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Ref. # Tech. Spec. 5.6.3
10CFR50.36a

April 24, 2014

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

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT
DOCKET NOS. 50-445 AND 50-446
TRANSMITTAL OF YEAR 2013 RADIOACTIVE EFFLUENT RELEASE REPORT

Dear Sir or Madam:

In accordance with Comanche Peak Nuclear Power Plant Units 1 and 2 Technical Specifications (TS) 5.6.3 and Section 6.9.1.4 of the Comanche Peak Offsite Dose Calculation Manual (ODCM), enclosed is the Radioactive Effluent Release Report which covers the reporting period from January 1, 2013 through December 31, 2013.

The tabular summaries of radioactive liquid and gaseous releases are provided in the format defined in Appendix B of Regulatory Guide 1.21, Rev. 1, dated June, 1974.

During this reporting period there was one revision to the ODCM. This revision is discussed in the report and is denoted by change bars in the copy of the ODCM provided in Enclosure 2.

If there are any questions regarding this report, please contact Steve Dixon at (254) 897-5482 or Kerry Cooper at (254) 897-0462.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

By: _____
Fred W. Madden
Director, External Affairs

Received
7/8/2014

"Designated Original"
per B. Singal

IE48
NRR

Enclosures - 1. Comanche Peak 2013 Radioactive Effluent Release Report
2. Comanche Peak Offsite Dose Calculation Manual (ODCM)

c - M. L. Dapas, Region IV
K. M. Kennedy, Region IV
B. Singal, NRR
Resident Inspectors, Comanche Peak

Enclosure 1

Comanche Peak 2013 Radioactive Effluent Release Report

CPNPP

Comanche Peak Nuclear Power Plant

2013 RADIOACTIVE EFFLUENT RELEASE REPORT

January 1, 2013 - December 31, 2013

Prepared By: David Valentine Date 3/19/14

Reviewed By: Don Rebstock Date 3/19/14

Approved By: Kerry Cooper Date 3/19/14

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CPNPP	Comanche Peak Nuclear Power Plant
ECL	Effluent Concentration Limit
IFSFI	Independent Spent Fuel Storage Installation
LDCR	Licensing Document Change Request
LHMT	Laundry Holdup and Monitor Tanks
LVW	Low Volume Waste
ODCM	Offsite Dose Calculation Manual
PET	Primary Effluent Tanks
pCi	Pico-Curie
REC	Radiological Effluent Control
SORC	Station Operations Review Committee
uCi	Micro-Curie
WMT	Waste Monitor Tanks
WWHT	Waste Water Holdup Tanks

1.0 Introduction

This Radioactive Effluent Release Report, for Comanche Peak Nuclear Power Plant Unit 1 and Unit 2, is submitted as required by Technical Specification 5.6.3 and Offsite Dose Calculation Manual (ODCM) Administrative Control 6.9.1.4 for the period January 1, 2013, through December 31, 2013.The data in this report was calculated in accordance with the CPNPP ODCM and using the Canberra OpenEMS software.

1.1 Executive Summary

The radioactive effluent monitoring program for the year 2013 was conducted as described in the following report. The results of the monitoring program indicate the continued effort to maintain the release of radioactive effluents to the environment as low as reasonably achievable (ALARA).

In June 2009, the NRC provided revised guidance in Regulatory Guide 1.21, *Measuring, Evaluating and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste, Revision 2*, establishing an updated approach for identifying principal radionuclides. Because the overall quantity of radioactive releases has steadily decreased due to improvements in power plant operations, carbon 14 (C-14) now qualifies as a "principal radionuclide" (anything greater than one percent of overall radioactivity in effluents) under federal regulations at many plants. In other words, C-14 has not increased and C-14 is not a new nuclear plant emission. Rather, the improvements in the mitigation of other isotopes have made C-14 more prominent.

Attachment 10.3 on page 50 provides more detail about C-14.

Gaseous Effluents:

A summary of all the radioactive gaseous releases to the environment during 2013:

Gaseous Waste	2012	2013	Comments
Tritium	51.6 Ci	35.8 Ci	1
C-14 Activity	23.5 Ci	23.4 Ci	
Total Fission and Activation Activity	1.27 Ci	0.88 Ci	2
Total Particulate Activity	0 Ci	0 Ci	3
Gross Alpha Activity	0 Ci	0 Ci	3
Iodine Activity	0 Ci	0 Ci	3
Calculated Gamma Air Dose	4.15E-04 mRad	3.86E-04 mRad	2
Calculated Beta Air Dose	3.08e-04 mRad	2.33E-04 mRad	2
Total Whole body dose	0.11 mRem	0.09 mRem	2

Comments:

1. The major contributor to gaseous tritium activity is evaporation from the spent fuel pools. Factors contributing to the tritium activity in the pools is related to the type of fuel used (i.e., 18-month fuel) the core life and power output and number of core cycles.
2. There was only 1 refueling outage in 2013. However in 2012, there was a mid-cycle outage that required degassing of the RCS in addition to a planned refueling outage. Consequently, activities and doses are lower in 2013.
3. No alpha, iodine or particulate activity was released.

Overall the gaseous radioactivity releases from CPNPP are well controlled and maintained ALARA. CPNPP is well below all applicable limits for gaseous releases. Neither unit had fuel defects during 2013.

Liquid Effluents:

A summary of all the radioactive liquid releases to the environment during 2013:

Liquid Waste	2012	2013	Comments
Total Activity (excluding tritium)	1.38E-02 Ci	3.47E-03 Ci	1,2
Tritium Activity	2430 Ci	919 Ci	1,2,4
Total Whole Body Dose	0.171 mRem	0.175 mRem	3
Total Volume Released	18,733,509 gal	697886 gal	4

Comments

1. 29% less waste water was processed in 2013 versus 2012.

2. There was only 1 refueling outage in 2013. However in 2012, there was a mid-cycle outage that required degassing of the RCS in addition to a planned refueling outage. Consequently, activities and doses are lower in 2013.

3. Although the total curies released are much lower in 2013, the specific isotopes that have the highest dose factors are approximately the same as those in 2012. Thus although the activity released was lower in 2013, the dose is about the same as that from 2012.

4. Explanation for the larger than normal total volume released during 2012: CPNPP processes many millions of gallons of non-radioactive water each year from the secondary portion of the plant. Water plant waste, turbine building sumps and other sources all contribute to these totals. This waste water is processed through the low volume waste (LVW) system which then discharges to Squaw Creek Reservoir. A quarterly composite sample from the LVW is analyzed quarterly for activity.

   Analysis of the 2012 Q2 LVW composite indicated a small concentration of tritium. Consequently, the volume discharged from the LVW had to be accounted for as radioactive liquid waste for that quarter resulting in a much larger than normal total annual liquid waste volume.

   There was no tritium in the LVW composite in 2013. Thus the volume and tritium activity was significantly reduced.

Meteorological Data

The CPNPP meteorological system achieved a greater than 99.3% recoverable data rate for the joint frequency parameters required by Regulatory Guide 1.23 for wind speed, wind direction and delta temperature. See section 7.1 for the actual recovery percentages.

Monitors OOS > 30 Days

During 2013 there were no Technical Specification/ODCM effluent radiation monitors out of service for >30 days.

ODCM Changes

There was one change made to the ODCM during 2013. The change replaces references of OSL (Optically Stimulated Luminescence) dosimetry badges with TLD (Thermo Luminescent Dosimeter) dosimetry.

Solid Waste

Summary of the solid waste production

Total Waste	2012	2013	% Error
Shipped (m3)	230	412	25%
Shipped (Ci)	2.97	235	25%
Buried (m3)	46.8	49.1	25%
Buried (Ci)	2.98	235	25%

Comments

In 2013 CPNPP shipped and buried significantly more Class B and C waste to the compact disposal facility in Andrews, Texas. This waste has a very high specific activity with respect to Class A waste. In 2012, CPNPP only disposed of Class A waste and consequently the activity was very low with respect to 2013 values. The buried volume in both years are similar since Class B and C wastes are in packages of 120 cubic feet, or about 3 cubic meters, and consequently, the impact on the overall waste volume is minimal.

Groundwater Tritium

There were two indications of tritium in sentinel well location CP-A near the Water Plant. The source of the tritium is from a leaking pipe that goes from the Water Treatment Plant and Microfiltration Building sumps to the Low Volume Waste (LVW) Pond. Because Squaw Creek Reservoir (SCR) water contains a low background concentration of tritium, SCR water used in the plant will contain similar concentrations. All of these samples were well below the state drinking water reportable criteria of 20,000 pCi/L and the environmental reportable criteria of 30,000 pCi/L. The leaking pipe has been repaired.

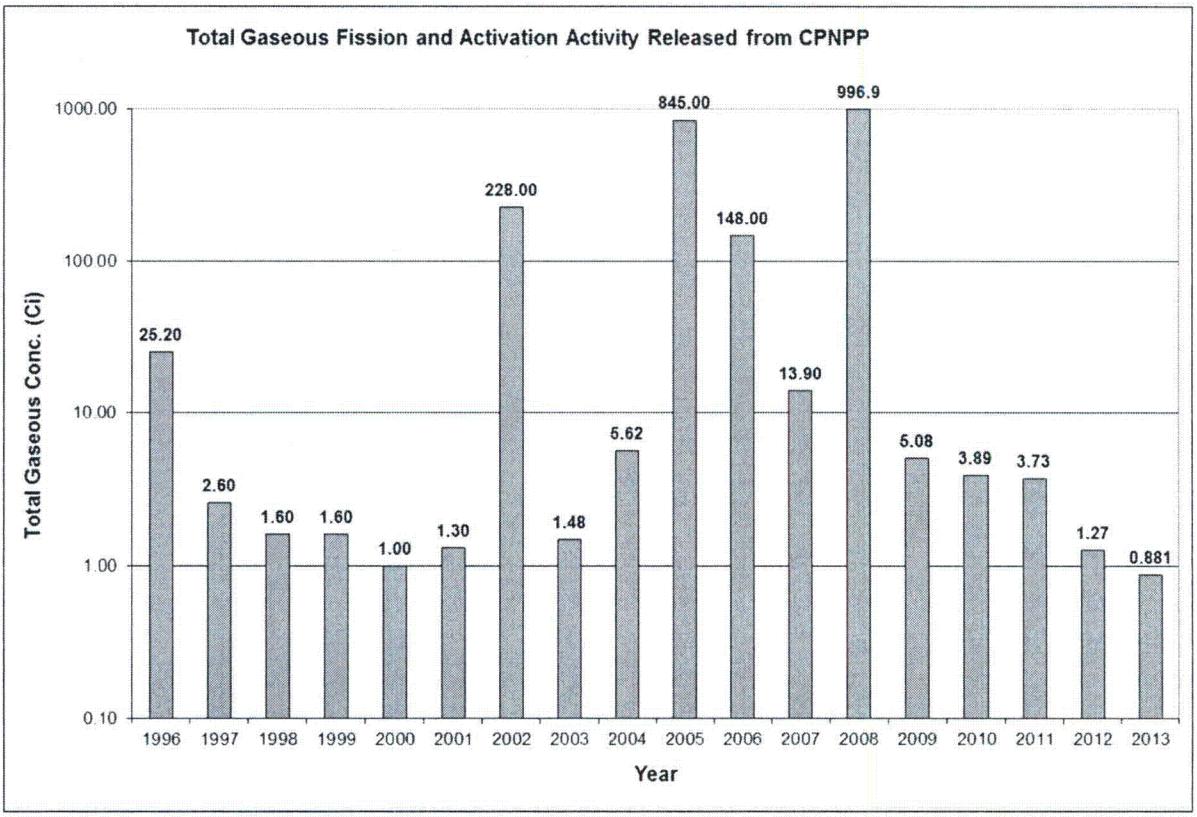
All other monitoring well samples during 2013 were < Minimum Detectable Activity (MDA) for tritium.

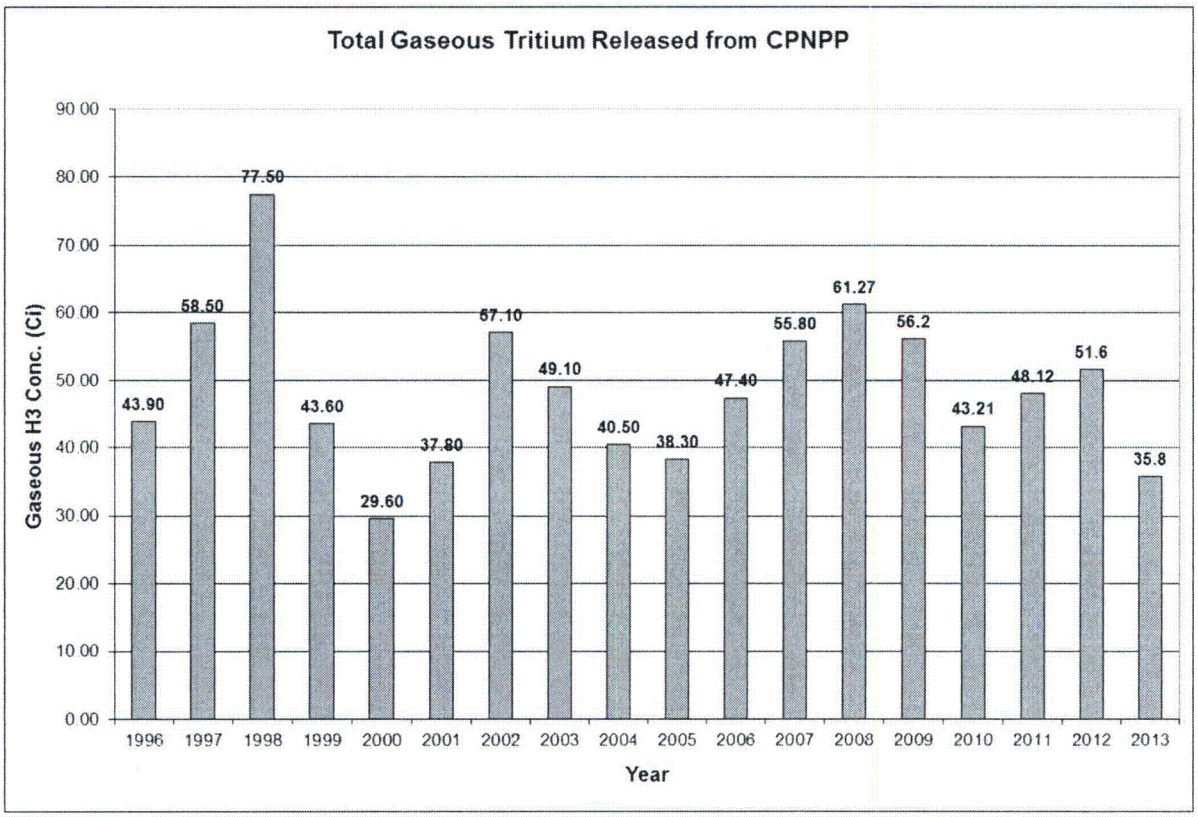
See section 8.8 for details.

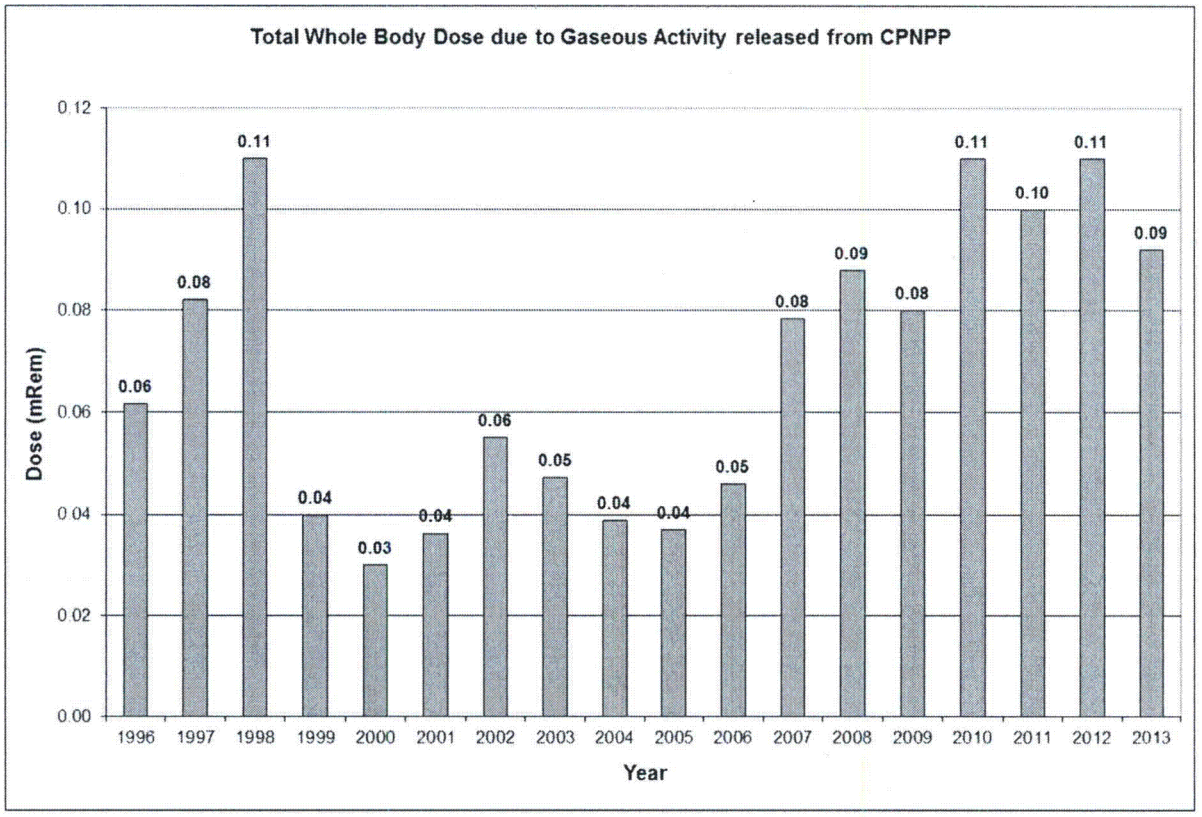
Conclusion

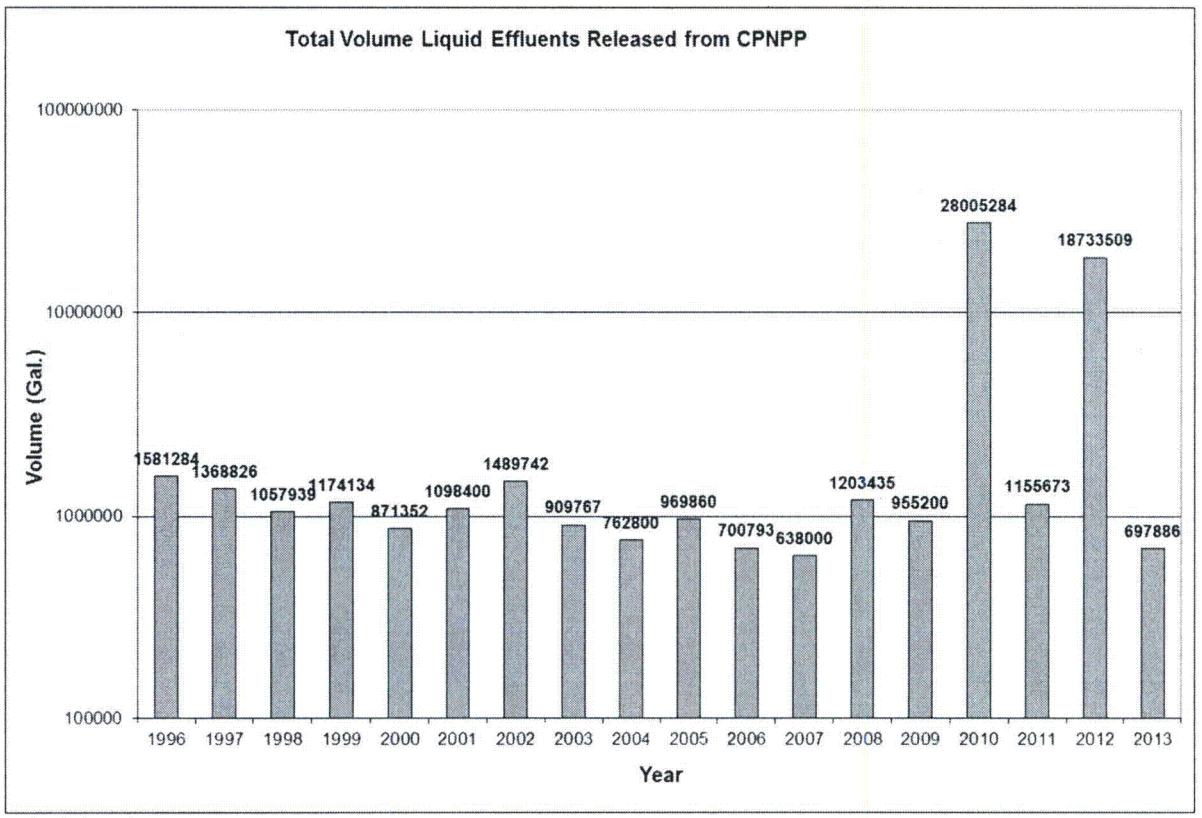
Overall, the radioactive effluent monitoring program has been conducted in an appropriate manner to ensure the activity released and associated dose to the public has been maintained as low as reasonably achievable (ALARA)

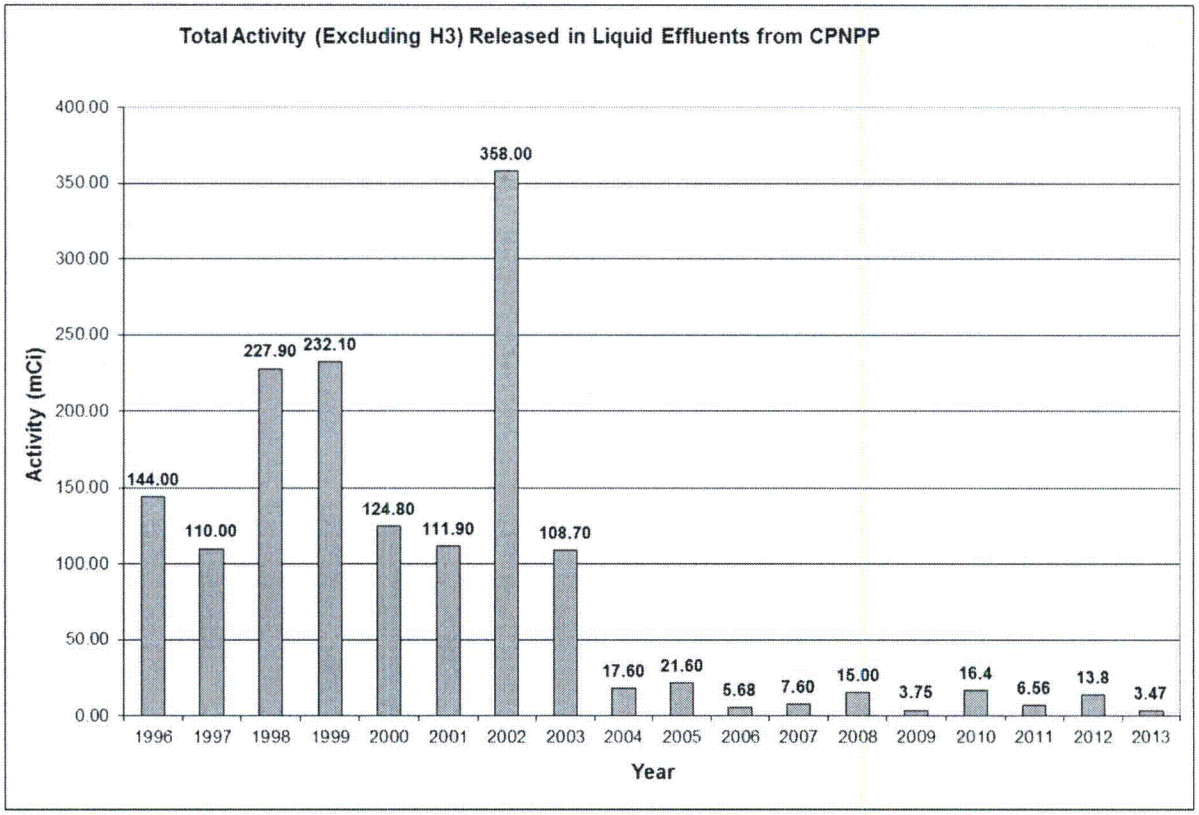
1.2 Historical Trend Graphs

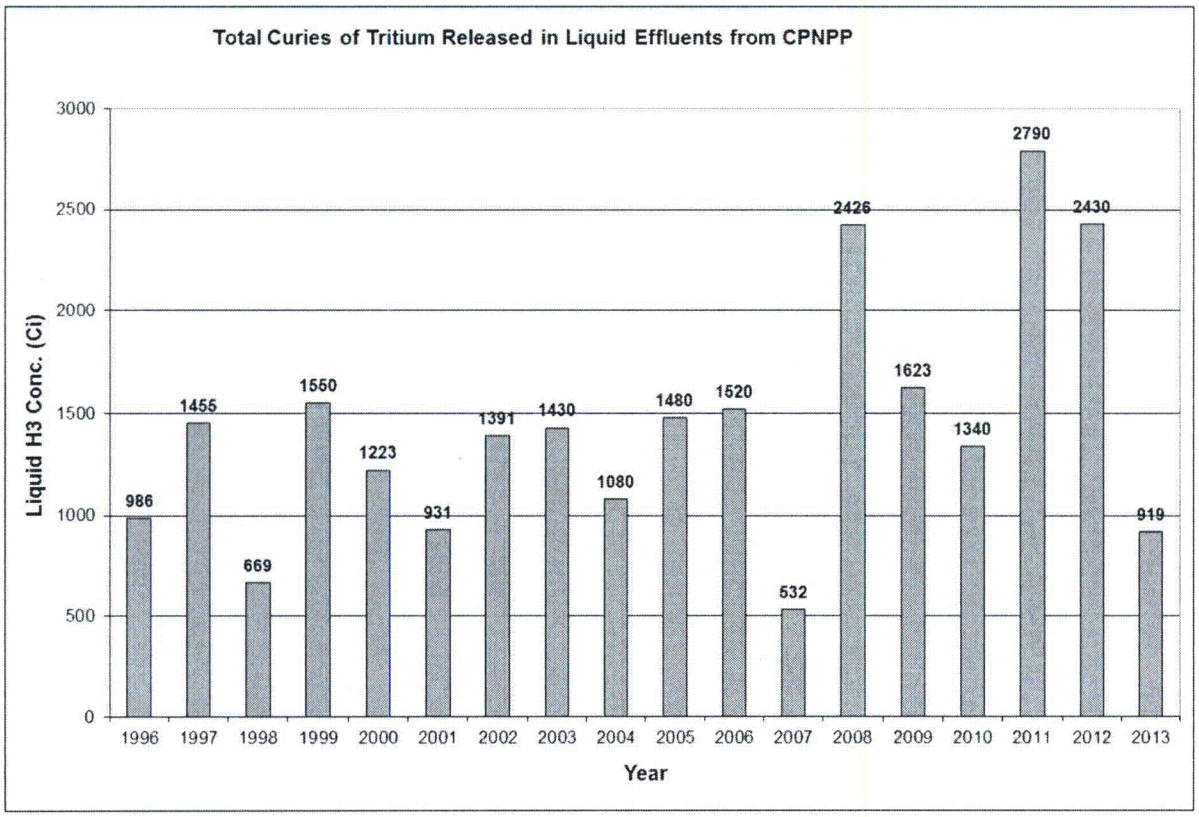


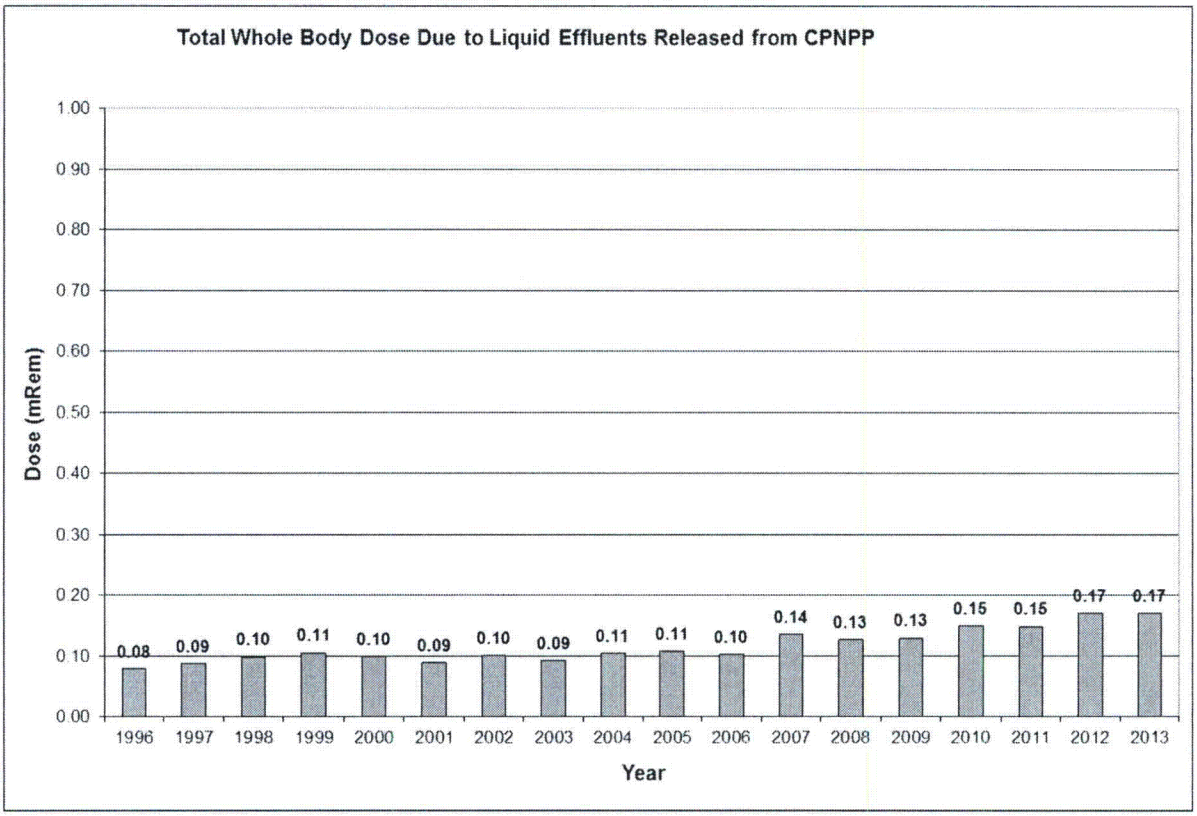


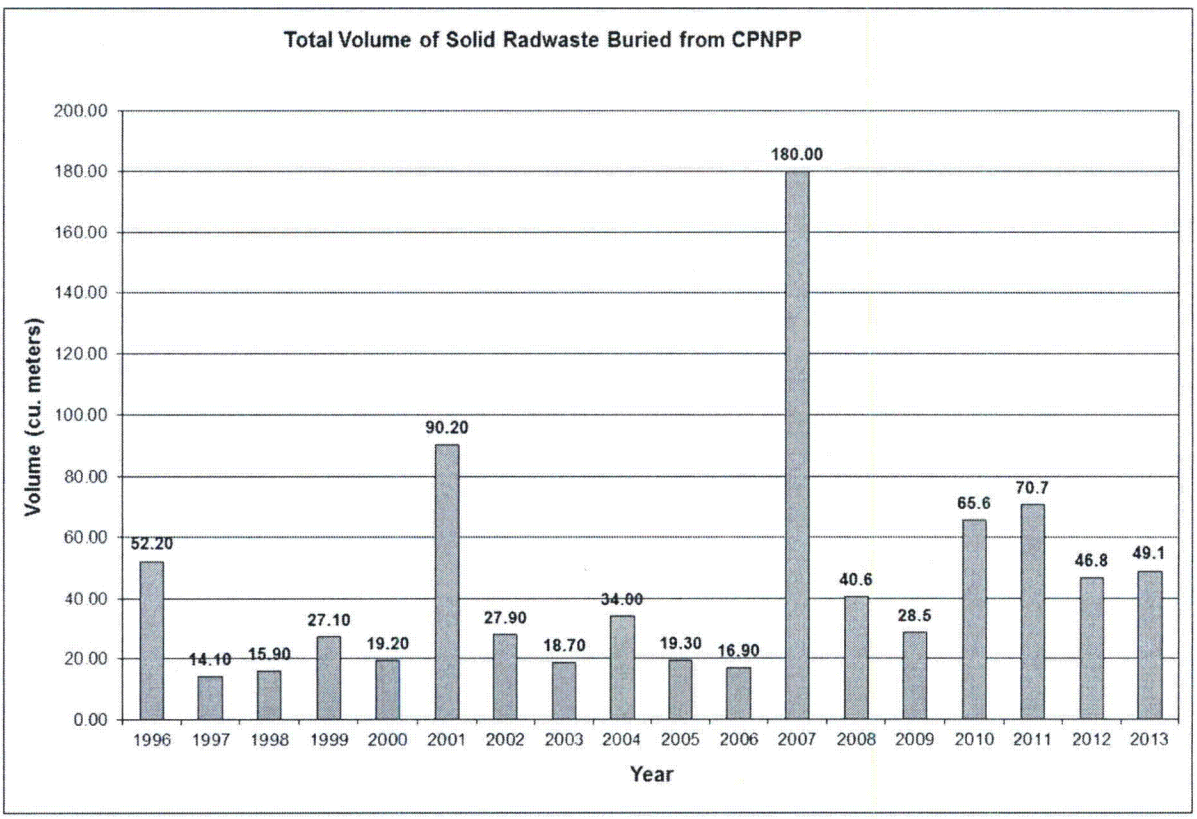

Total Whole Body Dose due to Gaseous Activity released from CPNPP
Dose (mRem)
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.06
0.08
0.11
0.04
0.03
0.04
0.06
0.05
0.04
0.04
0.05
0.08
0.09
0.08
0.11
0.10
0.11
0.09
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Year

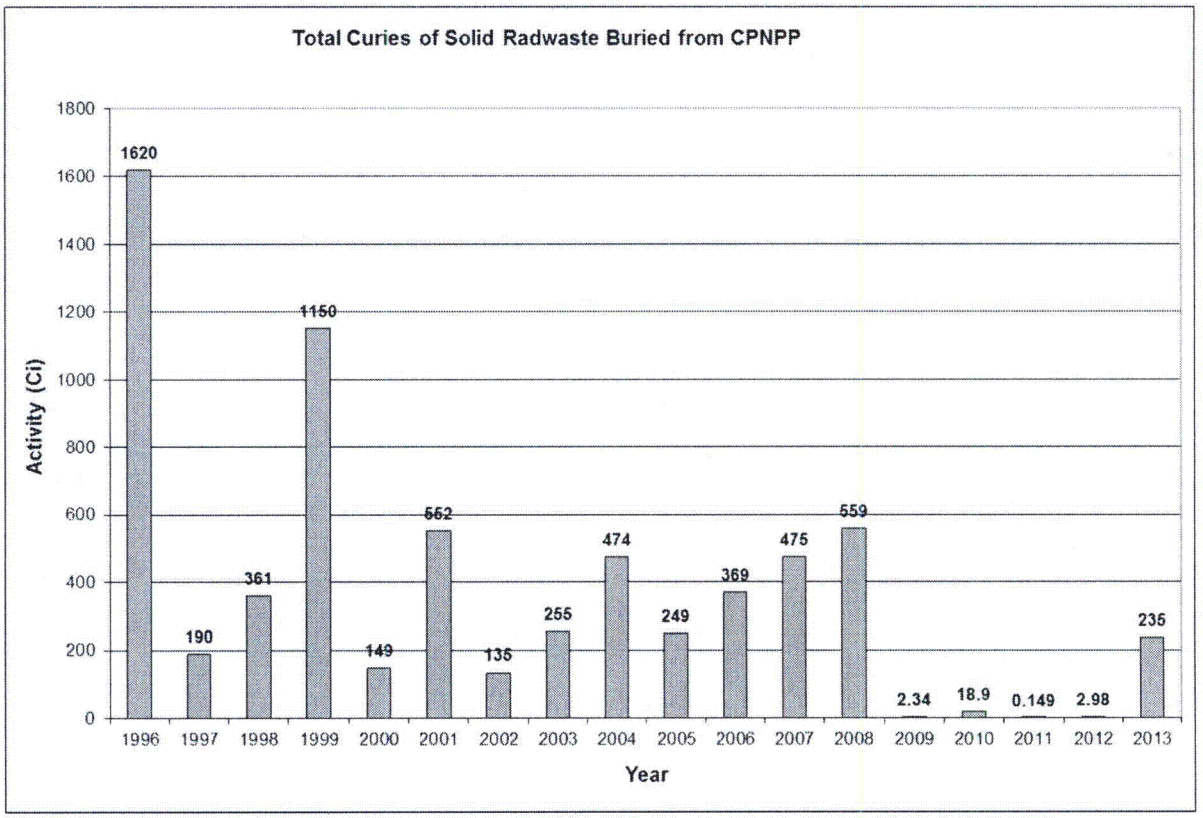

Total Volume Liquid Effluents Released from CPNPP
Volume (Gal.)
100000000
10000000
1000000
100000
1581284
1368826
1057939
1174134
871352
1098400
1489742
909767
762800
969860
700793
638000
1203435
955200
28005284
1155673
18733509
697886
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Year


Total Activity (Excluding H3) Released in Liquid Effluents from CPNPP
Activity (mCi)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
144.00
110.00
227.90
232.10
124.80
111.90
358.00
108.70
17.60
21.60
5.68
7.60
15.00
3.75
16.4
6.56
13.8
3.47
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Year


Total Curies of Tritium Released in Liquid Effluents from CPNPP
Liquid H3 Conc. (Ci)
3000
2500
2000
1500
1000
500
0
986
1455
669
1550
1223
931
1391
1430
1080
1480
1520
532
2426
1623
1340
2790
2430
919
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Year


Total Whole Body Dose Due to Liquid Effluents Released from CPNPP
Dose (mRem)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.08
0.09
0.10
0.11
0.10
0.09
0.10
0.09
0.11
0.11
0.10
0.14
0.13
0.13
0.15
0.15
0.17
0.17
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year


Total Volume of Solid Radwaste Buried from CPNPP
Volume (cu. meters)
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
52.20
14.10
15.90
27.10
19.20
90.20
27.90
18.70
34.00
19.30
16.90
180.00
40.6
28.5
65.6
70.7
46.8
49.1
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year


Total Curies of Solid Radwaste Buried from CPNPP
Activity (Ci)
1800
1600
1400
1200
1000
800
600
400
200
0
1620
190
361
1150
149
562
135
255
474
249
369
475
559
2.34
18.9
0.149
2.98
235
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year

2.0 SUPPLEMENTAL INFORMATION

2.1 Regulatory Limits

The ODCM Radiological Effluent Control limits applicable to the release of radioactive material in liquid and gaseous effluents are described in the following sections.

2.1.1 Fission and Activation Gases (Noble Gases)

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 less than or equal to 500 mRem/yr to the whole body and less than or equal to 3000 mRem/yr to the skin.

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

a. During any calendar quarter: Less than or equal to 5 mRad for gamma radiation and less than or equal to 10 mRad for beta radiation, and

b. During any calendar year: Less than or equal to 10 mRad for gamma radiation and less than or equal to 20 mRad for beta radiation.

2.1.2 Iodine-131, Iodine-133, Tritium and Radioactive Material in Particulate Form

The dose rate due to iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days, released in gaseous effluents from the site to areas at and beyond the site boundary, shall be limited to less than or equal to 1500 mRem/yr to any organ.

The dose to a MEMBER OF THE PUBLIC from iodine-131, iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days, in gaseous effluents released, from each unit, to areas at and beyond the site boundary, shall be limited to the following:

a. During any calendar quarter: Less than or equal to 7.5 mRem to any organ, and

b. During any calendar year: Less than or equal to 15 mRem to any organ.

2.1.3 Liquid Effluents

The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to 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. For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-4 μCi/ml total activity.

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each unit, to unrestricted areas shall be limited:

a. During any calendar quarter to less than or equal to 1.5 mRem to the whole body and to less than or equal to 5 mRem to any organ, and

2.1.3 **b.** During any calendar year to less than or equal to 3 mRem to the whole body and to less than or

equal to 10 mRem to any organ.

2.1.4 LVW Pond Resin Inventory

The quantity of radioactive material contained in resins transferred to the LVW pond shall be limited by the following expression:

$$(264/V) \bullet \Sigma_j A_j/C_j < 1.0$$

excluding tritium, dissolved or entrained noble gases and radionuclides with less than an 8 day half life, where:

A_j = pond inventory limit for a single radionuclide j (Curies),

C_j = 10CFR20, Appendix B, Table 2 Column 2, concentration for a single radionuclide j (μCi/mL),

V = volume of resins in the pond (gallons), and

264 = conversion factor (μCi/Ci per mL/gal)

2.1.5 Total Dose

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 less than or equal to 25 mRem to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mRem.

2.2 Effluent Concentration Limits

2.2.1 Gaseous Effluents

For gaseous effluents, effluent concentration limits (ECL) values are not directly used in release rate calculations since the applicable limits are expressed in terms of dose rate at the site boundary.

2.2.2 Liquid Effluents

The values specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 are used as the ECL for liquid radioactive effluents released to unrestricted areas. A value of 2.0E-04 μCi/mL is used as the ECL for dissolved and entrained noble gases in liquid effluents.

2.3 Measurements and Approximations of Total Radioactivity

Measurements of total radioactivity in liquid and gaseous radioactive effluents were accomplished in accordance with the sampling and analysis requirements of Tables 4.11-1 and 4.11-2, respectively, of the CPNPP ODCM.

2.3.1 Liquid Radioactive Effluents

Each batch release was sampled and analyzed for gamma emitting radionuclides using gamma spectroscopy. Composite samples were analyzed monthly and quarterly for the Primary Effluent Tanks (PET), Waste Monitor Tanks (WMT), Laundry Holdup and Monitor Tanks (LHMT) and Waste Water Holdup Tanks (WWHT). Composite samples were analyzed monthly for tritium and gross alpha radioactivity in the onsite laboratory using liquid scintillation and gas flow proportional counting techniques, respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90, Fe-55, and Ni-63 by a contract laboratory. The results of the composite analyses from the previous month or quarter were used to estimate the quantities of these radionuclides in liquid effluents during the current month or quarter. The total radioactivity in liquid effluent releases was determined from the measured and estimated concentrations of each radionuclide present and the total volume of the effluent released during periods of discharge.

For batch releases of powdex resin to the LVW pond, samples were analyzed for gamma emitting radionuclides, using gamma spectroscopy techniques. Composite samples were analyzed quarterly for Sr-89 and Sr-90 by a contract laboratory.

For continuous releases to the Circulating Water Discharge from the LVW pond, daily grab samples were obtained over the period of pond discharge. These samples were composited and analyzed for gamma emitting radionuclides, using gamma spectroscopy techniques. Composite samples were also analyzed for tritium and gross alpha radioactivity using liquid scintillation and gas flow proportional counting techniques respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90, Fe-55, and Ni-63 by a contract laboratory.

2.3.2 Gaseous Radioactive Effluents

Each gaseous batch release was sampled and analyzed for radioactivity prior to release. Waste Gas Decay Tank samples were analyzed for gamma emitting radionuclides. Containment Building charcoal (iodine), particulate, noble gas, and tritium grab samples were also analyzed for radioactivity prior to each release. The results of the analyses and the total volume of effluent released were used to determine the total amount of radioactivity released in the batch mode.

For continuous effluent release pathways, noble gas and tritium grab samples were collected and analyzed weekly. Samples were analyzed for gamma emitting radionuclides by gamma spectroscopy and liquid scintillation counting techniques. Continuous release pathways were continuously sampled using radioiodine adsorbers and particulate filters. The radioiodine adsorbers and particulate filters were analyzed weekly for I-131 and gamma emitting radionuclides using gamma spectroscopy. Results of the noble gas and tritium grab samples, radioiodine adsorber and particulate filter analyses from the current week and the average effluent flow rate for the previous week were used to determine the total amount of radioactivity released in the continuous mode. Monthly composites of particulate filters were analyzed for gross alpha activity, in the onsite laboratory using the gas flow proportional counting technique. Quarterly composites of particulate filters were analyzed for Sr-89 and Sr-90 by a contract laboratory.

C-14 was estimated in accordance with the methodology in the EPRI report *Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents.* EPRI, Palo Alto, CA: 2010, 1021106. See attachment 10.3 on page 50 for more information on C-14.

2.4 Batch Releases

A summary of information for liquid and gaseous batch releases is included in Table 9.1.

2.5 Abnormal or Unplanned Releases

Abnormal or unplanned releases are defined as the unintended discharge of a volume of liquid or airborne radioactivity to the environment. There were no abnormal (monitored) unplanned gaseous effluent releases during 2013.

3.0 GASEOUS EFFLUENTS

The quantities of radioactive material released in gaseous effluents are summarized in Tables 9.3 and 9.4. All releases of radioactive material in gaseous form are considered to be ground level releases.

4.0 LIQUID EFFLUENTS

The quantities of radioactive material released in liquid effluents are summarized in Tables 9.5 and 9.6.

5.0 SOLID WASTES

The quantities of radioactive material released as solid effluents are summarized in Table 9.10.

6.0 RADIOLOGICAL IMPACT ON MAN

6.1 Dose Due to Liquid Effluents

The dose to an adult from the fish and cow-meat consumption pathways from Squaw Creek Reservoir were calculated in accordance with the methodology and parameters in the ODCM. The results of the calculations are summarized on a quarterly and annual basis in table 9.7.

6.2 Dose Due to Gaseous Effluents

The air dose due to gamma emissions and the air dose due to beta emissions were calculated using the highest annual average atmospheric dispersion factor at the Site Boundary location, in accordance with the methodology and parameters in the ODCM. The results of the calculations are summarized on a quarterly and annual basis in Table 9.8.

6.3 Dose Due to Radioiodines, Tritium and Particulates

The dose to an adult, teen, child, and infant from radio-iodines and particulates, for the pathways listed in Part II, Table 2.4 of the ODCM, were calculated using the highest dispersion and deposition factors, as appropriate, in accordance with the methodology and parameters in the ODCM. The results of the calculations are summarized on a quarterly and annual basis in Table

9.9. Because of pathway similarity, C-14 dose is included in this table.

6.4 40CFR190 Dose Evaluation

ODCM Radiological Effluent Control 3.11.4 requires dose evaluations to demonstrate compliance with 40 CFR Part 190 only if the calculated quarterly or yearly dose exceed two times the applicable quarterly or annual dose limits. At no time during 2013 were any of these limits exceeded, therefore no evaluations are required.

6.5 Dose to a MEMBER OF THE PUBLIC From Activities Inside the Site Boundary

Three activities are considered in this evaluation: fishing on Squaw Creek Reservoir, recreation activities at the CPNPP employee recreational area and site tours through the CPNPP Visitors Center.

The highest dose occurred in the evaluation for fishing, resulting in a dose of 1.46E-03 mRem/yr. The dose to a MEMBER OF THE PUBLIC (fisherman) on Squaw Creek Reservoir was calculated based on fishing twice a week, five hours each day, six months per year. Pathways included in the calculation were gaseous inhalation and submersion. Liquid pathways are not considered since all doses are calculated at the point of circulation water discharge into the reservoir.

The dose to a MEMBER OF THE PUBLIC engaged in recreational activities at the CPNPP employee recreational park was calculated based on one visit a week, five hours each day, six months per year. Pathways included in the calculation were gaseous inhalation, submersion and ground plane.

The dose to a MEMBER OF THE PUBLIC during site tours through the CPNPP Visitors Center was calculated based on two visits per year, thirty minutes each visit. Pathways included in the calculation were gaseous inhalation and submersion.

All calculations were performed in accordance with the methodology and parameters in the ODCM.

7.0 METEROLOGICAL DATA

7.1 Meteorological Monitoring Program

In accordance with ODCM Administrative Control 6.9.1.4, a summary of hourly meteorological data, collected during 2013, is retained onsite. This data is available for review by the NRC upon request. Joint Frequency Tables are included in Attachment 10. During 2013, the goal of >90% joint data recovery was met. The individual percent recoveries are listed below:

Meteorological Data Recovery	
Channel	**% Recovery**
Wind Speed	99.3
Wind Direction	99.3
Delta Temperature A	99.3
Delta Temperature B	99.3

8.0 RELATED INFORMATION

8.1 Operability of Liquid and Gaseous Monitoring Instrumentation

ODCM Radiological Effluent Controls 3.3.3.4 and 3.3.3.5 require an explanation of why designated inoperable liquid and gaseous monitoring instrumentation was not restored to operable status within thirty days.

During the period covered by this report, there were no instances where these instruments were inoperable for more than thirty days.

8.2 Changes to the Offsite Dose Calculation Manual

During the period covered by this report, there was one revision to the ODCM. The change replaced references of OSL (Optically Stimulated Luminescence) dosimetry badges with TLD (Thermo Luminescent Dosimeter) dosimetry.

8.3 New Locations for Dose Calculations or Environmental Monitoring

ODCM Administrative Control 6.9.1.4 requires any new locations for dose calculations and/or environmental monitoring, identified by the Land Use Census, to be included in the Radioactive Effluent Release Report. Based on the 2013 Land Use Census, no new receptor locations were identified which resulted in changes requiring a revision in current environmental sample locations. Values for the current nearest resident, milk animal, garden, X/Q and D/Q values in all sectors surrounding CPNPP were included in the 2013 Land Use Census.

8.4 Liquid Holdup and Gas Storage Tanks

ODCM Administrative Control 6.9.1.4 requires a description of the events leading to liquid holdup or gas storage tanks exceeding the limits required to be established by Technical Specification 5.5.12. Technical Requirements Manual 13.10.33 limits the quantity of radioactive material contained in each unprotected outdoor tank to less than or equal to ten curies, excluding tritium and dissolved or entrained noble gases. Technical Requirements Manual 13.10.32 limits the quantity of radioactive material contained in each gas storage tank to less than or equal to

200,000 curies of noble gases (considered as Xe-133 equivalent). These limits were not exceeded during the period covered by this report.

8.5 Noncompliance with Radiological Effluent Control Requirements

This section provides a listing and description of Abnormal Releases, issues that did not comply with the applicable requirements of the Radiological Effluents Controls given in Part I of the CPNPP ODCM and/or issues that did not comply with associated Administrative Controls and that failed to meet CPNPP expectations regarding Station Radioactive Effluent Controls. Detailed documentation concerning evaluations of these events and corrective actions is maintained onsite.

8.5.1 Normal, Unplanned Gaseous Release

There were no normal, unplanned gaseous effluent releases occurred during 2013.

8.5.2 Abnormal, Unplanned Gaseous Effluent Release

No abnormal, unplanned gaseous effluent releases occurred during 2013.

8.5.3 Abnormal, Unplanned Liquid Effluent Releases

No abnormal, unplanned liquid effluent releases occurred during 2013.

8.6 Resin Releases to the LVW Pond

A total of 342 ft^3 of powdex resin was transferred to the LVW pond during the period covered by this report. The cumulative activity deposited in the LVW pond since operations began through the end of 2013 is 2.06e-3 Curies, consisting of Co-58, Co-60, Cs-134, Cs-137, I-131, Sr-90 and Sb-125.

8.7 Changes to the Liquid, Gaseous, and Solid Waste Treatment Systems

In accordance with the CPNPP Process Control Program, Section 6.2.6.2, changes to the Radwaste Treatment Systems (liquid, gaseous and solid) should be summarized and reported to the Commission in the Radioactive Effluent Release Report if the changes implemented required a 10CFR50.59 safety evaluation.

For the reporting period of this report, no changes to the Radwaste Treatment Systems occurred that meet the reporting criteria of the Process Control Program.

8.8 Groundwater Tritium monitoring Program

The wells used to monitor CPNPP for tritium leaks into the ground water all had results that were less than detectable with the exception of sentinel well CP-A near the Water Plant during the third and fourth quarters. CR-2013-012215 documents this issue.

The source of the tritium is from a leaking pipe that goes from the Water Treatment Plant and Microfiltration Building sumps to the Low Volume Waste (LVW) Pond. Because Squaw Creek Reservoir (SCR) water always contains a low background concentration of tritium, SCR water used in the plant will contain similar concentrations. All of these samples were well below the state drinking water reportable criteria of 20,000 pCi/L and the environmental reportable criteria of 30,000 pCi/L. The leaking pipe has been repaired.

Other areas that are also monitored, but are not considered part of the ground monitoring program include the seepage sump, and Leachate Basins A,B, and C. These sample points are actually of perched (surface) and not indicative of ground water tritium.

Previous hydrogeology studies performed by Pastor, Behling and Wheeler LLC, showed that this perched water sits above an impermeable layer of bedrock. This prevents the migration of the tritiated perched water into the Twin Mountain Aquifer and a potential new pathway to drinking water sources but is re-routed back to Squaw Creek Lake.

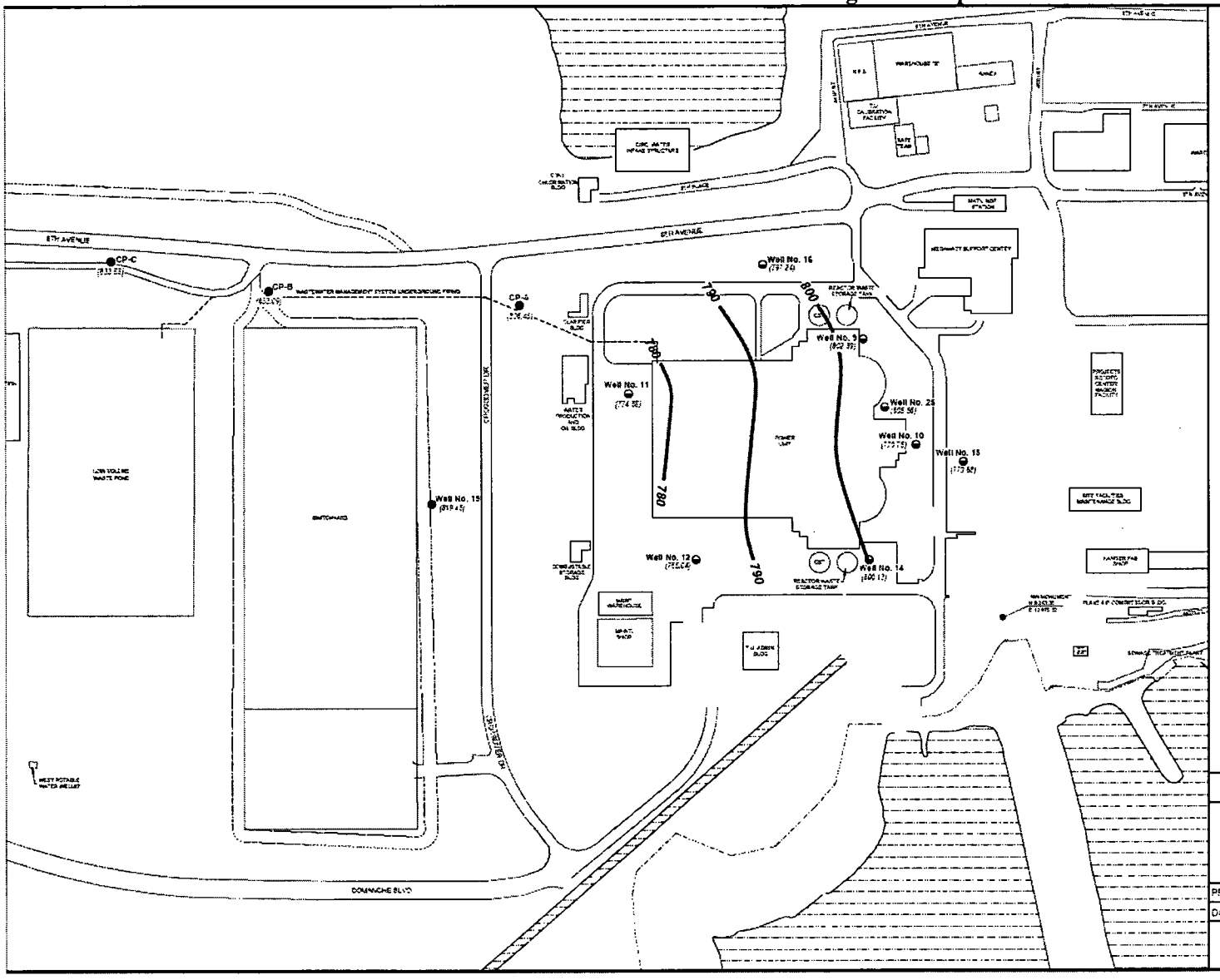
Groundwater monitoring wells below the perched layer have not identified any tritium above the MDA and confirm the claims of the hydrogeology study. Based on this information and the guidance in NEI 07-07, there is no requirement for notification to the NRC or local officials and no requirement for remediation as it is not considered licensed material. Continued monitoring of these perched water sample points will occur as part of the Groundwater Monitoring Program (STA-654) and any new sources of tritium or increase in the activity will be evaluated and remediated as necessary.

Ground Water Tritium Results (pCi/L)

Location	Quarter 1	Quarter 2	Quarter 3	Quarter 4
MW 9	<649	<616	<766	<775
MW 10	<649	<616	<766	<775
MW 11	<649	<616	<766	<775
MW 12	<649	<616	<766	<775
MW 14	<649	<616	<766	<775
MW 15	DRY	DRY	DRY	DRY
MW16	<649	<616	<766	<775
MW 19	<649	<616	<766	<775
MW 25	<649	<616	<766	<775
CP-A	<649	<616	6020*	12200*
CP-B	<649	<616	<766	<775
CP-C	<649	<616	<766	<775
OSGSF	DRY	DRY	DRY	DRY

*CR-2013-012215 Result was attributed to a leak in a water treatment plant line (lake water)

Ground Water Tritium Monitoring Well Map



SECTION 9.0
EFFLUENT TABLES

Table 9.1
Site Liquid and Gaseous Batch Release Summary (2013)

A. Liquid Releases	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
1. Number of batch releases		13	10	6	7	36
2. Total time period for Batch releases	(Minutes)	4.23E+03	3.09E+03	1.93E+03	2.33E+03	1.16E+04
3. Maximum time period for a batch release	(Minutes)	4.22E+02	3.33E+02	3.77E+02	3.67E+02	4.22E+02
4. Average time period for a batch release	(Minutes)	3.25E+02	3.08E+02	3.21E+02	3.33E+02	3.21E+02
5. Minimum time period for a batch release	(Minutes)	2.84E+02	2.85E+02	2.87E+02	3.11E+02	2.84E+02

B. Gaseous Releases	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
1. Number of batch releases		29	28	28	26	111
2. Total time period for batch releases	(Minutes)	9.81E+03	1.09E+04	9.04E+03	9.48E+03	3.92E+04
3. Maximum time period for a batch release	(Minutes)	6.06E+02	1.10E+03	4.16E+02	4.37E+02	1.10E+03
4. Average time period for a batch release	(Minutes)	3.38E+02	3.89E+02	3.23E+02	3.65E+02	3.53E+02
5. Minimum time period for a batch release	(Minutes)	1.75E+02	2.11E+02	2.25E+02	3.07E+02	1.75E+02

Table 9.2
Site Abnormal Liquid and Gaseous Batch Release Summary (2013)

A. Liquid Abnormal Release Totals	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Totals
1. Number of abnormal releases		0	0	0	0	0
2. Total activity of abnormal releases	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

B. Gas Abnormal Release Totals	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Totals
1. Number of abnormal releases		0	0	0	0	0
2. Total activity of abnormal releases	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 9.3
Site Gaseous Effluents - Summation of All Releases (2013)

Type of Effluent	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
A. Fission And Activation Gases						
1. Total Release	Curies	2.61E-01	1.95E-01	3.33E-01	9.88E-02	8.88E-01
2. Average Release rate for period	uCi/sec	3.35E-02	2.49E-02	4.19E-02	1.24E-02	2.82E-02
3. Percent of Applicable Limit	%	*	*	*	*	*
B. Radioiodines						
1. Total Iodine-131		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average Release rate for period		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Percent of Applicable Limit	%	*	*	*	*	*
C. Particulates						
1. Particulates (Half-Lives > 8 Days)		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average Release rate for period		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Percent of Applicable Limit	%	*	*	*	*	*
D. Tritium						
1. H3 Release	Curies	9.01E+00	9.78E+00	1.04E+01	6.65E+00	3.58E+01
2. Average Release rate for period	uCi/sec	1.16E+00	1.24E+00	1.30E+00	8.36E-01	1.14E+00
3. Percent of Applicable Limit	%	*	*	*	*	*
D. C14						
1. C14 Release	Curies	5.94E+00	5.34E+00	6.08E+00	6.05E+00	2.34E+01
2. Average Release rate for period	uCi/sec	7.65E-01	6.77E-01	7.63E-01	7.61E-01	2.97E+00
3. Percent of Applicable Limit	%	*	*	*	*	*
Gross Alpha						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

*** Applicable limits are expressed in terms of dose.**

Estimated Total Error For All Values Reported Is < 1.0%

Table 9.4
Site Gaseous Effluents - Ground Level Releases (2013)

Continuous Mode

Nuclides Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
Fission Gases						
No Nuclides Found	Curies	N/A	N/A	N/A	N/A	N/A
Iodines						
No Nuclides Found	Curies	N/A	N/A	N/A	N/A	N/A
Particulates						
No Nuclides Found	Curies	N/A	N/A	N/A	N/A	N/A
Tritium & C-14						
H-3	Curies	8.97E+00	9.74E+00	1.02E+01	6.58E+00	3.55E+01
C14						
C-14	Curies	1.78E+00	1.60E+00	1.82E+00	1.81E+00	7.02E+00
Gross Alpha						
No Nuclides Found	Curies	N/A	N/A	N/A	N/A	N/A

Table 9.4 (cont)
Site Gaseous Effluents - Ground Level Releases (2013)

Batch Mode

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
Fission Gases						
Ar-41	Curies	1.41E-01	7.33E-02	7.98E-02	9.88E-02	3.93E-01
Kr-85m	Curies	1.00E-04	1.41E-06	0.00E+00	0.00E+00	1.02E-04
Kr-85	Curies	8.83E-02	1.12E-01	2.53E-01	0.00E+00	4.53E-01
Xe-133m	Curies	0.00E+00	2.82E-04	0.00E+00	0.00E+00	2.82E-04
Xe-133	Curies	2.44E-02	7.76E-03	3.53E-04	0.00E+00	3.25E-02
Xe-135m	Curies	0.00E+00	9.73E-05	0.00E+00	0.00E+00	9.73E-05
Xe-135	Curies	7.21E-03	1.62E-03	0.00E+00	0.00E+00	8.82E-03
Total For Period	Curies	2.61E-01	1.95E-01	3.33E-01	9.88E-02	8.88E-01
Iodines						
No Nuclides Found	Curies	N/A	N/A	N/A	N/A	N/A
Particulates						
No Nuclides Found	Curies	N/A	N/A	N/A	N/A	N/A
Tritium						
H-3	Curies	4.38E-02	3.85E-02	1.28E-01	6.37E-02	2.74E-01
Carbon 14						
C-14	Curies	4.16	3.74	4.26	4.23	16.38
Gross Alpha	Curies	N/A	N/A	N/A	N/A	N/A
No Nuclides Found						

* Zeroes in this table indicate that no radioactivity was present at detectable levels.

Table 9.5
Site Liquid Effluents - Summation Of All Releases (2013)

	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
A. Fission And Activation Products						
1. Total Release (not including tritium, gases, alpha)	Curies	1.53E-03	1.52E-03	3.01E-04	1.22E-04	3.47E-03
2. Average diluted concentration during period	uCi/ml	1.21E-10	1.39E-10	4.17E-11	1.45E-11	3.16E-10
3. Percent of Applicable Limit	%	*	*	*	*	*
B. Tritium						
1. Total Release	Curies	3.01E+02	1.37E+02	1.06E+02	3.75E+02	9.19E+02
2. Average diluted concentration during period	uCi/ml	2.39E-05	1.25E-05	1.47E-05	4.45E-05	9.56E-05
3. Percent of Applicable Limit	%	*	*	*	*	*
C. Dissolved and Entrained Gases						
1. Total Release	Curies	5.21E-04	1.82E-04	0.00E+00	3.68E-05	7.40E-04
2. Average diluted concentration during period	uCi/ml	4.12E-11	1.67E-11	0.00E+00	4.37E-12	6.23E-11
3. Percent of Applicable Limit	%	*	*	*	*	*
D: Gross Alpha Radioactivity						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average diluted concentration during period	uCi/ml	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E: Waste Vol Release (Pre-Dilution)	Liters	9.44E+05	7.33E+05	4.38E+05	5.26E+05	2.64E+06
F. Volume of Dilution Water Used	Liters	1.26E+10	1.09E+10	7.23E+09	8.42E+09	3.92E+10

*** Applicable limits are expressed in terms of dose.**

Estimated Total Error For All Values Reported Is < 1.0%

Table 9.6
Site Liquid Effluents (2013)

Continuous Mode

Nuclides Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Fission & Activation Products						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium						
H-3	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dissolved And Entrained Gases						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha Radioactivity	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 9.6 (cont.)
Site Liquid Effluents (2013)

Batch Mode

Nuclides Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
A. Fission & Activation Products						
Fe-55	Curies	3.67E-04	0.00E+00	0.00E+00	0.00E+00	3.67E-04
Co-57	Curies	0.00E+00	0.00E+00	0.00E+00	2.36E-07	2.36E-07
Co-58	Curies	2.41E-04	9.30E-04	2.91E-04	7.97E-05	1.54E-03
Co-60	Curies	1.13E-05	8.52E-06	9.86E-06	1.19E-05	4.17E-05
Ni-63	Curies	9.05E-04	5.80E-04	0.00E+00	2.31E-05	1.51E-03
Zn-65	Curies	0.00E+00	0.00E+00	0.00E+00	9.87E-07	9.87E-07
Nb-95	Curies	0.00E+00	0.00E+00	0.00E+00	4.30E-07	4.30E-07
Ba-140	Curies	0.00E+00	0.00E+00	0.00E+00	3.29E-06	3.29E-06
W-187	Curies	0.00E+00	0.00E+00	0.00E+00	2.08E-06	2.08E-06
Total For Period	Curies	1.52E-03	1.52E-03	3.01E-04	1.22E-04	3.47E-03
B. Tritium						
H-3	Curies	3.01E+02	1.37E+02	1.06E+02	3.75E+02	9.19E+02
C. Dissolved And Entrained Gases						
Xe-133	Curies	5.21E-04	1.82E-04	0.00E+00	3.68E-05	7.40E-04
D. Gross Alpha Activity						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicates that no radioactivity was present at detectable levels.

Table 9.7
Dose to a member of the public due to Liquid Releases (2013)

Ogan Dose	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Bone	mRem	1.58E-04	8.02E-05	0.00E+00	4.37E-06	2.43E-04
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.003	0.002	0.00	0.00	0.002
Liver	mRem	4.53E-02	4.86E-02	4.55E-02	3.61E-02	1.75E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.905	0.972	0.909	0.721	1.754
Total Body	mRem	4.53E-02	4.86E-02	4.55E-02	3.61E-02	1.75E-01
Limit	mRem	1.5	1.5	1.5	1.5	3
Percent of Limit	%	3.017	3.24	3.031	2.404	5.846
Thyroid	mRem	4.52E-02	4.86E-02	4.55E-02	3.61E-02	1.75E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.905	0.972	0.909	0.721	1.754
Kidney	mRem	4.52E-02	4.86E-02	4.55E-02	3.61E-02	1.75E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.905	0.972	0.909	0.721	1.754
Lung	mRem	4.52E-02	4.86E-02	4.55E-02	3.61E-02	1.75E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.905	0.972	0.909	0.721	1.754
GI-Lli	mRem	4.53E-02	4.86E-02	4.55E-02	3.61E-02	1.75E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.905	0.972	0.909	0.721	1.754

Table 9.8
Air Dose Due To Gaseous Releases – Site (2013)

NG Dose	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Gamma Air	mRad	1.40E-04	7.22E-05	7.81E-05	9.61E-05	3.86E-04
Limit	mRad	5	5	5	5	10
Percent of Limit	%	0.003	0.001	0.002	0.002	0.004
Beta Air	mRad	7.09E-05	4.94E-05	7.90E-05	3.39E-05	2.33E-04
Limit	mRad	10	10	10	10	20
Percent of Limit	%	0.001	0	0.001	0	0.001

Table 9.9

Dose to A Member Of The Public Due To Radioiodines, Tritium, and Particulates in Gaseous Releases (2013)

Organ Dose	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Liver	mRem	2.33E-02	2.33E-02	2.54E-02	2.02E-02	9.23E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.310	0.311	0.339	0.269	0.615
Total Body	mRem	2.33E-02	2.33E-02	2.54E-02	2.02E-02	9.23E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.310	0.311	0.339	0.269	0.615
Thyroid	mRem	2.33E-02	2.33E-02	2.54E-02	2.02E-02	9.23E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.310	0.311	0.339	0.269	0.615
Kidney	mRem	2.33E-02	2.33E-02	2.54E-02	2.02E-02	9.23E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.310	0.311	0.339	0.269	0.615
Lung	mRem	2.33E-02	2.33E-02	2.54E-02	2.02E-02	9.23E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.310	0.311	0.339	0.269	0.615
GI-Lli	mRem	2.33E-02	2.33E-02	2.54E-02	2.02E-02	9.23E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.310	0.311	0.339	0.269	0.615
Bone	mRem	5.53E-02	4.97E-02	5.66E-02	5.64E-02	2.18E-01
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.74	0.66	0.76	0.75	1.45

TABLE 9.10
SOLID RADWASTE AND IRRADIATED FUEL SHIPMENTS 2013

A. Solid Waste Shipped Offsite for Burial or Disposal (Not Irradiated Fuel)

1. Type of Waste	Shipped M^3	Shipped Ci	Buried M^3	Buried Ci	Percent Error
a. Spent resins/filters	1.36E+01	2.35E+02	1.36E+01	2.35E+02	25%
b. Dry active waste	3.98E+02	1.21E-01	3.55E+01	9.27E-02	25%
c. Irradiated components	-0-	-0-	-0-	-0-	N/A
d. Other (oil/miscellaneous liquids sent to processor for volume reduction)	-0-	-0-	-0-	-0-	N/A
TOTAL	4.12E+02	2.35E+02	4.91E+01	2.35E+02	25%

Note: Shipped volumes and curies are not always equal to the buried volumes and curies since some disposal occurs outside the twelve month time period in which shipments occurred.

Dry active waste also includes some low-level radioactive resins, tank sediments and filters that are handled and processed in a manner that is consistent with this waste stream.

2. Estimate of Major Nuclide Composition (by type of waste)	Nuclide	% Abundance.	Activity (Ci)
a. Spent resins/filters	Ni-63	77.38	1.82E+02
	Fe-55	10.15	2.38E+01
	Co-60	8.71	2.05E+01
	Cs-137d	1.90	4.45E+00
	C-14	0.05	1.06E-01
	H-3	0.53	1.24E+00
	Tc-99	<0.01	2.37E-03
	I-129	LLD	-0-
	OTHER*	1.28	3.03E+00
	TOTAL	100.00	2.35E+02

*Nuclides representing <1% of total shipped activity: Be-7,Cr-51,Mn-54,Co-57,Fe-59,Zn-65,Sr-90,Zr-95,Nb-95,Ag-110m,Sn-113, Sb-124

TABLE 9.10 (cont.)
SOLID RADWASTE AND IRRADIATED FUEL SHIPMENTS 2013

A. Solid Waste Shipped Offsite for Burial or Disposal (Not Irradiated Fuel) cont.

2. **Estimate of Major Nuclide Composition (by type of waste)**	Nuclide	% Abundance.	Activity (Ci)
b. Dry active waste	Ni-63	35.44	4.30E-02
	Fe-55	29.87	3.63E-02
	Co-60	28.60	3.47E-02
	Co-58	2.21	2.68E-03
	Mn-54	1.46	1.77E-03
	Sb-125	1.22	1.48E-03
	C-14	0.30	3.64E-04
	H-3	LLD	-0-
	Tc-99	LLD	-0-
	I-129	LLD	-0-
	Other*	0.90	1.09E-03
	Total	100.00	1.21E-01

*Nuclides representing <1% of total shipped activity: Cr-51,Co-57,Sr-90d,Zr-95,Nb-94,Nb-95,Sn-113,Cs-134,Cs-137d,Ce-144d,Pu-239/40,Am-241, Am-243

2. **Estimate of Major Nuclide Composition (by type of waste)**	Nuclide	% Abundance.	Activity (Ci)
d. Other (oil/miscellaneous liquids sent to processor for volume reduction)	N/A	N/A	N/A

Waste Type	Waste Class	Container Type	Number of Shipments	Destination
a. Resin/filters	A	Poly HIC*	2	Waste Control Specialists, Andrews, TX
	B	Poly HIC*	2	Waste Control Specialists, Andrews, TX
b. Dry active waste	A	General Design	6	Energy Solutions Oak Ridge, TN.
d. Other	NA	NA	NA	NA

*High Integrity Container

B. Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
0	N/A	N/A

Attachment 10.1

2013 Meteorological Joint Frequency Table

REG. Guide 1.21 Joint Frequency Table

LUMINANT

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2013 00:00 to 31-DEC-2013 23:59

STABILITY CLASS **A**

ELEVATION:
10m.

WIND DIRECTION	Wind Speed (mph) at 10 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N		1	18	10			29
NNE		1	5				6
NE	0		2				2
ENE		0	4				4
E		5	22				27
ESE		3	36	6			45
SE	1	5	29	9			44
SSE		2	22	6			30
S		5	6				11
SSW		1	3				4
SW		4	3				7
WSW		3	2	0			5
W		5	2				7
WNW		2	5		1		8
NW		6	20	9	3	1	39
NNW		0	25	13	3		41
VARIABLE	1	44	33	4			82
TOTAL	2	87	237	57	7	1	391
Periods of calm (hours):							
Hours of missing data:							

REG. Guide 1.21 Joint Frequency Table

LUMINANT

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2013 00:00 to 31-DEC-2013 23:59

STABILITY CLASS **B**

ELEVATION:
10m.

WIND DIRECTION	Wind Speed (mph) at 10 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N		5	7	2			14
NNE		2		0			2
NE				1	1		2
ENE		3	6				9
E		6	7	1			14
ESE		6	16	4			26
SE		8	29	7			44
SSE		5	20	14	5		44
S		4	8	4	2		18
SSW		4	5	1			10
SW		1	1				2
WSW		2	3	1			6
W	0	7	1				8
WNW		5	1	1	2		9
NW	1	3	6	6	3	1	20
NNW		6	24	16	11		57
VARIABLE	1	29	10	2			42
TOTAL	2	96	144	60	24	1	327
Periods of calm (hours):							
Hours of missing data:							

REG. Guide 1.21 Joint Frequency Table

LUMINANT

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2013 00:00 to 31-DEC-2013 23:59

STABILITY CLASS **C**

ELEVATION: 10m.

WIND DIRECTION	Wind Speed (mph) at 10 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	2	14	3			19
NNE		1	6	1			8
NE		1	5	1	1		8
ENE		1	7	1			9
E	1	5	12				18
ESE		6	21	7			34
SE		0	25	10	1		36
SSE		8	33	42	10	1	94
S		7	10	6	7		30
SSW		2	13	3			18
SW		4	4				8
WSW	1	3	2	1	2		9
W		1	1				2
WNW		6	2		2	1	11
NW	1	5	13	27	16	3	65
NNW	0	10	29	27	18		84
VARIABLE	2	24	22	2			50
TOTAL	5	86	219	131	57	5	503

Periods of calm (hours):

Hours of missing data:

REG. Guide 1.21 Joint Frequency Table

LUMINANT

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2013 00:00 to 31-DEC-2013 23:59

STABILITY CLASS **D**

ELEVATION: 10m.

WIND DIRECTION	Wind Speed (mph) at 10 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N		29	98	38			165
NNE		13	14	0			27
NE	0	9	38	6			53
ENE		27	59	4	1		91
E	1	122	69	11			203
ESE	10	102	203	28			343
SE	5	75	381	217	23	2	703
SSE	2	43	348	490	131	8	1022
S		40	172	147	66	5	430
SSW	4	54	69	39	2	2	170
SW	1	38	52	24	5		120
WSW	1	21	20	14	9	2	67
W		17	16	13	2		48
WNW	1	21	48	34	24	6	134
NW	0	44	84	160	72	9	369
NNW	3	59	218	176	44	5	505
VARIABLE	3	106	91	36	1		237
TOTAL	31	820	1980	1437	380	39	4687
Periods of calm (hours):							
Hours of missing data:							

REG. Guide 1.21 Joint Frequency Table

LUMINANT

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2013 00:00 to 31-DEC-2013 23:59

STABILITY CLASS **E**

ELEVATION:
10m.

WIND DIRECTION	Wind Speed (mph) at 10 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	11	19	2			33
NNE	2	10	4	1			17
NE		4	9				13
ENE	1	13	5				19
E	1	77	9	1			88
ESE	4	126	134	1	1		266
SE	5	169	344	21			539
SSE	6	98	195	54	1		354
S	12	78	105	19			214
SSW	6	50	36	11			103
SW	2	46	8	2	1		59
WSW	2	22	15	2			41
W	3	31	13	8			55
WNW	2	51	57	6	1		117
NW	2	37	51	10	1		101
NNW	2	29	58	11		1	101
VARIABLE	4	63	30	6			103
TOTAL	55	915	1092	155	5	1	2223
Periods of calm (hours):							1
Hours of missing data:							

REG. Guide 1.21 Joint Frequency Table

LUMINANT

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2013 00:00 to 31-DEC-2013 23:59

STABILITY CLASS **F**

ELEVATION: 10m.

WIND DIRECTION	Wind Speed (mph) at 10 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N		1	1				2
NNE							
NE		3					3
ENE							
E	1	3					4
ESE	2	15	5				22
SE	6	29	14				49
SSE	6	21	5				32
S	7	31	11				49
SSW	6	35	11	2			54
SW	5	38	11				54
WSW	5	35	5				45
W	6	29	2				37
WNW	4	28	9				41
NW	3	9					12
NNW		1	1				2
VARIABLE	4	15	1				20
TOTAL	55	293	76	2			426
Periods of calm (hours):							1
Hours of missing data:							

REG. Guide 1.21 Joint Frequency Table

LUMINANT

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2013 00:00 to 31-DEC-2013 23:59

STABILITY CLASS **G**

ELEVATION: 10m.

WIND DIRECTION	Wind Speed (mph) at 10 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N							
NNE							
NE							
ENE							
E							
ESE							
SE	2	2					4
SSE	1	3					4
S	5	3	3				11
SSW	3	10	15				28
SW	7	12	11				30
WSW	5	8	2				15
W	2	10					12
WNW	5	18					23
NW	3	7	1				11
NNW							
VARIABLE	4	3					7
TOTAL	37	76	32				145
Periods of calm (hours):							
Hours of missing data:							

REG. Guide 1.21 Joint Frequency Table

LUMINANT

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2013 00:00 to 31-DEC-2013 23:59

STABILITY CLASS **ALL**

ELEVATION: 10m.

WIND DIRECTION	Wind Speed (mph) at 10 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	49	157	55			262
NNE	2	27	29	2			60
NE	0	17	54	8	2		81
ENE	1	44	81	5	1		132
E	4	218	119	13			354
ESE	16	258	415	46	1		736
SE	19	288	822	264	24	2	1419
SSE	15	180	623	606	147	9	1580
S	24	168	315	176	75	5	763
SSW	19	156	152	56	2	2	387
SW	15	143	90	26	6		280
WSW	14	94	49	18	11	2	188
W	11	100	35	21	2		169
WNW	12	131	122	41	30	7	343
NW	10	111	175	212	95	14	617
NNW	5	105	355	243	76	6	790
VARIABLE	19	284	187	50	1		541
TOTAL	187	2373	3780	1842	473	47	8702
Periods of calm (hours):							2
Hours of missing data:							56

Attachment 10.2

Atmospheric Dispersion (x/q) and Deposition (d/q) Calculation Methodology Discussion

CR-2014-001059 evaluated the atmospheric dispersion (x/q) and deposition (d/q) calculation methodology and frequency as they relate to the meteorological data to ensure they are up to date. The CPNPP ODCM does not require a re-evaluation on any frequency or specific criteria for comparison. The NRC guidance documents cited in the ODCM also do not provide any requirements for re-evaluation. Revision 2 of Regulatory Guide 1.21, to which we are not obligated, recommends that 5 years of meteorological data be used to evaluate the dispersion factors and that variation in the factors be within 10% in the non-conservative direction. The re-evaluation of our meteorological data included 6 years of data and meets the criteria.

Meteorological data collected for the original FSAR, the NuBuild FSAR and historical Effluent reports were reviewed. The data list the predominant wind direction, as a percentage, averaged for all speeds and stability classes within the period. For periods not summarized and when the plant was operable (1990-2000) only 1990, 1995 and 1996 show the predominant wind direction to be from the SSE. This information was not included, however, since the data should include a summary of at least 5 years of data. The original dispersion and deposition factors were calculated based on meteorological data collected and summarized from 1972 through 1976 at Comanche Peak. This data show the predominant wind direction to be from the South but only slightly more than winds originating from the SSE. The historical data from 1957-1976 was included in the original FSAR for comparison and show more bias toward the southerly direction but was collected from the Dallas-Fort Worth Airport location. Wind patterns for the DFW Airport were reviewed on the National Weather Service website for 1981-2010 and show that the prevailing wind direction remains from the South. This accounts for the slight variation in prevailing winds between historical and current data collected on site. During the New Build project for Units 3&4 and from OE 25286 the meteorological data were again summarized from 1997-2006, for Comanche Peak, and showed that the predominant wind direction shifted to the SSE. Using this data, new dispersion and deposition factors were calculated. The new factors were less conservative when compared to the original dispersion and deposition factors at the Exclusion Area Boundary (See Reference 3). The conclusion was to continue reporting offsite exposures based on the original values. The last column of data in Table 1 is summarized for the purposes of this evaluation and includes meteorological data since the New Build evaluation through 2012. This data, like the NuBuild data, show the predominant wind direction to be from the SSE.

Conclusion:

Although the predominant wind direction frequency changes slightly from SSE to S when comparing the NuBuild Data to the original FSAR and Historical Data, the NuBuild calculations show that dispersion and deposition factors do not increase. Following the NuBuild evaluation, the wind direction remains the same and does not impact the calculation of the dispersion and deposition. Using the original factors would be conservative when calculating doses to the public.

Attachment 10.3

Carbon 14 Supplemental Information

Carbon-14 Supplemental Information

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

In June 2009, the NRC provided revised guidance in Regulatory Guide 1.21, *Measuring, Evaluating and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste, Revision 2*, establishing an updated approach for identifying principal radionuclides. Because the overall quantity of radioactive releases has steadily decreased due to improvements in power plant operations, C-14 now qualifies as a "principal radionuclide" (anything greater than one percent of overall radioactivity in effluents) under federal regulations at many plants. In other words, C-14 has not increased and C-14 is not a new nuclear plant emission. Rather, the improvements in the mitigation of other isotopes have made C-14 more prominent.

The dose contribution of C-14 from liquid radioactive waste is essentially insignificant compared to that contributed by gaseous radioactive waste. Therefore the evaluation of C-14 in liquid radioactive waste is not required by the new Reg. Guide 1.21, Rev. 2. The Reg. Guide 1.21, Rev. 2 also states that the quantity of gaseous C-14 released to the environment can be estimated by use of a C-14 source term production model.

A recent study produced by EPRI (*Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents,* EPRI, Palo Alto, CA: 2010, 1021106) developed a model for estimation of C-14 source production. This model was used by CPNPP for the 2010 Radioactive Effluent Release Report. Also in the CPNPP report, the assumption that 70% of the C-14 gaseous effluent is estimated to be from batch releases (e.g. WGDTs), and 30% of C-14 gaseous effluent is estimated to be from continuous releases through the unit vents (Ref. IAEA Technical Reports Series no. 421, "Management of Waste Containing Tritium and Carbon-14", 2004).

The C-14 released from PWR's is primarily a mix of organic carbon and carbon dioxide released from the waste gas system. The C-14 species initially produced are primarily in the organic form, such as methane. The C-14 in the primary coolant can be converted to an inorganic chemical form of primarily carbon dioxide through a chemical transformation. Studies documented by the EPRI Report *Characterization of Carbon-14 Generated by the Nuclear Power Industry,* EPRI Palo Alto, CA: 1995, TR-105715, measured C-14 releases from PWRs indicating a range of 70% to 95% organic. The average value was indicated to be 80% organic with the remainder being carbon dioxide. As a result, a value of 80% organic C-14 is assumed by the CPNPP Radioactive Effluent Release Report methodology.

The public dose estimates from airborne C-14 in the CPNPP Effluent report are performed using dose models from NUREG-0133 and Regulatory Guide 1.109. The dose models and assumptions used for the dose estimates of C-14 are documented in the 2011 ODCM changes. The estimated C-14 dose impact on the maximum organ dose from airborne effluents released during 2011 is well below the 10CFR50, Appendix I, ALARA design objective of 15 mRem/yr per unit.

Putting Radiation Dose in Context

Humans are exposed to radiation every day. The majority comes from natural sources including the earth, food and water consumption, the air, the sun and outer space. A smaller fraction radiation comes from man-made source such as X-rays, nuclear medical treatments, building materials, nuclear power plants, smoke detectors and televisions.

Radiation is measured in units called millirem (mRem). One mRem is a very small amount of exposure. On average, Americans receive 620 mRem of radiation dose every year. Approximately one-half of the dose comes from natural sources and the other half comes from medical procedures such as CAT scans.

The table below can help to give some perspective to dose from various sources.

Source	Average Annual Dose
Smoke detector in the home	0.008 mRem
Live within 50 miles of a nuclear power plant	0.009 mRem
Live within 50 miles of a coal-fired power plant*	0.03 mRem
NRC guideline for keeping radiation dose from nuclear power plants as low as reasonably achievable (ALARA)	5 mRem
Round trip flight from New York City to Los Angeles	5 mRem
Medical X-ray	10 mRem
EPA limit for dose to the public from the commercial nuclear fuel cycle	25 mRem
Food and water consumed throughout the course of one year	30 mRem
NRC limit for dose to the public from nuclear power plants	100 mRem
Mammogram	100 mRem
Average annual exposure for a nuclear power plant worker	120 mRem
Average annual exposure from background radiation	300 mRem
CT scan	1,000 mRem
NRC's annual limit for occupational exposure	5,000 mRem
Cardiac catheterization or coronary angiogram	5,000 mRem

*Coal is naturally radioactive.

Sources: U.S. Environmental Protection Agency, Health Physics Society.