Operated Dampers – MD32000, MD32330, MD32331, MD32332, MD32333,

Solenoid Valves – SW851/33781, SW1261/33778, 33280, 33360, 33365, 33707, & 33713.

The following shall be used as boundary isolations:

RHR FCU 1A, SW1200A and SW1212A
RHR FCU 1B, SW1200B and SW1212B
Aux Basement FCU1A, SW800A and SW-804
Aux Basement FCU1B, SW800B and SW804
Charging Pump FCU, SW-850 and SW852
Aux Mezz 1A FCU, SW1219A and SW1222B
Component Cooling Pump 1B FCU, SW1260 and SW1262
CRDM Room 1A FCU, SW1070A and SW1072A
CRDM Room 1B FCU, SW1070B and SW1072B
Aux Fan Floor FCU 1B, SW1016B and SW1017B

Aux Basement FCU 1C, SW1006C and SW-1007C
SW1020A to SFP Exhaust 1A Charcoal filter spray nozzle, After charcoal removed
SW1010A to SFP Exhaust 1B Charcoal filter spray nozzle, After charcoal removed
Heating Steam Valves: HS363A, HS6361A, HS360A, HS6361A, HS5360A1, HS5360A2, HS364A, HS5364A, HS373A, HS6371A, HS370A, HS6371A, HS5370A1, HS5370A2, & HS374A to HS5374A.

3.0 Mark up the affected drawings using color coding to identify system category type and boundaries. These drawings are to include system, electrical one-line and distribution, and select building and isometric drawings. Related system drawings <u>NOT</u> incorporated in the system category require an explanation. **REFER** to Step 2.7 for a list of drawings.

OPERM-601 Flow Diagram Turbine & Aux Building Ventilation

Abandon:

1A Aux Building Supply Fan
1A Aux Building Basement FCU
1C Aux Building Basement FCU
1D Aux Building Basement FCU
1A Aux Building Mezz FCU
1B Aux Building Fan Floor FCU
1A CRDM Room FCU
1B CRDM Room FCU
Charging Pump Room FCU
CCW Pump Room FCU
1A RHR Pit FCU
1B RHR Pit FCU
HRSR Exhaust Fan
HRSR Sampling Room Air Handling Unit
HRSR Condensing unit
Decon Room Exhaust Fan
132-477 Weld Shop Room exhaust fan

Maintain:

1B Aux Building Supply Fan
1A Aux Building Exhaust Fan
1B Aux Building Exhaust Fan
1A SFP Exhaust Fan
1B SFP Exhaust Fan
SFP Supply Fan

Electric Shop Exhaust/Supply Fan Motor
1B Aux Basement FCU
1B Aux Mezz FCU
1A Fan Floor FCU
Heating Boiler Roof Vent Fan
Aux Building Recirc Fan
132-476 Welding Fume Exhaust Fan
Fire Dampers: ABV-FD1, ABV-FD2, ABV-FD3, ABV-FD4, ABV-FD5, ABV-FD6, ABV-FD7, ABV-FD8, ABV-FD9, ABV-FD10, ABV-FD11, ABV-FD-12, ABV-FD13, ABV-FD14, ABV-FD15, ABV-FD16, ABV-FD17, & ABV-FD18.

OPERM-604

Available:
Toilet and Locker Room Exhaust Fan

OPERM-606 Flow Diagram Air Conditioning and Cooling Water Flow Diagram

Abandon:
RHR FCU 1A From SW1200A to SW1212A
RHR FCU 1B From SW1200B to SW1212B
HRSR Refrigeration including piping/tubing, compressors, receivers, valves and fans
Aux Basement FCU1A from SW800A to SW-804
Aux Basement FCU1B from SW800B to SW804
Charging Pump FCU from SW-850 to SW852
Aux Mezz 1A FCU from SW1219A to SW1222B
Component Cooling Pump 1B FCU from SW1260 to SW1262
CRDM Room 1A FCU from SW1070A to SW1072A
CRDM Room 1B FCU from SW1070B to SW1072B
From SW1020A to SFP Exhaust 1A Charcoal filter spray nozzle, After charcoal removed
From SW1010A to SFP Exhaust 1B Charcoal filter spray nozzle, After charcoal removed

Available:
Aux Mezz 1B FCU from SW1219B to SW1222A

OPERM-588 Flow Diagram Air Cond. Cooling Water Piping

Abandon:
Aux Basement FCU 1C From SW1006C to SW-1007C
Aux Fan Floor FCU 1B SW1016B to SW1017B

Maintain:
Aux Basement 1D FCU from SW1006D to SW1007D
Aux Fan Floor 1A FCU from SW1016A to SW1017A

OPERM-605-1 Flow Diagram Heating System

Abandon:

HS363A to HS6361A
HS360A to HS6361A, HS5360A1, HS5360A2
HS364A to HS5364A
HS373A to HS6371A
HS370A to HS6371A, HS5370A1, HS5370A2
HS374A to HS5374A

Available:

HS363B to HS6361B
HS360B to HS6361B, HS5360B1, HS5360B2
HS364B to HS5364B
HS373B to HS6371B
HS370B to HS6371B, HS5370B1, HS5370B2
HS374B to HS5374B

E-254 Circuit Diagram 480V 1-35A, 1-35D, 1-45A, 1-45D

Abandon:

MCC35D-B8 to 1-192 Decon Room Exhaust Fan Motor

Available:

MCC35D-A3 to 1-453 SFP Supply Fan Motor

E-256 Circuit Diagram 480 Volt MCC 1-32D, 1-35C, 1-35F, 1-42D, 1-45C & 1-45F

Available:

MCC32D-B4 to 1-303 Aux Recirc Fan Motor

E-257 Circuit Diagram 480 Volt MCC 1-35E & 1-45E

Abandon from electrical breaker out:

MCC35E-D1 to 1-310 Aux Supply Fan 1A Motor

Available:

MCC35E-D4 to 1-272 Aux Exhaust Fan 1A Motor
MCC35E-E2 to 1-339 SFP Exhaust Fan 1A Motor
MCC45E-D1 to 1-273 Aux Exhaust Fan 1B Motor
MCC45E-A6 to 1-311 Aux Supply Fan 1B Motor
MCC45E-E2 to 1-340 SFP Exhaust Fan 1B Motor

E-258 Circuit Diagram 480 Volt MCC 1-62A, 1-52F, 1-52B

Abandon from electrical breaker out:

MCC52F-D5 to 1-601 CRDM Room 1A FCU Motor

Available:

MCC52F-D6 to 1-1082 Aux Fan Floor 1A FCU

E-259 Circuit Diagram 480V MCC1-62D & 62E

Abandon:
MCC62E-H2 to 1-299 RHR Pit FCU 1B Motor
MCC62E-H3 to 1-183 Aux Basement FCU 1B Motor

Available:
MCC62E-J7 to 1-136 Aux Mezz FCU 1B Motor
MCC62E-G4 to 1-1085 Aux Basement FCU 1D Motor

E-260 Circuit Diagram 480V 1-52C, 1-52E, & 1-62C

Abandon:
MCC52E-A4 to 1-298 RHR Pit FCU 1A Motor
MCC52E-A5 to 1-131 Aux Mezz FCU 1A Motor
MCC52E-J1 to 1-1084 Aux Basement FCU 1C Motor
MCC52E-A2 to 1-164 Aux Basement FCU 1A Motor
MCC52E-J6 to Charging Pump FCU Motor

E-889 Lighting Panels RPB1, RPB2, RPB3, RPB4, RPB5, RPB6

Abandon:
RPB6 CKT 17 to 1-325 Decon Rm ceiling fan motor & 1-456 Monitor Rm Ceiling Fan Motor
RPB6 CKT 19 to 1-523 HP lab ceiling fan motor

E-896 Lighting panel

Available:
RPA24 CKT 8 To Electric Shop Supply Fan Motor

E-2350 Schematic Diagram Fuse Panel RR172

Abandon:
Fuse FUG2 to SV33280 and indicating lights 44523-01,02 44524-01,02

Available:
Fuse FUG3 to SV 33281

E-2524 Wiring Diagram Distribution Panel 1-35G and Misc Circuits

Abandon:
LPB-20 CKT 2 to weld shop roof exhaust Fan

Available:
LPB-20 CKT 3 to weld shop weld extractor exhaust fan

E-2886 Circuit Diagram 480 Volt MCC 1-46A & 1-46D

Abandon from electrical breaker out:
MCC46D-1EF to 1-898 HRSR Exhaust Fan Motor
MCC46D-1CD to 1-896 HRSR Air Handling Unit Motor
MCC46D-2AB to 1-899 HRSR Condensing unit

E-2990 Circuit Diagram 480V MCC 1-52B, 1-52F, 1-62B Ext, and I-62H

Abandon:

MCC62H-3GH to 1-979 CCW Pump Room 1B FCU Motor

E-3072 Circuit Diagram 480V MCC 1-46C

Available until Heating boiler is abandoned:

MCC46C-B4 to 1-206 Heating Boiler Roof Vent Motor and ABV100 Roof vent damper

E-3075 Circuit Diagram 480V MCC 1-62J

Abandon:

MCC62J-2GI to 1-1083 Aux Fan Floor FCU 1B Motor
MCC62J-4EF to 1-602 CRDM Room FCU 1B Motor

OPERM-213-5 Flow Diagram Station and Instrument Air System

Available:

IA34024 to CD34024/ASV31B
IA34023 to CD34023/ASV31A

OPERM-213-6 Flow Diagram Station and Instrument Air System

Abandon:

IA31311 to CV31311/HS-371A
IA31312 to CV31312/HS-361A

Available:

IA1451 to Aux Building Supply Vent Control Cabinet
IA1452 to CV31313 and CV31314

4.0 Evaluation (Basis for choosing category type):

Purpose/Function

The ABV System shall provide emergency cooling to areas containing equipment required for safe shutdown and accident mitigation of limiting events. The ABV System shall provide sufficient cooling to maintain the following areas below the EQ limit for equipment reliability:

Auxiliary Building Basement, Auxiliary Building Mezzanine, Auxiliary Building Fan Floor, RHR Pump Pits, and CRDM Equipment Room.

The air distribution ducts of ABV are provided with safety-related zone isolation dampers at all Zone SV barrier penetrations.

The ABV System shall provide support for Appendix R safe shutdown so that a single fire in any part of the plant cannot render both trains of ABV inoperable.

The ABV shall support the station Fire Plan in maintaining the fire ratings of walls, floors or ceilings by being fitted with fire dampers at all fire barrier penetrations.

The Spent Fuel Pool Sweep Ventilation Sub-System (SFP) shall support all fuel handling operations and movements of heavy loads over the SFP when it contains irradiated fuel of less than 30 days old.

The ABV System shall provide ventilation for the High Radiation Sample Room to maintain comfortable conditions and to protect personnel from the effects of airborne contaminants.

The ABV System shall maintain a negative pressure in the Auxiliary Building, with respect to atmosphere, and direct the air flow from areas of low contamination through areas of progressively higher contamination.

The ABV System shall provide a supply of outdoor ventilation air and cold weather heating to the Auxiliary Building to maintain space temperatures within acceptable limits for the operation of critical equipment.

During normal operations, the ABV System shall provide a ventilation flow path across the SFP to exhaust vapors evaporating from its surface.

The ABV System shall provide an exhaust air flow path from the CRDM Equipment Room.

The ABV System shall provide a means of ventilation of the Heating Boiler Room.

Basis for Category

On February 25, 2013, DEK submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2).

The basis for the abandoned category for the Auxiliary Building Ventilation System is determined by the following criteria:

The ABV System is not required for the following except as indicated:

1. To prevent or mitigate the consequences of a design basis accident of a permanently defueled plant.

   The ABV system is relied upon to mitigate the consequences of a beyond design basis accident of a loss of all water in the Spent Fuel Pool (SFP). One Auxiliary Building Exhaust Fan and one Spent Fuel Pool Exhaust Fan are credited with providing cooling to the area by the SFP to prevent fuel ignition.
2. To prevent or mitigate the consequences of a Fuel Handling Accident or Gas Decay Tank rupture.
3. For safe storage and handling of radioactive waste or spent fuel. This is not a complete abandonment. ABV is not required for safe storage and handling of spent fuel except as noted in #1 above.
4. To meet Requirements of Technical Specifications, Technical Requirements Manual, License Requirements, Design Basis, permits, regulatory requirements, insurance requirements, other commitments, safe storage of spent fuel, or support of the Radiological Effluent Monitoring/Offsite Dose Calculation Manual for KPS. This is not a complete abandonment. The system functions that are needed to support the Radiological Effluent Monitoring/Offsite Dose Calculation Manual will not change.
5. To support the execution of plans and programs of Kewaunee Power Station.
6. Support day to day operations in the decommissioning plant.

   This is not a complete abandonment. The system functions that are needed to support day to day operations will be maintained as delineated herein.
7. Support plant decommissioning efforts.

Regulatory Impact

Technical Specifications

There are no Technical Specifications associated with Auxiliary Building Ventilation System.

Technical Requirements manual (TRM)

TRM 8.9.6 Spent Fuel Pool Sweep System, has been deleted from the TRM

USAR

2.7.5 Outside Air Temperature
The climatic design conditions for the site are listed below. Nuclear plant building structures have a high degree of thermal inertia; therefore excursions in temperature above or below the design basis values have a minimal and short-term effect on the operation of HVAC ventilation equipment to perform their intended design functions. The overall effect of this variance on the operation of HVAC Ventilating Equipment to perform their intended design functions and impact the initial conditions assumed in the Environmental Service Conditions of the plant's areas are negligible. Indoor Normal and Accident Design Basis Environmental Service Conditions (ESC) at the Kewaunee Power Station for all areas are tabulated in tables contained in Appendix I of the Kewaunee Environmental Qualification Plan.

Winter Outdoor Design Criteria (Dry Bulb Temp °F) = -15.0°F
Summer Outdoor Design Criteria (Dry Bulb Temp °F) = 95.0°F

The climatic design criteria varies slightly compared to the derived design criteria set forth in the 2005 ASHRAE Handbook - Fundamentals Chapter 28 for climatic design conditions at Green Bay, WI, USA.

The ASHRAE climatic design conditions are as determined at the 99.0% annual cumulative frequency of occurrence for the mean coincident monthly value. For comparison, these ASHRAE design basis temperatures for the Green Bay, WI area are stated below:

Winter ASHRAE Design Criteria (Dry Bulb Temp °F) = -6.0°F
Summer ASHRAE Design Criteria (Dry Bulb Temp °F) = 85.1°F

USAR 7.2.3.4 Protection System Reliability

One control rod drive equipment room safeguards fan coil unit can recirculate 4,000 CFM of room air to provide either additional cooling during normal operation or provide required cooling when the normal ventilation system is isolated.

USAR 8.2.3 Emergency Power

8.2.4.7 Effects of Loss of Ventilation
Steady state heat-up analyses were performed using NUMARC 87-00 guidelines to determine the effects of loss of ventilation in the control room, relay room, charging pump room,

turbine driven auxiliary feedwater pump room, containment and steam generator power operated relief valve areas. A steady state heatup analysis using Gothic was performed to determine the effects of loss of ventilation in the battery rooms. The calculated steady state temperatures for these rooms are below the temperature limits described in NUMARC 87-00, Section 2.7, as described in Table 8.2-2.

9.6.3 Auxiliary Building Ventilation Systems

9.6.3.1 Design Basis
The Auxiliary Building Ventilation System is designed to provide maximum safety and convenience for operating personnel, with equipment arranged so that potentially contaminated areas are separated from clean areas. The Auxiliary Building Ventilation System is designed to maintain a minimum inside air temperature of 60°F under nominal winter design outside air temperature conditions, and a maximum inside air temperature not to exceed 10°F above the nominal summer design outside air temperature.

To ensure that the auxiliary building remains at a slight negative pressure with respect to the turbine building and the ambient atmosphere, the total air exhaust flow always exceeds the supply air flow (by typically a minimum of 10 percent during normal operations). This is accomplished by running an equal number of SFP exhaust fans and ABV exhaust fans to match the number of operating ABV supply fans to maintain the negative pressure.

The particulate filters used are high-efficiency particulate (HEPA) filters. They are designed to have 99.97 percent dioctyl phthalate (DOP) removal efficiency on a 0.3-micron aerosol particle when the system is operated at rated air flow (+) or (-) 10%. The performance requirements for the charcoal filters are found in Technical Specifications.

9.6.3.2 System Descriptions
The Auxiliary Building has separate normal ventilation systems to serve the auxiliary equipment areas, the Spent Fuel Pool area, the non-radioactive area, and the Control Room area, as shown in Figure 9.6-5. The path of ventilating air is from clean or low activity area toward areas of progressively higher activity.

Air is exhausted through high efficiency particulate (HEPA) filters that are located in the Auxiliary Building Exhaust Fan and the Spent Fuel Pool Exhaust Fan trains. After flowing through the HEPA filters, the air is discharged out the Auxiliary Building Vent stack to the atmosphere.

The Spent Fuel Pool area is ventilated by a supply fan that draws air from the Auxiliary Building operating floor area. The supply fan blows air across the pool surface towards exhaust grills where the air is then ducted to the Spent Fuel Pool exhaust fans. In normal operation, exhaust air from the system passes through HEPA filters before being discharged to atmosphere through the monitored Auxiliary Building Vent. Charcoal filters are provided,

which are bypassed during normal operation. During spent fuel handling activities, the charcoal filters are in service. A deluge system is installed in the charcoal filter assembly. The water spray is provided from the Service Water System. Administrative procedures assure that the bypass is closed during fuel handling operations. Also, the monitor in the Auxiliary Building vent will close bypass dampers if they are open, in event of high radiation.
To maintain post-accident design basis local environment below 120-degrees F as specified in the EQ Plan, the Auxiliary Building Ventilation system includes fan coil units in the following locations: Auxiliary Building Basement, Auxiliary Building Mezzanine, Auxiliary Building Fan Floor, and the CRDM Equipment Room. These units are provided in redundant train pairs. Each train is capable of handling the entire heat load in its respective area in the event of a failure of the other train. The RHR Pump Pit area, however, is not provided with a redundant pair of FCUs but rather a single dedicated FCU for each RHR pump. All of these units receive cooling water from the Class I Service Water System.

The Auxiliary Building Ventilation System fan coil units start on a Safety Injection, Steam Exclusion Zone Area Isolation, or Auxiliary Building Vent High Radiation signal. These fan coil units can also be operated at the operator discretion when additional cooling is desired.

Some non-Safeguard Auxiliary Building Ventilation System fan coil units are also provided in the Auxiliary Building. They are used to satisfy Appendix "R" safe shutdown support requirements in conjunction with some of the Class I fan coil units.

10A.3.1 Steam Exclusion Zones
Design features of the Steam Exclusion system include, where necessary, ventilation ducts protected against steam intrusion with two active and separately powered isolation dampers, or passive protection by means of duct designed or reinforced to resist the calculated pressures.

11.1.2.3 Gas Processing
Gas held in the decay tanks can either be returned to the CVCS holdup tanks, or discharged to the atmosphere provided the radioactive waste gases are at acceptable levels. Before a tank is discharged to the environment, it is sampled and analyzed to determine and record the activity to be released, and then will be discharged to the Auxiliary Building Ventilation System at a controlled rate, which is monitored by a radiation monitor.

11.2 Radiation Protection
The containment atmosphere, the Containment System vent, the Auxiliary Building vent, the Control Room Air Conditioning System, the spent fuel pool heat exchanger service water discharge, the RHR pump pit ventilation exhaust, the condenser air ejector exhaust, the containment fan-coil service water discharge, blowdown from the steam generators, the component cooling water, and the Waste Disposal System liquid effluent are monitored for radioactivity concentration during normal operations, anticipated transients, and accident conditions. High radiation in any of these is indicated and planned in the Control Room.

11.2.1.2 Monitoring Fuel and Waste Storage Areas
The Spent Fuel Pool Cooling System loop flow is monitored to ensure proper operation, as described in Chapter 9. A controlled ventilation system removes gaseous radioactivity from the atmosphere of the fuel storage and waste treatment areas of the Auxiliary Building and discharges it to the atmosphere via the Auxiliary Building vent. Radiation monitors are in continuous service in these areas to actuate high radiation alarms.
11.2.3.5 Auxiliary Building Vent Monitors (R-13, R-14)
The Auxiliary Building vent monitors are used to monitor the Auxiliary Building vent flowpath on a continuous basis. The detectors are used to measure airborne radioactivity in the air as it is discharged out the stack. An off-line sampler is used to monitor and sample the Auxiliary Building vent stack. Upon receipt of a high radiation alarm, the system performs the following functions:
1. Shuts down normal Auxiliary Building ventilation.
2. Activates the Special Zone Auxiliary Building ventilation.
3. Initiates isolation of all normal ducting to the Auxiliary Building vent stack.
4. Closes the waste gas decay tank gas release valve.
5. Reroutes R11/12 sample exhaust flow from Auxiliary Bldg. vent to Containment on a high radiation alarm from R-13 only.
6. Isolates the 2 inch post LOCA hydrogen recombiner line and stops the 2 inch containment supply blower.
7. Automatically diverts the Spent Fuel Pool Ventilation System exhaust through its charcoal filter banks.
8. Automatically isolates the Waste Gas Analyzer via redundant isolation valves MG(R)-560, MG(R)-561, MG(R)-562 and MG(R)-563.
9. Turns on the Safeguards Fan Coil Units
10. Closes the Steam Exclusion Dampers

14.2.1.3 Method of Analysis (Applicable up to 90 Days Permanently Shutdown)
The volatile gaseous activities associated with the fuel handling accident could be released either inside the Containment Building or in the Auxiliary Building. Both of these areas have ventilation systems in operation under administrative control during fuel handling operations. Radioactivity monitors provide continuous indication of radiation levels and signal evacuation of these areas on high alarm. In the analysis no credit is taken for the Spent Fuel Pool Ventilation System operation in the auxiliary building.

USAR Table B.2-1 Classification of Systems and Components

- Auxiliary Building Ventilation System Class III
- Safeguards Fan Coil Units I

On February 25, 2013, DEK submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2). Since KPS will no longer be authorized to operate or place fuel in the reactor the functions associated with abandoned ABV credited in the USAR are no longer required. The USAR will be revised to address requirements following cessation of power operation.

FIRE PLAN

11.4.1 Water Spray Systems
The water spray systems for the Auxiliary Building charcoal filters (shield building, the containment purge, containment cleanup and the Control Room air conditioning ventilation units) are nonstandard; however, they are adequate for their intended purpose. The water supply is the service water system. These systems have detectors that operate solenoid valves that feed water to the spray nozzles.

12.6 Fire Barriers
All fire barriers and barrier components (e.g., such as doors, dampers, penetration seals, etc.) which separate redundant trains of safe shutdown equipment (e.g., "Appendix R Fire Barriers") shall be verified to be FUNCTIONAL:

> 12.6.1 At least once per 18 months by visually inspecting each fire penetration barrier seal, fire damper and fire door.
> 12.6.2 At least once per 18 months by cycling each roll up fire door.
> 12.6.3 At least once per 5 years by a visual inspecting and functionally testing each fire damper.

With any fire penetration seal, fire damper, or fire door non-functional, establish a fire watch on at least one side of the affected barrier within 1 hour. If the non-functionality is not intentionally developed (such as in support of planned maintenance or testing requirements), initiate action in accordance with the station corrective action process outlining the actions taken, the cause of the non-functionality, and the plans and schedule for restoring the equipment to a functional condition.

The fire dampers and the associated surveillances are not being abandoned as part of the Categorization package.

ODCM

2.1.4 Auxiliary Building Vent
The Auxiliary Building vent receives discharges from the waste gas holdup system, condenser evacuation system, fuel storage area ventilation, Auxiliary Building radwaste processing area ventilation, 2-inch containment pressure relief purge/vent system, and Auxiliary Building

general area. All effluents pass through the R-13 and/or R-14 channels which contain:

- a noble gas monitor
- an iodine sampler, and
- a particulate sampler.

The noble gas monitor provides auto isolation of any waste gas decay tank release and diverts other releases through the special ventilation system. Effluent flow rates are determined by installed flow measurement equipment or as a function of fan operation (fan curves). Sampler flow rates are determined by flow rate instrumentation.

2.1.5 Containment Mini-Purge/Vent System

Slight pressure buildup in containment is a recurring event resulting from normal operation of the plant. Prior to exceeding 2 psig in containment, this excess pressure is vented off. Air from containment is routed to the Auxiliary Building ventilation system, via the post-LOCA hydrogen recombiner piping and then out through the Auxiliary Building vent stack.

2.1.6 Non-routine Discharge Locations

Periodically, non-routine breaches are made in the Auxiliary and Containment buildings that might allow the release of the atmosphere, which contains some levels of radioactivity. These breaches include, but are not limited to, opening the Containment equipment hatch during outages, holes cut in walls or ceilings to allow for moving equipment in or out of the Radiologically Controlled Areas (RCAs). All efforts to maintain these areas at negative pressure will be made. IF negative pressure cannot be maintained (i.e., more exhaust than supply fan volume), THEN supply ventilation to the area must be secured. Criteria for determining if and when a release occurs from these areas are provided in implementing procedures. As possible, the effects of these possible releases shall be evaluated beforehand. Any actual releases shall be documented and included in the monthly, quarterly and annual reports as appropriate.

2.2 Gaseous Effluent Monitor Setpoint Determination
  2.2.1 Containment and Auxiliary Building Vent Monitor
2.3 Gaseous effluent Instantaneous Dose Rate Calculations – 10 CFR 20
  2.3.1 SITE BOUNDARY Dose Rate – Noble Gases
  2.3.2 SITE BOUNDARY Dose Rate – Radioiodine and Particulates.
2.4 Gaseous Effluent Dose Calculations – 10 CFR 50
  2.4.1 UNRESTRICTED AREA Dose – Noble Gases
  2.4.2 UNRESTRICTED AREA Dose – Radioiodine and Particulates
2.5 Gaseous Effluent Dose Projection

Following the ABV and ABV changes described above, these systems will continue to operate and maintain the requirements as stated in the ODCM.

On February 25, 2013, DEK submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2). Since KPS will no longer be authorized to operate or place fuel in the reactor there cannot be any releases into the Auxiliary Building Ventilation zones from Containment leakage or systems that interconnect with the Reactor Coolant System. The only potential releases are related to radioactive material handling or the Spent Fuel Pool. The ODCM discusses Auxiliary Building Ventilation as a monitored release path with alarm setpoints. The Auxiliary Building Ventilation System will continue to operate as it had previously only with one train of ventilation available. This change does not negatively impact the release path, alarm setpoints or the ability of the rad monitors to perform their functions.

COMMITMENTS

Commitment Number: 86-032 **Commitment Made to:** NRC
Required Date: 08/01/1988
Title: DCR 1819: FIRE DAMPER ACCESS
Back-g round: BY LETTER NRC-85-26, WPS COMMITED TO A FORMAL PROCEDURE TO INSPECT FIRE DAMPERS.

Commitment Number: 86-043 **Commitment Made to:** NRC
Required Date: 0410111 987
Title: DCR 1853: REPLACE FIRE DAMPERS
Background: TO MEET FIRE DAMPER OPERABILITY REQUIREMENTS IMPOSED BY AN1 AND THE NRC
APPENDIX R SCOPE CHANGE.
Corrective Actions:
REPLACE WALL AND VENTILATION FIRE DAMPERS WHICH WILL NOT CLOSE UNDER FLOW CONDITIONS.
SYSTEMS: TURBINE BLDG. VENT, AUX BLDG. VENT, SV, AND AC.

Commitment Number: 87-114 **Commitment Made to:** NRC
Required Date: 0411 6/1/1993
Title: DCR 1853: REPLACE FIRE DAMPERS
Background: TO MEET FIRE DAMPER OPERABILITY REQUIREMENTS IMPOSED BY AN1 AND THE NRC.
THIS IS BEING HANDLED AS AN APPENDIX R SCOPE CHANGE.
Corrective Actions:
REPLACE WALL AND VENTILATION FIRE DAMPERS WHICH WILL NOTCLOSE UNDER FLOW CONDITIONS.

The modifications associated with these commitments are all complete. The ABV fire dampers are not being abandoned as part of this Categorization package.

Plant Impact

The Service Water system supports the Spent Fuel Pool Exhaust Charcoal Filter Units fire suppression spray manifolds. The service water system shall be isolated and drained to the SFP charcoal filter units. This cannot be completed until the charcoal is removed. The heat detectors for the charcoal fire suppression system must also remain in service until the charcoal is removed.

The Auxiliary Building Ventilation System supports spent fuel pool cooling in a beyond design basis loss of all water in the pool event. The A train of Auxiliary Building Exhaust and A train of SFP Exhaust are being maintained as a backup to the B train of equipment in the event of a loss of all water in the SFP. The A train is not planned to normally be in operation.

The Auxiliary Building Ventilation System supports spent fuel pool cooling in a beyond design basis loss of all water in the pool event.

ABV-5 (SE AB FF), ABV-20, ABV-21, ABV-22, & ABV-23 (SE CRD Eq Rm), ASV-10 (SE ASV to Exh Fans), ASV-20 (SE Bndry), ASV-21 (SE AB Bsmt & Mezz Sup), ASV-22 & ASV-23 (SE ASV to Exh), ASV-40 & ASV-41 (SE ASV Sup & Exh), ASV-50 (SE SGBT to Exh), ASV-60 (SE RPO to Exh), ASV-65 (ZSV bndry), ASV-70 & ASV-75 (SE AB Off & Dos Off), ASV-80 & ASV-81 (SE AB AC Sup), and ASV-21 & ASV-25 (SE AB Exh Vent) are to be gagged as part of DC-KW-13-2001 and WO KW100967500 to maintain ventilation to areas.

There is no impact on any temporary changes that are active as of 2/5/14.

No outstanding drawing changes that required disposition as a result of system abandonment were identified.

5.0 Special conditions to support categorization(s):

None

6.0 Assumptions/Open Items to be validated or dispositioned:

None

7.0 Expected duration for SSC category if <u>NOT</u> ABANDONED:

Auxiliary Building Ventilation is expected to be required in form indefinitely.

The Fire dampers are expected to be required indefinitely to prevent the spread of fire.

8.0 **PREPARE** and **ATTACH** the following documents:

- Completed 10 CFR 50.59 Screening or Evaluation, if required
- Proposed DUs for appropriate drawings

9.0 Technical Concurrence:

Type Of Review Engineering	Name (Print) DAVID DeGRAVE	Approval Signature	Date 2-6-14
Type Of Review Fire Protection	Name (Print) Michael Townsend	Approval Signature	Date 2-6-14
Type Of Review Security	Name (Print) David Falk	Approval Signature	Date 2-6-14
Type Of Review Rad Protection	Name (Print) Daniel J. Shannon	Approval Signature	Date 2-6-14
Type Of Review	Name (Print)	Approval Signature	Date
Type Of Review	Name (Print)	Approval Signature	Date
Type Of Review	Name (Print)	Approval Signature	Date
Type Of Review	Name (Print)	Approval Signature	Date
Type Of Review	Name (Print)	Approval Signature	Date

10.0 Review and Approval:

BRIAN O'CONNELL /	2/6/2014
Prepared By (Print/Sign)	Date
DAVID DEGRAVE /	2-6-14
Reviewed By (Screen Qual.) (Print/Sign)	Date
C S SWOREK /	2/11/14
Nuclear Licensing (Print/Sign)	Date
WILLIAM G. SWANSON	2/6/14
Concurrence by DSERT Coordinator (Print/Sign)	Date
Jeffrey Stafford	2-19-14
FSRC (Print/Sign), if required	Date

FSRC Meeting Number: 14-004

Dominion

Drawing Update Request (DUR)

SECTION 1 Requestor	
Name (Print) Brian O'Connell	Date 11/14/2013
SECTION 2 Change Description	
Attach drawing markup and/or describe the change: System 17 (ACA) Auxiliary Building Ventilation abandonment markups are attached.	
Provide Change Purpose Number (Modification, CR, Work Order, or other applicable change number): System Categorization Plan for ACA System	
List document(s) supporting drawing change:	

SECTION 3 List Drawings to Update

OPERM-601	WCA	E-2886	WCA	
OPERM-604	WCA	E-2990	WCA	
OPERM-606	WCA	E-3072	WCA	
OPERM-588	WCA	E-3075	WCA	
OPERM-605-1	WCA	OPERM-213-5	WCA	
E-254	WCA	OPERM-213-6	WCA	
E-256	WCA			
E-257	WCA			
E-258	WCA			
E-259	WCA			
E-260	WCA			
E-889	WCA			
E-896	WCA			
E-2350	WCA			
E-2524	WCA			

Submit to Configuration Management

Document Number: ____________________

Auxiliary Building Ventilation System Drain Plan

Ensure vent and drain hoses are routed to Aux Bldg. standpipe or Laundry Tanks, as SW should not go to SGBT system.

Note: Vent and drain valves may be throttled to control flow to within waste carry off capacity.

Initial	Valve Number	Nomenclature	Location	Position	Notes
		RHR FCU A			
		Use rotoflex pump to a barrel. Take barrel up to AB BB court and drain to laundry tanks.			
	SW-1200A	RHR Pump Pit Fan Coil Unit 1A Isol	(above Hi Rad Sample Room)	Closed	Requires Checklist change
	SW-1212A	RHR Pump Pit Fan Coil Unit 1A - SW Return		Closed	Requires Checklist change
	SW-17050	RHR Pump Pit FCU 1A SW Outl Pressure Test Conn		Open/Uncapped	
	SW-17049	RHR Pump Pit FCU 1A SW Inlet Pressure Test Conn		Open/Uncapped	
		RHR FCU B			
		Use rotoflex pump to a barrel. Take barrel up to AB BB court and drain to laundry tanks.			
	SW-1200B	RHR Pump Pit Fan Coil Unit 1B Isol		Closed	Requires Checklist change
	SW-1212B	RHR Pump Pit Fan Coil Unit 1B - SW Return		Closed	Requires Checklist change
	SW-17052	RHR Pump Pit FCU 1B SW Outl Pressure Test Conn		Open/Uncapped	
	SW-17051	RHR Pump Pit FCU 1B SW Inlet Pressure Test Conn		Open/Uncapped	
		Charging Pump Room FCU			
		Drain by keeping outlet open and opening vent.			
	SW-850	Charging Pump 1C Fan Coil Unit - SW Supply		Closed	Requires Checklist change
	SW-850-1	Charging Pump 1C Fan Coil Unit - SW Inlet		Closed	Requires Checklist change
	SW-852	Charging Pump 1C Fan Coil Unit - SW Return		Closed	Requires Checklist change
	SW-17091	Charging Pump 1C FCU SW Outl Pressure Test Conn		Open/Uncapped	
	SW-17090	Charging Pump 1C FCU SW Inlet Pressure Test Conn		Open/Uncapped	

Auxiliary Building Ventilation System Drain Plan

Initial	Valve Number	Nomenclature	Location	Position	Notes

AB Bsmt FCU A & B

Use rotoflex pump to a barrel. Take barrel up to AB BB court and drain to laundry tanks.

	SW-800A	Aux Bldg Bsmt FCU 1A SW Isolation		Closed	Requires Checklist change
	SW-800B	Aux Bldg Bsmt FCU 1B SW Isolation		Closed	Requires Checklist change
	SW-804	Aux Bldg Bsmt Fan Coil Unit 1A - Outlet		Closed	Requires Checklist change
	SW-17046	Aux Bldg Bsmt FCU 1A SW Outl Pressure Test Conn		Open/Uncapped	
	SW-17045	Aux Bldg Bsmt FCU 1A SW Inlet Pressure Test Conn		Open/Uncapped	
	SW-17048	Aux Bldg Bsmt FCU 1B SW Outl Pressure Test Conn		Open/Uncapped	
	SW-17047	Aux Bldg Bsmt FCU 1B SW Inlet Pressure Test Conn		Open/Uncapped	

AB Bsmt FCU C

Drain by keeping outlet open and opening vent.

	SW-1006C	Aux Bldg Bsmt Fan Coil Unit 1C Inlet		Closed	Requires Checklist change
	SW-1007C	Aux Bldg Bsmt Fan Coil Unit 1C - SW Return		Closed	Requires Checklist change
	SW-1006C-1	Aux Bldg Bsmt Fan Coil Unit 1C - Drain		Open/Uncapped	
	SW-1006C-2	Aux Bldg Bsmt Fan Coil Unit 1C - Vent		Open/Uncapped	

Aux Bldg Mezz FCU A

Drain by keeping outlet open and opening vent.

	SW-1219A	Aux Bldg Mezz Fan Coil Unit 1A SW Isol	(above B Charging Pump)	Closed	Requires Checklist change
	SW-1222A	Aux Bldg Mezz Fan Coil Unit 1A - SW Return		Closed	Requires Checklist change
	SW-17075	Aux Bldg Mezz FCU 1A SW Outl Pressure Test Conn		Open/Uncapped	
	SW-17074	Aux Bldg Mezz FCU 1A SW Inlet Pressure Test Conn		Open/Uncapped	

Auxiliary Building Ventilation System Drain Plan

Initial	Valve Number	Nomenclature	Location	Position	Notes

Comp Clg FCU B

Drain by keeping outlet open and opening vent.

[illegible]	SW-1260	Comp Clg Pump 1B Fan Coil Unit - SW Supply		Closed	Requires Checklist change
[illegible]	SW-1262	Comp Clg Pump 1B Fan Coil Unit - SW Return		Closed	Requires Checklist change
[illegible]	SW-17089	Comp Clg Pump 1B FCU SW Outl Pressure Test Conn		Open/Uncapped	
[illegible]	SW-17088	Comp Clg Pump 1B FCU SW Inlet Pressure Test Conn		Open/Uncapped	

CRDM Room FCU A

Drain by keeping outlet open and opening vent.

[illegible]	SW-1070A	CRDM Equip Rm Fan Coil Unit 1A - SW Supply		Closed	Requires Checklist change
[illegible]	SW-1072A	CRDM Equip Rm Fan Coil Unit 1A - SW Return		Closed	Requires Checklist change
[illegible]	SW-17036	CRDM Equip Rm FCU 1A SW Outl Pressure Test Conn		Open/Uncapped	
[illegible]	SW-17035	CRDM Equip Rm FCU 1A SW Inlet Pressure Test Conn		Open/Uncapped	

CRDM Room FCU B

Drain by keeping outlet open and opening vent.

[illegible]	SW-1070B	CRDM Equip Rm Fan Coil Unit 1B - SW Supply		Closed	Requires Checklist change
[illegible]	SW-1072B	CRDM Equip Rm Fan Coil Unit 1B - SW Return		Closed	Requires Checklist change
[illegible]	SW-17038	CRDM Equip Rm FCU 1B SW Outl Pressure Test Conn		Open/Uncapped	
[illegible]	SW-17037	CRDM Equip Rm FCU 1B SW Inlet Pressure Test Conn		Open/Uncapped	

Auxiliary Building Ventilation System Drain Plan

Aux Bldg Fan Floor FCU B

Drain by keeping outlet open and opening vent.

Initial	Valve Number	Nomenclature	Location	Position	Notes
	SW-1016B	Aux Bldg Fan Fl Fan Coil Unit 1B Inlet		Closed	Requires Checklist change
	SW-1017B	Aux Bldg Fan Fl Fan Coil Unit 1B - SW Return		Closed	Requires Checklist change
	SW-1016B-1	Aux Bldg Fan Fl Fan Coil Unit 1B - Drain		Open/Uncapped	
	SW-1016B-2	Aux Bldg Fan Fl Fan Coil Unit 1B - Vent		Open/Uncapped	

Aux Bldg Ventilation Unit A

Initial	Valve Number	Nomenclature	Location	Position	Notes
	HS-363A	Aux Bldg Vent Unit 1A RHT Coil Cont Station Bypass		Closed	Requires Checklist change
	HS-360A	Aux Bldg Vent Unit 1A PRHT Coil Cont Station		Closed	Requires Checklist change
	HS-364A	Aux Bldg Vent Unit 1A PRHT Coil SPLY Trap Inlet		Closed	Requires Checklist change
	IA-31312	IA to CV-31312/HS-371A		Closed	
	HS-373A	Aux Bldg Vent Unit 1A RHT Coil Cont Station Bypass		Closed	Requires Checklist change
	HS-370A	Aux Bldg Vent Unit 1A Reheat Coil Cont Station		Closed	Requires Checklist change
	HS-374A	Aux Bldg Vent Unit 1A RHT Coil SPLY Trap Inlet		Closed	Requires Checklist change
	IA-31311	IA to CV-31311/HS-371A		Closed	
	HS-6361A	Aux Bldg Vent Unit 1A Preheat Coil Vac Bkr Line		Closed	Requires Checklist change
	HS-5360A1	Aux Bldg Vent Unit 1A PRHT Coil Cond Trap Return		Closed	Requires Checklist change
	HS-5360A2	Aux Bldg Vent Unit 1A PRHT Coil Cond Trap Return		Closed	Requires Checklist change
	HS-5364A	Aux Bldg Vt Unit 1A PRHT Coil Supply Trap Outlet		Closed	Requires Checklist change

Auxiliary Building Ventilation System Drain Plan

	HS-6371A	Aux Bldg Vent Unit 1A Reheat Coil Vac Bkr Line		Closed	Requires Checklist change
	HS-5370A-1	Aux Bldg Vent Unit 1A Reheat Coil Cond Trap		Closed	Requires Checklist change
	HS-5370A-2	Aux Bldg Vent Unit 1A Reheat Coil Cond Trap		Closed	Requires Checklist change
	HS-5374A	Aux Bldg Vent Unit 1A RHT Coil Supply Trap Outlet		Closed	Requires Checklist change

Initial	Valve Number	Nomenclature	Location	Position	Notes
		HRSR Refrigeration Unit			
	SW-1251	Hdr Stop to HRS Room		Closed/Sealed	Requires Checklist change
TV	SW-1020A	SFP Exhaust Filter A SW Supply		Closed/~~Sealed~~	(Once Charcoal emptied from SFP Exh Fan A) /Requires Checklist change
TV	SW-1020B	SFP Exhaust Filter B SW Supply		Closed/~~Sealed~~	(Once Charcoal emptied from SFP Exh Fan B) /Requires Checklist change

SYSTEM NAME: AUXILIARY BUILDING VENTILATION **SSC STATUS** (Category A or X): AX
SYSTEM NUMBER: SYS-17-DSERT

The following describes the process that will be used to remove hazards (such as oil, glycol, etc.) from the SSC. The process for removal of water is described in the Drain Plan.

Internal Hazards shall be removed in accordance with applicable permits and stored in appropriate locations. **COORDINATE** with Fire Protection, Health Physics and Waste Services to arrange for final removal and disposal.

☒	REMOVE CHARCOAL FROM 1A SFP EXHAUST HOUSING (169-321) PER CMP-17-01 WO KW 100979828 3/27/14
☒	REMOVE CHARCOAL FROM 1B SFP EXHAUST HOUSING (169-322) PER CMP-17-01 WO KW100979829 Complete 3/26/14
☒	Remove freon from HRSR Refrigeration Unit with help of vendor. Requires WO 100981327 5-13-14
☐	
☐	
☐	
☐	

Dominion

Hazard Removal Plan

SYSTEM NAME: Aux Bldg Ventilation **SSC STATUS** (Category A or X): AX

The following describes the process that will be used to remove hazards (such as oil, glycol, etc.) from the SSC. The process for removal of water is described in the Drain Plan.

Internal Hazards shall be removed in accordance with applicable permits and stored in appropriate locations. **COORDINATE** with Fire Protection, Health Physics and Waste Services to arrange for final removal and disposal.

☒	The following Mercoid switches will require visual inspection to verify the presence of mercury switch bulbs and require removal of the mercury bulb.
☒	16340 POSTULATED BRK AT SHIELD BLDG AREA TS 16341 POSTULATED BRK AT LETDOWN HT EXCH AREA TS
☐	The following Mercoid switches which contain mercury switch bulbs and require removal of the mercury bulb.
☒	16342 POSTULATED BRK AT STM GEN BLOWDOWN LINES TS 16343 POSTULATED BRK AT MN STM/FW LINE AREA B1 TS 16344 POSTULATED BRK AT MN STM/FW LINE AREA D2 TS 16391 CC PMP 1B FAN COIL TS
☒	16392 CHARGING PMP 1C FAN COIL TS
☐	
☐	

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Other Activities Plan

SYSTEM NAME: Auxiliary Building Ventilation **SSC STATUS** (Category A or X): AX
SYSTEM NUMBER: SYS-17-DSERT

Other activities may be required to place an SSC its lowest energy state. Said activities may include, but are NOT limited to complete de-energization. The following describes the process that will be used to conduct such activities in support of the SSC categorization.

Independent review of power supplies.

GARY AHRENS [signature] 3/5/14

Print/Sign/Date

☑	MCC-35E Bkr D1 Auxiliary Building Supply Air Vent Unit 1A Bkr 3-17-14 **MCC-35E BKR D1 OFF**	E-257 1-310
☑	MCC-62J Bkr 2GI Aux Bldg Fan Floor Fan Coil Unit 1B Bkr 3-17-14 **MCC-62J BKR 2GI OFF**	E-3075 1-1083
☑	MCC-62J Bkr 4EF Control Rod Drive Equipment Room Fan Coil Unit 1B Bkr 3-17-14 **MCC-62J BKR 4EF OFF**	E-3075 1-602
☑	MCC-35D Bkr B8 Decontamination Room Exhaust Fan Bkr 3-17-14 **MCC-35D BKR B8 OFF**	E-254 1-192
☑	RPB-6 Ckt 17 Decon Rm Ceiling Fan Motor & Monitor Rm Ceiling Fan Motor Bkr (Main Feed A Pen Area) 3-17-14 **RPB-6 CKT 17 OFF**	E-889 1-325 & 1-456
☑	RPB-6 Ckt 19 HP Lab Ceiling Fan Motor Bkr (Main Feed A Pen Area) 3-17-14 **RPB-6 CKT 19 OFF**	E-889 1-523

☑	MCC-52E Bkr A4 RHR Pump A Pump Pit Fan Coil Unit Bkr 3-17-14 **MCC-52E BKR A4 OFF**	E-260 1-298
☑	MCC-52E Bkr A5 Aux Bldg Mezzanine Fan Coil Unit A Bkr 3-17-14 **MCC-52E BKR A5 OFF**	E-260 1-131
☑	MCC-52E Bkr J1 Aux Bldg Basement Fan Coil Unit C Bkr 3-17-14 **MCC-52E BKR J1 OFF**	E-260 1-1084
☑	MCC-52E Bkr A2 Aux Bldg Basment Fan Coil Unit A Bkr 3-17-14 **MCC-52E BKR A2 OFF**	E-260 1-164
☑	MCC-52E Bkr J6 Charging Pump C Fan Coil Unit Bkr 3-17-14 **MCC-52E BKR J6 OFF**	E-260 1-978
☑	(Can be deenergized once HRSR Refrigeration Unit evacuated) LRPB3 Bkr 13 (AB Bsmt North of HRSR) SV33707 ACTUATOR-HRSR REFRIG COMPR 2 LIQUID LINE SV SV33713 ACTUATOR-HRSR REFRIG COMPR 1 LIQUID LINE SV SV33703 ACTUATOR- CONTAINMENT AIR SAMPLE BY-PASS SV SV33704 ACTUATOR-SMPL RETURN EDUCTOR N2 SUPPLY SV SV33705 ACTUATOR-SMPL RETURN EDUCTOR SMPL INLET SV SV33709 ACTUATOR-WASTE TO CNTMT SV ~~MD32392~~ DCR1290 ~~MD32393~~ DCR1290 SV33695 ACTUATOR-SF1 CNTMT AIR SMPL INLET SV SV33696 ACTUATOR-SF1 CNTMT AIR SMPL OUTLET SV SV33697 ACTUATOR-SF2.1 CNTMT AIR SMPL INLET SV SV33698 ACTUATOR-SF2.1 CNTMT AIR SMPL OUTLET SV **LRPB3 BKR 13 OFF**	 E-2982, E-2673, E-2980, E-2979

☑ MCC-62E Bkr H2 Residual Heat Removal Pump Fan Coil Unit 1B Bkr		E-259
	3-17-14	
MCC-62E BKR H2 OFF		1-299
☑ MCC-62E Bkr H3 Auxiliary Building Basement Fan Coil Unit 1B Bkr		E-259
	3-17-14	
MCC-62E BKR H3 OFF		1-183
☑ MCC-62H Bkr 3GH Component Cooling Pump 1B Fan Coil Bkr		E-2990
	3-17-14	
MCC-62H BKR 3GH OFF		1-979
☑ LPB-20 Ckt 2 Roof Exhaust Fan Bkr		E-2524
	3-17-14	
LPB-20 Ckt 2 OFF		
☑ MCC-46D Bkr 1EF HRSR Sample Room Exhaust Fan Motor Bkr		E-2886, E-2981
	3-17-14	
MCC-46D BKR 1EF OFF		1-898
☑ MCC-46D Bkr 1CD HRSR Sample Room Air Handling Unit Motor Bkr		E-2886, E-2981
	3-17-14	
MCC-46D BKR 1CD OFF		1-896
☑ MCC-46D Bkr 2AB(L) HRSR Condensing Unit Bkr		E-2886
MCC-46D BKR 2AB(L) OFF	3-17-14	1-899
☑ SD-100 FUG 09 SW851/SV33781 ACTUATOR-SW TO CHARGING PUMP 1C FAN COIL UNIT SV		
SD-100 FUG 09 REMOVED	3-17-14	E-3119
☑ SD-100 FUG 10 ACTUATOR-SW1261/SV33778 CC PMP B FAN COIL COOLING WTR		
SD-100 FUG 10 REMOVED	3-17-14	E-3133, E-3119

☑	RR-172 FUG 02 SV33280 ACTUATOR-AUX BLDG SPLY AIR VENT UNIT 1A SV 4452401 INDICATOR-MS-201A2/CV-31020 RHTR A2 STEAM CONT VLV CLOSE IL 4452402 INDICATOR-MS-201A2/CV-31020 RHTR A2 STEAM CONT VLV OPEN IL 4452301 INDICATOR-MS-201A1/CV-31019 RHTR A1 STEAM CONT VLV CLOSE IL 4452302 INDICATOR-MS-201A1/CV-31019 RHTR A1 STEAM CONT VLV OPEN IL **RR172 FUG 02 REMOVED**	3-17-14	E-2350
☑	MCC-52F Bkr D5 Control Rod Drive Fan Coil Unit 1A Bkr **MCC-52F BKR D5 OFF**	3-17-14	E-258 1-601
☐			
☐			

Dominion

Recommended "Abandoned" Label Location

SYSTEM NAME: Auxiliary Building Ventilation **SSC STATUS** (Category A or X): AX
SYSTEM NUMBER: SYS-17-DSERT

The following table describes the placement location of "Abandoned" labels. The labels are used to indicate the abandoned status of a SSC.

"ABANDONED" LABEL LOCATIONS		
Labels Installed		Component and Location
Initial	Date	
DJ	3-17-14	(Local) Aux Bldg Bsmt Fan Coil A 1-164 CS - Auto
DJ	3-17-14	(Local) Aux Bldg Bsmt Fan Coil B 1-183 CS - Auto
DJ	3-17-14	(Local) Aux Bldg Bsmt Fan Coil 1C CS - Auto
DJ	3-17-14	19530 –Resid Ht Pump Pit Fan Coil Unit 1A (on MCC-52E) CS - Auto
DJ	3-17-14	19531 –Resid Ht Pump Pit Fan Coil Unit 1B (next to MCC-62H) CS - Auto
DJ	3-17-14	(Local) Charging Pump C Fan Coil (Sel Sw 19662) - Auto
DJ	3-17-14	(Local) Sample Room Ventilation Mode Selector – OFF (Refrigeration Unit) & SAMPLE ROOM EXHAUST FAN E-2981
		~~(Local) Sample Room Exhaust Fan CS – OFF~~ WGr 5/19/14
DJ	3-17-14	(Local) Component Cooling Pump 1B Fan Coil (Sel Sw 19661) - Auto
DJ	3-17-14	(Local) Aux Bldg Mezz FCU A 1-131 CS - Auto
DJ	3-17-14	(Local) Aux Bldg Supply Fan A CS - OFF

PJ	3-17-14	(Local) 19606 Decon Room Exhaust Fan PB - STOP
PJ	3-17-14	(Local) Rod Drive Room FCU A CS – Auto
PJ	3-17-14	(Local) Rod Drive Room FCU B CS – Auto
PJ	3-17-14	(Local) Aux Bldg Fan Fl Fan Coil 1B CS - Auto
PJ	3-17-14	(Local) Weld Shop Roof Exhaust Fan CS - OFF
[illegible]	3/18/14	SW-1200A - RHR Pump Pit Fan Coil Unit 1A Isol (Boundary)
[illegible]	3/18/14	SW-1212A - RHR Pump Pit Fan Coil Unit 1A - SW Return (Boundary)
[illegible]	3/18/14	SW-1200B - RHR Pump Pit Fan Coil Unit 1B Isol (Boundary)
[illegible]	3/18/14	SW-1212B - RHR Pump Pit Fan Coil Unit 1B - SW Return (Boundary)
[illegible]	3/30/14	SW-850 - Charging Pump 1C Fan Coil Unit - SW Supply (Boundary)
[illegible]	3/30/14	SW-850-1 Charging Pump 1C Fan Coil Unit - SW Inlet (Boundary)
[illegible]	3/30/14	SW-852 Charging Pump 1C Fan Coil Unit - SW Return (Boundary)
[illegible]	4/10/14	SW-800A Aux Bldg Bsmt FCU 1A SW Isolation (Boundary)

N/A DB	4/10/14	SW-803A Aux Bldg Bsmt Fan Coil Unit 1A – Outlet (Boundary) SW-804 is the boundary valve, this label is not required
[illegible]	4/10/14	SW-800B Aux Bldg Bsmt FCU 1B SW Isolation (Boundary)
[illegible]	4/10/14	SW-804 Aux Bldg Bsmt FCUs 1A & 1B Return (Boundary)
[illegible]	4/10/14	SW-1006C Aux Bldg Bsmt Fan Coil Unit 1C Inlet (Boundary)
[illegible]	4/10/14	SW-1007C Aux Bldg Bsmt Fan Coil Unit 1C - SW Return (Boundary)
[illegible]	4/10/14	SW-1219A Aux Bldg Mezz Fan Coil Unit 1A SW Isol (Boundary)
[illegible]	4/10/14	SW-1222A Aux Bldg Mezz Fan Coil Unit 1A - SW Return (Boundary)
[illegible]	3/29/14	SW-1260 Comp Clg Pump 1B Fan Coil Unit - SW Supply (Boundary)
[illegible]	3/29/14	SW-1262 Comp Clg Pump 1B Fan Coil Unit - SW Return (Boundary)
[illegible]	3/25/14	SW-1070A CRDM Equip Rm Fan Coil Unit 1A - SW Supply (Boundary)
[illegible]	3/25/14	SW-1072A CRDM Equip Rm Fan Coil Unit 1A - SW Return (Boundary)
[illegible]	3/25/14	SW-1070B CRDM Equip Rm Fan Coil Unit 1B - SW Supply (Boundary)
[illegible]	3/26/14	SW-1072B CRDM Equip Rm Fan Coil Unit 1B - SW Return (Boundary)
[illegible]	3/25/14	SW-1016B Aux Bldg Fan Fl Fan Coil Unit 1B Inlet (Boundary)

[illegible]	3/28/14	SW-1017B Aux Bldg Fan Fl Fan Coil Unit 1B - SW Return (Boundary)
JV	3/27/14	SW-1020A SFP Exhaust Filter A SW Supply (Once Charcoal tray has been emptied)
JV	3/27/14	SW-1020B SFP Exhaust Filter B SW Supply (Once Charcoal tray has been emptied)
[illegible]	5/13/14	SW-1251 Hdr Stop to HRS Room
DJ	3-17-14	MCC-35E Bkr D1 Auxiliary Building Supply Air Vent Unit 1A Bkr
DJ	3-17-14	MCC-62J Bkr 2GI Aux Bldg Fan Floor Fan Coil Unit 1B
DJ	3-17-14	MCC-62J Bkr 4EF Control Rod Drive Equipment Room Fan Coil Unit 1B
DJ	3-17-14	MCC-35D Bkr B8 Decontamination Room Exhaust Fan Bkr
DJ	3-17-14	RPB-6 Ckt 17 Decon Rm Ceiling Fan Motor & Monitor Rm Ceiling Fan Motor Bkr (Main Feed A Pen Area)
DJ	3-17-14	RPB-6 Ckt 19 HP Lab Ceiling Fan Motor Bkr (Main Feed A Pen Area)
DJ	3-17-14	MCC-52E Bkr A4 RHR Pump A Pump Pit Fan Coil Unit Bkr
DJ	3-17-14	MCC-52E Bkr A5 Aux Bldg Mezzanine Fan Coil Unit A Bkr
DJ	3-17-14	MCC-52E Bkr J1 Aux Bldg Basement Fan Coil Unit C Bkr
DJ	3-17-14	MCC-52E Bkr A2 Aux Bldg Basment Fan Coil Unit A Bkr

DJ	3-17-14	MCC-52E Bkr J6 Charging Pump C Fan Coil Unit Bkr
DZ	5-13-14	(once HRSR Refrigeration Unit evacuated) LRPB3 Bkr ~~1~~13 DZ (AB Bsmt North of HRSR)
DJ	3-17-14	MCC-62E Bkr H2 Residual Heat Removal Pump Fan Coil Unit 1B Bkr
DJ	3-17-14	MCC-62E Bkr H3 Auxiliary Building Basement Fan Coil Unit 1B Bkr
DJ	3-17-14	MCC-62H Bkr 3GH Component Cooling Pump 1B Fan Coil
DJ	3-17-14	MCC-46D Bkr 1EF HRSR Sample Room Exhaust Fan Motor Bkr
DJ	3-17-14	MCC-46D Bkr 1CD HRSR Sample Room Air Handling Unit Motor Bkr
DJ	3-17-14	MCC-52F Bkr D5 Control Rod Drive Fan Coil Unit 1A Bkr
DJ	3-17-14	DPI11688 INDICATOR-AUX BLDG SUPPLY AIR VENT UNIT 1A FILTER DPI
DJ	3-17-14	DPI11686 INDICATOR-DECON ROOM EXHAUST FAN PREFILTER DPI
DJ	3-17-14	DPI11687 INDICATOR-DECON ROOM EXHAUST FAN HEPA FLTR DPI
DB	3/29/14	DPI11460 INDICATOR-SPENT FUEL POOL FLTR 1A CARBON FLTR DPI
DB	3/29/14	DPI11463 INDICATOR-SPENT FUEL POOL FLTR 1B CARBON FLTR DPI
DD	3/29/14	44910030~~8~~ STATUS LITE-RHR PUMP FAN COIL ~~B~~ A ON ~~44910030?~~ ~~AS 3-26-14~~ 449100303 DD 3/29/14

DB	3/29/14	449100307 STATUS LITE-RHR PUMP FAN COIL B ON
DB	3/29/14	449100705 STATUS LITE-AUX BLDG BSMT FAN COIL B ON
DB	3/29/14	~~449100708~~ STATUS LITE-CRDM FAN COIL B ON 449100805 DB 3/29/14
DB	3/29/14	449100801 STATUS LITE-CRDM FAN COIL A ON
DB	3/29/14	449100703 STATUS LITE-AUX BLDG MEZZ FAN COIL A ON
DB	3/29/14	449100702 STATUS LITE-AUX BLDG BSMT FAN COIL C ON
DB	3/29/14	449100701 STATUS LITE-AUX BLDG BSMT FAN COIL A ON
[illegible]	4/24/14	RHR PUMP B PUMP PIT FAN IND ON MCC-C 4431202 - R 4431201 - G
[illegible]	4/24/14	RHR PUMP A PUMP PIT FAN IND ON MCC-C 4431102 - R 4431101 - G

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Recommended "Abandoned" Label Location

Page: 1 of 1

SYSTEM NAME: Auxiliary Building Ventilation **SSC STATUS** (Category A or X): X

SYSTEM NUMBER: SYS-17-DSERT

The following table describes the placement location of "Abandoned" labels. The labels are used to indicate the abandoned status of a SSC.

"ABANDONED" LABEL LOCATIONS		
Labels Installed		Component and Location
Initial	Date	
DB	4/11/14	RHR FCU A Local/Remote Switch ES-87150
DB	4/11/14	Aux Bldg Mezz SFGRD Fan Coil 1A ES-87148
DB	3/20/14	MCC-46D BKR 2AB(L) HRSR Condensing Unit BKR

Dominion

Recommended WO Closure List

SYSTEM NAME: AUXILIARY BUILDING VENTILATION(m) **SSC STATUS** (Category A or X): AX

SYSTEM NUMBER: SYS-17-DSERT Sh. 1

The following list identifies recommended Work Orders that may be closed/canceled as a result of the system categorization noted above.

WORK ORDERS CLOSED/CANCELED			
Work Order Closed		Work Order	Description
Initial	Date		
a	3/11	KW07-002534 90	1A AUX BLDG BSMT FCU
DAK	3/19/14	KW100398693 20	1A AUX SUPPLY PRE HEAT COPIL HS-361A
↓	↓	KW100384797 32	AUX SUPPLY INSULATION
↓	↓	KW100417382 35	AUX SUPPLY INSULATION
a	3/11	KW100923998 90	ASV-51A
DAK	3/19/14	KW100652006 35	HRSR VENT
↓	↓	KW100809497 23	1A AUX SUPPLY
↓	↓	KW100836084 20	1A CRDM FCU
↓	↓	KW100867490 20	1A CRDM FCU
↓	↓	KW100867491 20	1B CRDM FCU
↓	↓	KW100945132 20	1A AUX SUPPLY
↓	↓	KW100945134 20	1A AUX SUPPLY
↓	↓	KW100946125 20	1A AUX BSMT FCU

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Recommended WO Closure List

SYSTEM NAME: Aux Bldg Vent Elect **SSC STATUS** (Category A or X): AX
SYSTEM NUMBER: SYS-17-DSERT

The following list identifies recommended Work Orders that may be closed/canceled as a result of the system categorization noted above.

WORK ORDERS CLOSED/CANCELED			
Work Order Closed		Work Order	Description
Initial	Date		
a	3/11	KW100957594 95	REPLACE MOTOR ON COMPONENT COOLING PUMP 1B FAN COIL UNIT
DAK	3/19/14	KW100546968 20	Small nic in Power Cables
		KW100748533 33	Replace degraded wiring in MCC35E-D4
		KW100686167 20	Grease fitting on Motor 1-1084

Dominion

Recommended WO Closure List

SYSTEM NAME: SYS-17-DSERT (I1C) **SSC STATUS** (Category A or X): AX

The following list identifies recommended Work Orders that may be closed/canceled as a result of the system categorization noted above.

WORK ORDERS CLOSED/CANCELED			
Work Order Closed		Work Order	Description
Initial	Date		
DAK	3/19/14	KW100916964 20	Performing GIP-005 on HS-371A found no coiled loop
		KW100916969 20	Performing GIP-005 on HS-371B found no coiled loop
		KW100916970 20	Performing GIP-005 on HS-361A found no coiled loop
		KW100916971 20	Performing GIP-005 on HS-361B found no coiled loop
		KW100960111 20	Spent Fuel Pool Exhaust Fan B Charcoal Filter Hour

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Recommended WO Closure List

SYSTEM NAME: AUXILIARY BUILDING VENTILATION(m) **SSC STATUS** (Category A or X): AX
SYSTEM NUMBER: SYS-17-DSERT Sh. 2

The following list identifies recommended Work Orders that may be closed/canceled as a result of the system categorization noted above.

WORK ORDERS CLOSED/CANCELED			
Work Order Closed		Work Order	Description
Initial	Date		
DAK	3/19/14	KW100952390 20	1B FAN FLOOR FCU
		KW100956049 20	1B FAN FLOOR FCU
		KW100917031 20	HS-371A 1A AUX SUPPLY

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Recommended Clearance Closure List

SYSTEM NAME: Auxiliary Building Ventilation **SSC STATUS** (Category A or X): AX

SYSTEM NUMBER: SYS-17-DSERT

The following list identifies recommended Clearances that may be closed/canceled as a result of the system categorization noted above.

CLEARANCES CLOSED/CANCELED			
Clearances Closed		Clearance	Description
Initial	Date		
QB	4/10/14	17-ACA-0046 (Status)	SW Leak Aux Bldg Mezz FCU A
SMC	3/18/14	17-ACA-OPS-001	Component Cooling B FCU turned off due to acrid smell
1 N/A [illegible]		17-ACA-Mech-0010	Need Info on SFP Exh Fan A Charcoal Filter trays
1 N/A [illegible]		17-ACA-Mech-0011	Need Info on SFP Exh Fan B Charcoal Filter trays

1 Tags not hung – WO cancelled [illegible]

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Record Change Notice

Type of Change: ☐ Supplement ☒ Correction ☐ Deletion

Document Type:	Document Sub Type:	Document ID:	Revision:	Original Record Date:
REPORT	DEC	SYS-32A-DSERT	0	07/24/14

Title/Subject:
WASTE DISPOSAL - LIQUID

Reason for Change:
Request from W. Swanson 1/6/15 to replace existing DSERT package for System 32A in D7 with this file, See attached.

Note: Changes to approved records shall be reviewed and approved by the same organizations and level of authority that performed the original review and approval.

Review and Approval

Department Review: See attached email from W. Swanson	Print Name and Sign:	Date:
Department Review:	Print Name and Sign:	Date:
Department Review:	Print Name and Sign:	Date:
Department Approval:	Print Name and Sign:	Date:

Lori L Leanna (Generation - 4)

From: William G Swanson (Generation - 4)
Sent: Tuesday, January 06, 2015 6:16 AM
To: Lori L Leanna (Generation - 4)
Subject: SYS-32A-DSERT
Attachments: DSERT Package 32A-Waste Disposal-Liquid .pdf

Lori,

This package was missing the cover paperwork in DocTop. Could replace this with the attached complete package?

1.0 NOTIFICATION

SSC: SYS-32A-DSERT, Waste Disposal - Liquid

A change in SSC categorization has been made from Available to Partially Abandoned

2.0 DISTRIBUTION

The following documents will be distributed for this SSC category determination:

- ☒ OP-KW-DEC-SYC-001, System Evaluation and Categorization (Attachment B, SSC Category Determination Document)
- ☐ 10 CFR 50.59 Safety Screening and Evaluation, if required
- ☒ Miscellaneous Station Drawing Update Request

3.0 RECOMMENDATIONS

- **REVIEW** the justification and basis provided in OP-KW-DEC-SYC-001 (Attachment B, SSC Category Determination Document) for the change in SSC categorization.
- **REVIEW** your department procedures, processes, and programs for potential changes and **MAKE** the appropriate modifications.

> **NOTE:** The notification to responsible departments is intended to be a list of processes and programs that may need modification and is NOT intended to be all encompassing.

Notification to Responsible Departments						
E-Plan	**Fire Protection**	**Operations**	**Engineering**	**Licensing**	**Maintenance**	**RP**
Abandoned Instrumentation	Hazards removed NEIL Updates	Procedures and Programs	Procedures and Programs	Procedures and Programs	Procedures and Programs	Modified Waste Processing Systems
		Corrective Action	Corrective Action	Corrective Action	Corrective Action	
		Work Orders	Work Orders	SAR Updated	Work Orders	
		Safety Tags	Safety Tags	Regulatory Relief of Commitments	Surveillance Tracking	
		OMs	PMMS Coding	Review of 10 CFR 50.59		
		Technical Specifications	Controlled Documents	Surveillance Tracking		
		Operability Determination	Surveillance Tracking			
		Subsystem and Support Systems Modified	WI Registered Pressure Vessel List			

TO: Decommissioning Director

FROM: Decommission System Evaluation Re-categorization Team (DSERT)

RE: SSC Release from DSERT

System Name: Waste Disposal - Liquid Revision: 0

System Number: SYS-32A-DSERT

FSRC Meeting: 14-007 Date: 4-7-14

This SSC has been Abandoned and is ready for release to the Decommissioning Director. The following list represents the status of associated OPEN ITEMS.

1. OP-KW-DEC-SYC-001, SSC Evaluation Open Items: 1. Waste Condensate Tank and Laundry Tank procedures require updating for single pump operations. Added to open items tracking form. - Lindahl
   2. USAR requires update - Helfenberger
   2. ODCM may require revision - Steckler
2. OP-KW-DEC-CM-001, Walkdown Open Items: None
3. OP-KW-DEC-CM-002, Abandoned Plan Open Items: None

The release of this SSC is done under the following conditions:

1. DSERT will continue to coordinate activities to resolve the above Open Items to closure.
2. DSERT will continue to maintain control of abandoned system boundaries until the plant reaches the Cold and Dark condition.

William Swanson Will S 7/7/14

DSERT Coordinator (Print/Sign) Date

WF Zipp WFZ 7/24/14

Decommissioning Director (Print/Sign) Date

ATTACHMENT B
System Transition Documentation
(Page 1 of 2)

1.0 SYSTEM RELEASE TO DSERT COORDINATOR

SYSTEM NAME: Waste Disposal – Liquid

SYSTEM NUMBER: SYS-32A-DSERT

SSC: Partial Abandonment

System catagorization as ABANDONED using OP-KW-DEC-SYC-001	WGSwanson 4/7/14 DSERT Coordinator Print/Sign/Date
Authorization for release of the Abandoned SSC	BJMcMichael 4-7-14 Operations Manager Print/Sign/Date
Assumptions and Open Items listed on OP-KW-DEC-SYC-001 for the appropriate SSC have been reviewed. Resolution is being coordinated with the responsible groups.	WGSwanson 4/7/14 DSERT Coordinator Print/Sign/Date

2.0 SYSTEM ASSESSMENT

• SSC has been flushed (if required) and drained. • Abandoned SSC boundaries have been tagged using OP-AA-200 or equivalent.	4-18-14 Shift Manager Print/Sign/Date
Final system walkdown, using ATTACHMENT C, has been performed. Findings have been resolved or are attached for reconciliation by DSERT Coordinator.	4-25-14 Shift Manager Print/Sign/Date
Maintenance has been notified of the Work Orders within the SSC boundary associated with Safety Tagging orders that may be dispositioned.	4-18-14 Shift Manager Print/Sign/Date
Safety Tags within the SSC boundary have been cleared.	4-18-14 Shift Manager Print/Sign/Date
Final system alignments been performed. Incorporate the final alignment in this package.	4-18-14 Shift Manager Print/Sign/Date

ATTACHMENT B
System Transition Documentation
(Page 2 of 2)

3.0 SYSTEM TRANSITION TO DECOMMISSIONED STATUS

ENSURE Tagging Clearance is appropriate.	William Swanson 7-1-14 DSERT Coordinator Print/Sign/Date
Controlled Prints are updated and ready for distribution.	William Swanson 7-1-14 DSERT Coordinator Print/Sign/Date
Original SSC Categorization documents of OP-KW-DEC-SYC-001 and OP-KW-DEC-CM-001 are incorporated in the package.	William Swanson 7-1-14 DSERT Coordinator Print/Sign/Date
Final SSC walkdown reviewed with Operations including justification for accepting open items.	WG Swanson 7/7/14 7-7-14 DSERT Coordinator Print/Sign/Date
Concurrence to transition the SSC to Decommissioned Status.	Bradly McMahon 7-9-14 Operations Manager Print/Sign/Date

ATTACHMENT A
SSC Abandonment Plan
(Page 1 of 2)

PHASE I: PLAN DEVELOPMENT

SYSTEM NAME: Waste Disposal - Liquid FSRC APPROVAL DATE: ~~NA~~ 4-7-14
SYSTEM NUMBER: SYS-32A - DSERT
SSC STATUS (Category A or X): AX FSRC MEETING NUMBER: 14-007

The attached Abandonment Plan outlines the process that will be used to place the SSC in the lowest energy state and remove internal hazards in preparation for transfer of the SSC from DSERT to the Decommissioning Director. The forms indicated below comprise the Abandonment Plan for the SSC indicated above.

- [x] SSC Abandonment Plan Phase II: Plan Implementation Form, OP-KW-DEC-CM-002, ATTACHMENT A
- [ ] Boundary Clearance Number for the SSC
- [x] Drain Plan, OP-KW-DEC-CM-002, ATTACHMENT B
- [ ] Drain Permit
- [ ] Abandoned SSC Valve Alignment, OP-KW-DEC-CM-002, ATTACHMENT C
- [ ] Drilled Vent and Drain Hole Locations, OP-KW-DEC-CM-002, ATTACHMENT D
- [x] Hazard Removal Plan, OP-KW-DEC-CM-002, ATTACHMENT E
- [x] Other Activities Plan, OP-KW-DEC-CM-002, ATTACHMENT F
- [ ] SER/Annunciator Disabled, OP-KW-DEC-CM-002, ATTACHMENT G
- [x] Recommended "Abandoned" Label Location, OP-KW-DEC-CM-002, ATTACHMENT H
- [x] Recommended Work Order Closure List, OP-KW-DEC-CM-002, ATTACHMENT I
- [ ] Recommended Clearance Closure List, OP-KW-DEC-CM-002, ATTACHMENT J
- [ ] Job Hazard Analysis for the Abandonment Plan
- [ ] Computer Points Disabled, OP-KW-DEC-CM-002, ATTACHMENT K
- [ ] Foxboro/NUS Module Power Supply Removal, OP-KW-DEC-CM-002, ATTACHMENT L

PREPARED BY: William Swanson [signature] DATE: 3/13/14
Print/Sign

REVIEWED BY: KEVIN SINES [signature] DATE: 3/13/14
Print/Sign

APPROVED BY: David Burks/ [signature] DATE: 3/13/14
Print/Sign

ATTACHMENT A
SSC Abandonment Plan
(Page 2 of 2)

PHASE II: PLAN IMPLEMENTATION

PLAN IMPLEMENTATION STATUS	NAME (Print/Sign)	DATE
1. Abandonment Plan approved:	DM [illegible] AHRENS	4/7/14
2. Pre-job Brief conducted: (ALARA, Job Hazards Analysis, Applicable Permits, Personnel Access, Other Information, Other work in progress)	DM [illegible] AHRENS	4/7/14
3. Clearance implemented:	N/A	
4. Drain Plan completed: (Abandoned SSC valves aligned per ATTACHMENT C, Drain Permit, Vent and Drain valves aligned per the Clearance, Drilled Vent and Drain Holes as required on ATTACHMENT D, other drain actions completed)	Daniel Banks / Daniel Banks	4/17/14
5. Hazard Removal Plan completed: (Hazards removed per applicable permits, and inappropriate storage locations/containers as identified on ATTACHMENT E, arrangements made for final offsite disposal through appropriate responsibility, other hazard removal actions completed)	T Albrecht D Albrecht	4-23-14
6. Other Activities Plan completed:	Daniel Banks / [illegible]	4/16/14
7. Walk-down completed:	T Albrecht D Albrecht	4-23-14
8. SER Points disabled:	N/A	
9. Abandoned labels installed:	Daniel Banks / [illegible]	4/16/14
10. Open Items recorded:	T Albrecht D Albrecht	4-23-14
11. Health Physics notified:	T Albrecht D Albrecht	4-18-14
12. Work Orders closed:	Daniel Banks / [illegible]	4/16/14
13. Clearances have been consolidated or closed:	N/A	
14. Computer Points disabled:	N/A	
15. Foxboro/NUS module power removed:	N/A	
Abandonment Plan Complete:	T Albrecht D Albrecht	4-23-14

1.0 Doc Type: Report Revision No.: 0 Date: 01/21/2014
Sub Type: DEC
Document Number (ID): SYS-32A-DSERT
Title: Liquid Radioactive Waste

1.1 Brief description or reason for revision: Not applicable for Rev 0

2.0 System Category (Check Appropriate):

NOTE:	*A SSC may be divided and have more than one category determination depending upon its functional requirements.*

☒ Available (Category A) ☒ Abandoned (Category X)

Describe the assessed boundaries:

This is a partial functional abandonment of the Liquid Radioactive Waste system. The majority of this system is being maintained as available to support day to day operation of the facility. Redundant portions of the system that are no longer needed are being abandoned.

The Reactor Coolant Drain Tank and associated pumps are no longer needed and will be abandoned. Redundent equipment such as Laundry Pump A, Laundry Tank Discharge Filter A, Waste Condensate Pump A, and Reactor Cavity Filtration are being abandoned.

The following instrument boundaries will be abandoned along with their respective sensing lines:

PIA-1004, PT-1004, LT-1003, LICA-1003, TE-1058, TIA-1058, PI-1018B, PI-1018A, PI-1018D, PI-1018G

3.0 Mark up the affected drawings using color coding to identify system category type and boundaries. These drawings are to include system, electrical one-line and distribution, and select building and isometric drawings. Related system drawings NOT incorporated in the system category require an explanation. **REFER** to Step 2.7 for a list of drawings.

OPERXK-100-131, Flow Diagram Waste Disposal System
Available:
Laundry Tanks A, B
Laundry Pump B
Sludge Interceptor Tank and Pump
Waste Holdup Tank
Waste Evaporator Feed Pump
Sump Tank
Sump Tank Pump A and B
Waste Condensate Tanks A and B
Waste Condensate Pump B

Abandon:
Reactor Coolant Drain Tank
Reactor Coolant Drain Tank Pump A and B
Laundry Pump A
Laundry Tank Discharge Filter A
Waste Condensate Pump A
Reactor Cavity Filtration System

Boundary Valves:
MD(R)-102A, 2 IN. VALVE-MANUAL-LAUNDRY PUMP 1A SUPPLY
MD(R)-104A, 1 IN. VALVE-MANUAL-LAUNDRY PUMP 1A DISCH
MD(R)-113A, 1 IN. VALVE-MANUAL-LAUNDRY PUMP 1A DISCH DRAIN
MD(R)-104A-1, 1.5 IN. VALVE-MANUAL-LAUNDRY TNK DISCH FLTR 1A INLET
MD(R)-104A-2, 1.5 IN. VALVE-MANUAL-LAUNDRY TNK DISCH FLTR 1A OUTLET
MD(R)-113A, 1 IN. VALVE-MANUAL-LAUNDRY PUMP 1A DISCH DRAIN
WD-14A, 2 IN. VALVE-MANUAL-WASTE CONDENSATE TANK PUMP 1A SUPPLY
WD-16A, 1 IN. VALVE-MANUAL-WASTE CONDENSATE PUMP 1A DISCHARGE

E-251, Circuit Diagram 480V MCC 1-32E
Abandon:
MCC 1-32E (C4) Reactor Coolant Drain Tank Pump 1A

E-252, Circuit Diagram 480V MCC 1-42E
Abandon:
MCC 1-42E (E6) Reactor Coolant Drain Tank Pump 1B

E-254, Circuit Diagram 480V MCC 1-35A, 1-35D, 1-45A & 1-45D
Abandon:
MCC 1-35A (B5) Laundry Pump 1A

Available:
MCC 1-35A (B3) Waste Evaporator Feed Pump
MCC 1-35A (B4) Sump Tank Pump 1A
MCC 1-35A (A5) Sludge Interceptor Pump
MCC 1-45A (A4) Laundry Pump 1B
MCC 1-45A (A5) Sump Pump 1B

E-255, Circuit Diagram 480V MCC 1-35B, & 1-45B
Abandon:
MCC 1-35B (B2) Waste Condensate Pump 1A

Available:
MCC 1-45B (B4) Waste Condensate Pump 1B

4.0 Evaluation (Basis for choosing category type):

Purpose/Function

The Radioactive Liquid Waste Disposal (WD) System collects radioactive wastes produced by the operation of the nuclear plant and processes the waste as required to permit disposal within established limits of 10 CFR 20.

Radioactive water is collected in various sumps and tanks. This collected water is generally categorized as reusable, and must be processed before disposal. Drains and leakoff from equipment containing Reactor Coolant (RC) are collected in the RCDT and in the DDT. RCDT liquid is transferred directly to the CVCS Holdup Tank or can be pumped to the Waste Holdup Tank. DDT liquid is normally pumped to the CVCS Holdup Tank. Potentially radioactive liquid from sources other than RC is collected in the Waste Holdup Tank. Drains from the laundry and showers are collected in the laundry tanks. These liquids are usually sampled and released, or if not, stored for future processing.

Liquids can be discharged to the sanitary sewer line via Valve WD-20, but are routinely discharged to the Auxiliary Building (Aux. Bldg.) standpipe (via Valve WD-22) through Radiation Detector R-18 and automatic Control Valves WD-18/CV-31627 and WD-19/ CV-31138. Valve WD-19 automatically trips closed on a high radiation signal from Detector R-18.

Basis for Category
The portions of the system that are being abandoned are associated with the Reactor Coolant Drain Tank and 1 Laundry Pump and 1 Waste Condensate Pump.

On February 25, 2013, DEK submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2).

The basis for the abandonment category for the Liquid Radioactive Waste system is determined by screening to the following criteria:

1. To prevent or mitigate the consequences of a design basis accident of a permanently defueled plant.
2. Fuel Handling Accident as defined in Updated safety Analysis Report (USAR).
3. For safe storage and handling of radioactive waste or spent fuel.
4. The Requirements of Technical Specifications, Technical Requirements Manual, License Requirements, Design Basis, permits, regulatory requirements, insurance requirements, other commitments, safe storage of spent fuel, or support of the Radiological Effulent Monitoring / Offsite Dose Calculation Manual for KPS.
5. The requirements of SSCs that support the execution of plans and programs at KPS (e.g., Security Plan, Fire Protection Plan, Emergency Management Plan, Radiation Protection Program).
6. Support day to day operations in the decommissioning plant.
7. Support decommissioning efforts.

The abandoned portions of the Liquid Radioactive Waste system are not required to support the above criteria. The active portions support item 3, 4, 6, and 7 above.

Regulatory Impact
Updated Safety Analysis Report (USAR)

On February 25, 2013, DEK submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2). Since KPS will no longer be authorized to operate or place fuel in the reactor the functions credited in the USAR associated with the abandoned equipment are no longer required. The USAR will be revised to address requirements following cessation of power operation.

The USAR will require revision to reflect abandonment of the Reactor Coolant Drain Tank and associated piping. Portions of the liquid radioactive waste system are being abandoned. i.e. Laundry Pump A, Waste Condensate Pump A. These SSCs are mentioned in the following chapters/sections:

6.2.2.2.1 Accumulators
The level of borated water in each accumulator tank is adjusted as required during normal plant operations. Water is added from the Refueling Water Storage Tank (RWST) using a safety injection pump. The maximum boron concentration for the RWST also applies to the SI accumulator. Water level is reduced by draining to the reactor coolant drain tank. Local samples of the solution in the tanks are taken for periodic checks of boron concentration.

11.1.2.7 Reactor Coolant Drain Tank
The reactor coolant drain tank is a right circular cylinder with spherically dished heads. The tank, which is all welded stainless steel, serves as a drain collection point for the RCS and other equipment located inside the Reactor Containment. The tank contents can be discharged to the waste holdup tank, refueling water storage tank or the CVCS holdup tanks.

11.1.2.1.1 Liquid Processing
The Liquid Waste Disposal System collects, processes, stores and disposes of radioactive liquid waste originating in the plant.
The major sources of liquid waste are:
- Reactor Coolant System drainage
- Deaerated equipment drains and leaks
- Aerated equipment drains and leaks
- Chemical laboratory drains
- Decontamination area drains
- Radioactive laundry and hot shower drains
- Sampling System

These liquids flow to the reactor coolant drain tank or suction of the reactor coolant drain tank pumps and are discharged either directly to the CVCS holdup tanks or to the waste holdup tank by the reactor coolant drain pumps. These pumps can also return water from the refueling cavity to the RWST. There is one reactor coolant drain tank with two reactor coolant drain tank pumps located inside of the Containment.

Table 11.1-2
WASTE DISPOSAL COMPONENTS CODES
Reactor Coolant Drain Tank

Table 11.1-3
COMPONENT SUMMARY DATA
Reactor Coolant Drain
Laundry and Hot Shower
Waste Condensate

Technical Specifications
On February 25, 2013, DEK submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2). Therefore, the LCOs (and associated Surveillance Requirements (SRs)) that only apply in Modes 1 thru 6, are no longer applicable.

A review of technical specifications did not identify any specific requirements associated with SSCs that are being categorized as abandoned.

Technical Requirements Manual (TRM)
On February 25, 2013, DEK submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2). Therefore, the TNC's (and associated Technical Verification Requirements (TVR's)) that only apply in Modes 1 thru 6, are no longer applicable.

A review of the technical requirements manual did not identify any specific requirements associated SSCs that are being categorized as abandoned.

Offsite Dose Calculation Manual (ODCM)
On February 25, 2013, DEK submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR

50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2).

A review of the ODCM identified that the Laundry Tanks, Filter, and Waste Condensate Tanks are included in the Liquid Radioactive Effluent Flow diagram (ODCM Figure 1); however, there are no specific ODCM requirements to maintain these components in service. One train of the Laundry Pump and Filter will be maintained in service to process liquid wastes as needed to permit disposal within ODCM and 10CFR20 limits.

Licensing Commitments

On February 25, 2013, DEK submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2). Since the KPS license will be modified to a possession only license, the regulatory commitments associated with the portions of the Miscellaneous Sumps and Drains System being abandoned will not be maintained. These commitments will be dispositioned per LI-AA-110, Commitment Management.

A search of the licensing department folder "All True Commitments By Number" did not identify any commitments associated SSCs that are being categorized as abandoned.

A review of USAR Table 15.7-1, License Renewal Commitments, did not identify any commitments associated SSCs that are being categorized as abandoned.

Plant Impact

Changes are required to Laundry and Waste Condensate Tank operation procedures.

There is no impact on any temporary changes that are active as of 3-7-2014.

The Drawing Control Team did not identify any outstanding drawing changes that required disposition as a result of system abandonment.

5.0 Special conditions to support categorization(s):

None

6.0 Assumptions/Open items to be validated or dispositioned:

Open item: Change Laundry and Waste Condensate Tank procedures to reflect only using one pump & filter for Laundry system, and one pump in Waste Condensate system.

7.0 Expected duration for SSC category if NOT ABANDONED:

Available SSCs in the Liquid Radioactive Waste system are expected to remain available until plant demolition.

8.0 **PREPARE** and **ATTACH** the following documents:

- Completed 10 CFR 50.59 Screening or Evaluation, if required
- Proposed DUs for appropriate drawings

9.0 Technical Concurrence:

Type Of Review	Name (Print)	Approval Signature	Date
Engineering	DAVID DEGRAVE	[signature]	3-27-14
Type Of Review Fire Protection	Name (Print) Michael Townsend	Approval Signature [signature]	Date 4/7/14
Type Of Review Security	Name (Print) David Falk	Approval Signature [signature]	Date 4-7-14
Type Of Review	Name (Print)	Approval Signature	Date
Type Of Review Radiation Protection	Name (Print) Daniel J. Shannon	Approval Signature [signature]	Date 3-27-14
Type Of Review	Name (Print)	Approval Signature	Date
Type Of Review	Name (Print)	Approval Signature	Date
Type Of Review	Name (Print)	Approval Signature	Date

10.0 Review and Approval:

Rick Steinhardt	3-11-14
Prepared By (Print/Sign)	Date
DAVID DeGRAVE	3-11-14
Reviewed By (Screen Qual.) (Print/Sign)	Date
C. S. SMOKER	3/11/14
Nuclear Licensing (Print/Sign)	Date
William Swanson	3/13/14
Concurrence by DSERT Coordinator (Print/Sign)	Date
Jeffrey Stafford	4-7-14
FSRC (Print/Sign), if required	Date

FSRC Meeting Number: 14-007

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Drawing Update Request (DUR)

SECTION 1 Requestor

Name (Print)	Date
Rick Steinhardt	01/21/2014

SECTION 2 Change Description

Attach drawing markup and/or describe the change:

Color code drawings to identify portions of the Liquid Radioactive Waste system which will be abandoned in red and available in blue per OP-KW-DEC-SYC-001, System Evaluation and Categorization.

Provide Change Purpose Number (Modification, CR, Work Order, or other applicable change number):

N/A

List document(s) supporting drawing change:

OP-KW-DEC-SYC-001,	System Evaluation and Categorization.	Attachment B.

SECTION 3 List Drawings to Update

OPERXK-100-131 WGS
E-251 WGS
E-252 WGS
E-254 WGS
E-255 WGS

Submit to Configuration Management

Document Number: DUR 14-31

Draining will require an appropriately sized container and putting fluids back into Laundry Tanks, as fluids could damage SGBT resins.

This attachment provides instruction to Isolate and drain Waste Disposal - Liquid System.

INT	Valve Number	Nomenclature	Location	Position	Notes

ISOLATION BOUNDARIES

Laundry Pump A Area

INT	Valve Number	Nomenclature	Location	Position	Notes
[illegible]	MD(R)-102A	Laundry Pump 1A Suction		CLOSED	Boundary
[illegible]	MD(R)-104A	Laundry Pump 1A Discharge		CLOSED	Boundary
[illegible]	MD(R)-113A	Laundry Pump 1A Discharge Drain		CLOSED	Boundary
[illegible]	MD(R)-112A	Laundry Pump 1A Casing Drain		Uncapped/open	

Laundry Filter A Area

INT	Valve Number	Nomenclature	Location	Position	Notes
[illegible]	MD(R)-104A-1	Laundry Filter 1A Inlet		CLOSED	Boundary
[illegible]	MD(R)-104A-2	Laundry Filter 1A Outlet		CLOSED	Boundary
[illegible]	MD(R)-150A	Laundry Filter 1A Drain		OPEN	
[illegible]	MD(R)-151A	Laundry Filter 1A Vent		Uncapped/Open	

Waste Condenste Tank A Area

INT	Valve Number	Nomenclature	Location	Position	Notes
[illegible]	WD-14A	Waste Cond Tank Pump 1A Supply		CLOSED	Boundary
[illegible]	WD-16A	Waste Cond Pump 1A Disch		CLOSED	Boundary
[illegible]	WD-39A	Waste Cond Pump 1A Disch Drain		Uncapped/Open	
[illegible]	WD-38A	Waste Cond Pump 1A Casing Drain		Uncapped/Open	

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Hazard Removal Plan

SYSTEM NAME: LIQUID RADIOACTIVE WASTE

SSC STATUS (Category A or X): AX

SYSTEM NUMBER: SYS-32A-DSERT

The following describes the process that will be used to remove hazards (such as oil, glycol, etc.) from the SSC. The process for removal of water is described in the Drain Plan.

Internal Hazards shall be removed in accordance with applicable permits and stored in appropriate locations. **COORDINATE** with Fire Protection, Health Physics and Waste Services to arrange for final removal and disposal.

☒	REMOVE OIL FROM 1A WASTE CONDENSATE PUMP (145-201) PER PMP-32A-01 Done Kelly L. Gretz 4-16-14
☒	REMOVE OIL FROM 1A LAUNDRY PUMP (145-331) PER PMP-32A-01 Done Kelly L. Gretz 4-16-14
☒	REMOVE FILTERS FROM 1A LAUNDRY TANK DISCHARGE FILTER. Done by HP on 4/17/14
☒	REMOVE OIL FROM RX CAVITY FILTRATION PUMP (143-031) Done Kelly L. Gretz 4-23-14
☐	
☐	
☐	

Dominion

Hazard Removal Plan

SYSTEM NAME: Waste Disposal - Liquid SYS-32A-DSERT **SSC STATUS** (Category A or X): AX

The following describes the process that will be used to remove hazards (such as oil, glycol, etc.) from the SSC. The process for removal of water is described in the Drain Plan.

Internal Hazards shall be removed in accordance with applicable permits and stored in appropriate locations. **COORDINATE** with Fire Protection, Health Physics and Waste Services to arrange for final removal and disposal.

☒	The following Magnetrol switches which contain mercury switch bulbs and require removal of the mercury bulb. 26839 WASTE HOLD-UP SLUDGE INTERCEPTOR TANK LIC
☐	Decision was made to not remove mercury at this time. WGS 7-1-14
☐	
☐	
☐	
☐	
☐	

Dominion

Other Activities Plan

SYSTEM NAME: Waste Disposal - Liquid **SSC STATUS** (Category A or X): AX
SYSTEM NUMBER: SYS-32A-DSERT

Other activities may be required to place an SSC its lowest energy state. Said activities may include, but are NOT limited to complete de-energization. The following describes the process that will be used to conduct such activities in support of the SSC categorization.

Independent review of power supplies.

GARY AHRENS [signature] 4/7/14

Print/Sign/Date

☒	MCC-32E (C4) Reactor Coolant Drain Tank Pump 1A Bkr	E-251
	MCC-32E Cub. C4 OFF Aux BLDG mezz	1-159
☒	MCC-42E (E6) Reactor Coolant Drain Tank Pump 1B Bkr	E-252
	MCC-42E Cub. E6 OFF Aux BLDG mezz	1-189
☒	MCC-35A (B5) Laundry Pump 1A Bkr	E-254
	MCC-35A Cub. B5 OFF Aux BLDG Basement (Laundry)	1-174
☒	MCC-35B (B2) Waste Condensate Pump 1A Bkr	E-255
	MCC-35B Cub. B2 OFF Aux BLDG basement (Gas Stripper)	1-039
☐		
☐		

Dominion

Recommended "Abandoned" Label Location

SYSTEM NAME: Waste Disposal - Liquid **SSC STATUS** (Category A or X): AX

SYSTEM NUMBER: SYS-32A-DSERT

The following table describes the placement location of "Abandoned" labels. The labels are used to indicate the abandoned status of a SSC.

"ABANDONED" LABEL LOCATIONS		
Labels Installed		Component and Location
Initial	Date	
[illegible]	4/16/14	MCC-32E (C4) Reactor Coolant Drain Tank Pump 1A Bkr
[illegible]		MCC-42E (E6) Reactor Coolant Drain Tank Pump 1B Bkr
[illegible]		MCC-35A (B5) Laundry Pump 1A Bkr
[illegible]		MCC-35B (B2) Waste Condensate Pump 1A Bkr
[illegible]		Switch - Laundry Pump 1A Start/Stop PB - ES19402
[illegible]		PI-1018D - Laundry Pump A Discharge PI 11162
[illegible]		PI-1018G - Waste Condensate Pump A Discharge PI 11165
[illegible]		Switch - Waste Condensate Pump 1A Start/Stop PB - ES19405
[illegible]	4/21/14	5340701 - STOP IND LITE 5340702 - START IND LITE > WASTE COND PP A IND LITES ON WASTE PNL
[illegible]	4/21/14	LAUNDRY P/A IND LITES ON WASTE PNL 5340101- STOP IND LITE 5340102- START IND LITE

Dominion

Recommended WO Closure List

SYSTEM NAME: LIQUID RADIOACTIVE WASTE **SSC STATUS** (Category A or X): AX
SYSTEM NUMBER: SYS-32A-DSERT

The following list identifies recommended Work Orders that may be closed/canceled as a result of the system categorization noted above.

WORK ORDERS CLOSED/CANCELED			
Work Order Closed		Work Order	Description
Initial	Date		
a	4/7	KW100583016 90	MD(R)-142B-51
		KW100583059 90	MD(R)-142B-41
		KW100583060 90	MD(R)-142B-31
		KW100583061 90	MD(R)-142B-21
a	4/8	KW100601032 20	RX CAVITY FILTRATION PUMP
		KW100603400 20	RX CAVITY FILTRATION PUMP
		KW100674532 35	DDT TANK
		KW100883781 20	RC-506B
		KW100721110 20	WG-32B
		KW100783896 22	WCT Pump A Green Light
a	4/7	KW100356867 95	MCC-42E (E6)

1.0 Doc Type: Report Revision No.: 0 Date: 11/20/2013
Sub Type: DEC
Document Number (ID): SYS-32D-DSERT
Title: Solid Radioactive Waste

1.1 Brief description or reason for revision: Not applicable for Rev 0

2.0 System Category (Check Appropriate):

NOTE:	*A SSC may be divided and have more than one category determination depending upon its functional requirements.*

☒ Available (Category A) ☒ Abandoned (Category X)

Describe the assessed boundaries:

This is a partial functional abandonment of the Solid Radioactive Waste system. Parts of the system remaining available include:

- Spent Resin Storage Tank
- Radwaste Compactor

The following instrument boundaries will be abandoned along with their respective sensing lines:

ES-19495, LI-18014, L-24006, PI-11316, FI-18205, DPS-16415, PI-11426, PS-16133, LI-18038, LT-24069, PS-16171, FT-23038, PI-11634, PS-16899, LC-53809

3.0 Mark up the affected drawings using color coding to identify system category type and boundaries. These drawings are to include system, electrical one-line and distribution, and select building and isometric drawings. Related system drawings <u>NOT</u> incorporated in the system category require an explanation. **REFER** to Step 2.7 for a list of drawings.

OPERM-385, Flow Diagram Radioactive Waste Solidification
Available:
Spent Resin Storage Tank including Station Air and Makeup Water to the tank
Dewatering Pump

Abandon:
Waste Metering Tank
Waste Feeder Pump
Mixer/Feeder
Ultrasonic Level Sensing Equipment (Waste Metering Tank and Drum Fill)

Bucket Elevator & Bag Dump Station
Cement Bin/Hopper
Cement Conveyor
Dust Collector
Drum Handling System
Drum Capper
Drum Decontamination Station
Waste Metering Tank

Boundary valves:
MU-1042-60, 1 IN. VALVE-MANUAL-REACTOR MAKE-UP WTR TO WASTE CONC. HOLD-UP TK-I
MU-1042-55, 0.5 IN. VALVE-MANUAL-REAC M-U WTR TO LI-18014 WST CONC HLD UP TK
MU-1042-50, 1 IN. VALVE-MANUAL-REACTOR MAKE-UP WTR TO WASTE CONC. HOLD-UP TK-O
MU-1041, 1 IN. VALVE-MANUAL-REACTOR MAKE UPWTK TO RADWASTE DECON STATION
RWS-4, 2 IN. VALVE-CONTROL-WASTE FEEDER TO SPENT RESIN STORAGE TANK
RWS-32, 2 IN. VALVE-MANUAL-SPENT RESIN STORAGE TANK DISCHARGE
RWS-5, 2 IN. VALVE-CONTROL-WASTE FEEDER BY-PASS
MU-1042-30, 1 IN. VALVE-CONTROL-DEWATERING PUMP VALVE
MU-1042-3, 1.5 IN. VALVE-CONTROL-REACTOR MAKE-UP WATER INLET
RWS-8, 1 IN. VALVE-MANUAL-SOLID WASTE METERING TANK DEWATERING PUMP TO RE

E-255, Circuit Diagram 480V MCC 1-35B & 1-45B
Available:
MCC 1-35B (A2) Radwaste Compactor Hydraulic Pack and Exhaust Fan

> Note: On E-263 MCC 1-45G (A2), Radwaste Distribution Cabinet Transformer, supplies Distribution Panel RW1-1 (E-2473). On RW1-1, security equipment is supplied by breaker 9 therefore MCC 1-45G (A2) must remain available.

E-263, Circuit Diagram 480V MCC 1-45G & 1-32H
Available:
MCC 1-45G (F5) Spent Resin Storage Tank Inlet RWS 40/MV32351
MCC 1-45G (A2) Radwaste Distribution Cabinet Transformer
MCC 1-45G (A4) Radwaste Transfer Cart
MCC 1-45G (B4) Dewatering Pump

Abandoned from the electrical breaker out:
MCC 1-45G (F3) Mixer/Feeder Flush Booster Pump
MCC 1-45G (E1) Drum Storage Aisle Conveyor
MCC 1-45G (E2) Drum to Storage Conveyor
MCC 1-45G (E3) Chain Transfer Conveyor
MCC 1-45G (E4) Decon Sta Conveyor

MCC 1-45G (D2) Radwaste Drum Processing & Storage Control Panels
MCC 1-45G (D3) Radwaste Cement Feeder
MCC 1-45G (D5) Transfer Car
MCC 1-45G (D6) Drum Fill Station Conveyor
MCC 1-45G (F4) Waste Concentrate Holdup Tank Inlet MD(R)501/MV32350
MCC 1-45G (A1) Radwaste Station Handling Crane
MCC 1-45G (A3) Chain Transfer Conveyor
MCC 1-45G (A5) Boric Acid Concentrates Filter Hoist
MCC 1-45G (B1) Radwaste Metering Tank Electric Heaters
MCC 1-45G (B2) Radwaste Drum Conveyor
MCC 1-45G (B3) Radwaste Tank Agitator
MCC 1-45G (B5) Radwaste Feeder
MCC 1-45G (B6) Radwaste Mixer Feeder
MCC 1-45G (C1) Cement Storage Bin Activator
MCC 1-45G (C2) Dust Collector Blower
MCC 1-45G (C3) Radwaste Cement Feeder Vibrator
MCC 1-45G (C4) Cement Bag Dump Station and Bucket Elevator
MCC 1-45G (C6) Drum Decon Station Hood

E-2473, Wiring Diagram-Auxiliary Relay Cabinet & Distribution Panel
Available:
Distribution Panel RW1-1 Circuit 1, Solidification Panel A (Power to 24007 and 33349 which support Spent Resin Storage Tank operation)
Distribution Panel RW1-1 Circuit 9, Mux 4 A/C Unit (Security equipment)

Abandon:
Distribution Panel RW1-1 Circuit 13, Drum Capping Panel A2
Distribution Panel RW1-1 Circuit 15, Cement Control Panel A5
Distribution Panel RW1-1 Circuit 12, Junction Box B
Distribution Panel RW1-1 Circuit 14, Drum Decon Panel A3
Distribution Panel RW1-1 Circuit 16, 17, 18 Waste Concentrates Heat Tracing Panel

4.0 Evaluation (Basis for choosing category type):

Purpose/Function

The Solid Radioactive Waste system is designed to collect, prepare and package Solid Radioactive Waste for shipment to a processor or direct to a burial site.

Functions of the Solid Radioactive Waste system include the following:

- Solidification processing performed remotely to minimize personnel radiation exposure.
- Compacting dry active waste to minimize the volume required to be transported to a burial site.
- Packaging radioactive solid wastes in acceptable waste containers prior to shipment to a licensed burial site.
- Ensuring storage, labeling, surveying, and identification of solid waste packages are in accordance with plant procedures.
- Ensuring the radiation level on contact of the packaged wastes meet the requirements.

Basis for Category

On February 25, 2013, DEK submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2).

With irradiated fuel being stored in the SFP and the ISFSI, the reactor, RCS and secondary system are no longer in operation and have no function related to the storage of the irradiated fuel. Therefore, the postulated accidents involving failure or malfunction of the reactor, RCS or secondary system are no longer applicable. USAR Chapter 14 accidents/transients that are applicable include: Fuel Handling Accident (FHA), Accidental Release –Recycle of Waste Liquid while radioactive gases and liquids are still present.

The available portions of Solid Radioactive Waste system do perform a function or provide support for Items 3-7 below. The abandoned portions do not perform a function or provide support of any of the following items:

1. To prevent or mitigate the consequences of a design basis accident of a permanently defueled plant.

2. Fuel Handling Accident and Gas Decay Tank Rupture as defined in Updated safety Analysis Report (USAR).

3. For safe storage and handling of radioactive waste or spent fuel.

Requirements, Design Basis, permits, regulatory requirements, insurance requirements, other commitments, safe storage of spent fuel, or support of the Radiological Effulent Monitoring / Offsite Dose Calculation Manual for KPS.

5. The requirements of SSCs that support the execution of plans and programs at KPS (e.g., Security Plan, Fire Protection Plan, Emergency Management Plan, Radiation Protection Program).

6. Support day to day operations in the decommissioning plant.

7. Support decommissioning efforts.

Regulatory Impact

Updated Safety Analysis Report (USAR)

The Solid Radioactive Waste system is mentioned in the following chapters/sections:

Section 11.1.2.4 Solids Processing
The Waste Disposal System is designed to package solid wastes for removal to burial facilities. Miscellaneous materials such as paper and plastic are collected, analyzed, packaged and shipped from the site per Kewaunee's Solid Radioactive Waste Process Control Program (PCP).

The PCP contains the current formulae, sampling, analyses, tests, and determinations to be made to ensure that the processing and packaging of solid radioactive wastes, based on demonstrated processing of actual or simulated wet solid wastes, will be accomplished in such a way as to ensure compliance with 10 CFR Part 20, 10 CFR Part 61, 10 CFR Part 71, Federal and State regulations, burial ground requirements, and other requirements governing the disposal of the radioactive waste.

Section 11.1.2.13 Baler
A hydraulically operated baler is used to compress solid wastes into containers. The baler is operated manually from a local station and is enclosed, supplied with a dust shroud to prevent escape of radioactive particulate matter, and is vented to the Auxiliary Building Ventilation System.

Section 11.1.3.3 Solid Wastes
Solid wastes consist of filters, spent resins and miscellaneous materials such as paper and plastic. All solid wastes are packaged as described in Section 11.1.2.4, "Solids Processing" for removal to a burial facility. Table 11.1-1 contains a summary of the typical annual average solids (exclusive of solidified resins shipped for burial) shipped from the plant.

Technical Specifications
The Solid Radioactive Waste system is not explicitly identified in technical specifications. Technical Specification 5.6.2, Radioactive Effluent Release Report, The Radioactive Effluent Release Report covering the operation of the unit in the previous year shall be submitted by May 1 of each year in accordance with 10 CFR 50.36a. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and Process Control Program and in conformance with 10 CFR 50.36a and 10 CFR Part 50, Appendix I, Section IV.B.1.

Offsite Dose Calculation Manual (ODCM):
The Solid Radioactive Waste system is not explicitly identified in the ODCM. However it is mentioned in the following administrative section:

15.1 Major Changes to Radioactive Waste Systems
15.2 Radioactive Effluent Release Report

Licensing Commitments
A search of licensing commitments using the following file path S:\KEWAUNEE\4\DATA1\LICENSING\Commitments\COMTRAKS\TRUECOMMITMENTS\ALL TRUE Commitments by Number, did not identify any open commitments related to the Solid Radioactive Waste system. Additionally the license renewal commitments in table 15.7-1 of the USAR were reviewed and no commitments related to the Solid Radioactive Waste system were identified.

Plant Impact
No changes are required to SSCs, procedures, programs, processes, etc.

There is no impact on any temporary changes that are active as of 1/23/2014.

The Drawing Control Team did not identify any outstanding drawing changes that required disposition as a result of system abandonment.

5.0 Special conditions to support categorization(s):

None

6.0 Assumptions/Open Items to be validated or dispositioned:

OPEN: USAR will require update for above items in regulatory impact section above.

7.0 Expected duration for SSC category if <u>NOT</u> ABANDONED:

Available SSCs in the Solid Radioactive Waste system are expected to remain available until plant demolition.

8.0 **PREPARE** and **ATTACH** the following documents:

- Completed 10 CFR 50.59 Screening or Evaluation, if required
- Proposed DUs for appropriate drawings

9.0 Technical Concurrence:

Type Of Review	Name (Print)	Approval Signature	Date
Engineering	DAVID DEGRAVE		1-22-14
Type Of Review Fire Protection	Name (Print) Michael Townsend	Approval Signature	Date 12/30/13
Type Of Review Security	Name (Print) David Falk	Approval Signature	Date 1-22-14
Type Of Review	Name (Print)	Approval Signature	Date
Type Of Review Radiation Protection	Name (Print) Mark [illegible]	Approval Signature	Date 1-23-14
Type Of Review	Name (Print)	Approval Signature	Date
Type Of Review	Name (Print)	Approval Signature	Date
Type Of Review	Name (Print)	Approval Signature	Date
Type Of Review	Name (Print)	Approval Signature	Date

10.0 Review and Approval:

Rick Steinhardt	12/19/13
Prepared By (Print/Sign)	Date
DAVID DEGRAVE /	12-19-13
Reviewed By (Screen Qual.) (Print/Sign)	Date
C J SWACKER /	12/19/13
Nuclear Licensing (Print/Sign)	Date
William Swanson	1/22/14
Concurrence by DSERT Coordinator (Print/Sign)	Date
Jeffrey Stafford	1-30-14
FSRC (Print/Sign), if required	Date

FSRC Meeting Number: 14-003

Dominion

Design Change Control

Design Change Number: KW-14-02008 Rev 0	**System ID: 17 and 45**		
Design Change Title: Disable R-13/R-14 Trip of Aux Bldg Exhaust Fans			
☐ SR ☐ NSQ ☒ NS	**Work Order Number(s): KW100982361**		
Preparer:			
Preparer (Print) Dean Anderson	Signature	Date 5/6/14	
Reviewer(s):			
Reviewer (Print) ☒ IND ☐ PEER Dale Charapata	Signature	Date 5/7/14	
System Engineer (Print) BRIAN O'CONNELL	Signature	Date 5/7/14	
Other (Print) ☐ IND ☒ PEER/AFFILIATION **Daniel J. Shannon** / RP / Decommissioning	Signature	Date 5/7/14	
Other (Print) ☐ IND ☒ PEER/AFFILIATION *SECTION 3 OF DESIGN DESC. DEAN ANDERSON FOR WILLIAM EAKIN PER TELECOM	Signature	Date 5/20/14	
Other (Print)/AFFILIATION	Signature	Date	
Chair Facility Safety Review Committee (Print/Sign) JEFFREY T. STAFFORD		Mtg No. 14-011	Date 5-19-14
Engineering Supervisor/Designee (Print/Sign) MICHAEL R. HANKOSKY			Date 05/20/2014

Approved for Implementation Phase?

	Print Name	Signature	Date
Project Manager:	N/A		

Ready to Install:

	Print Name	Signature	Date
Responsible Engineer:	DEAN ANDERSON		10/1/14

Acceptance/Turnover: Plant modification is installed, tested, and turned over. (Items listed as required for turnover are complete or punchlisted.)

	Print Name	Signature	Date
Responsible Engineer:	DEAN ANDERSON		10/2/14

Closeout: Plant modification is complete. (Includes completion of all remaining items listed.)

	Print Name	Signature	Date
Responsible Engineer:	DEAN ANDERSON		10/7/14
Engineering Supervisor:	J. W. McNAMARA	J.W. McNamara	10/7/14

CHANGE INITIATION: Modification Number (if assigned): KW-14-02008

Title: Disable R-13/R-14 Trip of Aux Bldg Exhaust Fans

Quality Class: NS

System Code: 17 and 45 Initiating Reference: REA 2013-018

Description (add additional pages as required):

Diabatic Heatup calculation (S&L 2013-11284 Maximum Cladding and Fuel Temperature Analysis for Uncovered Spent Fuel Pool) shows that a loss of all water in the pool will not result in a Zr fire after October 30th, 2014 if one of two Auxiliary Building exhaust fans are operating to provide cooling by the Spent Fuel Pool area. The radiation levels as a result of the loss of water may result in an actuation of the trip function of R-13 and R-14 Auxiliary Building Vent Radiation Monitors. The trip function results in tripping the Auxiliary Building Exhaust Fans. This modification will disable the trip function that secures the Auxiliary Building Exhaust fans and isolates their associated discharge dampers.

Initiated By: Dean Anderson (Print Name) 1/6/14 (Date)

CHANGE DETERMINATION:	**YES**	**NO**	
1. Is change an Equivalent or Document Only change?	☐	☒	If **YES,** use CM-KW-IEE-301 for equivalent and CM-KW-ETE-101 for document only. Skip question 2 below. If **NO**, complete page 2 and then answer question 2 below.
2. Is change a Safety Related, Augmented Quality, or Commercial Controls change?	☒	☐	If **YES,** document process below and proceed with Attachment B. If **NO**, the activity may be implemented under the Work Order (WO) process.

Attach additional justification, if needed.

CONFIGURATION CHANGE TYPE:

The screening results may be modified with Engineering Manager approval. The proposed change should be rescreened and reclassified if necessary during the design phase. The classification should be noted below, along with any comments or justification. Attach additional pages if necessary. The cognizant supervisor shall specify below the document(s) to be updated to reflect the ABANDONED System Alteration (ASA) and any documentation to be included in the WO package to catalog technical bases for the ASA determination (e.g., seismic assessment, 50.59 assessment beyond scope of abandonment 50.59, if needed).

☐ Safety Related Modification ☒ Augmented Quality Modification ☐ Commercial Controls change

☐ ABANDONED System Alteration

Comments: None

Screened By:	Dean Anderson / [signature] Print/Sign	5/6/14 Date
Reviewed By:	Michael R. Hankosky / [signature] Print/Sign	5/6/2014 Date

MODIFICATION CLASSIFICATION

1. Does change involve nuclear safety related structures, systems or components, (SSCs)?	☐ Yes	☒ No
If YES, change is a SAFETY RELATED PLANT MODIFICATION. Return to page 1.		
2. Does change involve SSCs whose functions impact the safety analysis or AVAILABLE SSCs that are designated as NSQ/Augmented Quality? Although not safety related, would this modification benefit from the additional controls similar to a safety related modification?	☒ Yes	☐ No
3. Does the change involve ISFSI-related important to safety SSCs or activities as defined by 10CFR72?	☐ Yes	☒ No
4. Programs Interaction – Does change have the potential to impact the following programs: Fire Protection, Accident Initiation, PA Security, or Emergency Planning?	☐ Yes	☒ No
If YES, change is an AUGMENTED QUALITY MODIFICATION. Return to page 1.		
5. Does change involve AVAILABLE SSCs whose functions are subject to special consideration or would this change benefit from the modification process?	☐ Yes	☐ No
6. Systems Interactions – Does change have interfaces with the potential to impact any AVAILABLE plant SSCs, programs, or processes such as: electrical power distribution systems, HVAC, pneumatic systems, instrument air capacity, instrumentation and controls systems, cooling water systems, or pipe system pressure rating?	☐ Yes	☐ No
7. Programs Interaction – Does change have the potential to impact programs such as: Maintenance Rule (10 CFR 50.65), Seismic 2/1, ALARA, Radwaste, personnel safety, EMI/RFI, chemical control, OCA security, or process computer (PPCS)?	☐ Yes	☐ No
8. Does change involve AVAILABLE SSCs whose function requires engineering controls? Does the change involve significant plant impact? Does the change require significant engineering involvement? Is the change interdisciplinary, multifaceted, or complex? Does it require the use/application of general industry codes? Would the change benefit from the configuration control aspects of performing?	☐ Yes	☐ No
If YES, change is a COMMERCIAL CONTROLS CHANGE. Return to page 1.		
Comments, clarifications, explanation (Attach additional sheets if required):		
9. Does change involve ONLY ABANDONED SSCs (i.e., there are no direct/indirect seismic effects upon AVAILABLE SSCs)? ABANDONED system boundaries between AVAILABLE and ABANDONED systems (other than air gaps) are considered part of the AVAILABLE system.	☐ Yes	☐ No
If YES, change is an ABANDONED SYSTEM ALTERATION. Return to page 1.		

Modification Number: KW-14-02008 Revision: 0

Modification Title: Disable R-13/R-14 Trip of Aux Bldg Exhaust Fans

Use this form to identify and track documents included in the modification package. Required items shall be included except as noted. Recommended items shall be included unless a written justification is included in the space provided on this form. Optional items may be included if they benefit the package. Add items as appropriate.

Identify items included in this package			TYPE (Check One)		
X	Form	Form or Document Title [1]	Safety Related ☐	Augmented Quality ☒	Commercial Controls Change ☐
☒	CM-KW-DDC-201 Attach A	Configuration Change Process Screening	Recommended	Recommended	Recommended
☒	CM-KW-DDC-201 Attach B	Modification Package Index	Required	Required	Recommended
☒	CM-KW-DDC-201 Attach C	Design Change Control	Required	Required	Recommended
☐	CM-KW-DIA-101 Attach B	Design Interface Agreement (Check if not applicable ☒)	Required, if applicable	Recommended, if applicable	Optional
☒	CM-KW-DDC-401 Attach A	Design Input Checklist (Part A) - Engineering Programs and Departmental Reviews	Required	Required	Optional
☒	CM-KW-DDC-401 Attach B	Design Input Checklist (Part B) - Design Considerations, Requirements, and Standards	Required	Recommended	Optional
☒	CM-KW-DDC-401 Attach C	Design Input Consultation(s) (Check if none ☐)	Required, if applicable	Required, if applicable	Optional
☒	CM-KW-DDC-201 Attach D	Design Change Description	Required	Required	Recommended
☒	No Form	Installation Plan [2] (Check if no installation ☐	Required, if applicable	Required, if applicable	Optional
☒	No Form	Test Plan [2] (Check if no Testing Required ☐	Required, if applicable	Required, if applicable	Optional
☐	CM-KW-DDC-501 Attach C	FMEA Worksheet	Required, if applicable	Required, if applicable	Optional
☒	Applicable CM-KW-400 Forms	10 CFR 50.59/10 CFR 72.48 Pre-Screening [3] (Check if not required or not applicable ☐)	Required, if applicable	Required, if applicable	Required, if applicable
☒	Applicable CM-KW-400 Forms	10 CFR 50.59/10 CFR 72.48 Screening [3] (Check if not required ☐)	Required, if applicable	Required, if applicable	Required, if applicable
☐	Applicable CM-KW-400 Forms	10 CFR 50.59/10 CFR 72.48 Evaluation [3] (Check if not required ☒)	Required, if applicable	Required, if applicable	Required, if applicable
☒	No Form	Independent Review	Required	Recommended	Optional
☐	CM-KW-REV-101 Attach C	Design Review Comments (Check if no comments ☐)	Required, if applicable	Recommended, if applicable	Optional
☒	CM-KW-PIL-101 Attach B	Plant Impact List (Check if no impact ☐)	Required	Required	Recommended
☒	CM-KW-PIL-101 Attach D	Training Evaluation	Required	Required	Optional
☐	CM-KW-PIL-101 Attach C	Plant Impact Review Request(s)	Optional	Optional	Optional
☒	CM-KW-DDC-201 Attach H	Turnover and Closeout Control	Required	Required	Recommended

☒ **All applicable Recommended items shall be included with this package.**
Print name, Sign, and Date "Prepared By" block below.

☐ **Not all applicable Recommended items are included in this package.** Complete section below for each applicable Recommended item exempted from package inclusion - exemption requires two signatures.

	Form	Form or Document Title	Give the reason that each Recommended item is not needed for this package. This exemption is not required for items that are not applicable (omitted) in accordance with the conditions described on this form. Expand table or attach additional pages as needed.
1			
2			
3			

Prepared By: Dean Anderson / [signature] 5/6/14
Print/Sign Date

Engineering Supervisor: N/A
(Required only if Recommended items dispositioned above):
Print/Sign Date

Notes:
[1] A checked box under an individual form title indicates that the specific form is not applicable/not required and the specific form or document is not applicable. In this case no Recommended disposition is needed.
[2] The Installation Plan or the Test Plan, when applicable, may be included in the Design Description or may be a separate document which is referenced in the Design Description.
[3] If required by 10 CFR 50.59/10 CFR 72.48 procedure.

1.0 Purpose

Diabatic Heatup calculation (2013-11284 Maximum Cladding and Fuel Temperature Analysis for Uncovered Spent Fuel Pool) shows that a loss of all water in the Spent Fuel Pool will not result in a Zirconium (Zr) fire after October 30th, 2014 if one of two Auxiliary Building exhaust fans are operating to provide cooling by the Spent Fuel Pool (SFP) area. The radiation levels as a result of the loss of water in the SFP may result in an actuation of the trip function of R-13 and R-14 Auxiliary Building Vent Radiation Monitors. The trip function results in tripping the Auxiliary Building Exhaust Fans and isolates their associated discharge dampers.

Operation of the Aux Building Exhaust Fans, when SFP water is lost, promotes heat removal and thus, eliminates the potential for a Zr fire during a drain down event. This modification will remove the high radiation trip function from the Aux Building exhaust fans and the ASV-51A and ASV-51B discharge dampers.

2.0 Description of the Modification

The modification will be done by installing a total of eight jumpers. Two jumpers in each of relay racks RR-143 and RR-144 will be installed for bypassing the exhaust fan trips. The jumpers will be placed to bypass the following relay contacts:

RMXA1/29098, contact A
RMXA1/29098, contact E
RMXB/29099, contact A
RMXB/29099, contact H

Two jumpers in each of terminal boxes TB1626 and TB1739 will be installed for bypassing the discharge damper trips. The jumpers will be placed to bypass the following relay contacts:

ABZXA2, contact 8
ABZXA3, contact 5
ABZXB1, contact 3
ABZXB1, contact 4

Contacts A and E on RMXA1/29098, contact 8 on ABZXA2, and contact 5 on ABZXA3 open upon a high radiation level on channel R-13. Contacts A and H on RMXB/29099 and contacts 3 and 4 on ABZXB1 open upon a high radiation level on channel R-14. These contacts are located in the control circuits for the Auxiliary Building Exhaust Fan A (motor 1-272), the Auxiliary Building Exhaust Fan B (motor 1-273), damper ASV-51A and damper ASV-51B.

With the contacts bypassed, the Aux Building exhaust fans will not trip, nor will the discharge dampers close, on high radiation levels detected by R-13 or R-14. Bypassing the contacts in the ASV-51A & ASV-51B circuits will also remove the Safety Injection Signal and Steam Exclusion Zone SV isolation signal used to close the dampers. However, since the permanent shutdown of KPS and removal of fuel from the reactor, these systems have been abandoned and their associated signals can no longer be active.

3.0 Basis of Design

Diabatic Heatup calculation (2013-11284 Maximum Cladding and Fuel Temperature Analysis for Uncovered Spent Fuel Pool) shows that a loss of all water in the Spent Fuel Pool will not result in a Zirconium (Zr) fire after October 30th, 2014 if Auxiliary Building exhaust fans are operating to provide cooling by the Spent Fuel Pool area.

Engineering Technical Evaluation ETE-KW-2013-0025 documents the Auxiliary Building Ventilation System alignment and flow rates for input into the Spent Fuel Pool Area to provide Design Input for calculation 2013-11284 "Maximum Cladding and Fuel Temperature Analysis for Uncovered Spent Fuel Pool" Rev 0. ETE-KW-2013-0025 assumes the Auxiliary Building Exhaust Fans do not trip as a result of all the water in the SFP being lost. This design change will eliminate the R-13 and R-14 initiated trip of the Auxiliary Building Exhaust Fans and the trip shut of the associated Auxiliary Building Exhaust Fan discharge dampers to ensure the exhaust fans are available in the event of a loss of all water in the SFP.

With the Auxiliary Building Exhaust fans operating, a zirconium fire in a drained down SFP will no longer be a possibility by the end of October 2014. If the Auxiliary building Exhaust is not operating because of a trip signal from R-13 or R-14, the risk of a Zr fire would be extended until the fuel has further decayed.

R-13 and R-14 provide indication and numerous trip or initiation functions. The only trip functions being removed are shutting down of the normal Auxiliary Building Ventilation System and their associated discharge damper isolation. This results in the normal Auxiliary Building Exhaust flow to the Auxiliary Building Exhaust Stack to continue to operate in the event of an R-13 or R-14 trip due to high radiation. This does not affect the indication from R-13 or R-14.

The other trip and initiation functions were reviewed to determine if there is a detrimental effect on these functions as a result of the Auxiliary Building Exhaust Fans continuing to run on an R-13 or R-14 high rad trip signal.

1. Shuts down normal Auxiliary Building ventilation.
   This trip function is being eliminated per this modification.
2. Activates the Special Zone Auxiliary Building ventilation.
   The Auxiliary Building Ventilation System was abandon and will not start per SYS-14-DSERT. There is no impact to this activation function.
3. Initiates isolation of all normal ducting to the Auxiliary Building vent stack.
   The Aux Building Exhaust will not isolate per this modification.
4. Closes the waste gas decay tank gas release valve.

The waste gas decay tank valve trip function will not be affected by this modification. Isolating the tank is not impacted by the Aux exhaust fans continuing to run.

5. Reroutes R11/12 sample exhaust flow from Auxiliary Bldg. vent to Containment on a high radiation alarm from R-13 only.

   R11/12 reroute is not disabled by this modification. The reroute to containment will not be negatively impacted by the Aux Exhaust Fans continuing to run.

6. Isolates the 2 inch post LOCA hydrogen recombiner line and stops the 2 inch containment supply blower.

   The isolation and trip is not disabled by this modification. The isolation and trip of these containment systems will not be negatively impacted by the Aux Exhaust Fans continuing to run. The Aux Exhaust Fans are required when these systems are in operation to provide an exhaust path.

7. Automatically diverts the Spent Fuel Pool Ventilation System exhaust through its charcoal filter banks.

   The divert function is not disabled per this modification. The charcoal filters have been removed from the SFP Exhaust system per system abandonment SYS-17-DSERT. The SFP Exhaust Fans are not abandoned and their ventilation function is unaffected whether the Auxiliary Building Exhaust fans are operating or not.

8. Automatically isolates the Waste Gas Analyzer via redundant isolation valves MG(R)-560, MG(R)-561, MG(R)-562 and MG(R)-563.

   The trip or isolation of these valves is not disabled by this modification. The isolation of the waste gas analyzer will not be negatively impacted by the Aux Building Exhaust continuing to operate.

9. Turns on the Safeguards Fan Coil Units

   The initiation of the Safeguards Fan Coil Units (FCUs) is not disabled by this modification. The FCUs do not directly interact with the Aux Building Exhaust fans so this function is not negatively impacted by the Auxiliary Building Exhaust fans continuing to operate.

10. Closes the Steam Exclusion Dampers

    The trip signal to isolate all steam exclusion dampers has not been disabled by this modification. The steam exclusion damper trip functions have been abandoned per SYS-14-DSERT. Some of the Steam Exclusion dampers have been gagged open per the abandonment plan and Design Change KW-13-02001 to provide normal ventilation flow paths in various systems. The gagged open dampers will allow a flow path for the Aux Building Exhaust system in the event of an R-13 or R-14 trip. The trip functions of ASV-51A & B have been disabled as part of this modification to maintain a flow path for the Auxiliary Building Exhaust Fans.

The current licensing basis Fuel Handling Accident is reviewed for effects of this design change. Maintaining ventilation during a Fuel Handling Accident (FHA) has no effect to the calculated dose consequences to the site boundary or control room. The approved >90 day decayed FHA in the USAR assumes the most conservative set of assumptions to maximize dose to the control room (i.e., X/Q not credited) and inherently assumes that all released activity from the event escapes from the Spent Fuel Pool Building directly to the environment within 2 hours. With or without ventilation, the conclusions and results of the DB analysis do not change. All released activity is assumed to escape and transport to the receptor (control room, TSC and EAB) under the worst pathway, independent of ventilation. Whether ventilation is operating or not, it is reasonable to assume that most radioactive material that releases from the spent fuel during an accident would essentially all escape to the environment due to lack of leak tightness of the spent fuel and auxiliary building structures and that the SFP Exhaust fans will not trip or the identified dampers isolate. Hold up of the radioactive material released would provide minimal or negligible benefit since the half life of isotopes that remain in the spent fuel are long-lived. Therefore, additional decay time before release provides no benefit.

Calculation RA-0028 (Kewaunee Fuel Handling Accident Post-Cessation of Operations) determines a reasonable time post-cessation of operations for movement of fuel from the Kewaunee Spent Fuel Pool during which if a Fuel Handling Accident occurs, dose consequences would be within 10 CFR 50.67 dose limits given Spent Fuel Pool decontamination based on 23 feet of water over the failed fuel assembly, no credit for emergency ventilation or filtration (Control Room or otherwise) and no credit for Control Room atmospheric dispersion for a bounding upper limit of acceptable Control Room unfiltered inflow.

The following are the dose results of this calculation for a single FHA damaged fuel assembly with 90 days decay post-cessation of operations:

	Dose Limits	90-Day Decayed Dose
CR	5.0 Rem	1.9 Rem
EAB	6.3 Rem	0.001 Rem
LPZ	6.3 Rem	0.001 Rem

RA-28-0-0

This calculation supports the transition to a post-cessation of operations configuration. It differs from the previous AOR (DEK Calculation C11761-2-0) in the following model parameters:

	Previous AOR***	RA-28-0-0
ST – Source Term Decay	100 hrs	90 days
CR – Control Room:		
• Isolation	Credited	Not Credited
• Recirculation	Credited	Not Credited
• Unfiltered Inflow**	Pre & Post Isolation*	3,000 cfm**
X/Q – Atmospheric Dispersion	Credited	Not Credited

** Pre-Isolation is Unfiltered Normal Intake; Post–Isolation is Unfiltered Inleakage*
*** Combined Unfiltered Normal Intake & Unfiltered Inleakage for entire accident duration, which was varied between 400 – 6000 cfm to maximize dose*
**** C11761-2-0*

Assumption 9.1 of RA-0028 states: IT IS ASSUMED THAT atmospheric dispersion is not credited, which models the source and receptor as co-located using a value of 1. This is conservative because the actual radiological plume will experience dispersion in the environment in route to the Control Room intake.

The Offsite Dose Calculation Manual (ODCM), Part II – Calculational Methodologies, identifies the automatic isolation functions of R-13 and R-14 in Section 2.0 – Gaseous Effluents Methodology. The radiation monitors are discussed in Section 2.1.1 – Waste Gas Holdup System, Section 2.1.2 – Condenser Evacuation System, Section 2.1.4 – Auxiliary Building Vent, and Section 2.1.5 – Containment Mini-Purge/Vent System. The ODCM will require revision as a result of this modification.

4.0 Installation Plan

Note: The following fans will be shut off or tripped off as a result of the installation plan:
Aux Bldg Exhaust Fan A (132-031)
Aux Bldg Exhaust Fan B (132-032)
Aux Bldg Supply Air Vent Fan A (155-121)
Aux Bldg Supply Air Vent Fan B (155-122)
Decontamination Room Exhaust Fan (132-071)
Aux Bldg Air Conditioning Unit Fan (155-131)
Sample Room Hood Exhaust Fan (169-154)
Hot Chem Lab Hood 1A Exhaust Fan (132-271)
Hot Chem Lab Hood 1B Exhaust Fan (132-272)

- Operations to verify that either Spent Fuel Pool Exhaust Fan A (132-121) or Spent Fuel Pool Exhaust Fan B (132-122) is running.

- Operations to secure the Decontamination Room Exhaust Fan (132-071) via control switch PB 19606.

- Operations to secure the Aux Bldg Air Conditioning Unit Fan (155-131) via control switch ES 19516.

Open the following breakers:

- MCC 1-35E, cubicle D4, Ref. drawing E-580
  (This will isolate power from motor 1-272 "Aux Bldg Exhaust Fan A")

- MCC 1-45E, cubicle D1, Ref. drawing E-594
  (This will isolate power from motor 1-273 "Aux Bldg Exhaust Fan B")

Remove the following fuses:

- FUG-26 from fuse panel RR-175, Ref. drawing E-2343
  (This will isolate power to solenoids from the following damper circuits:
  ASV-22, Aux Bldg Special Vent Areas to Exh Fans Boundary Damper
  ASV-23, Aux Bldg Special Vent Areas to Exh Fans Boundary Damper
  ASV-51B, ASV Exh Fan B Stack Boundary Damper
  ASV-51A, ASV Exh Fan A Stack Boundary Damper
  ASV-10, ASV Areas to Exh Fans Boundary Damper
  ASV-66, Rad Prot Office Area & Toilet Exh Boundary Damper
  ASV-60, Pro Area & Laundry Rm Exh Boundary Damper
  ASV-70, I&C Shop Exhaust Boundary Damper
  ASV-75, Dosimetry Room Exh Boundary Damper
  ASV-65, RPO Area & Toilet Exh Boundary Damper
  ASV-50, Aux Bldg Special Vent Boundary Damper)

- FUG-24 from fuse panel RR-170, Ref. drawing E-2328
  (This will isolate power to solenoids from the following damper circuits:
  ASV-22, Aux Bldg Special Vent Areas to Exh Fans Boundary Damper
  ASV-23, Aux Bldg Special Vent Areas to Exh Fans Boundary Damper
  ASV-51B, ASV Exh Fan B Stack Boundary Damper
  ASV-51A, ASV Exh Fan A Stack Boundary Damper
  ASV-10, ASV Areas to Exh Fans Boundary Damper
  ASV-20, Aux Bldg Bsmt & Mezz Supply Boundary Damper
  ASV-40, Aux Bldg Fan Floors Supply Boundary Damper
  ASV-66, Rad Prot Office Area & Toilet Exh Boundary Damper
  ASV-81, Aux Bldg A/C Unit Boundary Damper
  ASV-60, Pro Area & Laundry Rm Exh Boundary Damper
  ASV-70, I&C Shop Exhaust Boundary Damper
  ASV-75, Dosimetry Room Exh Boundary Damper
  ASV-65, RPO Area & Toilet Exh Boundary Damper
  ASV-50, Aux Bldg Special Vent Boundary Damper)

Reference Design Drawings 1402008-E-734, 1402008-E-736 and 1402008-E-2651

- Remove applicable interpanel wiring as depicted on the design drawings identified above.

- Install applicable interpanel wiring as depicted on the design drawings identified above.

- When interpanel wiring modifications are complete, install the following fuses:
  - FUG-26 from fuse panel RR-175
  - FUG-24 from fuse panel RR-170

  And close the following breakers:
  - MCC 1-35E, cubicle D4 (Fan A)
  - MCC 1-45E, cubicle D1 (Fan B)

Fans are to be restored per shift manager's discretion.

5.0 Test Plan

After fuses are installed and breakers are closed, open dampers (or verify auto open). Verify Aux Bldg Exhaust Fans A and B start as required. Continuity of the installed jumper wires will be verified by successfully starting the fans and opening the dampers.

Partial procedure NOP-RM-003 "Control Room Radiation Monitor Functional Checks" will be performed and will provide verification that the Aux Bldg Exhaust Fans A and B do not trip and dampers ASV-51A and B do not close upon high trip setpoint of R-13 and R-14.

6.0 References

S&L Calc. No. 2013-11284, Maximum Cladding and Fuel Temperature Analysis for Uncovered Spent Fuel Pool, Rev. 0

Calculation RA-0028, Kew Fuel Handling Accident Post-Cessation of Operations, Rev. 0

Offsite Dose Calculation Manual (ODCM), Rev. 16

Engineering Technical Evaluation ETE-KW-2013-0025, Ventilation Flow Rate Input for S&L Calc 2013-11284, Rev. 0

Design Change KW-13-02001, Damper Gagging To Support Plant Shutdown, Rev. 0

Procedures
OP-KW-NOP-RM-003, Control Room Radiation Monitor Functional Checks, Rev. 0
OP-KW-AOP-RM-001, Abnormal Radiation Monitoring System, Rev. 8
SP-45-049.13, RMS Channel R-13 Aux Building Ventilation Exhaust Train A Radiation Monitor Quarterly Functional Test, Rev. 37
SP-45-049.14, RMS Channel R-14 Aux Building Ventilation Exhaust Train B Radiation Monitor Quarterly Functional Test, Rev. 39

Drawings
E-734, W/D Auxiliary Relay Rack RR 143 Train “A” – Rear View, Rev. AX
E-736, W/D Auxiliary Relay Rack RR 144 Train “B” – Rear View, Rev. AV
E-1206, Schematic Diagram MCC 1-35E Motors 1-272, Rev. N
E-1321, Schematic Diagram MCC 1-45E Motors 1-273 & 1-285, Rev. P
E-1623, Integrated Logic Diagram Auxiliary Bldg Vent System, Rev. Z
E-2170, Schematic Diagram Radiation Monitor Aux Relays, Rev. U
E-2171, Schematic Diagram Radiation Monitor Aux Relays, Rev. U
E-1616, Integrated Logic Diagram Aux Bldg Spec Vent, Rev. W
E-2651, W/D Terminal Boxes 1626 & 1739, Rev. L
E-1534, Schem Diag-Solenoid Valves 33417, 3326101, 02, 33418, 3326201, 02, 33419, 3326301, 02, Rev. J
E-1535, Schem Diag-Solenoid Valves 33420, 3326401, 02, 33265, 33266, Rev. H
E-2199, Schematic Diagram Damper Control Relays, Rev. M
E-580, Wiring Diagram – Motor Control Center 1-35E, Rev. AB
E-594, Wiring Diagram – Motor Control Center 1-45E, Rev. AD
E-2328, Schematic Diagram – Fuse Panel RR-170 A.C. Safeguard 5, Rev. F
E-2343, Schematic Diagram – Fuse Panel RR-175 A.C. Safeguard 6, Rev. L

1. Document Number/Title/Revision No.: KW-14-02008, Disable R-13/R-14 Trip of Aux Bldg Exhaust Fans, Rev. 0

2. Brief description of proposed activity (what is being changed and why):
This modification will eliminate the function from R-13 and R-14 that trips the Auxiliary Building exhaust fans and isolates their associated discharge dampers. This will be done by installing a total of eight jumpers. Two jumpers in each of relay racks RR-143 and RR-144 will be installed for bypassing the exhaust fan trips. Two jumpers in each of terminal boxes TB1626 and TB1739 will be installed for bypassing the discharge damper trips. The jumpers will bypass the following relay contacts: RMXA1/29098 (contact A), RMXA1/29098 (contact E), RMXB/29099 (contact A), RMXB/29099 (contact H), ABZXA2 (contact 8), ABZXA3 (contact 5), ABZXB1 (contact 3) and ABZXB1 (contact 4).

3. Determine if 10 CFR 50.59/72.48 is applicable to the activity.

A. Is the activity limited to the revision of one (or more) of the following documents/plans or their implementing procedure(s)?

				NOTE: User may contact following group(s) for guidance.
1	Technical Specifications or Operating License	☐ Yes	☒ No	Licensing
2	Dominion Quality Assurance Program Description	☐ Yes	☒ No	NOD
3	Emergency Plan	☐ Yes	☒ No	Emergency Response
4	IST Plan	☐ Yes	☒ No	Engineering -Programs
5	ISI Plan	☐ Yes	☒ No	Engineering -Programs
6	Security Plan	☐ Yes	☒ No	Protection Services
7	Fire Plan	☐ Yes	☒ No	Engineering -Programs

B. Does the activity involve one or more of the following?

				NOTE: User may contact following group(s) for guidance.
1.	A change previously approved by NRC in license amendment or NRC SER, or supports ITS LA/LAR.	☐ Yes	☒ No	Engineering / Licensing
2.	Activity/change covered by an existing approved 10 CFR 50.59/72.48 review, screening, or evaluation.	☒ Yes	☐ No	Engineering
3.	Commitment Change – A change to an NRC Commitment processed under the KPS Commitment Change Process.	☐ Yes	☒ No	Licensing
4.	Maintenance activity or new/revised maintenance procedure – Check YES only if clearly maintenance and equipment is unrelated to ISFSI.	☐ Yes	☒ No	Engineering – See Attachment B
5.	New/revised administrative procedure or a change to any procedure or other controlled document (e.g., plant drawing) which is clearly editorial or administrative.	☐ Yes	☒ No	Engineering – See Attachment B

C. Conclusion. Check one of the following:

☐ All documents/processes listed above are checked NO. 10 CFR 50.59/72.48 applies to the proposed activity. A 50.59/72.48 pre-screening shall be performed.

☐ One or more of the documents/processes listed above are checked YES, AND controls all aspects of the proposed activity. 10 CFR 50.59/72.48 does NOT apply. Process the change under the applicable program/process/procedure.

☒ One or more of the documents/processes listed above are checked YES, however, some portion of the proposed activity is NOT controlled/bounded by any of the above processes (e.g., it affects the activities or schedule described in the PSDAR). 10 CFR 50.59 applies to that portion. A 50.59/72.48 pre-screening shall be performed.

D. Comments: The R-13 and R-14 trip and isolation of ASV-51 A&B shall be screened except for Steam Exclusion/Zone SV functions of ASV-51 A&B as this function was abandoned per SYS-14-DSERT.

E. Print name followed by signature. Attach completed form to document/activity/change package.

Performed By:

Dean Anderson (Print) ______ (Sign) 5/5/14 (Date)

1. Document Number/Title/Revision No.: KW-14-02008, Disable R-13/R-14 Trip of Aux Bldg Exhaust Fans, Rev. 0

2. Brief description of proposed activity (what is being changed and why): This modification will eliminate the function from R-13 and R-14 that trips the Auxiliary Building exhaust fans and isolates their associated discharge dampers. This will be done by installing a total of eight jumpers. Two jumpers in each of relay racks RR-143 and RR-144 will be installed for bypassing the exhaust fan trips. Two jumpers in each of terminal boxes TB1626 and TB1739 will be installed for bypassing the discharge damper trips. The jumpers will bypass the following relay contacts: RMXA1/29098 (contact A), RMXA1/29098 (contact E), RMXB/29099 (contact A), RMXB/29099 (contact H), ABZXA2 (contact 8), ABZXA3 (contact 5), ABZXB1 (contact 3) and ABZXB1 (contact 4).

3. Does the proposed activity change any of the following documents? Explain in Comments if necessary.

NOTE: If you are unsure if a document or process may be affected, contact the Process Owner.

	Yes	No	Document	Process Owner
a	☒	☐	Updated Safety Analysis Report (USAR)	Engineering - Design
b	☐	☒	Technical Specifications Bases or Technical Requirements Manual (TRM)	Licensing
c	☐	☒	Commitments made in response to NRC Generic Letters/Bulletins, and those described in USAR	Licensing
d	☐	☒	Environmental Qualification (EQ) Plan	Engineering -Programs
e	☐	☒	Regulatory Guide 1.97 (RG 1.97) Accident Monitoring Instrumentation Plan	Engineering -Programs
f	☐	☒	Fire Protection Program Plan	Engineering -Programs
g	☒	☐	Offsite Dose Calculation Manual (ODCM)	Radiation Protection
h	☐	☒	Radiological Environmental Monitoring Manual (REMM)	Radiation Protection
i	☐	☒	Control Room Habitability Evaluation Report	Engineering -Systems
j	☐	☒	Engineering Specifications – Check YES only if a design function or design requirement may be affected.	Engineering - Design

4. Does the proposed activity involve any of the following items or processes? Explain in Comments if necessary. [Ref USA 50.59 Resource Manual]

NOTE: If you are unsure if a document or process may be affected, contact the Process Owner.

	Yes	No	Document/Process	Process Owner
a	☐	☒	Plant Drawing Change – Check YES only if: 1) the change adds information to, deletes information from, or alters the configuration of a drawing that is incorporated in the USAR, or 2) configures an SSC differently than described or credited (directly or indirectly) in USAR test.	Engineering - Design
b	☐	☒	Calculations/Evaluations/Analyses/Computer Software – Check YES only if: 1) It affects a method of evaluation described in the USAR, or 2) It independently (i.e., not part of a modification) affects the licensing or design basis	Engineering - Design
c	☒	☐	Permanent Plant Physical Change- All require a screening	Engineering - Design
d	☐	☒	Temporary Plant Physical Change (TCRs) – Check NO only if installed for maintenance.	Engineering - Design
e	☐	☒	SSC Safety Classification Change - Check YES only if reduction in classification, or affects design function as described in USAR.	Engineering - Design
f	☐	☒	A Revised Setpoint or Acceptance Criterion - Check YES only if change affects plant monitoring, performance, or operation.	Engineering -Systems
g	☐	☒	Plant Procedures/Revision – Check YES only if the change directly or indirectly involves operating, controlling or configuring an SSC differently than described or credited in USAR.	Operations
h	☐	☒	Operations Night Order, Operator Work-Around, or Alternate Plant Configuration (APC) – Check YES only if SSCs are operated or configured differently than described or credited in USAR.	Operations
i	☐	☒	Temporary plant alterations (e.g., jumpers, scaffolding, shielding, barriers) – Check NO if implemented for maintenance.	Engineering - Design
j	☐	☒	Corrective/Compensatory Actions - Check YES only if degraded/non-conforming plant condition accepted "as-is" or compensatory action taken to support "operability" or a "reasonable assurance of safety."	Engineering -Systems
k	☐	☒	Permanent OR temporary deviations from the facility, procedures, calculations, or analyses as described in the ISFSI Technical Specifications, Safety Analysis Report, Certificate of Compliance, or KPS 10 CFR 72.212 Evaluation.	Engineering -Systems
l	☐	☒	A deviation from the activities or schedule as described in the PSDAR.	Licensing

5. Conclusion. Check one of the following:

☐ All of the documents or processes listed above are checked NO. A 50.59/72.48 screening is <u>NOT</u> required. Process change in accordance with the applicable program/process/procedure.

☒ One or more of the documents or processes listed above are checked YES. A 50.59/72.48 screening shall be performed.

6. Comments: USAR sections 9.6.5.3 and 11.2.3.5 will need to be revised as a result of the modification, therefore, question 3.a above is checked Yes. The ODCM credits the R-13/R-14 trips and will also need to be revised. Therefore, question 3.g above is checked Yes.

7. Print name followed by signature. Either the preparer or reviewer shall be 50.59 screening qualified. Attach completed form to document/activity/change package.

Preparer / Date: Dean Anderson (Print) / [signature] (Sign) 5/5/14 (Date)

Reviewer / Date: Dale Charapata (Print) / [signature] (Sign) 5/5/14 (Date)

Dominion®

50.59/72.48 Screen

Applicable Station	Applicable Unit(s)	Parent Document / Revision
☒ Kewaunee Power Station	☒ Unit 1 ☐ ISFSI	KW-14-02008, Rev. 0

Part I – Describe the Proposed Activity and Document Search Results

A. Describe the proposed activity and scope of activities. Appropriate descriptive materials may be referenced or attached.

This modification will eliminate the function from R-13 and R-14 that trips the Auxiliary Building exhaust fans and isolates their associated discharge dampers. This will be done by installing a total of eight jumpers. Two jumpers in each of relay racks RR-143 and RR-144 will be installed for bypassing the exhaust fan trips. Two jumpers in each of terminal boxes TB1626 and TB1739 will be installed for bypassing the discharge damper trips. The jumpers will bypass the following relay contacts: RMXA1/29098 (contact A), RMXA1/29098 (contact E), RMXB/29099 (contact A), RMXB/29099 (contact H), ABZXA2 (contact 8), ABZXA3 (contact 5), ABZXB1 (contact 3) and ABZXB1 (contact 4).

B. Search the Technical Specifications and SAR including documents "Incorporated by Reference." Describe relevant SAR-described function(s), performance requirements, and methods of evaluation of the affected SSCs, and where this information is in the Technical Specifications and SAR, including documents "Incorporated by Reference."

See supplemental pages.

C. Does the Activity involve a change to the Operating License or Technical Specifications? ☐ Yes ☒ No

If the answer is YES, process Operating License or Technical Specification change according to the appropriate procedure.
If the answer is NO, describe the basis for the conclusion.
Basis:

SR 3.7.12.3 Verify each ASV train actuates on an actual or simulated actuation signal. This surveillance is only required when modes of applicability are 1,2,3,4.

On May 14, 2013, DEK certified the permanent shutdown and defueling of the station per 10 CFR 50.82. Per 50.82, the DEK operating license no longer allows the station to enter these modes of applicability.

5.5.3 Radioactive Effluent Controls Program

a. Limitations on the functional capability of radioactive liquid and gaseous monitoring instrumentation including surveillance tests and setpoint determination in accordance with the methodology in the ODCM; The trip of the Aux exhaust fans is not credited within the effluent release program for defueled condition.

On May 14, 2013, DEK certified the permanent shutdown and defueling of the station per 10 CFR 50.82. Per 50.82, the DEK operating license no longer allows the station to leave the defueled condition.

The modification will not affect the operation of SSC's associated with the Operating License or Technical Specifications. A change to the Operating License or Technical Specifications is not required.

D. Decommissioning – Prior Regulatory Approval Requirement

1. Does the proposed activity foreclose release of the site for possible unrestricted use? ☐ Yes ☒ No
2. Does the proposed activity result in significant environmental impacts not previously reviewed? ☐ Yes ☒ No
3. Will the proposed activity result in there no longer being reasonable assurance that adequate funds will be available for decommissioning? ☐ Yes ☒ No

If question 1, 2, or 3 is answered YES, the activity can <u>NOT</u> be performed without additional NRC approval.
Proceed to Part IV and describe the basis for the YES answers under "Additional Comments".

E. Decommissioning – NRC Notification Requirement

1. Is this activity inconsistent with actions described in the PSDAR? ☐ Yes ☒ No
2. Does this activity make a significant change to the schedules described in the PSDAR? ☐ Yes ☒ No

3. Does this activity significantly increase decommissioning cost? ☐ Yes ☒ No

If question 1, 2, or 3 is answered YES, the activity can NOT be performed without prior notification to the NRC. Proceed to Part IV and describe the basis for the YES answers under "Additional Comments".

Part II – Identify Areas Requiring Written Documentation

1. Does the proposed activity involve a change to a Safety Analysis? ☐ Yes ☒ No
2. Does the proposed activity involve a change to an SSC(s) credited in the Safety Analyses ☐ Yes ☒ No
3. Does the proposed activity involve a change to an SSC(s) that support SSC(s) credited in the Safety Analyses? ☐ Yes ☒ No
4. Does the proposed activity involve a change to an SSC(s) whose failure could initiate a transient (e.g., reactor trip, loss of feedwater, etc) or accident? ☐ Yes ☒ No
5. Does the proposed activity involve a change to SAR-described SSC(s) or procedure controls that perform functions that are required by or otherwise necessary to comply with regulations, license conditions, orders or Technical Specifications? ☒ Yes ☐ No
6. Does the activity involve a change to a method of evaluation described in the SAR? ☐ Yes ☒ No
7. Is the activity a test or experiment? (i.e., a non-passive activity which gathers data) ☐ Yes ☒ No
8. Does the activity exceed or potentially affect design basis limit for a fission product barrier (DBLFPB)? ☐ Yes ☒ No

If the answers to all of the questions are NO, answer PART III as Not Applicable, and proceed to Part IV. An Evaluation is not needed. IF any of the above questions are checked YES, continue to Part III.

Part III – Determine Whether the Activity Involves Adverse Effects

If all the questions in Part II were answered NO, then N/A this block ☐ N/A

Otherwise, identify below the specific SAR-described design function (YES from questions 1-5), method of evaluation (YES from question 6), test or experiment (YES from question 7), or DBLFPB (YES from question 8).

1. SAR-Described Design Functions

If the activity does not involve a SAR-described design function, then N/A this block ☐ N/A

Does the activity have an adverse effect on the SAR-described design function? ☐ Yes ☒ No

If the answer is YES an Evaluation is required. If the answer is NO, describe the basis for the conclusion.

USAR Section 11.2.3.5, Auxiliary Building Vent Monitors (R-13, R-14), states that upon receipt of a high radiation alarm, the system performs the following functions:

1. Shuts down normal Auxiliary Building ventilation.

2. Isolates normal ducting to the Auxiliary Building Vent Stack

Maintaining ventilation with the discharge dampers open during a design basis accident (FHA) that remains for KPS has no effect to the calculated dose consequences to the site boundary or control room. The approved >90 day decayed FHA in the USAR assumes the most conservative set of assumptions to maximize dose to the control room (i.e., X/Q not credited) and inherently assumes that all released activity from the event escapes from the Spent Fuel Pool Building directly to the environment within 2 hours. With or without ventilation, the conclusions and results of the DB analysis do not change. All released activity is assumed to escape and transport to the receptor (control room, TSC and EAB) under the worst pathway, independent of ventilation. Whether ventilation is operating or not, it is reasonable to assume that most radioactive material that releases from the spent fuel during an accident would essentially all escape to the environment due to lack of leak tightness of the spent fuel and auxiliary building structures and that the

SFP Exhaust fans will not trip or the identified dampers isolate. Hold up of the radioactive material released would provide minimal or negligible benefit since the half life of isotopes that remain in the spent fuel are long-lived. Therefore, additional decay time before release provides no benefit.

2. Method of Evaluation
If the activity does not involve a change to a method, then N/A this block ☒ N/A
Does the activity result in an adverse change to a method of evaluation as described in the SAR that is used in establishing the design bases or in the safety analyses? ☐ Yes ☐ No
If the answer is YES an Evaluation is required. If the answer is NO, describe the basis for the conclusion (attach additional discussion as necessary).
Basis:

3. Design Basis Limits for a Fission Product Barrier (DBLFPB)
If the activity does not involve a change to a DBLFPB, then N/A this block ☒ N/A
Does the activity change or exceed a DBLFPB? ☐ Yes ☐ No
If the answer is YES an Evaluation is required. If the answer is NO, describe the basis for the conclusion (attach additional discussion as necessary).
Basis:

4. Tests or Experiment
If the activity does not involve a test or experiment, then N/A this block ☒ N/A
Is the proposed test or experiment not described in the SAR AND does it utilize an SSC outside the reference bounds for design or is inconsistent with the analyses and description in the SAR? ☐ Yes ☐ No
If the answer is YES an Evaluation is required. If the answer is NO, describe the basis for the conclusion.
Basis:

PART IV Conclusion

Check all that apply
1. An Evaluation is ☒ NOT REQUIRED ☐ REQUIRED (Provide 50.59/72.48 Evaluation in accordance with Subsection 3.3)
2. A change to the SAR and/or any document "Incorporated by Reference" is:
 ☐ NOT REQUIRED ☒ REQUIRED (Process change in accordance with applicable procedure)

Additional Comments

Revise the USAR to remove the Auxiliary Building Ventilation trip on high R-13 / R-14 function. The ODCM will also require a revision as a result of this modification.

The completed Screen is part of the document/activity/change package

Preparer Name (Print)	Preparer Signature	Date
Dean Anderson	[signature]	5/5/14
Co-signer (only if Preparer is not qualified (Print)	Co-signer Signature	Date
BRIAN O'CONNELL	[signature]	5/5/14
Reviewer (Print)	Reviewer Signature	Date
Dale Charapata	Dale W Charapata	5/5/14

Explanation

USAR Section 1.3.3 Nuclear and Radiation Controls (GDC 11 - GDC 18)

Monitoring Fuel and Waste Storage

Monitoring and alarm instrumentation are provided for waste storage and handling areas to detect inadequate cooling and to detect excessive radiation levels. Monitoring and alarms are also provided to detect inadequate cooling in the spent fuel pool. Radiation monitors are provided to maintain surveillance over the release of radioactive gases and liquids.

Radiation monitors are in continuous service in these areas to actuate high-activity alarms on the control board annunciator as described in Chapter 11. Reference sections: Waste Disposal and Radiation Protection System; Radiation Protection 11.2.

USAR section 9.6.3.1 Auxiliary Building Special Ventilation Systems Design Basis

The Auxiliary Building Ventilation System is designed to provide maximum safety and convenience for operating personnel, with equipment arranged so that potentially contaminated areas are separated from clean areas.

The Auxiliary Building Ventilation System is designed to maintain a minimum inside air temperature of 60°F under nominal winter design outside air temperature conditions, and a maximum inside air temperature not to exceed 10°F above the nominal summer design outside air temperature.

USAR section 9.6.5.3 Auxiliary Building Special Ventilation System Description

The initiating signal for the Auxiliary Building Special Ventilation System is a signal from the detection of a high radiation in the Auxiliary Building Vent. When the Auxiliary Building Ventilation System is actuated, the normal supply and exhaust ducts from the Zone SV are closed automatically, and the normal supply and exhaust fans for the Auxiliary Building are tripped.

USAR section 11.2.1.1 Monitoring Radioactivity Releases

Criterion: Means shall be provided for monitoring the containment atmosphere and the facility effluent discharge paths for radioactivity released from normal operations, from anticipated transients, and from accident conditions. An environmental monitoring program shall be maintained to confirm that radioactivity releases to the environs of the plant have not been excessive (GDC 17).

USAR Section 11.2.3 Radiation Monitoring System

The Radiation Monitoring System provides continuous radiological surveillance of plant system and working areas. The system performs the following basic functions:

- Warns operating personnel of radiological health hazards, such as abnormal radiation fields.
- Provides warning of plant malfunctions, which could lead to plant damage and/or radiological hazards.
- Prevents or minimizes inadvertent releases of radioactivity to the environment via automatic action capability.
- Provides monitoring of controlled radiological plant releases.

USAR Section 11.2.3.1 Main Process Radiation Monitoring System

The Main Process Radiation Monitoring System is designed to provide information to plant personnel on:

• Radioactivity levels present in fluid (air and water) systems.
• Leakage across boundaries of closed systems.
• Radioactivity concentrations in liquid and gaseous flow paths that lead to release from the plant.

In conjunction with the design functions spelled out above, the system is capable of initiating automatic actions designed to prevent or minimize any inadvertent/uncontrolled release of radioactivity to the environment.

The Main Process Monitoring System consists of 13 channels of monitoring equipment, 9 of which are equipped with some level of automatic action upon receipt of a high radiation alarm. Only 5 of the 13 channels perform safety related functions. The Main Process Monitoring System consists of the following:

Process Monitors *(monitors other than R-13 and R-14 have been removed from this summary)*
• R-13 Auxiliary Building vent A
• R-14 Auxiliary Building vent B

USAR Section 11.2.3.5 Auxiliary Building Vent Monitors (R-13, R-14)

The Auxiliary Building vent monitors are used to monitor the Auxiliary Building vent flowpath on a continuous basis. The detectors are used to measure airborne radioactivity in the air as it is discharged out the stack. An off-line sampler is used to monitor and sample the Auxiliary Building vent stack. Upon receipt of a high radiation alarm, the system performs the following functions:

1. Shuts down normal Auxiliary Building ventilation.
2. Activates the Special Zone Auxiliary Building ventilation.
3. Initiates isolation of all normal ducting to the Auxiliary Building vent stack.
4. Closes the waste gas decay tank gas release valve.
5. Reroutes R11/12 sample exhaust flow from Auxiliary Bldg. vent to Containment on a high radiation alarm from R-13 only.
6. Isolates the 2 inch post LOCA hydrogen recombiner line and stops the 2 inch containment supply blower.
7. Automatically diverts the Spent Fuel Pool Ventilation System exhaust through its charcoal filter banks.
8. Automatically isolates the Waste Gas Analyzer via redundant isolation valves MG(R)-560, MG(R)-561, MG(R)-562 and MG(R)-563.
9. Turns on the Safeguards Fan Coil Units
10. Closes the Steam Exclusion Dampers

USAR 14.2.1.3 Fuel Handling Accident, Method of Analysis

The volatile gaseous activities associated with the fuel handling accident could be released either inside the Containment Building or in the Auxiliary Building. Both of these areas have ventilation systems in operation under administrative control during fuel handling operations. Radioactivity monitors provide continuous indication of radiation levels and signal evacuation of these areas on high alarm.

Table B.2-1
Classification of Structures, Systems and Components

Radiation Monitoring System (to the extent that it must function in support of Class I equipment)	I*
Auxiliary Building Ventilation System	III

Technical Specifications -

TS 5.5.3 Radioactive Effluent Controls Program

a. Limitations on the functional capability of radioactive liquid and gaseous monitoring instrumentation including surveillance tests and setpoint determination in accordance with the methodology in the ODCM;

SR 3.7.12.3 Verify each ASV train actuates on an actual or simulated actuation signal. 18 months

B 3.7.12 Auxiliary Building Special Ventilation (ASV) System

The ASV System is a standby system. During emergency operations, the ASV System dampers are realigned, and fans are started to begin filtration. Upon receipt of the actuating Engineered Safety Feature Actuation System signal(s), the normal supply and exhaust ducts from the ASV are closed automatically and the normal supply and exhaust fans for the Auxiliary Building are tripped, and the stream of ventilation air discharges through the system filter trains.

Offsite Dose Calculation Manual (ODCM), Part II – Calculational Methodologies, identifies the automatic isolation functions of R-13 and R-14 in Section 2.0 – Gaseous Effluents Methodology. The radiation monitors are discussed in Section 2.1.1 – Waste Gas Holdup System, Section 2.1.2 – Condenser Evacuation System, Section 2.1.4 – Auxiliary Building Vent, and Section 2.1.5 – Containment Mini-Purge/Vent System.

Change Document Number: KW-14-02008

Instructions –

- List the affected items on the appropriate table. If the item is required for approval, check the APP box. If the item is required for turnover, check the TO box. All items not checked for approval or turnover are required for closeout. If an item is required for partial turnover, make a notation in the Notes column stating which stage of partial turnover this item supports. (For example, "TO #2).
- When Corrective Actions (CAs or their daughter activities) are tracking closeout of items, the assigned corrective action activity performer should be identified.

Table I
Installation and Test Instructions

APP	TO	Procedure Number	Title	Rev.	WO Number	Date Completed	Notes
☐	☐		I&C Work Order		KW100982361	10/7/14	Status 80
☐	☐						
☐	☐						
☐	☐						
☐	☐						
☐	☐						
☐	☐						
☐	☐						
☐	☐						

Table IA
Construction Drawings and Sketches

APP	(As-Built) TO	Drawing Number	Description or Title	Rev.	WO or Procedure	Notes
☐	☐					
☐	☐					
☐	☐					
☐	☐					
☐	☐					
☐	☐					
☐	☐					
☐	☐					
☐	☐					

Table II
Design Drawings and Specifications

APP	TO	Number	Description or Title	Tracking Number	Assigned Activity Performer	New Rev.	Date Completed
☐	☒	E-734	W/D Auxiliary Relay Rack RR143 Train "A" (Rear View)				10/6/14
☐	☒	E-736	W/D Auxiliary Relay Rack RR144 Train "B" (Rear View)				10/6/14
☐	☒	E-1206	Schematic Diagram MCC 1-35E Motors 1-272				10/6/14
☐	☒	E-1321	Schematic Diagram MCC 1-45E Motors 1-273 & 1-285				10/6/14
☐	☒	E-1623	Integrated Logic Diagram Schematic Diagram MCC 1-52A Motors 1-201 & 1-116 Auxiliary Bldg Vent System				10/6/14
☐	☒	E-2170	Schematic Diagram Radiation Monitor Aux Relays				10/6/14
☐	☒	E-2171	Schematic Diagram Radiation Monitor Aux Relays				10/6/14
☐	☒	E-1616	Integrated Logic Diagram Aux Bldg Spec Vent				10/6/14
☐	☒	E-2651	W/D Terminal Boxes 1626 & 1739				10/6/14
☐	☒	E-1534	Schem Diag-Solenoid Valves 33417, 3326101, 02, 33418, 3326201, 02, 33419, 3326301, 02				10/6/14
☐	☒	E-1535	Schem Diag-Solenoid Valves 33420, 3326401, 02, 33265, 33266				10/6/14
☐	☒	E-2199	Schematic Diagram Damper Control Relays				10/6/14

Table III
Plant Procedures and Manuals

APP	TO	Number	Description or Title	Tracking Number	Assigned Activity Performer	New Rev.	Date Completed
☐	☐	MA-KW-ISP-RM-001-13	RMS Channel R-13 Aux Building Ventilation Exhaust Train A Radiation Monitor Quarterly Functional Test			2	8/7/14
☐	☐	MA-KW-ISP-RM-001-14	RMS Channel R-14 Aux Building Ventilation Exhaust Train B Radiation Monitor Quarterly Functional Test			2	8/7/14
☐	☒	OP-KW-AOP-RM-001	Abnormal Radiation Monitoring System	Action # 55411		10	10/2/14
☐	☒	OP-KW-NOP-RM-003	Control Room Radiation Monitor Functional Checks	Action # 55410		1	10/2/14
☐	☒	ODCM	Offsite Dose Calculation Manual (ODCM)			17	9/25/14

Table IV
Calculations & Other Design Outputs

APP	TO	Number	Description or Title/Rev	Tracking Number	Assigned Activity Performer	Date Completed	Notes
☐	☐						
☐	☐						
☐	☐						
☐	☐						

Table V
Data Files / Configuration Management Items

APP	TO	Number	Description or Title/Rev	Tracking Number	Assigned Activity Performer	Date Completed	Notes
☐	☐	RMXA1/29098	R13 Aux Bldg Vent Aux Relay			10/2/14	
☐	☐	RMXB/29099	R14 Aux Bldg Vent Aux Relay			10/2/14	
☐	☐	ABZXA2	Stm Excl Bndry Dmprs Cont Rly			10/2/14	
☐	☐	ABZXA3	Stm Excl Bndry Dmprs Cont Rly			10/2/14	
☐	☐	ABZXB1	Stm Excl Bndry Dmprs Cont Rly			10/2/14	
☐	☐						

Table VI
Other Items

APP	TO	Description or Title	Tracking Number	Assigned Activity Performer	Date Completed	Notes
☐	☐	USAR Update	UCR # 2014-015-000		Submitted 10/2/14	
☐	☐	Training Evaluation Form	CR544424/CA 280625 CA282526		7/1/14	
☐	☐					
☐	☐					

Table VII
Design Change Updates

TO	DCU Number	Description or Title	Date Completed	Notes
☐				
☐				
☐				
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Modification Number:	KW-14-02008	Revision:	0

1.0 FIRE PROTECTION	**YES**	**NO**
If any of the following are checked YES, consult with the Fire Protection Engineer and follow the applicable Fire Protection program procedure to determine whether any Fire Protection documentation is affected.		
Fire Protection Equipment or Features		
a. Does the modification involve fire protection equipment? Examples include: • Fire barriers, doors or penetrations, and partial barriers credited in the fire hazards analysis • Fire dampers, hatches, or other elements installed in fire barriers • Emergency or exit lighting • Fire resistant coatings including structural steel fireproofing and electrical raceway wrap • Suppression systems, including sprinklers, CO2, and halon systems • Fire detection equipment, including smoke, heat, and flame detectors • Fire protection system interface devices such as HVAC shutdown trips, supervisory air supplies, and backup batteries • Firefighting equipment or systems including hose stations and portable fire extinguishers • Supports and restraints for Fire Protection systems and equipment	☐	☒
b. Does the modification affect any plant structure (including floors, doors, roofs, ceilings, drains, curbs, dampers, penetrations, hatches, equipment knockouts, stairwells, HVAC systems, pipe chases, elevator shafts, load bearing structural steel, etc.) that could affect, block or otherwise interfere with the operation of any of this equipment?	☐	☒
c. Does the modification represent a change in occupancy or function of the room or structure that could affect any of this equipment?	☐	☒
d. Does the modification affect the nearby environmental conditions (room ambient temperature, nearby heat sources, etc.) that may affect any of this equipment?	☐	☒
e. Will the change involve access to a fire zone/area, fire protection equipment, or manual firefighting activities? Will the change affect operator or fire brigade response time?	☐	☒
f. Will the change add, remove, or affect the performance of any plant communications system relied upon for firefighting or safe plant shutdown?	☐	☒
Combustible Loading		
g. Does the modification add, modify, relocate, or remove combustible material within a fire zone, or relocate combustible material between fire zones? Combustibles may include: • Ordinary Combustibles • Combustible Liquids (including any liquid with a flash point provided on the MSDS sheets) • Coatings, grease, charcoal, and insulation • Plastic Materials (especially halogenated plastics such as PVC or Neoprene) • Cables / Cable Tray Loading (Consult applicable procedures for tray fill criteria.) • Cables or other materials which give off corrosive gasses when burned	☐	☒

1.0 FIRE PROTECTION (Continued)	YES	NO
Hazards and Ignition Sources h. Does the modification create, alter, or remove any hazards or ignition sources not already accounted for in the fire hazard analysis such as: • Hydrogen or other explosive gasses • High pressure oils • Combustible metals (magnesium, zirconium, etc.) • New heat sources that could ignite combustible materials	☐	☒
Fire Protection Program i. Will the change modify the fire protection program or provisions of the program as described in the SAR this will include the Fire Protection Program and SERs associated with the Fire Protection Program)?	☐	☒
j. Does the change affect any basis for regulatory exemptions, fire protection analysis, or other requirements this will include exemption SERs or 86-10 evaluations)?	☐	☒
Implementation Concerns k. Does the modification involve any special or unusual circumstances that should be considered during implementation? If so, the Fire Protection Engineer should be consulted and the Design Description or Installation Plan should address these items. Examples may be: • Thermal stress relieving or annealing (Special precautions may be required) • Temporary removal of a fire barrier or fire protection system from service • Transient fire loading issues not already addressed by the fire hazards analysis	☐	☒

2.0 ALARA	YES	NO
If any of the following are checked YES, consult the ALARA / Radiation Protection Engineers and complete an ALARA checklist in accordance with applicable procedures.		
a. Does the modification involve work in a radiological controlled area?	☒	☐
b. Does the modification or the installation of the modification have the potential to affect personnel radiation exposure?	☐	☒
c. Will the modification generate any radioactive waste or affect radioactive waste systems (demolition of equipment in the RCA or clean areas)? If so, contact RP.	☐	☒

3.0 R-Stamp - State Registered Vessels	YES	NO
a. Does the modification involve a boiler, pressure vessel, piping system, or structural steel subject to jurisdictional requirements? If so, consult with the station R-Stamp Program Engineer or System Engineer, as applicable.	☐	☒

4.0 Heavy Loads (NUREG-0612)	YES	NO
If the following is checked YES, consult the Heavy Load Engineer/ structural engineer and complete documentation/ evaluations in accordance with applicable procedures.		
a. Does the modification add, remove, modify, or relocate any load handling systems (cranes, hoists, lifting devices, lift points) including their load path limits?	☐	☒

5.0 Maintenance Rule (10 CFR 50.65)	YES	NO
If any of the following are checked YES, the Maintenance Rule program may be affected. If so, consult with the Maintenance Rule engineer, as applicable.		
a. Does the modification add, delete, or change design function(s) of a SSC?	☐	☒
b. Does the modification change the safety classification of a SSC?	☐	☒
c. Does the modification install a new system?	☐	☒
d. Does the modification remove a system/ train?	☐	☒
e. Does the modification install or remove major equipment within a system/ train?	☐	☒

6.0 Motor Operated Valve (MOV) Program (GL 89-10)	YES	NO
If any of the following are checked YES, the MOV program may be affected. If so, consult with the MOV Engineer, as applicable.		
a. Does the modification involve any valve covered by the MOV Program?	☐	☒
b. Does the modification add a new MOV?	☐	☒
c. Does the modification affect any variable or assumption used in MOV analysis? This includes items that may alter the operating conditions of the MOV or input assumptions into valve design basis calculations, such as changes in elevation, line pressure, differential pressure across the valve disk, ambient area temperature, fluid temperature, bus voltage, seismic acceleration and other system operating parameters.	☐	☒

7.0 Air Operated Valve (AOV) Program	YES	NO
If any of the following are checked YES, the AOV Program may be affected. If so, consult with the AOV Engineer, as applicable.		
a. Does the modification involve any valve covered by the AOV Program?	☐	☒
b. Does the modification add a new AOV?	☐	☒
c. Does the modification affect any variable or assumption used in AOV analysis? This includes items that may alter the operating conditions of the AOV or input assumptions into valve design basis calculations, such as changes in elevation, line pressure, differential pressure across the valve disk, actuator supply air pressure, and other system operating parameters.	☐	☒

8.0 Industrial Safety	YES	NO
If any of the following are checked YES, consult the Safety program owner, as applicable.		
a. Does the modification affect safety equipment and thereby create personnel hazards (e.g., removal of handrails, create floor or wall openings, remove grating, etc.; Reference 29 CFR 1910.23)?	☐	☒
b. Are any OSHA regulations applicable? (Reference Safety Manual and OSHA 29 CFR 1910.)	☐	☒
c. Does the modification introduce hazardous material into the plant?	☐	☒
d. Does the modification affect evacuation routes or escape provisions from enclosures?	☐	☒
d. Does the modification move any energy sources (electrical, fluid, etc)?	☐	☒

9.0 Training	YES	NO
a. Does the modification have a significant impact on training programs? If so, consult with the appropriate training personnel.	☒	☐

10.0 Security	YES	NO
If any of the following are checked YES, consult with the Security department.		
a. Does the modification involve safeguards information?	☐	☒
b. Will security equipment or procedures be affected, including exterior lighting?	☐	☒
c. Will work be performed within 20 feet of a security fence?	☐	☒
d. Will an opening greater than 96 in^2 be permanently or temporarily created in any security barrier?	☐	☒

11.0 Plant Process Computer	YES	NO
If any of the following are checked YES, consult with the IT department, Plant Process Computer group, or System Engineer, as applicable.		
a. Does the modification add, delete or modify any computer points used by the plant process computer?	☐	☒
b. Does the modification change any formulae or calculations made by the plant process computer?	☐	☒
c. Does the proposed design change add, remove or modify Safety Related, Security Related, or Emergency Response computer or microprocessor based equipment, such that: • The proposed computer or microprocessor based equipment directly interfaces outside the power plant (e.g., by a modem or wireless device)? • The proposed computer or microprocessor based equipment has a plug-in interface (such as an Ethernet port, etc.) that can be accessed without an approved procedure?	☐	☒

12.0 Chemistry	YES	NO
If the modification involves any of the following, consult with the plant Chemistry Department or the appropriate System Engineer.		
a. Chemistry limits, chemical analyses, chemistry procedures or chemical additives.	☐	☒
b. Chemicals which need to be added to the Toxic Release Inventory, or which have special handling or disposal requirements.	☐	☒
c. Are any Environmental permits required?	☐	☒

13.0 Operations	**YES**	**NO**
If any of the following are checked YES, plant operational requirements may be affected. Consult with Operations personnel as appropriate.		
a. Does the modification affect plant operation under various conditions, such as abnormal or emergency operation?	☒	☐
b. Does the modification require new/ revised operational procedures?	☒	☐
c. Does the modification potentially impact other systems during installation?	☐	☒
d. Does the modification affect accessibility and/ or ease of operation of plant equipment?	☐	☒

14.0 Maintenance	**YES**	**NO**
If any of the following are checked YES, plant maintenance requirements may be affected. Consult with Maintenance personnel as appropriate.		
a. Does the modification affect accessibility and/or maintainability of plant equipment (existing or new)?	☐	☒
b. Does the modification install new equipment? Consideration is needed for compatibility, reliability, performance, and maintenance history.	☐	☒
c. Does the modification require spare parts, special tool/ equipment for maintenance?	☐	☒
d. Are preventive/ predictive maintenance requirements affected?	☒	☐

15.0 Emergency Planning/Preparedness	**YES**	**NO**
a. Does the modification or change affect the Emergency Plan, including: • Changes to access roads (evacuation routes)? • Changes to Emergency Facility equipment such as phones, microwave, radios and ventilation. (Refer to Emergency Facilities and Equipment section of Emergency Plan)? • Changes to facility activation criteria (i.e., Security events, etc.)? • Changes to significant fuel related issues that may affect EAL activation thresholds (i.e., dry cask storage, etc.)? • Changes to tools used by the ERO that may require retraining or procedural revision (i.e., changes to the SPDS, ERDS, MIDAS, etc.)? • Changes to Emergency Plan Implementing Procedures (EPIPs)? • Changes to Operations, Fire Brigade, or Security response protocols? If so, consult with the Emergency Preparedness Staff.	☐	☒

16.0 North American Electric Reliability Council (NERC) Compliance Program	YES	NO
Communication with the Transmission Operator (and Regional Transmission Operator) is required for modifications / setpoint changes on the following Systems / Equipment. If a modification / setpoint change impacts one or more of the systems / equipment identified below, then the NERC Compliance Stakeholder shall be contacted for applicable actions and required documentation:		
System 39, 4160V Supply and Distribution - 4KV Bus Protective Relaying - RAT Protective Relaying and Auxiliaries - TAT Protective Relaying and Auxiliaries - Load Flow	☐	☒
System 59, Substation - Substation Control House (all equipment) - Substation Yard & Facilities (all) - Substation breakers or protective relaying	☐	☒

17.0 Impact of Change on Independent Spent Fuel Storage Installation (ISFSI)	YES	NO
a. Will the proposed activity potentially affect the structural integrity of the ISFSI haul path or the ability to access the spent fuel storage areas with ISFSI loading equipment?	☐	☒
b. Will the proposed activity involve any modification or addition of buildings or structures along the ISFSI heavy haul path?	☐	☒
c. Will the proposed activity introduce or increase the amount of combustible fuel or explosive gasses stored in the vicinity of the ISFSI pad or haul path?	☐	☒
d. Will the proposed activity affect the drainage capability at or adjacent to the ISFSI pad?	☐	☒
e. Will the proposed activity affect the grounding grid in the area of the ISFSI pad?	☐	☒
f. Does the proposed activity directly affect the ISFSI Site, ISFSI equipment (including cask handling cranes) or the ISFSI loading process within the spent fuel storage areas?	☐	☒
g. Will the proposed activity add occupied buildings in the vicinity of the ISFSI that could affect dose calculation?	☐	☒

18.0 Impact of Change on NEIL	YES	NO
a. Does the activity affect the design requirements contained in the NEIL Loss Control Standards (NUCLEAR ELECTRIC INSURANCE LIMITED LOSS CONTROL MANUAL)? If so, have they been properly considered in the activity? If so, contact site NEIL contact with questions. (Reference 3.1.3.2 of NEIL Standards i.e., See Chapter 3)	☐	☒
b. Is NEIL Notification/Submittal Process required? If so, ensure the documentation (e.g., drawings, specifications, calculations) for all plant changes/modifications (including non-power block/commercial projects) which impact the plant's Property Loss Control Program are submitted to NEIL for review and comment.	☐	☒

19.0 Other	YES	NO
Does the modification affect other items pertaining to KPS commitments, for example:		
a. NEP-04.08, Attachment A, "Design Considerations" regarding KPS plans, programs, directives, procedures, and operating experience? This attachment has a listing of additional modification considerations from the KPS corrective action program.	☐	☒
b. COMTRAK 87-138, identifying LCOs entered during modification implementation, and adding to design change procedures where applicable?	☐	☒
If the modification impacts other programs or departments, list them here and consult with the appropriate personnel. __________ __________ __________		
Comments: None		

Summary of Impacts/ Consultations

Program/ Department	Program/Department Impacted? YES	NO	Consultation Complete	Comments
1. Fire Protection	☐	☒	☐	
2. ALARA	☒	☐	☒	Jumpers being installed in cabinets in Aux Bldg
3. R-Stamp	☐	☒	☐	
4. Heavy Loads	☐	☒	☐	
5. Maintenance Rule	☐	☒	☐	
6. MOV	☐	☒	☐	
7. AOV	☐	☒	☐	
8. Industrial Safety	☐	☒	☐	
9. Training	☒	☐	☒	Training Eval - CR544424 / CA280625
10. Security	☐	☒	☐	
11. Plant Process Computer	☐	☒	☐	
12. Chemistry	☐	☒	☐	
13. Operations	☒	☐	☒	OP-KW-AOP-RM-001 Revision Required OP-KW-NOP-RM-003 Revision Required ODCM Revision Required
14. Maintenance	☒	☐	☒	Revise SP-45-049.13 & SP-45-049.14
15. Emergency Planning/Preparedness	☐	☒	☐	
16. NERC Compliance	☐	☒	☐	
17. ISFSI	☐	☒	☐	
18. NEIL	☐	☒	☐	
19. Other	☐	☒	☐	

Modification Number:	KW-14-02008	Revision:	0

1.0 General Design Considerations (NQA-1), Codes, Standards, and Requirements	YES	NO
a. Have basic functions of each system, structure, and component been identified? Special attention should be given to the original design requirements specified within the design bases.	☒	☐
b. Are applicable codes and standards identified, including the issue or addenda? Specific mention shall be made when the ASME pressure boundary is affected.	☐	☒
c. Are applicable regulatory requirements and commitments or responses to federal, state and local regulations identified? Sources include, but are not limited to: • Updated Safety Analysis Report • NRC's Safety Evaluation Report and supplements • Environmental Report • NRC's environmental statement and supplements • Technical Specifications • Regulatory Guides • Code of Federal Regulations • NRC bulletins, circulars, notices, and generic letters • Commitments in correspondence with the NRC.	☒	☐
d. Have the applicable design conditions been established? (e.g. pressure, temperature, flow, fluid chemistry, and voltage)	☒	☐
e. Does the modification need to address environmental conditions? This includes conditions anticipated during storage, construction, and operation and accident conditions such as pressure, temperature, humidity, corrosion, site elevation, wind direction, exposure to weather, flooding, nuclear radiation, electromagnetic radiation. Also consider qualification testing requirements, shelf life, and service life limitations.	☐	☒
f. Are there material requirements that apply to the modification (including such items as compatibility, electrical insulation properties, protective coating, and corrosion resistance)?	☐	☒
g. Are there layout/ arrangement details that need to be specified?	☐	☒
h. Are there requirements for redundancy, diversity, and separation of systems, structures, and components?	☐	☒
i. Are there testing requirements applicable to the modification (including pre-operational and subsequent periodic tests and the conditions under which they will be performed)?	☐	☒
j. Are there requirements or limitations for personnel (including the qualification and number of personnel available for operation, maintenance, testing and inspection, and radiation exposures to the public and facility personnel)?	☐	☒
k. Are there requirements for transportability, such as size and shipping weight limitations, Interstate Commerce commission regulations?	☐	☒
l. Are there requirements for handling, storing, cleaning, and shipping?	☐	☒
m. Are there requirements to prevent undue risk to the health and safety of the public?	☒	☐
n. Are identified materials, processes, parts and equipment suitable for the application(s)?	☐	☒
o. Have applicable quality and quality assurance requirements been identified?	☒	☐

1.0 General Design Considerations (NQA-1), Codes, Standards, and Requirements (Cont'd)	YES	NO
p. Are there reliability requirements for systems, structures, and components, including interactions that may impair functions important to safety?	☐	☒
q. Are there interface requirements between equipment and operations/maintenance personnel?	☐	☒
r. Are there requirements for criticality control and accountability of nuclear materials?	☐	☒
s. Are any General Design Criteria applicable?	☐	☒
t. Do any design specifications or field standards apply to the design change?	☐	☒
u. Does the modification affect containment or any other release path?	☒	☐
v. Does the modification involve application of State Administrative Code requirements? (Administrative Code for Boilers and Pressure Vessels or the Authorized Inspector)	☐	☒
w. Does the modification involve environmental permits or require state (DNR) approval?	☐	☒
x. Does the modification incorporate new types/models of equipment not presently used?	☐	☒
y. Is there site specific or industry operating experience (OE) associated with the modification? Sources include, but are not limited to: • INPO • EPRI • EPIX • NRC (Information Notices, Generic Letters, etc) • Site specific OE • Dominion OE	☐	☒
z. Are there failure effects to be considered for systems, structures, and components, including: • How components may fail, and the effect of the failure on the system and related systems? • What mechanisms might produce failures? • How a failure would be detected? • What provisions are included to compensate for the failure?	☐	☒
aa. Does the modification need to discuss those events/accidents for which the system/components are to withstand?	☐	☒
bb. Does the modification affect nuclear fuel design requirements, including: • Consider potential for fuel failure? • Affect fuel-handling equipment? • Present the potential for introducing foreign material/debris into the Spent Fuel Pool or connected systems?	☐	☒
cc. Does the modification abandon equipment in place?	☐	☒
dd. Does the modification affect a design margin and/or result in operational changes?	☒	☐

2.0 Mechanical Design Considerations N/A ☒	YES	NO
a. Are any ASME Boiler & Pressure Vessel codes or other standards applicable to the design?	☐	☐
b. Are any ASTM and ANSI standards applicable to the design?	☐	☐
c. Does the modification need to consider component performance requirements such as capacity, rating, or output?	☐	☐
d. Does the modification need to consider hydraulic requirements such as pump net positive suction heads, allowable pressure drops, allowable fluid velocities and pressures, valve trim requirements, or packing/seal requirements?	☐	☐
e. Does the modification affect or introduce any pipe stress, pipe support, thermal expansion, seismic movement, or hydraulic analysis?	☐	☐
f. Does the modification affect or introduce any safety related, high energy, ASME code, or regulatory related pressure boundary?	☐	☐
g. Does the modification need to consider the possible effects of mechanical conditions such as vibration, stress, shock, and reaction forces?	☐	☐
h. Does the modification affect or introduce any mechanical setpoints, setpoint margins, or setpoint calculations (e.g., relief valve settings)?	☐	☐
i. Does the modification affect or introduce any piping erosion or corrosion concerns?	☐	☐
j. Does the modification introduce the potential for galvanic corrosion between dissimilar metals?	☐	☐
k. Are there requirements to provide vents, drains, and sample points to accommodate operational, maintenance and testing needs?	☐	☐
l. Does the modification require service water? (Considers affects on essential and nonessential service water loads)	☐	☐
m. Does the modification require the addition of check valves?	☐	☐
n. Does the modification result in heat load changes on HVAC systems, or affect ventilation flow during or after installation?	☐	☐
o. Does the modification affect ventilation barriers, including containment, primary auxiliary building (PWR), or control room? For example: • Cable or conduit pulls • Ducts/access doors • Pressure differential • Changes to adjacent HVAC systems	☐	☐
p. Does the modification add, remove, or modify insulation?	☐	☐
q. Are there requirements for independent means of pressure relief?	☐	☐
r. Does the modification affect the assigned system design pressure or temperature?	☐	☐
s. Does the modification need to consider the compatibility of coatings/platings with system chemistry and disposal systems?	☐	☐
t. Does the modification affect embedded or buried piping?	☐	☐

3.0 Electrical Design Considerations N/A ☒	YES	NO
a. Does the modification need to consider design conditions such as ampacity, voltage drop?	☐	☐
b. Does the modification need to consider component and system performance requirements, such as current, voltage, or power?	☐	☐
c. Are there requirements for redundancy, diversity, and separation of systems, structures, and components?	☐	☐
d. Are overcurrent devices required for proper protection and coordination?	☐	☐
e. Does the modification affect or introduce electrical protection features (overcurrent, surge, grounding, etc)?	☐	☐
f. Does the modification affect available fault current at any bus?	☐	☐
g. Does the modification add or replace electrical cables: • Ensure that all added cables meet fire retardancy requirements? (Reference IEEE 383) • Be compatible with existing electrical insulation and wiring? • Affect ampacity of existing cables? • Affect voltage drop? • Add cables to existing electrical raceways? • Be routed through fire wrapped raceways?	☐	☐
h. Does the modification affect or introduce any electrical setpoints, setpoint margins, or setpoint calculations?	☐	☐
i. Are there applicable UL (or equivalent) listings?	☐	☐
j. Does the modification alter the voltage harmonic distortion content or change the non-linear loading (i.e., the addition of switching power supplies, the alteration of the circuit's power factor, etc.) on a vital or sensitive instrument bus?	☐	☐
k. Does the modification add, replace, or modify raceways (including seismic analysis)?	☐	☐
l. Does the modification affect the station grounding or lightning protection system?	☐	☐
m. Does the modification affect electrical system loading: • Affect emergency diesel loading? • Add or remove station battery loading? • Add or remove load to a bus? • Compatible with transformer capacities? • Compatible with other associated electrical equipment capacities?	☐	☐
n. Does the modification affect/introduce electromagnetic interference between new/existing equipment and electromagnetic coupling interactions between circuits?	☐	☐
o. Does the modification affect embedded conduits or buried cables, including the station grounding system?	☐	☐
p. Does the modification result in heat load changes on HVAC systems, or affect ventilation flow during or after installation?	☐	☐

4.0 Instrumentation and Controls Design Considerations N/A ☐	YES	NO
a. Does the modification affect or introduce any instrument and control systems?	☒	☐
b. Does the modification affect or introduce any instrument piping or tubing?	☐	☒
c. Does the modification affect or introduce any I&C setpoints, setpoint margin, or setpoint calculations?	☐	☒
d. Does the modification affect or introduce any requirements for measurement and test equipment, or test equipment accuracy evaluations?	☐	☒
e. Have the instruments been properly selected for the application (including range and accuracy)?	☐	☒
f. Are there sufficient instruments for operators to monitor the process?	☐	☒
g. Are there requirements for instrument scales?	☐	☒
h. Are alarms required for off-normal conditions?	☐	☒
i. Are there requirements for remote and/or local operation?	☐	☒
j. Are there requirements for manual and/or automatic operation?	☐	☒
k. Are there calibration and maintenance requirements for the instruments?	☐	☒
l. Does the modification need to address solid state vulnerability to RFI?	☐	☒
m. Does the modification involve software and programming/programmable settings of digital or electronic equipment?	☐	☒
n. Does the modification affect logic circuits or associated GL 96-01 review/required testing?	☐	☒
o. Could a transient result if the equipment is bumped?	☐	☒

5.0 Structural Design Considerations N/A ☒	YES	NO
a. Does the modification involve seismically qualified equipment (Class 1 or 2) and therefore require a seismic qualification evaluation?	☐	☐
b. Does the modification affect seismic boundaries?	☐	☐
c. Does the modification affect stress calculations of pipe?	☐	☐
d. Does the modification affect the loading or require changes to existing equipment foundations?	☐	☐
e. Does the modification affect wall stress calculations for pressurized concrete cubicles or structures?	☐	☐
f. Does the modification require analysis of non-seismic components placed over or adjacent to seismic components?	☐	☐
g. Does the modification add items that span between two separate seismic areas/buildings? (The effect of the relative movement must be addressed.)	☐	☐
h. Does the modification require clearance review for seismic movement or thermal expansion considerations?	☐	☐
i. Does the modification require a floor or wall loading analysis?	☐	☐
j. Does the modification involve addition of new supports, hangers, or foundations or add weight to or between existing supports, hangers, embeds, or foundations during installation or post-installation?	☐	☐
k. Does the modification require core drills, expansion anchors, or re-bar cuts?	☐	☐
l. Does the modification create an external or internal missile hazard?	☐	☐
m. Does the modification impact wind and storm loading on external structures?	☐	☐
n. Does the modification involve dynamic requirements such as live loading, vibration, and shock/impact?	☐	☐
Is a masonry wall analysis/evaluation required? Consider the following: • Modification will add a masonry wall. • Modification will delete a wall, floor or ceiling affecting a masonry wall. • Modification will locate safety-related components/systems near a masonry wall. • Modification will attach to or route safety-related systems/components through a masonry wall.	☐	☐
Does the modification involve flooding protection considerations, including; • Modification of potential flooding sources or addition of new potential flooding sources to a flood zone and thereby increase the direct or indirect flooding vulnerability of essential equipment? • Degrade existing flood barriers or flood mitigation features providing unanalyzed pathway for flooding to propagate? • Involve the opening of potential flood sources anywhere at the station? • Reduce the capacity to isolate or cope with flooding? • Change plant drainage/backfill requirements? • Locate essential equipment or supporting systems where it would be susceptible to flooding?	☐	☐

Dominion

Design Input Consultation Form

From: Responsible Engineer: Dean Anderson Date: 2/26/14

To: Program/Department: ~~Radiation Protection~~ I&C MAINT Please Reply By: 3/13/14

Subject: Modification Number/Title: KW-14-02008 Disable R-13/R-14 Trip of Aux Bldg Exhaust Fans

<u>Note</u>: If an equivalent department or program procedure or form has been developed to provide design input for modifications, it may be used instead of this form.

The attached draft design description describes the purpose and scope of the proposed modification, identifies the plant systems, structures, and components that are affected, and includes a partial list of design inputs. This form is being routed to you for review because the proposed modification met one or more of the criteria listed on Attachment A for your program or department.

This form documents the review of the proposed modification by your program or department. The review should identify any additional design inputs to be incorporated or referenced in the final design along with any program or departmental impacts created by the proposed modification (e.g., changes to program documents, evaluations, calculations, procedures, training, etc). Attach additional sheets if necessary.

Design Inputs:
1.
2.
3.

References:
1.
2.
3.

Program Documents:
1.
2.
3.

Program/ Department Procedures:
1. SP-45-049.13 , SP-45-050.13
2. SP-45-049.14 , SP-45-050.14
3.

Other Design Considerations/Operating Experience/Comments:

I have reviewed the proposed modification and identified any design inputs or design considerations related to my program or department. Any additional design inputs or references have been identified and documented on this form.

Program Owner/ Department Rep. [signature] J Tinenthal (Print/Sign) Date: 2/26/14

* Return completed form to the Responsible Engineer.

Form No. 732162(June 2013)

Dominion

Design Input Consultation Form

From: Responsible Engineer: Dean Anderson Date: 2/26/14

To: Program/Department: Operations Please Reply By: 3/13/14

Subject: Modification Number/Title: KW-14-02008 Disable R-13/R-14 Trip of Aux Bldg Exhaust Fans

Note: If an equivalent department or program procedure or form has been developed to provide design input for modifications, it may be used instead of this form.

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Design Inputs:
1.
2.
3.

References:
1.
2.
3.

Program Documents:
1.
2.
3.

Program/ Department Procedures:
1. OP-KW-AOP-RM-001
2.
3.

Other Design Considerations/Operating Experience/Comments:

I have reviewed the proposed modification and identified any design inputs or design considerations related to my program or department. Any additional design inputs or references have been identified and documented on this form.

Program Owner/ Department Rep. Rick Smythe / [signature] (Print/Sign) Date: 4-16-14

* Return completed form to the Responsible Engineer.

Dominion

Design Input Consultation Form

From: Responsible Engineer:	Dean Anderson	Date:	2/26/14
To: Program/Department:	Radiation Protection	Please Reply By:	4/17/14
Subject: Modification Number/Title:	KW-14-02008 Disable R-13/R-14 Trip of Aux Bldg Exhaust Fans		

Note: If an equivalent department or program procedure or form has been developed to provide design input for modifications, it may be used instead of this form.

The attached draft design description describes the purpose and scope of the proposed modification, identifies the plant systems, structures, and components that are affected, and includes a partial list of design inputs. This form is being routed to you for review because the proposed modification met one or more of the criteria listed on Attachment A for your program or department.

This form documents the review of the proposed modification by your program or department. The review should identify any additional design inputs to be incorporated or referenced in the final design along with any program or departmental impacts created by the proposed modification (e.g., changes to program documents, evaluations, calculations, procedures, training, etc). Attach additional sheets if necessary.

Design Inputs:
1.
2.
3.

References:
1.
2.
3.

Program Documents:
1. Offsite Dose Calculation Manual (ODCM)
2.
3.

Program/ Department Procedures:
1.
2.
3.

Other Design Considerations/Operating Experience/Comments:

I have reviewed the proposed modification and identified any design inputs or design considerations related to my program or department. Any additional design inputs or references have been identified and documented on this form.

Program Owner/ Department Rep. Daniel J. Shannon/ [signature] (Print/Sign) Date: 4/16/14

* Return completed form to the Responsible Engineer.

Form No. 732162(June 2013)

Dominion

Training Evaluation

For Responsible Engineer Use

Change Document Number: KW-14-02008 **Rev.:** 0

Title: Disable R-13 and R-14 Trip of Aux Bldg Exhaust Fans

A copy of the draft design description AND this form have been attached to the following CRS item:

CONDITION REPORT #: CR544424

Responsible Engineer (RE): Dean Anderson 4/9/14

Print Name Date

For Training Use

Discipline	RFT No.	Training Required? Y	Training Required? N	Prior To Turnover? Y	Prior To Turnover? N	Provide Training Plan Tracking Number(s)	Impact Evaluation Performed By	Training Materials Impacted? Y	Training Materials Impacted? N	Provide Training Materials Tracking Number(s)
Plant Operator	CR544424	☒	☐	☒	☐	CA280625	J.W. Bausch	☒	☒	CA280625
Certified Fuel Handler/ Shift Manager	CR544424	☒	☐	☒	☐	CA280625	J.W. Bausch	☒	☐	CA280625
Electrical Maintenance	N/A	☐	☒	☐	☒	N/A	J.W. Bausch	☐	☒	N/A
I&C Maintenance	N/A	☐	☒	☐	☒	N/A	J.W. Bausch	☐	☒	N/A
Mechanical Maintenance	N/A	☐	☒	☐	☒	N/A	J.W. Bausch	☐	☒	N/A
Maintenance Supervisor	N/A	☐	☐	☐	☐	N/A	N/A	☐	☐	N/A
Chemistry	N/A	☐	☒	☐	☒	N/A	J.W. Bausch	☐	☒	N/A
Radiation Protection	N/A	☐	☒	☐	☒	N/A	J.W. Bausch	☐	☒	N/A
Engineering	N/A	☐	☒	☐	☒	N/A	J.W. Bausch	☐	☒	N/A
Nuclear Employee Training	N/A	☐	☒	☐	☒	N/A	J.W. Bausch	☐	☒	N/A
Other:	N/A	☐	☐	☐	☐	N/A	N/A	☐	☐	N/A

Dominion

Turnover and Closeout Control Form

DC Number: KW-14-02008

Type of Turnover: ☒ Final ☐ Partial: Part ______ of _____
(See attached explanation.)

Punchlist Attached? ☒ No ☐ Yes

Note: A gray box in the Turnover column indicates that type of item is normally updated during closeout. A gray box in the Closeout column indicates that that type of document is normally required to be updated or punchlisted prior to turnover.

Turnover Initials & Date	Punchlist Flag	Closeout Initials & Date	☐ (Closeout column N/A for Partial Turnover)
			I. Installation & Test Procedures
10/2/14	☐ Punchlist		A. Installation Complete
10/2/14	☐ Punchlist		B. Testing Complete
			II. Plant Drawings & Specifications
10/2/14	Not Allowed		A. Critical Drawings
10/2/14	☐ Punchlist		B. Other Drawings and Specifications Required for Turnover
		10/7/14	C. All Other Drawings & Specifications
			III. Procedures & Manuals
10/2/14	Not Allowed		A. Operating Procedures required for Turnover
N/A	☐ Punchlist		B. Other Procedures Required for Turnover
		10/7/14	C. All Other Procedures
			IV. Calculations and Other Outputs
N/A	Not Allowed		A. Design Calculations that support Operability
		N/A	B. All Other Outputs
			V. Data Files/Configuration Management Items
N/A	☐ Punchlist		A. Data Files Required for Turnover
		10/7/14	B. All Other Data Files

			VI. Other Turnover Items
[signature] 10/2/14	☐ Punchlist		A. Labels and Operator Aids Installed
[signature] 10/2/14	☐ Punchlist		B. Condition Reports and Actions Closed
[signature] 10/2/14	☐ Punchlist		C. 10 CFR 50.71(e) USAR Changes Submitted to USAR Change Coordinator
[signature] 10/2/14	Not Allowed		D. NRC Approval / License Amendment Received
[signature] 10/2/14	☐ Punchlist		E. Qualification Training Completed
			VII. Design Change Updates (DCUs)
N/A	☐ Punchlist		A. DCUs Required for Turnover
		N/A	B. All Other DCUs
			VIII. Other Closeout Items
		N/A	A. Punchlist(s) Completed
N/A	☐ Punchlist	N/A	B. Construction Drawings / As-Builts
		N/A	C. Spare/Obsolete Parts Evaluation Completed
		[signature] 10/7/14	D. All Training Completed
		[signature] 10/7/14	E. Other Items

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Facility Safety Review Committee

January 30, 2014 **0959 Hours**

ATTENDEES:

Quorum

Chairperson:	J Stafford, Chairperson – Director Safety and Licensing *(1)* BJ McMahon, Manager – Operations *(1)* ME Aulik, Manager – Engineering Design *(1)* JD Helbing, Nuclear Specialist—Maintenance *(1)*
FSRC Coordinator:	SA Smidel, Administrative Assistant -Safety and Licensing
Presenters:	SD Hills, Corrective Action BL Koehler, Engineer Programs Supervisor TS Wattleworth, Design Engineering CR Steinhardt, System Engineering
Guests:	DC Lohman, Project Manager Engineering DW Falk, SAFSTOR Security AW Murphy, Supervisor Nuclear Security Training

(1) Indicates Chairperson and Members required for quorum per LI-AA-600.
(alt) Alternate Member *(nv)* Non-Voting Member

The Chairperson called the meeting to order and noted that quorum requirements were met. The following items were discussed and dispositioned as noted.

FSRC 14-006 Miscellaneous Item
Presenter: Steinhardt *Approved*

1) SYS-32D-DSERT

Solid Rad Waste Categorization package was being presented to FSRC because this system processes effluents. Based on Chapter 15 of the ODCM, this package needs review by FSRC.

Discussion: FSRC reviewed and discussed the DSERT package and identified no safety issues or concerns.

The Committee recommended approval of DSERT Packet.

FSRC 14-007

Design Change
Presenter: Wattleworth *Approved w/comments*

1) DC-KW-13-01089, Internal Security

With the permanent cessation of plant operation (Ref. 6.1), it is financially desirable to find ways to reduce staffing levels. Changes to the interior of the plant are proposed so that Security Plan requirements could be met with a reduced Security staff. The changes proposed in this design change do not reduce the effectiveness of the current revision of the Security Plan. All changes proposed by this design may be implemented without prior NRC approval. NRC approval is required for Security to take advantage of many of the changes implemented by this modification. Security will obtain this approval as necessary and make any subsequent document updates (e.g., the Security Plan, Security Procedures, etc.) outside of this modification

This DC will implement changes to the interior of the plant to allow Security Plan requirements to be met with a reduced Security staff. The changes include: Removing sections Aux Building Stairwell J; Permanently blocking Door 52 to Stairwell J; Installing bullet resistant plate on the EL 659' platform in the Aux; Installing delay fencing at the Hot Tool Crib and at Door 96 on Aux EL 633'-6", Installing a net barrier over the existing SFP fence; Replacing the SFP FME barrier; Removing the Hot Machine Shop; Installing vehicle barrier blocks in the aux truck bay; Removing Door 32 from its frame; Installing an external deadbolt on Door 151; and removing the door handle locks from Doors 39, 70, 75, 109 and 427. These changes will not reduce the effectiveness of the current Security Plan.

Discussion: FSRC reviewed and discussed the design change and identified no safety issues or concerns.

The Committee recommended approval of the procedure with comments.

FSRC 14-008

Miscellaneous Item
Presenter: Koehler *Approved*

1) NAD-01-02, Plant Fire Protection Program

Directives are not required for implementation under the Dominion Quality Assurance Program. The information in the directive is either already contained within the Fire Protection Program Plan (FPPP), in another procedure, or no longer applicable. The referenced commitment (COMTRAK 94-012/QAR 95-007) is not an NRC Commitment, but rather a tracking action for NSRAC QA Open Item 76-01. The only aspect of the commitment relating to the directive was associated with development of a formal mechanism for Fire Protection staff to review and design changes for impact on the Fire Protection Program licensing documents (FPP, FPPA, and ARDD). This review is required by the FPPP, and implemented through CM-KW-DDC-401, Design Inputs and GNP-05.30.01, Fire Protection Program Document Change Control.

Discussion: FSRC reviewed and discussed the directive and identified no safety issues or concerns.

The Committee recommended approval of deletion of the directive.

FSRC 14-009 Miscellaneous Item
Presenter: Koehler *Approved*

1) FPP-08-13, Fire Report

References to Appendix R and its associated requirements were removed throughout the procedure since this regulatory requirement is no longer applicable for KPS (reference FPEE-069). Changes also include updates to current organizational titles and references.

Discussion: FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the procedure

FSRC 14-010 Miscellaneous Item
Presenter: Koehler *Approved*

1) FPP-08-015, Appendix R Fire Wrap Inspection

The regulatory requirement for compliance with Appendix R for the fire wrap systems is no longer applicable for KPS (reference FPEE-069). The referenced commitment (COMTRAK 94-012/QAR 95-007) is not an NRC commitment as described above, and the only aspect of the commitment relating to the procedure was associated with development and implementation of a formal inspection of the Appendix R fire wrap systems.

Discussion: FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the deletion of the procedure

FSRC 14-011

Miscellaneous Item
Presenter: Koehler *Approved*

1) FPP-08-016, Fire Protection Engineering Evaluations

References to Appendix R and its associated requirements were removed throughout the procedure since this regulatory requirement is no longer applicable for KPS (reference FPEE-069). Changes also include updates to current organizational titles and references. The SFPE Member eligibility reference was updated to reflect a change by the society in membership status from "Member" to "Professional Member" or "Associated Member".

Discussion: FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the procedure

FSRC 14-012

Miscellaneous Item
Presenter: Koehler *Approved w/comments*

1) FPP-08-017, Impairments to Active Fire Protection Systems

References to Appendix R and its associated requirements were removed throughout the procedure since this regulatory requirement is no longer applicable for KPS (reference FPEE-069). Changes also include updates to current organization titles, references, and editorial corrections.

Discussion: FSRC reviewed and discussed the procedure and asked the presenter to disposition the cross discipline review for operations.

The Committee recommended approval of the procedure

FSRC 14-013

Miscellaneous Item
Presenter: Koehler *Approved*

1) FPP-08-018, Pre-Fire Plan

References to Appendix R and its associated requirements were removed throughout the procedure since this regulatory requirement is no longer applicable for KPS (reference FPEE-069). Changes also include updates to current organization titles, references, and editorial corrections.

Discussion: FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the procedure

FSRC 14-014

Miscellaneous Item
Presenter: Hills *Approved*

1) Periodic Review of Open ODs and RAS's

6 Month Review of Open OD and RAS items per OP-AA-102, Operability Determinations. One issue was closed since the previous review, while one issue was added (FPC-11A). There are a total of 4 open issues; 2 remain open and are related to finalization of the SAFSTOR electrical configuration design, 1 that could be closed out to decommissioning related to Appendix R requirements that have since been removed, and 1 related to FPC-11A as mentioned. There are no adverse impacts due to the degraded or non-conforming condition.

Discussion: FSRC reviewed and discussed the open ODs and RAS's and identified no safety issues or concerns.

The Committee recommended approval of the procedure

The meeting adjourned at 1030.

To the best of the Committee's knowledge, none of the above items required NRC approval prior to implementation.

Submitted by: Sarah Smidel 2/3/14
SA Smidel Date
Recording Secretary

APPROVED: JT Stafford 2-3-14
JT Stafford Date
FSRC Committee Chairman

APPROVED: AJ Jordan 2-5-14
AJ Jordan Date
Site Vice President

ATTACHMENTS:
None

Facility Safety Review Committee

February 13, 2014 1000 Hours

ATTENDEES:

Quorum

Chairperson: J Stafford, Chairperson – Director Safety and Licensing *(1)*
JM Hale, Manager-Radiation Protection and Chemistry *(1)*
BJ McMahon, Manager – Operations *(1)*
ME Aulik, Manager – Engineering Design *(1)*

FSRC Coordinator: SA Smidel, Administrative Assistant -Safety and Licensing

Presenters: WG Swanson, Ops-Decommissioning
JR Barbier, Coordinator Nuclear Security Programs
J Gadzala, Decommissioning Licensing

Guests: B O'Connell, Systems Engineering

(1) Indicates Chairperson and Members required for quorum per LI-AA-600.
(alt) Alternate Member *(nv)* Non-Voting Member

The Chairperson called the meeting to order and noted that quorum requirements were met. The following items were discussed and dispositioned as noted.

FSRC 14-015 Miscellaneous Item
Presenter: Swanson *Approved w/comments*

1) CAT Plan for Turbine Building Vent- System 16

Turbine Bldg Ventilation was brought to FSRC because it supports cooling of equipment necessary for cooling, monitoring, and storage of spent fuel.

Discussion: FSRC had the following question:

- Will a single turbine building fan coil unit be sufficient to remove the heat from the bus work?

The Committee recommended approval of this CAT packet pending resolution of the question.

FSRC 14-016

Miscellaneous Item
Presenter: Swanson *Approved w/comments*

1) CAT Plan for Aux Building Vent- System 17

Aux Bldg Ventilation was brought to FSRC because it supports cooling of equipment necessary for cooling, monitoring, and storage of spent fuel.

Discussion:

FSRC reviewed and discussed the CAT plan and identified no safety issues or concerns.

The Committee recommended approval of CAT Plan for Aux Building Vent-System 17.

FSRC 14-017

Miscellaneous Item
Presenter: Gadzala *Approved*

1) NLAR 95- Deletion of TRM 8.3.6, Seismic Monitoring Instrumentation"

The purpose of NLAR 95 is to delete Technical Requirements (TRM) 8.3.6 Seismic Monitoring Instrumentation. TRM 8.3.6 BASES states the seismic monitoring instrumentation is used to provide data on seismic events in order to permit a timely determination of the need for shutting down the reactor as a result of the event. With the reactor permanently shut down and defueled, TRM 8.3.6 "Seismic Monitoring Instrumentation" can be deleted as this function of the seismic monitor is no longer required.

Discussion:

FSRC reviewed and discussed the NLAR and identified no safety issues or concerns.

The Committee recommended approval of the deletion of NLAR 95.

FSRC 14-018

Miscellaneous Item
Presenter: Barbier *Approved w/comments*

1) SY-KW-PLN-090, Vehicle Access Control

Procedure is being updated to align with revision 3 of the Physical Security Plan (PSP).

Discussion: NOTE: No safeguards information is contained in the following discussion. All individuals present verified they were safeguards qualified. PCS phones were not answered during discussion of this item.

FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the procedure with comments pending completion of GNP 03.01.01 attachment B.

FSRC 14-019 Security Implementing Procedure
Presenter: Barbier *Approved*

1) SIP-30.04, Compensatory Measures and Reportbility Consequences

Procedure is being updated to align with revision 3 of the Physical Security Plan (PSP).

Discussion: NOTE: No safeguards information is contained in the following discussion. All individuals present verified they were safeguards qualified. PCS phones were not answered during discussion of this item.

FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the procedure with comments pending completion of GNP 03.01.01 attachment B.

FSRC 14-020 Security Implementing Procedure
Presenter: Barbier *Approved w/comments*

1) SIP-20.02, Admittance and Control of Personnel

Procedure is being updated to align with revision 3 of the Physical Security Plan (PSP).

Discussion: NOTE: No safeguards information is contained in the following discussion. All individuals present verified they were safeguards qualified. PCS phones were not answered during discussion of this item.

FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the procedure with comments pending completion of GNP 03.01.01 attachment B.

FSRC 14-021

Security Implementing Procedure
Presenter: Barbier *Approved w/comments*

1) SIP-20.03, Admittance and Control of Vehicles

Procedure is being updated to align with revision 3 of the Physical Security Plan (PSP).

Discussion:

NOTE: No safeguards information is contained in the following discussion. All individuals present verified they were safeguards qualified. PCS phones were not answered during discussion of this item.

FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the procedure with comments pending completion of GNP 03.01.01 attachment B.

FSRC 14-022

Security Implementing Procedure
Presenter: Barbier *Approved w/comments*

1) SIP-30.03, Operation, Use and Testing of Communications Equipment

Procedure is being updated to align with revision 3 of the Physical Security Plan (PSP).

Discussion:

NOTE: No safeguards information is contained in the following discussion. All individuals present verified they were safeguards qualified. PCS phones were not answered during discussion of this item.

FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the procedure with comments pending completion of GNP 03.01.01 attachment B.

FSRC 14-023

Security Implementing Procedure
Presenter: Barbier *Approved w/comments*

1) SIP-30.05, Central/Secondary Alarm Station and Access Control Station Operating Procedures

Procedure is being updated to align with revision 3 of the Physical Security Plan (PSP).

Discussion:

NOTE: No safeguards information is contained in the following discussion. All individuals present verified they were safeguards qualified. PCS phones were not answered during discussion of this item.

FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the procedure with comments pending completion of GNP 03.01.01 attachment B.

FSRC 14-024

Security Implementing Procedure
Presenter: Barbier *Approved w/comments*

1) SIP-40.07, LLEA Response Plan

Procedure is being updated to align with revision 3 of the Physical Security Plan (PSP).

Discussion:

NOTE: No safeguards information is contained in the following discussion. All individuals present verified they were safeguards qualified. PCS phones were not answered during discussion of this item.

FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the procedure with comments pending completion of GNP 03.01.01 attachment B.

FSRC 14-025

Security Implementing Procedure
Presenter: Barbier *Approved w/comments*

1) SIP-40.02, Escort Responsibilities

Procedure is being updated to align with revision 3 of the Physical Security Plan (PSP).

Discussion:

NOTE: No safeguards information is contained in the following discussion. All individuals present verified they were safeguards qualified. PCS phones were not answered during discussion of this item.

FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of the procedure with comments pending completion of GNP 03.01.01 attachment B.

The meeting adjourned at 1032.

To the best of the Committee's knowledge, none of the above items required NRC approval prior to implementation.

Submitted by: Sarah Smidel 3/12/14
SA Smidel Date
Recording Secretary

APPROVED: JT Stafford 3-13-14
JT Stafford Date
FSRC Committee Chairman

APPROVED: Arnold Jordan 3-28-14
AJ Jordan Date
Site Vice President

ATTACHMENTS:
None

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Facility Safety Review Committee

March 13, 2014 0959 Hours

ATTENDEES:

Quorum

Chairperson:	J Stafford, Chairperson – Director Safety and Licensing *(1)* BJ McMahon, Manager – Operations *(1)* ME Aulik, Manager – Engineering Design *(1)* JD Helbing, Nuclear Specialist—Maintenance *(1)*
FSRC Coordinator:	SA Smidel, Administrative Assistant –Plant Manager
Presenters:	DA Jeanquart, Mechanical Maintenance Supervisor JR Barbier, Security Compliance Coordinator WG Swanson, Ops Decommissioning
Guests:	-None-

(1) Indicates Chairperson and Members required for quorum per LI-KW-600.
(alt) Alternate Member *(nv)* Non-Voting Member

The Chairperson called the meeting to order and noted that quorum requirements were met. The following items were discussed and dispositioned as noted.

FSRC 14-028 Miscellaneous Item
Presenter: Swanson *Approved*

1) R-15/19 RadMonitors Categorization plan for future abandonment

R-15/19 were brought to FSRC for future abandonment, as they are effluent monitors. So, per ODCM Chapter 15, they require FSRC review for abandonment.

Discussion: FSRC reviewed the R-15/19 Rad Monitors Categorization plan for future abandonment and had no safety issues or concerns.

The Committee recommended approval of categorization plan R-15/19.

FSRC 14-029

Security Procedure
Presenter: Barbier *Approved w/comments*

1) KPS Part 37 Security Plan for the protection of category 1 and 2 quantities of radioactive material

This will be a new Security Plan that has been established to be in compliance with the regulations of 10CFR part 37. This plan will also be a separate plan from the current Physical Plan which is designed to meet the regulations of 10CFR part 73.

Discussion:

FSRC recommended the following:

- Generate a corrective action regarding the need for Protection Services to make the proper updates to SY-KW-103 Attachment A to add the Part 37 Security Plan to the title and add a 4th step to ensure future changes to the Part 73 Physical Security Plan do not decrease or contradict the effectiveness of the Part 37 Security Plan. FSRC members also recommend Protection Services evaluate and determine if an effectiveness review, regarding the implementation of part 37 requirements, would be beneficial due to the timeline associated with the NRC established required compliance date.

The Committee recommended approval of this procedure pending resolution of the comment.

FSRC 14-030

Security Procedure
Presenter: Barbier *Approved*

1) RMSIP-1, Physical Protection of Category 1 and Category 2 Radioactive Material

This will be a new procedure to provide guidance for the implementation of the Part 37 Security Plan.

Discussion:

FSRC reviewed and discussed the procedure and identified no safety issues or concerns.

The Committee recommended approval of this procedure.

FSRC 14-031

Miscellaneous Item
Presenter: Jeanquart *Approved w/comments*

1) MA-KW-MPM-FP-030B, Inspection and Dry Test of CO2 System for Diesel Generator Room 1B

This procedure is being brought to FSRC with updates in regards to Cardox System vent piping changes per DC-KW-11-01162.

Discussion: FSRC had the following comments:

- Tech validation sheet will be completed and shown to the FSRC Chair prior to final approval by FSRC.

The Committee recommended approval of this procedure with comments.

FSRC 14-032 Miscellaneous Item
Presenter: Jeanquart *Approved w/comments*

1) MA-KW-MPM-FP-007, Fire Hose Pressure Test

This procedure is being reviewed by FSRC with changes directed by CA 269213, remove B.5.b hoses from MA-KW-MPM-FP-007 and develop a standalone procedure for testing B.5.b hoses and CA 266627, minimum fire hose test pressure not in accordance with Fire Protection program plan.

Discussion: FSRC had the following comments:

- Verify there is no impact on CAPRs
- Verify if you need to use the updated tracking and processing form

The Committee recommended approval of this procedure with comments.

The meeting adjourned at 1030.

To the best of the Committee's knowledge, none of the above items required NRC approval prior to implementation.

Submitted by: Sarah Smidel 4/21/14
SA Smidel Date
Recording Secretary

APPROVED: JT Stafford 4-23-14
JT Stafford Date
FSRC Committee Chairman

APPROVED: Arnold Jordan 5.1.14
AJ Jordan Date
Site Vice President

ATTACHMENTS:
None

DOMINION

Facility Safety Review Committee

March 27, 2014 **1000 Hours**

ATTENDEES:

Quorum

Chairperson:	J Stafford, Chairperson – Director Safety and Licensing *(1)* BJ McMahon, Manager – Operations *(1)* ME Aulik, Manager – Engineering Design *(1)* JD Helbing, Nuclear Specialist—Maintenance *(1)* JM Hale, Manager –RP/Chemistry *(1)*
FSRC Coordinator:	SA Smidel, Administrative Assistant –Plant Manager
Presenters:	JP Brandtjen, Nuclear Engineer III WG Swanson, Ops Decommissioning
Guests:	MR Sievert, Engineering

(1) Indicates Chairperson and Members required for quorum per LI-AA-600.
(alt) Alternate Member *(nv)* Non-Voting Member

The Chairperson called the meeting to order and noted that quorum requirements were met. The following items were discussed and dispositioned as noted.

FSRC 14-033 Miscellaneous Item
Presenter: Swanson *Approved w/comments*

1) Waste Disposal-Liquid, System 32A

Waste Disposal-Liquid, system 32A, was presented to FSRC due to being an effluent processing system and per ODCM, requires FSRC review for changes.

Discussion: FSRC reviewed the Waste Disposal-Liquid, System 32A and recommended the following:

- Correct editorial item on page 3
- Address the statement about no procedures and processes being affected by this plan
- On page 4 add reference to item 7

The Committee recommended approval of System 32A categorization plan pending resolution.

FSRC 14-034

Miscellaneous Item
Presenter: Swanson *Approved w/comments*

1) Categorization of DC & Emergency AC Electrical System 38

Electrical-DC & Emergency AC, System 38, was presented to FSRC because the system potentially affects the Fire Protection system.

Discussion:

FSRC recommended the following:

- In section 4 delineate by number which functions are required to be maintained.
- Verify with licensing if we are required to disposition commitments prior to approval of abandonment

The Committee recommended approval of System 38 categorization plan pending resolution.

FSRC 14-035

Miscellaneous Item
Presenter: Swanson *Approved w/comments*

1) Categorization of Electrical – Low Voltage System 40

Electrical-Low Voltage, System 40, was presented to FSRC because the system affects Fire Protection and Spent Fuel Pool Cooling system

Discussion:

FSRC recommended the following:

- In section 4 delineate by number which functions are required to be maintained.
- Verify with licensing if we are required to disposition commitments prior to approval of abandonment

The Committee recommended approval of System 40 categorization plan pending resolution.

FSRC 14-036

Design Change
Presenter: Brandtjen *Approved w/comments*

1) DC-KW-13-01052, Install BDB Pump Connection on SW Line for SFP Emergency Makeup

Design Change KW-13-01052 will provide a connection to facilitate connecting the portable diesel driven Beyond Design Basis (BDB) pump for emergency makeup to the Spent Fuel Pool (SFP). Piping and fitting will be connected to the SFP emergency SW makeup line in the SFP HX room. A hole will be drilled thought the pre-cast panel slab located in the north auxiliary building wall. Locally stored hose will be provided which will be fed through the new port in the wall to allow connection of the hose to BDB pump discharge hose.

This modification is needed to meet commitments associated with NRC Order EA-12-049 and letter dated August 23, 2013, Request to Rescind Order Modifying Licenses with regard to requirements for mitigation strategies for beyond-design-basis external events.

Discussion:

FSRC had the following comments:

- Disposition the measures we are going to take for gross leakage by adding the closing of SW-1500 in the Test Plan.

The Committee recommended approval of this design change with comments.

The meeting adjourned at 1030.

To the best of the Committee's knowledge, none of the above items required NRC approval prior to implementation.

Submitted by: Sarah Smidel 4/10/14
SA Smidel Date
Recording Secretary

APPROVED: JT Stafford 4-22-14
JT Stafford Date
FSRC Committee Chairman

APPROVED: Arnold Jordan 4-23-14
AJ Jordan Date
Site Vice President

ATTACHMENTS:
None

Facility Safety Review Committee

May 19, 2014 0958 Hours

ATTENDEES:

Quorum

Chairperson: J Stafford, Chairperson – Director Safety and Licensing *(1)*
BJ McMahon, Manager – Operations *(1)*
ME Aulik, Manager – Engineering Design *(1)*
JD Helbing, Nuclear Specialist—Maintenance *(1)*
JM Hale, Manager –RP/Chemistry *(1)*

FSRC Coordinator: SA Smidel, Administrative Assistant –Plant Manager

Presenters: DE Anderson, Design Engineering

Guests: TP Olson, Assistant Plant Manager
BD O'Connell, System Engineer

(1) Indicates Chairperson and Members required for quorum per LI-KW-600.
(alt) Alternate Member *(nv)* Non-Voting Member

The Chairperson called the meeting to order and noted that quorum requirements were met. The following items were discussed and dispositioned as noted.

FSRC 14-042 Design Change
Presenter: Anderson *Approved*

1) DC-KW-14-02008, Disable R-13/R-14 Trip of Aux Building Exhaust Fans

Design Change KW-14-02008 will eliminate the function from R-13 and R-14 that trips the Auxiliary Building exhaust fans and isolates their associated discharge dampers. This will be done by installing a total of eight jumpers. Two jumpers in each relay racks RR-143 and RR-144 will be installed bypassing the exhaust fan trips. Two jumpers in each of terminal boxes TB 1626 and TB1739 will be installed by bypassing the discharge damper trips. The jumpers will bypass the following relay contacts: RMXA1/29098 (contact A), RMXA1/29098 (contact E), RMXB/29099 (contact A), RMXB/29099 (contact H), ABZXA2 (contact 8), ABZXA3 (contact 5), ABZXB1 (contact 3) and ABZXB1 (contact 4).

Discussion: FSRC reviewed the design change and identified no safety issues or concerns.

The Committee recommended approval of the design change.

The meeting adjourned at 1002.

To the best of the Committee's knowledge, none of the above items required NRC approval prior to implementation.

Submitted by: Sarah Smidel 6/3/14
SA Smidel Date
Recording Secretary

APPROVED: JT Stafford 6-4-14
JT Stafford Date
FSRC Committee Chairman

APPROVED: AJ Jordan 6-9-14
AJ Jordan Date
Site Vice President

ATTACHMENTS:
None

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