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SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT
DOCKET NOS. 50-445 AND 50-446
TRANSMITTAL OF YEAR 2018 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, 2017 through December 31, 2017.

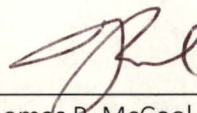
The tabular summaries of radioactive liquid and gaseous releases are provided in the format defined in Appendix B of Regulatory Guide 1.21, Rev. 1, dated June, 1974.

During this reporting period there were no revisions to the ODCM.

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

IE48
NRR

Sincerely,



Thomas P. McCool

Enclosure 1. Comanche Peak 2017 Radioactive Effluent Release Report

c - K. M. Kennedy, Region IV
M. O'Banion, NRR
Resident Inspectors, Comanche Peak



Luminant

CPNPP

Comanche Peak Nuclear Power Plant

2017 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

January 1, 2017 - December 31, 2017

Preparer: Donald Rebstock

Date: 3/12/2018

Reviewer: David Valentine

Date: 3/12/2018

Approval: Kerry Cooper

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Chemistry Manager

Date: 3/13/2018

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ACRONYMS AND ABBREVIATIONS

| | |
|-------|---|
| CFR | Code of Federal Regulations |
| CPNPP | Comanche Peak Nuclear Power Plant |
| ECL | Effluent Concentration Limit |
| IFSM | 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 |
| μCi | 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 (CPNPP) 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, 2017, through December 31, 2017. Data in this report were calculated in accordance with the CPNPP ODCM using the Canberra OpenEMS software.

1.1 Executive Summary

The radioactive effluent monitoring program for 2017 was conducted as described in the following report. Results of the monitoring program indicate 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, improvements in the mitigation of other isotopes have made C-14 more prominent. Attachment 10.3 provides more detail about C-14.

1.1 Executive Summary (continued)

Gaseous Effluents:

Two-year summary of all the radioactive gaseous releases to the environment:

| Gaseous Waste | 2016 | 2017 | Comments |
|--|----------|----------|----------|
| Tritium (Ci) | 35.3 | 34.4 | 1 |
| C-14 (Ci) | 25.9 | 19.3 | 2 |
| Total Fission and Activation Products (Ci) | 0.43 | 0.42 | |
| Total Particulate (Ci) | 0 | 0 | 3 |
| Gross Alpha (Ci) | 0 | 0 | 3 |
| Iodine (Ci) | 0 | 0 | 3 |
| Calculated Gamma Air Dose (mRad) | 3.72E-04 | 3.60E-04 | |
| Calculated Beta Air Dose (mRad) | 1.41E-04 | 1.35E-04 | |
| Total Body Dose (mRem) | 0.10 | 0.08 | 4 |

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 are related to the type of fuel used (i.e., 18-month fuel) the core life, power output, and number of core cycles.
2. C-14 activity released from the site is estimated using reactor power in accordance with EPRI document "Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents". 2017 C-14 activity decreased mainly due to unit refueling and maintenance outages during the year which resulted in less total C-14 produced for the site.
3. No detectable particulate, gross alpha, or iodine activity was released during 2017.
4. 2017 Total Body Dose in mRem decreased slightly because of less C-14 being produced for the site during the calendar year. C-14 activity contributes to Total Body Dose. Refer to Comment 2 for more information.

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 the year of this report.

1.1 Executive Summary (continued)

Liquid Effluents:

Two-year summary of all the radioactive liquid releases to the environment:

| Liquid Waste | 2016 | 2017 | Comments |
|---------------------------------------|----------|-----------|----------|
| Total Activity Excluding Tritium (Ci) | 1.92E-03 | 1.06E-03 | |
| Tritium Activity (Ci) | 1390 | 2510 | 1 |
| Total Body Dose (mRem) | 0.16 | 0.13 | |
| Total Volume Released (Gallons) | 678,996 | 1,231,176 | 2 |

Comments:

1. Tritium released values can vary significantly from year to year based on a couple of factors. First, reactor coolant tritium production changes based on fuel burnup characteristics. Tritium activity increases following reactor startup, then plateaus mid-cycle, and begins to decline towards the end of cycle. Second, the tritium released value is dependent upon on how many outages there were during a calendar year. More liquid waste is processed and released during unit outages. 2017 was a multi-outage year which resulted in more tritium activity being discharged.
2. Higher total liquid effluent volume released in 2017 was due to unit refueling and maintenance outages during the calendar year. More liquid waste is processed and released during unit outages.

Meteorological Data

During 2017, the CPNPP meteorological system achieved a greater than 98% mean 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 2017, there were no Technical Specification/ODCM effluent radiation monitors out of service for >30 days.

ODCM Changes

No changes were made to the ODCM during 2017.

1.1 Executive Summary (continued)

Solid Waste

Two-year summary of the solid waste production:

| Total Waste | 2016 | 2017 | % Error |
|---------------------------|-------------|-------------|----------------|
| Shipped (m ³) | 261 | 360 | 25% |
| Shipped (Ci) | 45.6 | 22.6 | 25% |
| Buried (m ³) | 30.0 | 48.5 | 25% |
| Buried (Ci) | 45.6 | 22.5 | 25% |

Comments:

Solid waste shipments and burials have generally trended downward over the past 5 years due to solid waste reduction measures. However, 2017 was a multi-outage year which led to a higher volume of solid waste shipped and buried. The Curie content buried was lower primarily due to overall lower activity within the buried waste.

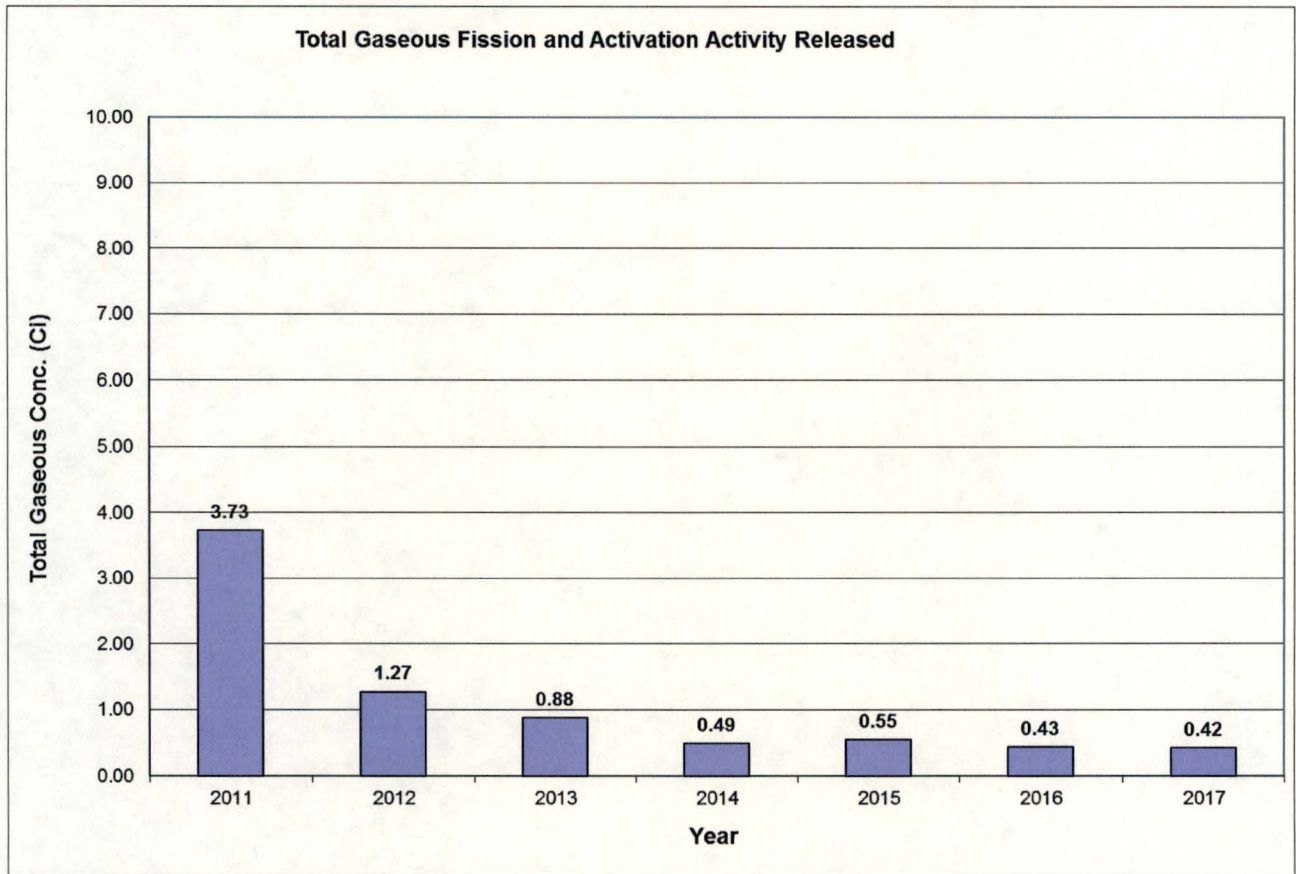
Groundwater Tritium

Sentinel Well location CP-A near the Water Plant continued showing positive results for tritium the first two quarters of 2017. The positive results were from a leak in the piping from the Low Volume Waste (LVW) Pond to the Water Treatment Waste Sump (IR-2016-008692). This leak was repaired in January of 2017. Following the repair, the well's tritium decreased to less than detectable. See section 8.8 for details.

Conclusion

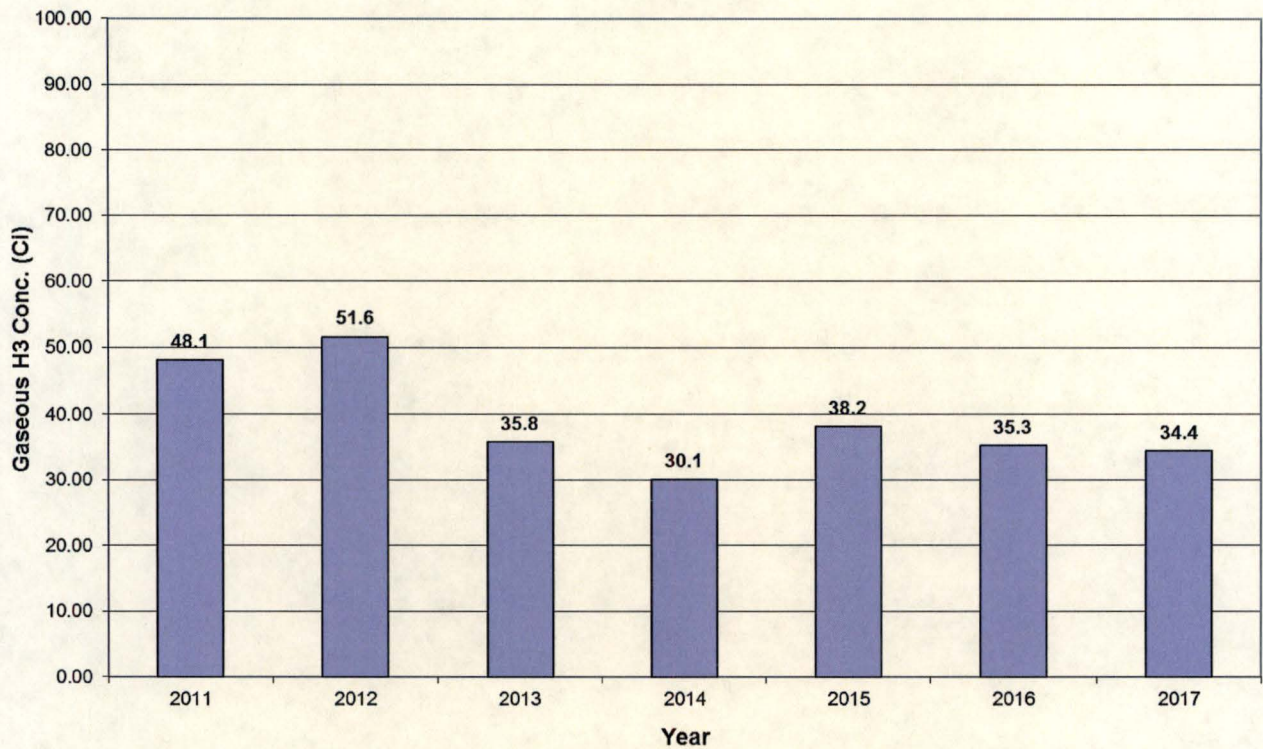
During 2017, the radioactive effluent monitoring program has been conducted in an appropriate manner to ensure the activity released and associated dose to the public has been maintained as low as reasonably achievable (ALARA).

1.2 Historical Trend Graphs

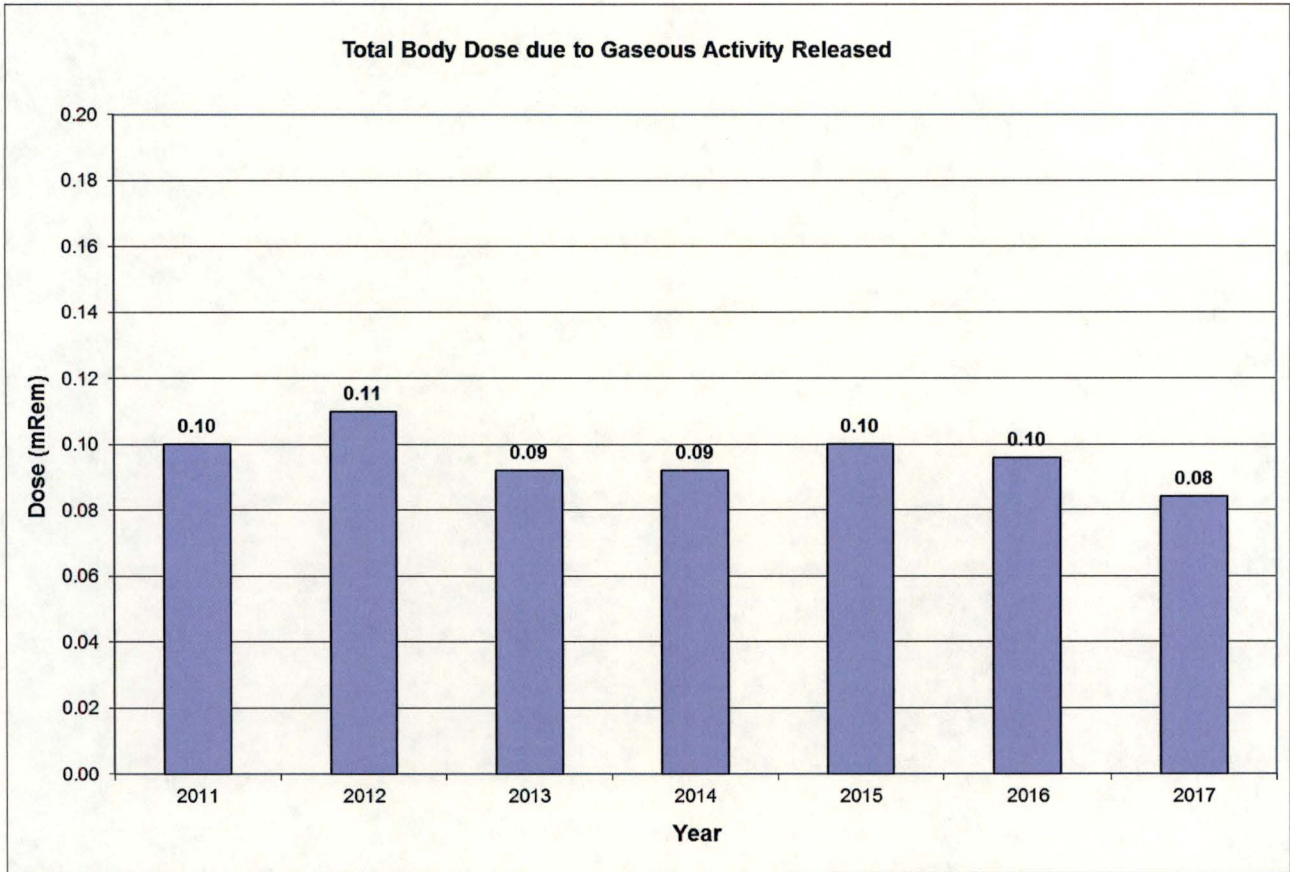


| Year | Total Gaseous Fission and Activation Activity Released Comments |
|------|---|
| 2011 | Higher gas activity released from the site due to fuel leaks occurring between 2004 and 2008. Another fuel leak occurred in 2011. |
| 2012 | Lower gas activity released from the site due to recovery from previous fuel leaks. |

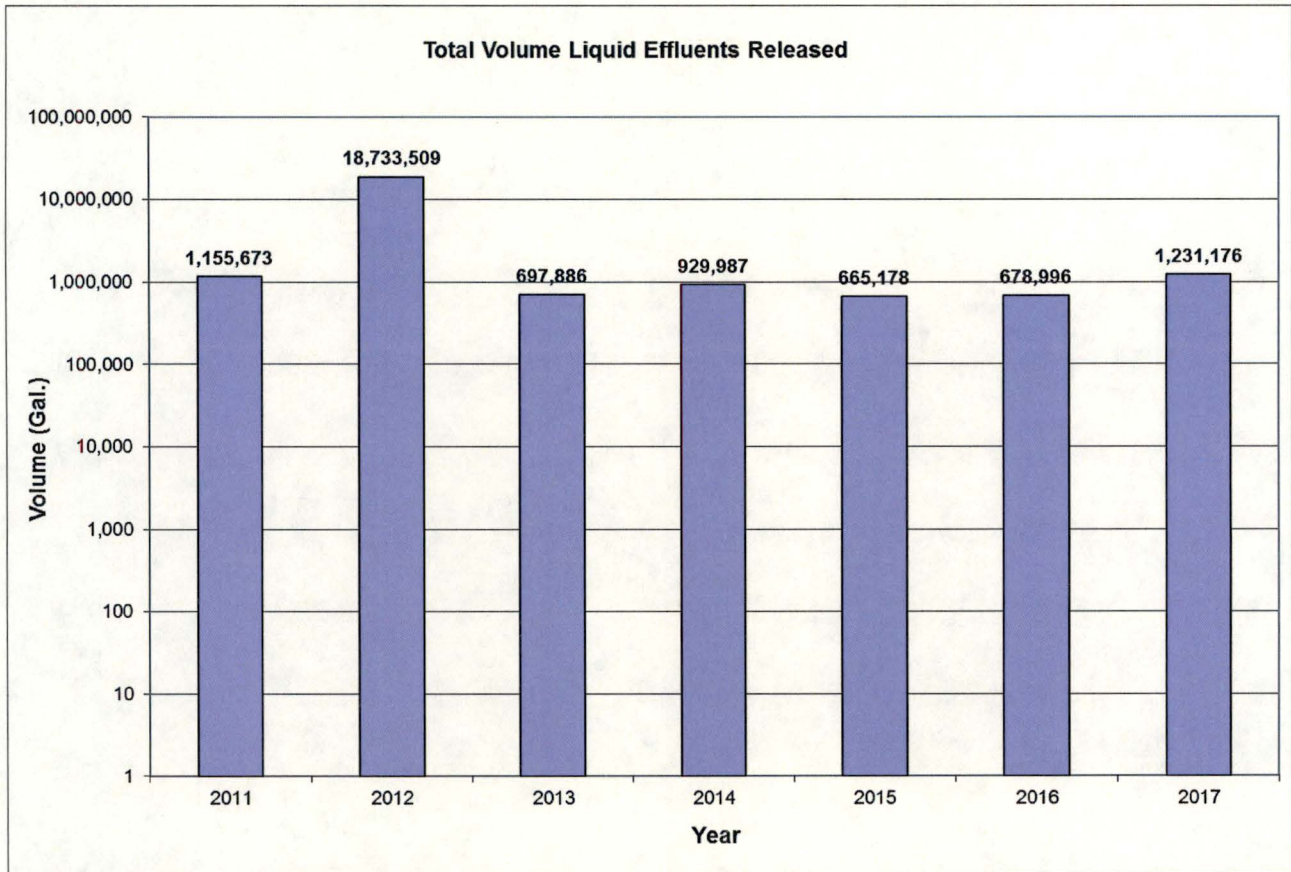
Total Gaseous Tritium Released



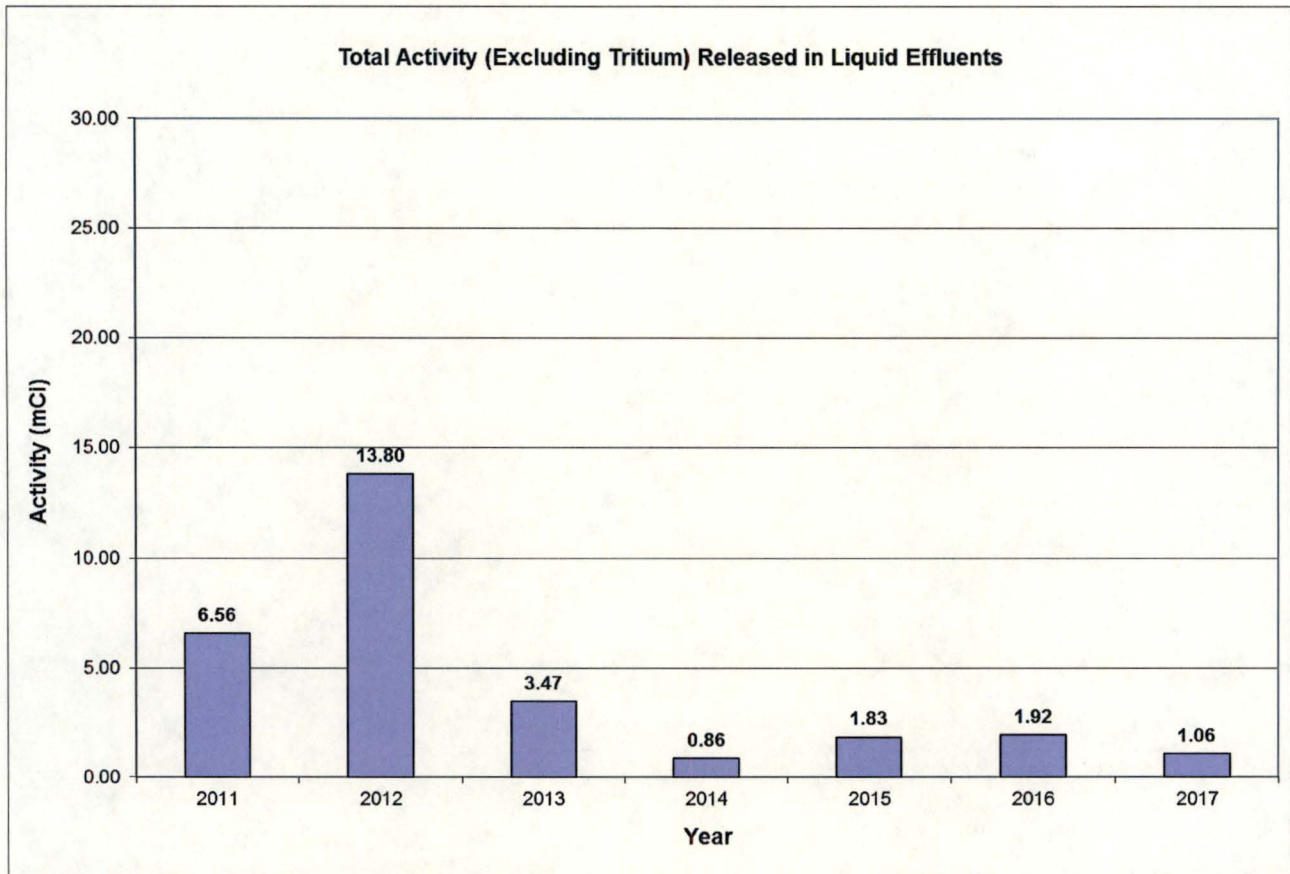
| Year | Total Gaseous Tritium Released Comments |
|-------------|---|
| All | The major contributor to gaseous tritium activity is evaporation from the spent fuel pools. Factors contributing to the tritium activity in the pools is related to the type of fuel used (i.e., 18-month fuel) the core life, power output, and number of core cycles. |



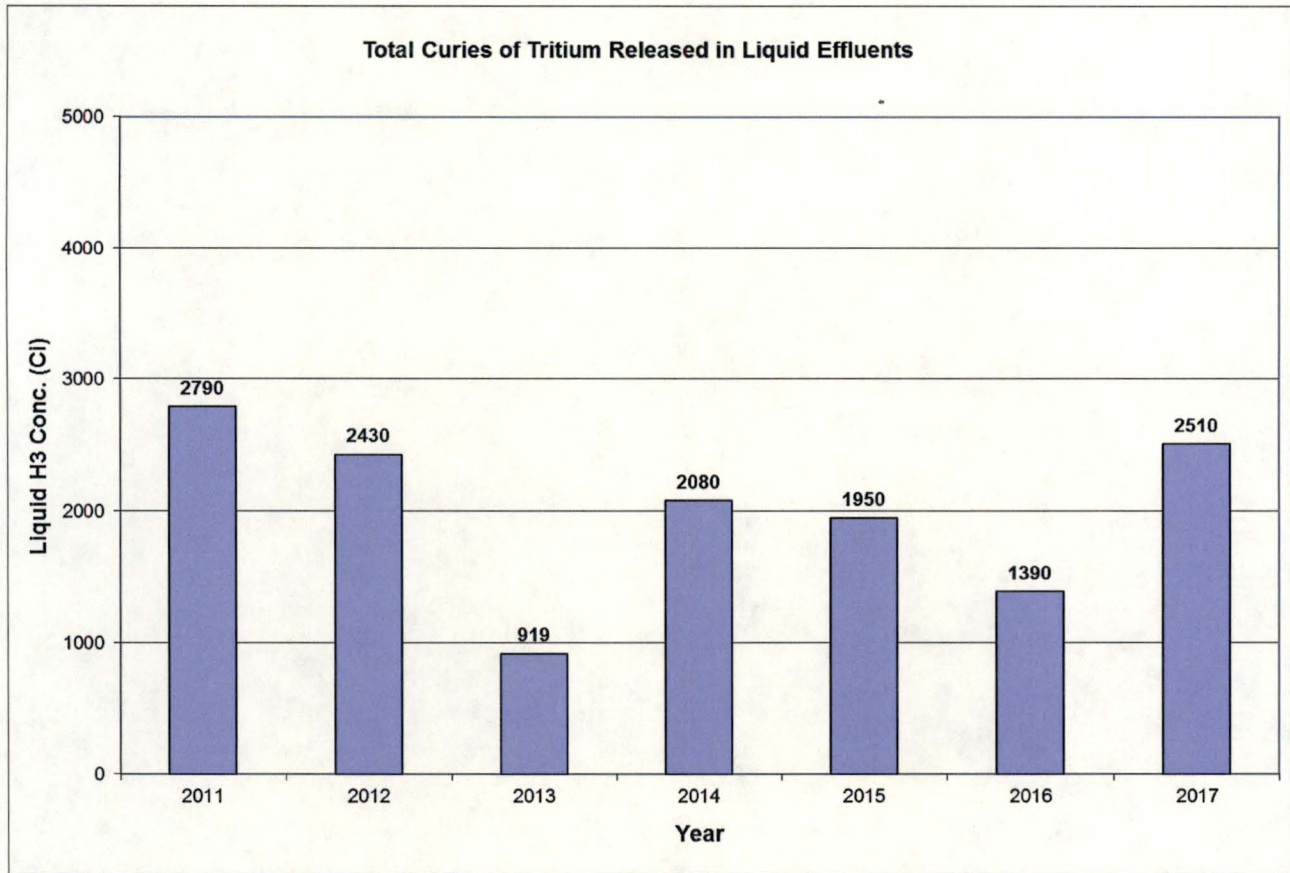
| Total Body Dose due to Gaseous Activity Released Comments | |
|--|--|
| Year | |
| 2012 | There was a mid-cycle outage during 2012 that required degassing of the RCS in addition to a planned refueling outage resulting in slightly higher total body dose for 2012. |
| 2017 | Slightly lower dose due to multi-outage year. Both units operated less during 2017. |



| Year | Total Volume Liquid Effluents Released Comments |
|------|--|
| 2012 | Analysis of the 2nd quarter 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. |
| 2017 | Higher total volume of liquid effluents released was due to unit refueling and maintenance outages during the calendar year. More liquid waste is processed and released during unit outages. |

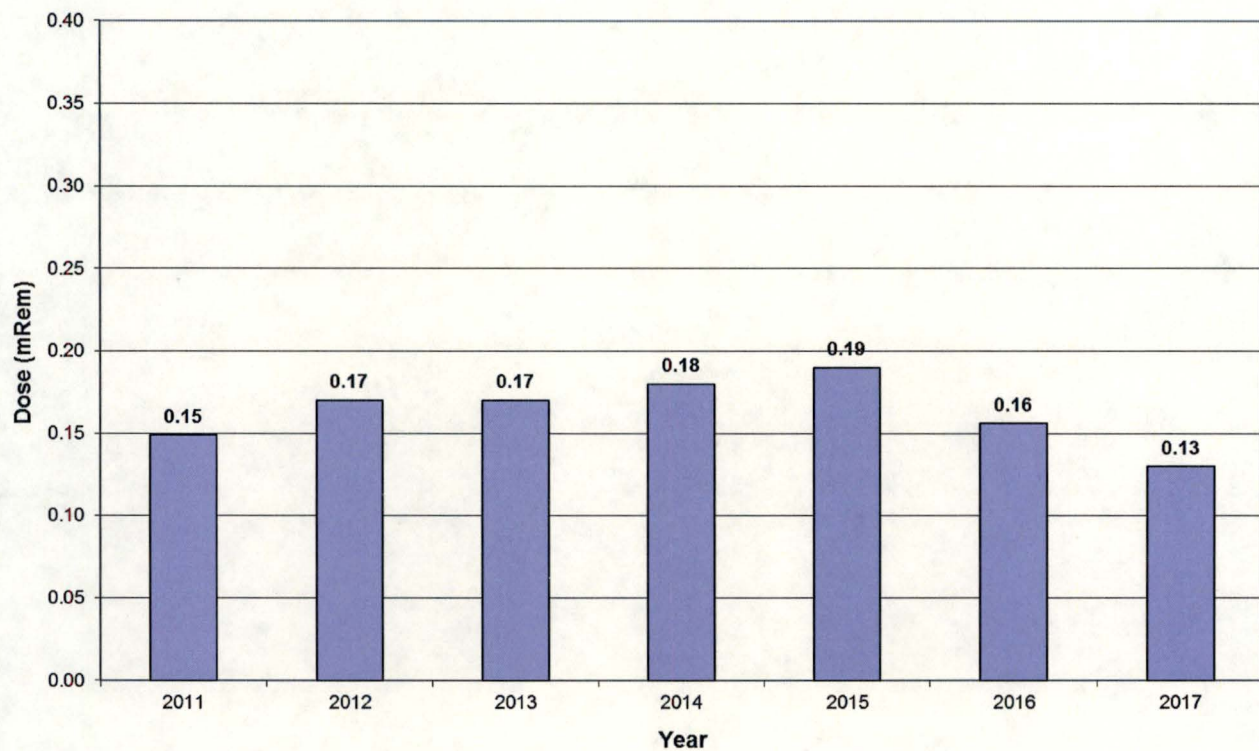


| Year | Total Activity (Excluding H3) Released in Liquid Effluents Comments |
|------|---|
| 2012 | The increased activity for 2012 is attributed to waste water processing for 1 refueling outage, 1 forced outage, and dry cask storage operations. |

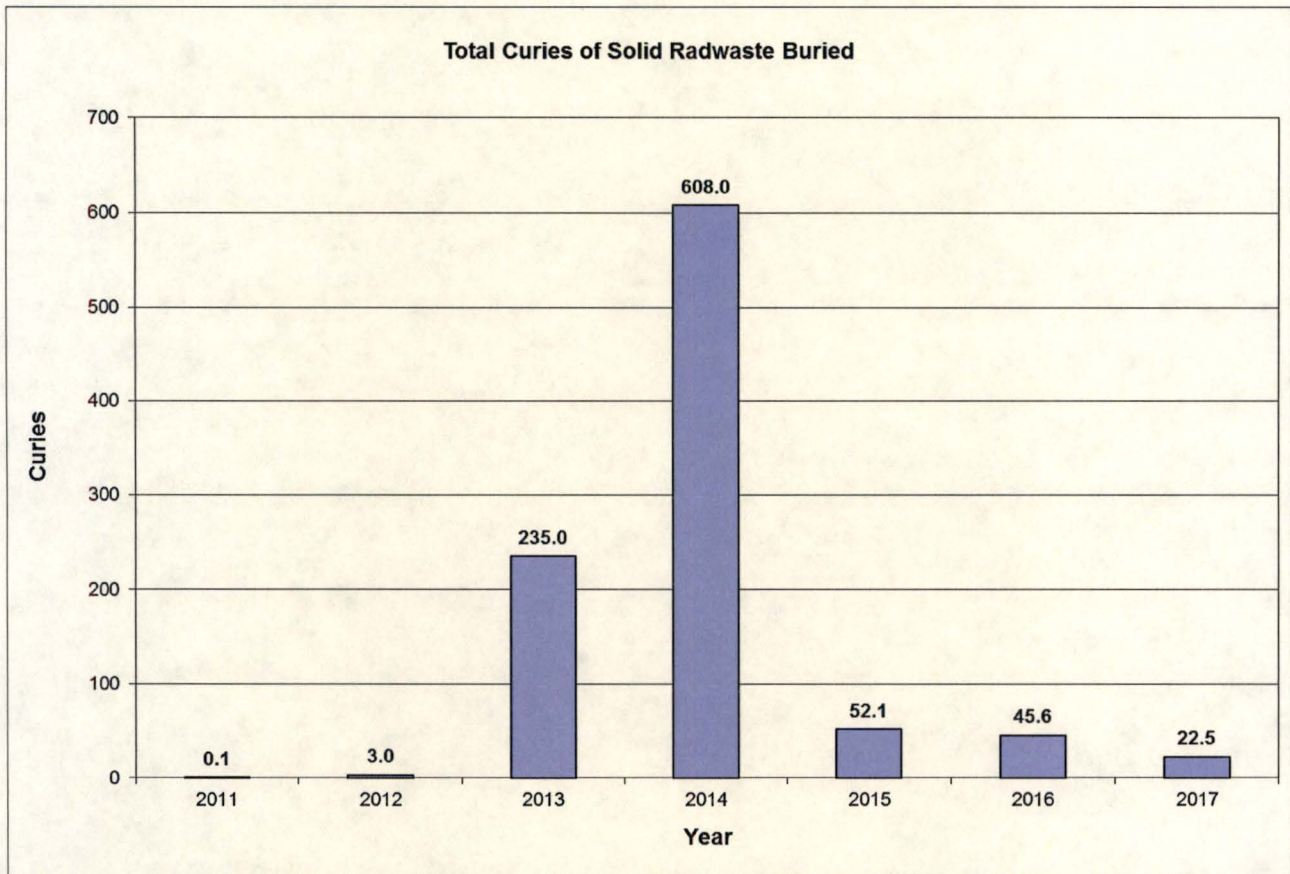


| Year | Total Curies of Tritium Released in Liquid Effluents Comments |
|------|--|
| All | Tritium released values can vary significantly from year to year based on a couple of factors. First, reactor coolant tritium production changes based on fuel burnup characteristics. Tritium activity increases following reactor startup, then plateaus mid-cycle, and begins to decline towards the end of cycle. Second, the tritium released value is dependent upon on how many outages there were during a calendar year. More liquid waste is processed and released during unit outages. |
| 2017 | More tritium was released due to multiple outages during the year. |

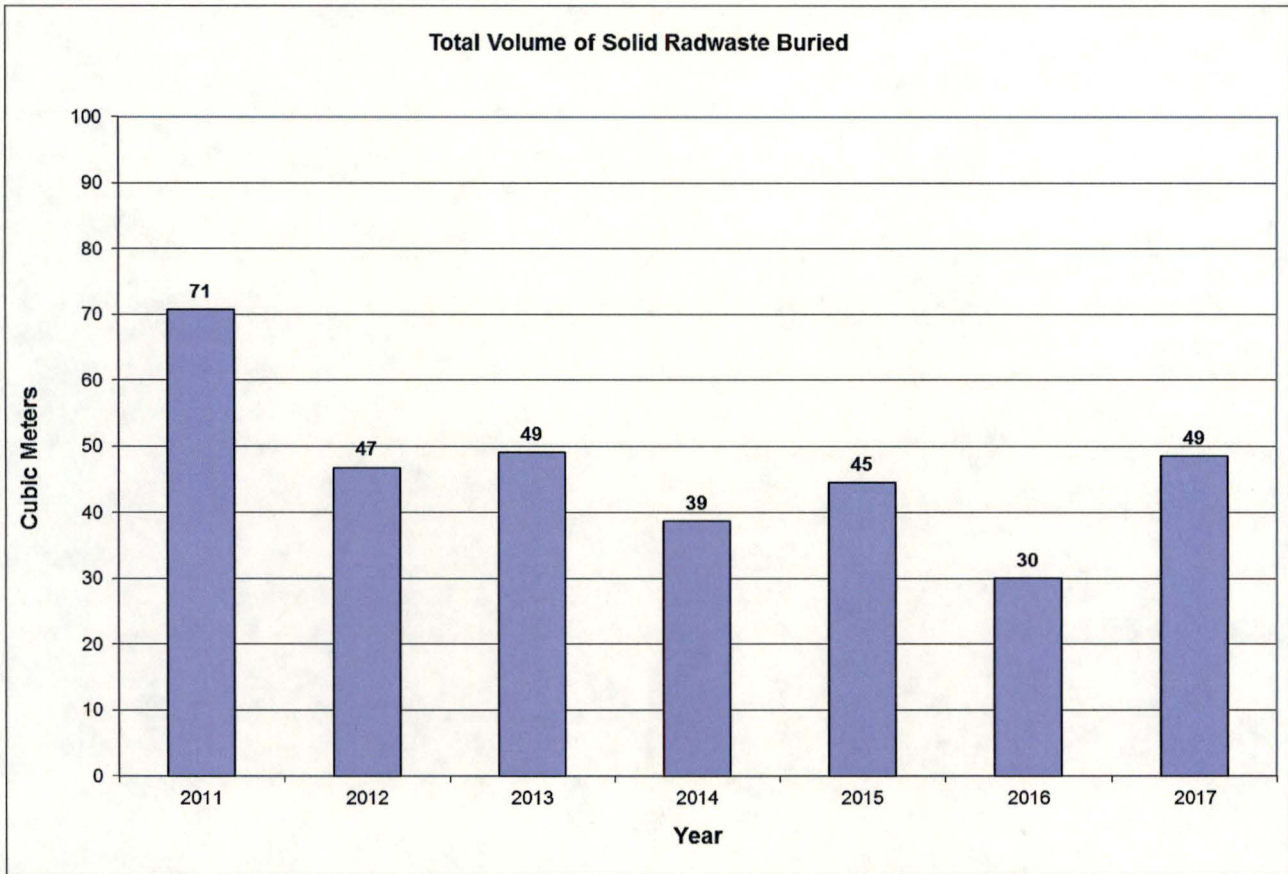
Total Body Dose Due to Liquid Effluents Released



| Year | Total Body Dose Due to Liquid Effluents Released Comments |
|-------------|--|
| N/A | No comments |



| Year | Total Curies of Solid Radwaste Buried Comments |
|------|---|
| 2013 | 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. |
| 2014 | In 2014 CPNPP continued to ship and bury stored Class B and Class C wastes at the compact disposal facility in Andrews, Texas. In advance of the compliance date for 10 CFR 37, waste containers with the highest radioactivity, particularly those exceeding category two quantities, were chosen to be shipped. In 2013, CPNPP had just began shipments to the new Andrews, Texas disposal facility and the waste containers chosen for shipment represented lower total activity to allow the staff to become familiar with the new procedure processes required by the new facility. Buried volume in both years are similar since these values are normally associated with Class A Dry Active Waste that represents an order of magnitude more volume than Class B and Class C wastes packaged in 120 cubic feet, or about 3 cubic meter, containers. |
| 2017 | Lower total activity buried was due to solid waste having lower activity. |



| Year | Total Body Dose Due to Liquid Effluents Released Comments |
|------|---|
| 2011 | Several containers of legacy dry activity waste were disposed of which resulted in greater volume during the year. |
| 2013 | 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. |
| 2014 | In 2014 CPNPP continued to ship and bury stored Class B and Class C wastes at the compact disposal facility in Andrews, Texas. In advance of the compliance date for 10 CFR 37, waste containers with the highest radioactivity, particularly those exceeding category two quantities, were chosen to be shipped. In 2013, CPNPP had just began shipments to the new Andrews, Texas disposal facility and the waste containers chosen for shipment represented lower total activity to allow the staff to become familiar with the new procedure processes required by the new facility. Buried volume in both years are similar since these values are normally associated with Class A Dry Active Waste that represents an order of magnitude more volume than Class B and Class C wastes packaged in 120 cubic feet, or about 3 cubic meter, containers. |
| 2016 | 2016 was a single outage year which resulted in less solid waste shipped and buried when compared to 2015. |
| 2017 | 2017 was a multi-outage year which led to a higher volume of solid waste shipped and buried. |

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 $2.0E-4$ $\mu\text{Ci/ml}$ 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
- 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:

$$(264/V) \cdot \sum_j A_j/C_j < 1.0$$

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 ($\mu\text{Ci/mL}$),
- V = volume of resins in the pond (gallons), and
- 264 = conversion factor ($\mu\text{Ci/Ci}$ per mL/gal)

This expression limits the total quantity of radioactive materials in resins discharged to the LVW Pond to a value such that the average concentration in the resins, calculated over the total volume of resins in the pond, will not exceed one times the Effluent Concentration Limits specified in 10 CFR 20, Appendix B, Table 2, Column 2.

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 $2.0E-04$ $\mu\text{Ci/mL}$ 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 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 radioactive releases are defined as the unintended discharge of a volume of liquid or airborne radioactivity to the environment. There were no abnormal or unplanned liquid or gaseous radioactive effluent releases during 2017.

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 was 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

Air doses due to gaseous effluent gamma and 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 radioiodines 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 2017 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

Dose to a MEMBER OF THE PUBLIC from activities inside the site boundary was evaluated. The highest dose resulted from recreational fishing on Squaw Creek Reservoir. A dose of 2.67E-03 mRem/yr was calculated based on an individual 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.

7.0 METEOROLOGICAL DATA

7.1 Meteorological Monitoring Program

In accordance with ODCM Administrative Control 6.9.1.4, a summary of hourly meteorological data, collected during 2017 is retained onsite. These data are available for review by the NRC upon request. Joint Frequency Tables are included in Attachment 10.1. During the year of this report, the goal of > 90% joint data recovery was met. The individual percent recoveries are listed below:

| Meteorological Data Recovery | |
|-------------------------------------|-------------------|
| Channel | % Recovery |
| 10 m Wind Speed | 99.5 |
| 10 m Wind Direction | 99.5 |
| Delta Temperature A | 98.3 |
| Delta Temperature B | 98.3 |

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 2017, there were no instances where these instruments were inoperable for more than thirty days.

8.2 Changes to the Offsite Dose Calculation Manual (ODCM)

There were no changes to the ODCM during 2017.

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 2017 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 2017 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 Abnormal, Unplanned Gaseous Effluent Release

No abnormal, unplanned gaseous effluent releases occurred during 2017.

8.5.2 Abnormal, Unplanned Liquid Effluent Releases

No abnormal, unplanned liquid effluent releases occurred during 2017.

8.6 Resin Releases to the LVW Pond

A total of 680 ft³ of powdex resin was transferred to the LVW pond during 2017. The cumulative activity deposited in the LVW pond since operations began through the end of 2017 is 1.93E-03 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.

During 2017, no changes to the Radwaste Treatment Systems occurred meeting the reporting criteria of the Process Control Program.

8.8 Groundwater Tritium Monitoring Program

Water wells used to monitor CPNPP for tritium leaks into the groundwater all had results that were less than detectable during 2017 with the exception of sentinel well CP-A. CP-A had positive tritium results for samples collected on 3/9/17 and 6/22/17. IR-2016-008692 documents a leak in a pipeline from the Low Volume Waste (LVW) Pond to the Water Treatment Waste Sump. Water from the Water Treatment Plant is purified using water from Squaw Creek Reservoir (SCR) and therefore contains tritium. The pipeline leak was repaired in January 2017. Samples collected from the well on 9/14/17 and 12/6/17 indicate the tritium concentration has subsequently decreased to less than detectable. All of these results were well below the state drinking water reportable criteria of 20,000 pCi/L and the environmental reportable criteria of 30,000 pCi/L.

Other areas also monitored, but 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) water and not indicative of groundwater 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 SCR.

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.

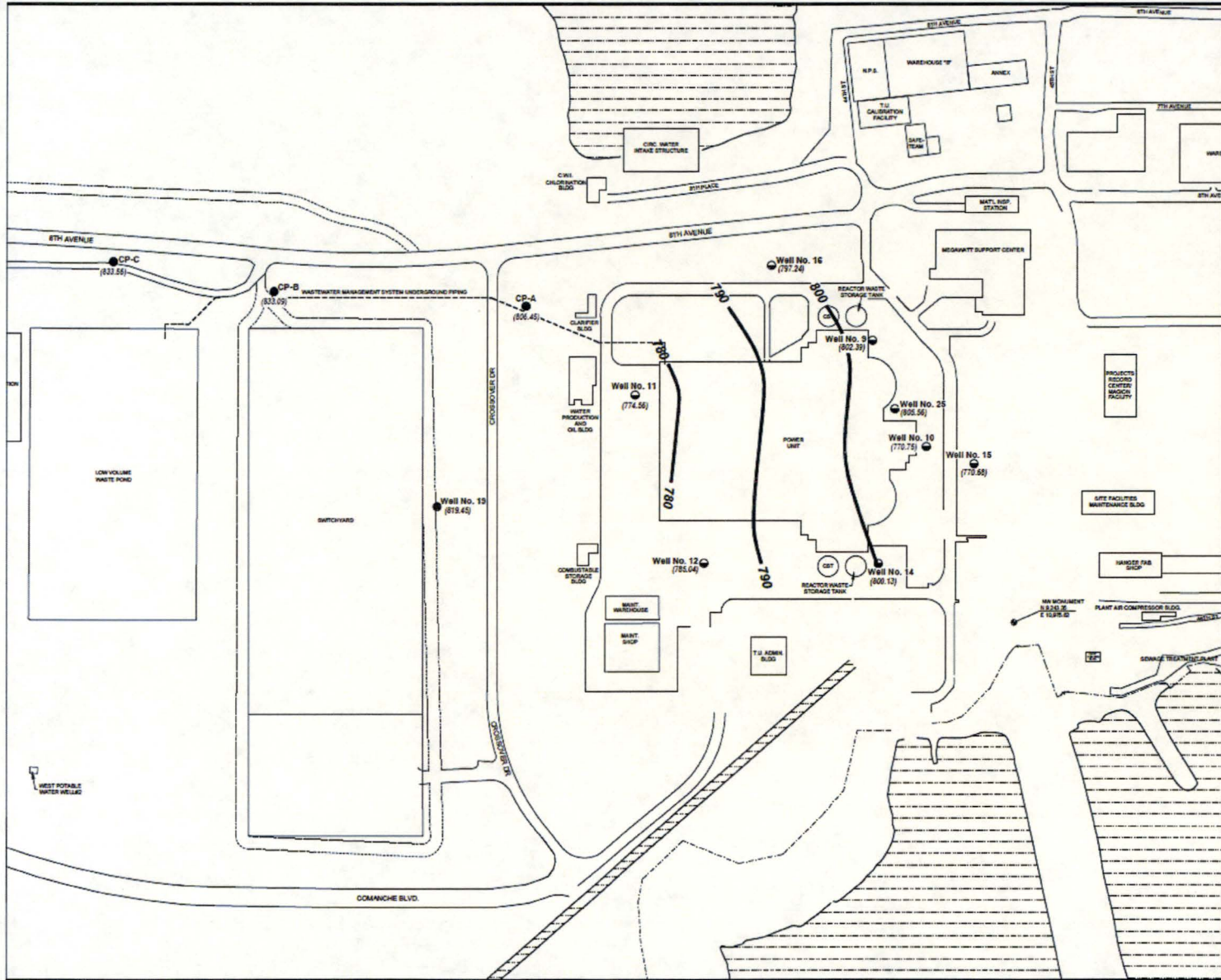
Groundwater Tritium Results (pCi/L)

| MW Location | 3/24/2016 | 6/9/2016 | 9/27/2016 | 12/14/2016 | 3/9/2017 | 6/22/2017 | 9/14/2017 | 12/6/2017 |
|-------------|---------------------|----------|---------------------|---------------------|---------------------|---------------------|-----------|-----------|
| 9 | <597 | <693 | <664 | <744 | <727 | <682 | <691 | <666 |
| 10 | <597 | <693 | <664 | <744 | <727 | <682 | <691 | <666 |
| 11 | 1450 ⁽²⁾ | <693 | <664 | <744 | <727 | <682 | <691 | <666 |
| 12 | <597 | <693 | <664 | <744 | <727 | <682 | <691 | <666 |
| 14 | <597 | <693 | <664 | <744 | <727 | <682 | <691 | <666 |
| 15 | DRY | <693 | DRY | DRY | <727 | <682 | <691 | <666 |
| 16 | <597 | <693 | <664 | <744 | <727 | <682 | <691 | <666 |
| 19 | <597 | <693 | <664 | <744 | <727 | <682 | <691 | <666 |
| 25 | <597 | <693 | <664 | <744 | <727 | <682 | <691 | <666 |
| CP-A | 5940 ⁽¹⁾ | <693 | 3190 ⁽²⁾ | 2100 ⁽²⁾ | 4660 ⁽²⁾ | 1700 ⁽²⁾ | <691 | <666 |
| CP-B | <597 | <693 | <664 | <744 | <727 | <682 | <691 | <666 |
| CP-C | <597 | <693 | <664 | <744 | <727 | <682 | <691 | <666 |

(1) CR-2016-001459; SCR water leakage via Water Treatment Plant's FWST (repaired mid-2016).

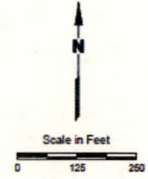
(2) CR-2016-008692; Leak in the line from Low Volume Waste pond line to the Water Treatment Waste Sump (repaired January 2017).

Groundwater Tritium Monitoring Well Map



- EXPLANATION**
- Monitoring Well Location (Weathered Glen Rose Formation)
 - Monitoring Well Location (Unweathered Glen Rose Formation)
 - (798.63) Water Level Elevation (Ft MSL) (NM = Not Measured)
 - 790** Groundwater Elevation Contour (Ft MSL) Contour Interval= 10 Ft

Note:
 1. Wells Nos. 10, 15, 19, CP-A, CP-B, and CP-C were not used to construct potentiometric surface contours for this figure because these wells are not considered to be in hydraulic connection with the other wells.
 2. Groundwater elevation contours were constructed based on predominant water level elevations in order to evaluate the overall hydraulic gradient at the Site, and thus contours may not be entirely consistent with the individual elevations at all wells.



Source: Created from TXU Electric CPSES Site Map SGM-01.

LUMINANT - CPNPP

Figure 23
UNWEATHERED GLEN ROSE FORMATION - GROUNDWATER ELEVATIONS - AUG. 29, 2010

| | | |
|-----------------|--------------|------------|
| PROJECT: 1786 | BY: AJD | REVISIONS: |
| DATE: AUG. 2012 | CHECKED: RJM | |

PASTOR, BEHLING & WHEELER, LLC
 CONSULTING ENGINEERS AND SCIENTISTS

SECTION 9.0
EFFLUENT TABLES

Table 9.1
Liquid and Gaseous Batch Release Summary

| A. Liquid Releases | Units | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | Annual |
|--|--------------|------------------|------------------|------------------|------------------|---------------|
| 1. Number of batch releases | | 12 | 23 | 12 | 14 | 61 |
| 2. Total time period for Batch releases | Minutes | 4.14E+03 | 5.89E+03 | 3.94E+03 | 4.89E+03 | 1.89E+04 |
| 3. Maximum time period for a batch release | Minutes | 3.79E+02 | 3.54E+02 | 3.50E+02 | 3.83E+02 | 3.83E+02 |
| 4. Average time period for a batch release | Minutes | 3.45E+02 | 2.56E+02 | 3.28E+02 | 3.49E+02 | 3.09E+02 |
| 5. Minimum time period for a batch release | Minutes | 3.08E+02 | 8.00E+01 | 2.80E+02 | 3.25E+02 | 8.00E+01 |
| | | | | | | |
| B. Gaseous Releases | Units | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | Annual |
| 1. Number of batch releases | | 27 | 29 | 28 | 27 | 111 |
| 2. Total time period for batch releases | Minutes | 2.27E+04 | 1.93E+04 | 1.13E+04 | 9.92E+03 | 6.32E+04 |
| 3. Maximum time period for a batch release | Minutes | 1.32E+04 | 5.25E+03 | 1.80E+03 | 9.49E+02 | 1.32E+04 |
| 4. Average time period for a batch release | Minutes | 8.40E+02 | 6.66E+02 | 4.03E+02 | 3.67E+02 | 5.69E+02 |
| 5. Minimum time period for a batch release | Minutes | 2.00E+02 | 2.88E+02 | 2.68E+02 | 2.28E+02 | 2.00E+02 |

Table 9.2
Abnormal Liquid and Gaseous Batch Release Summary

| 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
Gaseous Effluents - Summation of All Releases

| Type of Effluent | Units | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | Total |
|--|---------|--------------|--------------|--------------|--------------|----------|
| A. Fission and Activation Gases | | | | | | |
| 1. Total Release | Curies | 1.16E-01 | 9.59E-02 | 8.74E-02 | 1.23E-01 | 4.22E-01 |
| 2. Average Release rate for period | μCi/sec | 1.49E-02 | 1.22E-02 | 1.10E-02 | 1.54E-02 | 1.34E-02 |
| 3. Percent of Applicable Limit | % | * | * | * | * | * |
| B. Radioiodines | | | | | | |
| 1. Total Iodine-131 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 2. Average Release rate for period | μCi/sec | 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) | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 2. Average Release rate for period | μCi/sec | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 3. Percent of Applicable Limit | % | * | * | * | * | * |
| D. Tritium | | | | | | |
| 1. H-3 Release | Curies | 5.80E+00 | 9.71E+00 | 1.10E+01 | 7.89E+00 | 3.44E+01 |
| 2. Average Release rate for period | μCi/sec | 7.46E-01 | 1.23E+00 | 1.39E+00 | 9.93E-01 | 1.09E+00 |
| 3. Percent of Applicable Limit | % | * | * | * | * | * |
| E. Carbon-14 | | | | | | |
| 1. C-14 Release | Curies | 5.91E+00 | 3.96E+00 | 4.53E+00 | 4.85E+00 | 1.93E+01 |
| 2. Average Release rate for period | μCi/sec | 7.60E-01 | 5.02E-01 | 5.72E-01 | 6.10E-01 | 6.11E-01 |
| 3. Percent of Applicable Limit | % | * | * | * | * | * |
| F. 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
Gaseous Effluents - Ground Level Releases

| <i>Continuous Mode</i> Nuclides Released | Units | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | Total |
|---|--------|-----------|-----------|-----------|-----------|----------|
| Fission Gases | | | | | | |
| No Nuclides Found | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Iodines | | | | | | |
| No Nuclides Found | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Particulates | | | | | | |
| No Nuclides Found | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Tritium | | | | | | |
| H-3 | Curies | 5.66E+00 | 9.53E+00 | 1.09E+01 | 7.81E+00 | 3.39E+01 |
| Carbon-14 | | | | | | |
| C-14 | Curies | 1.77E+00 | 1.19E+00 | 1.36E+00 | 1.46E+00 | 5.78E+00 |
| Gross Alpha | | | | | | |
| No Nuclides Found | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

Table 9.4 (continued)
Gaseous Effluents - Ground Level Releases

| <i>Batch Mode</i> | | | | | | |
|--------------------------|---------------|------------------|------------------|------------------|------------------|--------------|
| Nuclides Released | Unit | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | Total |
| Fission Gases | | | | | | |
| Ar-41 | Curies | 9.66E-02 | 7.87E-02 | 8.61E-02 | 1.07E-01 | 3.68E-01 |
| Kr-85m | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.41E-04 | 4.41E-04 |
| Kr-85 | Curies | 1.76E-02 | 1.65E-04 | 0.00E+00 | 0.00E+00 | 1.78E-02 |
| Xe-131m | Curies | 0.00E+00 | 1.20E-05 | 0.00E+00 | 1.34E-05 | 2.54E-05 |
| Xe-133m | Curies | 0.00E+00 | 4.35E-05 | 0.00E+00 | 8.18E-05 | 1.25E-04 |
| Xe-133 | Curies | 1.80E-03 | 1.56E-02 | 1.32E-03 | 1.19E-02 | 3.06E-02 |
| Xe-135m | Curies | 0.00E+00 | 1.40E-06 | 0.00E+00 | 3.53E-06 | 4.93E-06 |
| Xe-135 | Curies | 0.00E+00 | 1.43E-03 | 0.00E+00 | 3.59E-03 | 5.02E-03 |
| Total for Period | Curies | 1.16E-01 | 9.59E-02 | 8.74E-02 | 1.23E-01 | 4.22E-01 |
| Iodines | | | | | | |
| No Nuclides Found | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Particulates | | | | | | |
| No Nuclides Found | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Tritium | | | | | | |
| H-3 | Curies | 1.44E-01 | 1.73E-01 | 9.40E-02 | 7.79E-02 | 4.88E-01 |
| Carbon-14 | | | | | | |
| C-14 | Curies | 4.14E+00 | 2.77E+00 | 3.17E+00 | 3.40E+00 | 1.35E+01 |
| Gross Alpha | | | | | | |
| No Nuclides Found | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

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

Table 9.5
Liquid Effluents - Summation Of All Releases

| | Units | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | Annual |
|---|--------|-----------|-----------|-----------|-----------|----------|
| A. Fission and Activation Products | | | | | | |
| 1. Total Release (excludes tritium, gases, alpha) | Curies | 1.15E-04 | 3.35E-04 | 2.37E-04 | 3.69E-04 | 1.06E-03 |
| 2. Average diluted concentration during period | μCi/mL | 9.99E-12 | 1.53E-11 | 1.62E-11 | 2.05E-11 | 1.60E-11 |
| 3. Percent of Applicable Limit | % | * | * | * | * | * |
| B. Tritium | | | | | | |
| 1. Total Release | Curies | 9.01E+02 | 6.37E+02 | 6.04E+02 | 3.70E+02 | 2.51E+03 |
| 2. Average diluted concentration during period | μCi/mL | 7.81E-05 | 2.91E-05 | 4.13E-05 | 2.06E-05 | 3.80E-05 |
| 3. Percent of Applicable Limit | % | * | * | * | * | * |
| C. Dissolved and Entrained Gases | | | | | | |
| 1. Total Release | Curies | 7.72E-04 | 1.59E-04 | 4.46E-04 | 1.06E-04 | 1.48E-03 |
| 2. Average diluted concentration during period | μCi/mL | 6.70E-11 | 7.25E-12 | 3.05E-11 | 5.89E-12 | 2.25E-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 | μCi/mL | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| E: Waste Vol Release (Pre-Dilution) | | | | | | |
| | Liters | 8.82E+05 | 1.79E+06 | 8.95E+05 | 1.10E+06 | 4.66E+06 |
| F. Volume of Dilution Water Used | | | | | | |
| | Liters | 1.15E+10 | 2.19E+10 | 1.46E+10 | 1.80E+10 | 6.61E+10 |

* Applicable limits are expressed in terms of dose.

Estimated Total Error for All Values Reported is < 1.0%

Table 9.6
Liquid Effluents

Continuous Mode

| Nuclides Released | Units | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | Annual |
|--|--------------|------------------|------------------|------------------|------------------|---------------|
| Fission and 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 |

Batch Mode

| Nuclides Released | Units | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | Annual |
|--|---------------|------------------|------------------|------------------|------------------|-----------------|
| Fission and Activation Products | | | | | | |
| Cr-51 | Curies | 0.00E+00 | 1.82E-05 | 0.00E+00 | 0.00E+00 | 1.82E-05 |
| Mn-54 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.10E-06 | 5.10E-06 |
| Fe-59 | Curies | 2.22E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.22E-06 |
| Co-58 | Curies | 3.21E-05 | 2.61E-04 | 1.68E-04 | 2.84E-04 | 7.45E-04 |
| Co-60 | Curies | 7.76E-05 | 5.32E-05 | 6.91E-05 | 7.17E-05 | 2.72E-04 |
| Nb-95 | Curies | 0.00E+00 | 1.94E-06 | 0.00E+00 | 8.13E-06 | 1.01E-05 |
| Sb-125 | Curies | 3.15E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.15E-06 |
| Total for Period | Curies | 1.15E-04 | 3.35E-04 | 2.37E-04 | 3.69E-04 | 1.06E-03 |
| Tritium | | | | | | |
| H-3 | Curies | 9.01E+02 | 6.37E+02 | 6.04E+02 | 3.70E+02 | 2.51E+03 |
| Dissolved and Entrained Gases | | | | | | |
| Kr-85 | Curies | 4.18E-04 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.18E-04 |
| Xe-133 | Curies | 3.55E-04 | 1.59E-04 | 4.41E-04 | 1.06E-04 | 1.06E-03 |
| Xe-135 | Curies | 0.00E+00 | 0.00E+00 | 5.56E-06 | 0.00E+00 | 5.56E-06 |
| Total for Period | Curies | 7.72E-04 | 1.59E-04 | 4.46E-04 | 1.06E-04 | 1.48E-03 |
| 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.

Zeros 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

| Organ Dose | Units | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | Annual |
|-------------------------|--------------|------------------|------------------|------------------|------------------|---------------|
| Bone | mRem | 1.45E-08 | 3.85E-09 | 0.00E+00 | 1.61E-08 | 3.44E-08 |
| Limit | mRem | 5 | 5 | 5 | 5 | 10 |
| Percent of Limit | % | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| <hr/> | | | | | | |
| Liver | mRem | 2.93E-02 | 2.94E-02 | 3.32E-02 | 3.77E-02 | 1.30E-01 |
| Limit | mRem | 5 | 5 | 5 | 5 | 10 |
| Percent of Limit | % | 0.587 | 0.589 | 0.664 | 0.754 | 1.297 |
| <hr/> | | | | | | |
| Total Body | mRem | 2.93E-02 | 2.94E-02 | 3.32E-02 | 3.77E-02 | 1.30E-01 |
| Limit | mRem | 1.5 | 1.5 | 1.5 | 1.5 | 3 |
| Percent of Limit | % | 1.955 | 1.962 | 2.215 | 2.514 | 4.323 |
| <hr/> | | | | | | |
| Thyroid | mRem | 2.93E-02 | 2.94E-02 | 3.32E-02 | 3.77E-02 | 1.30E-01 |
| Limit | mRem | 5 | 5 | 5 | 5 | 10 |
| Percent of Limit | % | 0.587 | 0.589 | 0.664 | 0.754 | 1.297 |
| <hr/> | | | | | | |
| Kidney | mRem | 2.93E-02 | 2.94E-02 | 3.32E-02 | 3.77E-02 | 1.30E-01 |
| Limit | mRem | 5 | 5 | 5 | 5 | 10 |
| Percent of Limit | % | 0.587 | 0.589 | 0.664 | 0.754 | 1.297 |
| <hr/> | | | | | | |
| Lung | mRem | 2.93E-02 | 2.94E-02 | 3.32E-02 | 3.77E-02 | 1.30E-01 |
| Limit | mRem | 5 | 5 | 5 | 5 | 10 |
| Percent of Limit | % | 0.587 | 0.589 | 0.664 | 0.754 | 1.297 |
| <hr/> | | | | | | |
| GI-Lli | mRem | 2.93E-02 | 2.95E-02 | 3.32E-02 | 3.78E-02 | 1.30E-01 |
| Limit | mRem | 5 | 5 | 5 | 5 | 10 |
| Percent of Limit | % | 0.587 | 0.589 | 0.664 | 0.755 | 1.298 |

Table 9.8
Air Dose Due To Gaseous Releases

| NG Dose | Units | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | Annual |
|-------------------------|--------------|------------------|------------------|------------------|------------------|---------------|
| Gamma Air | mRad | 9.41E-05 | 7.74E-05 | 8.38E-05 | 1.05E-04 | 3.60E-04 |
| Limit | mRad | 5 | 5 | 5 | 5 | 10 |
| Percent of Limit | % | 0.002 | 0.002 | 0.002 | 0.002 | 0.004 |
| Beta Air | mRad | 3.69E-05 | 2.91E-05 | 2.97E-05 | 3.89E-05 | 1.35E-04 |
| Limit | mRad | 10 | 10 | 10 | 10 | 20 |
| Percent of Limit | % | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 |
| NG Total Body | mRem | 8.94E-05 | 7.35E-05 | 7.97E-05 | 9.96E-05 | 3.42E-04 |
| Limit | mRem | 7.5 | 7.5 | 7.5 | 7.5 | 15 |
| Percent of Limit | % | 0.001 | 0.001 | 0.001 | 0.001 | 0.002 |
| NG Skin | mRem | 1.33E-04 | 1.08E-04 | 1.16E-04 | 1.46E-04 | 5.04E-04 |
| Limit | mRem | 7.5 | 7.5 | 7.5 | 7.5 | 15 |
| Percent of Limit | % | 0.002 | 0.001 | 0.002 | 0.002 | 0.003 |

Table 9.9
Dose to a Member of the Public Due to Radioiodines,
Particulates, Tritium, and C-14 in Gaseous Releases

| Organ Dose | Units | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | Annual |
|-------------------|--------------|------------------|------------------|------------------|------------------|---------------|
| Liver | mRem | 1.90E-02 | 2.09E-02 | 2.38E-02 | 2.00E-02 | 8.37E-02 |
| Limit | mRem | 7.5 | 7.5 | 7.5 | 7.5 | 15 |
| Percent of Limit | % | 0.253 | 0.278 | 0.318 | 0.267 | 0.558 |
| <hr/> | | | | | | |
| Total Body | mRem | 1.90E-02 | 2.09E-02 | 2.38E-02 | 2.00E-02 | 8.37E-02 |
| Limit | mRem | 7.5 | 7.5 | 7.5 | 7.5 | 15 |
| Percent of Limit | % | 0.253 | 0.278 | 0.318 | 0.267 | 0.558 |
| <hr/> | | | | | | |
| Thyroid | mRem | 1.90E-02 | 2.09E-02 | 2.38E-02 | 2.00E-02 | 8.37E-02 |
| Limit | mRem | 7.5 | 7.5 | 7.5 | 7.5 | 15 |
| Percent of Limit | % | 0.253 | 0.278 | 0.318 | 0.267 | 0.558 |
| <hr/> | | | | | | |
| Kidney | mRem | 1.90E-02 | 2.09E-02 | 2.38E-02 | 2.00E-02 | 8.37E-02 |
| Limit | mRem | 7.5 | 7.5 | 7.5 | 7.5 | 15 |
| Percent of Limit | % | 0.253 | 0.278 | 0.318 | 0.267 | 0.558 |
| <hr/> | | | | | | |
| Lung | mRem | 1.90E-02 | 2.09E-02 | 2.38E-02 | 2.00E-02 | 8.37E-02 |
| Limit | mRem | 7.5 | 7.5 | 7.5 | 7.5 | 15 |
| Percent of Limit | % | 0.253 | 0.278 | 0.318 | 0.267 | 0.558 |
| <hr/> | | | | | | |
| GI-Li | mRem | 1.90E-02 | 2.09E-02 | 2.38E-02 | 2.00E-02 | 8.37E-02 |
| Limit | mRem | 7.5 | 7.5 | 7.5 | 7.5 | 15 |
| Percent of Limit | % | 0.253 | 0.278 | 0.318 | 0.267 | 0.558 |
| <hr/> | | | | | | |
| Bone | mRem | 5.62E-02 | 3.76E-02 | 4.31E-02 | 4.61E-02 | 1.83E-01 |
| Limit | mRem | 7.5 | 7.5 | 7.5 | 7.5 | 15 |
| Percent of Limit | % | 0.749 | 0.502 | 0.574 | 0.615 | 1.220 |

Table 9.10
Solid Radwaste and Irradiated Fuel Shipments

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 | 2.09E+01 | 2.25E+01 | 2.09E+01 | 2.25E+01 | ± 25% |
| b. Dry active waste | 3.39E+02 | 9.79E-02 | 2.76E+01 | 4.85E-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 | 3.60E+02 | 2.26E+01 | 4.85E+01 | 2.25E+01 | ± 25% |

Note: Shipped volumes and curies are not always equal to the buried volumes and curies as a result of volume reducing processing, and 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 | H-3 | 11.90 | 2.68E+00 | |
| | Ni-63 | 61.21 | 1.38E+01 | |
| | Fe-55 | 12.68 | 2.86E+00 | |
| | Co-60 | 8.38 | 1.89E+00 | |
| | Cs-137d | 3.95 | 8.90E-01 | |
| | C-14 | 1.04 | 2.35E-01 | |
| | Tc-99 | 0.02 | 4.44E-03 | |
| | I-129 | LLD | -0- | |
| | Other ⁽¹⁾ | 0.82 | 1.84E-01 | |
| | Total | 100.00 | 2.25E+01 | |
| b. Dry active waste | Fe-55 | 36.44 | 3.57E-02 | |
| | Co-60 | 14.50 | 1.42E-02 | |
| | Ni-63 | 19.96 | 1.95E-02 | |
| | Co-58 | 22.31 | 2.19E-02 | |
| | Mn-54 | 1.98 | 1.94E-03 | |
| | Nb-95 | 1.42 | 1.39E-03 | |
| | C-14 | 0.13 | 1.27E-04 | |
| | H-3 | LLD | -0- | |
| | Tc-99 | LLD | -0- | |
| | I-129 | LLD | -0- | |
| | Other ⁽²⁾ | 3.26 | 3.19E-03 | |
| | | Total | 100.00 | 9.79E-02 |
| | d. Other (oil/miscellaneous liquids sent to processor for volume reduction) | N/A | N/A | N/A |

(1) Nuclides representing <1% of total shipped activity: Cr-51, Mn-54, Co-57, Co-58, Fe-59, Ni-59, Zn-65, Sr-89, Sr-90d, Zr-95, Nb-94, Nb-95, Ag-108m, Ag-110m, Sn-113, Sn-117m, Sb-124, Sb-125, Cs-134, Cs-136, Ba-140, Ce-144d, Am-241, and Cm-243/44.

(2) Nuclides representing <1% of total shipped activity: Cr-51, Co-57, Ni-59, Zn-65, Sr-90d, Zr-95, Sn-113, Sb-125, Cs-137d, and Ce-144d.

Table 9.10 (continued)
Solid Radwaste and Irradiated Fuel Shipments

| 3. Solid Waste Disposition (Mode of Transportation: Truck) | | | | |
|---|--------------------|-----------------------|----------------------------|---|
| 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 | |
| b. Dry active waste | A | General Design | 5 | Energy Solutions Oak Ridge, TN |
| d. Other | NA | NA | NA | NA |

*High Integrity Container

B. Irradiated Fuel Shipments (Disposition)

| | | |
|----------------------------|-------------------------------|--------------------|
| <u>Number of Shipments</u> | <u>Mode of Transportation</u> | <u>Destination</u> |
| 0 | N/A | N/A |

Attachment 10.1
Meteorological Joint Frequency Tables

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2017 00:00 to 31-DEC-2017 23:59

STABILITY CLASS **A**

ELEVATION:
10 m

| WIND DIRECTION | Wind Speed (mph) | | | | | | TOTAL |
|--------------------------|------------------|-----|------|-------|-------|-----|-------|
| | 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | |
| N | 1 | 22 | 36 | 25 | 0 | 0 | 84 |
| NNE | 5 | 19 | 22 | 9 | 0 | 0 | 55 |
| NE | 8 | 25 | 10 | 1 | 0 | 0 | 44 |
| ENE | 2 | 45 | 5 | 0 | 0 | 0 | 52 |
| E | 4 | 8 | 0 | 0 | 0 | 0 | 12 |
| ESE | 2 | 28 | 12 | 0 | 0 | 0 | 42 |
| SE | 2 | 29 | 30 | 9 | 0 | 0 | 70 |
| SSE | 0 | 36 | 78 | 37 | 1 | 0 | 152 |
| S | 1 | 9 | 34 | 16 | 0 | 0 | 60 |
| SSW | 0 | 2 | 3 | 4 | 0 | 0 | 9 |
| SW | 0 | 3 | 0 | 0 | 0 | 0 | 3 |
| WSW | 0 | 0 | 3 | 1 | 0 | 0 | 4 |
| W | 0 | 0 | 0 | 0 | 4 | 0 | 4 |
| WNW | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NW | 0 | 0 | 4 | 6 | 9 | 0 | 19 |
| NNW | 1 | 10 | 45 | 30 | 10 | 3 | 99 |
| VARIABLE | 10 | 1 | 0 | 0 | 0 | 0 | 11 |
| TOTAL | 36 | 237 | 282 | 138 | 24 | 3 | 720 |
| Periods of calm (hours): | 0 | | | | | | |
| Hours of missing data: | 9 | | | | | | |

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2017 00:00 to 31-DEC-2017 23:59

STABILITY CLASS **B**

ELEVATION:
10 m

| WIND DIRECTION | Wind Speed (mph) | | | | | | TOTAL |
|--------------------------|------------------|-----|------|-------|-------|-----|-------|
| | 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | |
| N | 2 | 11 | 20 | 19 | 4 | 1 | 57 |
| NNE | 4 | 10 | 8 | 7 | 1 | 0 | 30 |
| NE | 9 | 17 | 6 | 0 | 0 | 0 | 32 |
| ENE | 5 | 16 | 2 | 0 | 0 | 0 | 23 |
| E | 1 | 6 | 1 | 0 | 0 | 0 | 8 |
| ESE | 2 | 16 | 12 | 0 | 0 | 0 | 30 |
| SE | 1 | 23 | 27 | 6 | 0 | 0 | 57 |
| SSE | 0 | 23 | 37 | 22 | 1 | 0 | 83 |
| S | 1 | 17 | 43 | 35 | 10 | 1 | 107 |
| SSW | 2 | 8 | 19 | 14 | 7 | 2 | 52 |
| SW | 2 | 6 | 4 | 1 | 0 | 0 | 13 |
| WSW | 0 | 5 | 6 | 0 | 0 | 0 | 11 |
| W | 1 | 0 | 2 | 1 | 0 | 0 | 4 |
| WNW | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| NW | 0 | 3 | 17 | 9 | 0 | 0 | 29 |
| NNW | 0 | 8 | 29 | 23 | 5 | 2 | 67 |
| VARIABLE | 9 | 0 | 1 | 0 | 0 | 0 | 10 |
| TOTAL | 39 | 169 | 236 | 137 | 28 | 6 | 615 |
| Periods of calm (hours): | 1 | | | | | | |
| Hours of missing data: | 2 | | | | | | |

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2017 00:00 to 31-DEC-2017 23:59

STABILITY CLASS **C**

ELEVATION:
10 m

| WIND DIRECTION | Wind Speed (mph) | | | | | | TOTAL |
|--------------------------|------------------|-----|------|-------|-------|-----|-------|
| | 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | |
| N | 5 | 11 | 31 | 24 | 4 | 0 | 75 |
| NNE | 4 | 8 | 11 | 10 | 2 | 0 | 35 |
| NE | 7 | 4 | 7 | 1 | 0 | 0 | 19 |
| ENE | 12 | 7 | 5 | 0 | 0 | 0 | 24 |
| E | 6 | 9 | 4 | 0 | 0 | 0 | 19 |
| ESE | 2 | 11 | 13 | 1 | 0 | 0 | 27 |
| SE | 2 | 27 | 19 | 9 | 0 | 0 | 57 |
| SSE | 2 | 26 | 44 | 25 | 3 | 1 | 101 |
| S | 3 | 16 | 61 | 70 | 14 | 2 | 166 |
| SSW | 1 | 6 | 20 | 31 | 4 | 0 | 62 |
| SW | 1 | 10 | 19 | 9 | 1 | 0 | 40 |
| WSW | 1 | 14 | 11 | 4 | 1 | 0 | 31 |
| W | 0 | 3 | 4 | 0 | 0 | 0 | 7 |
| WNW | 0 | 2 | 4 | 5 | 3 | 0 | 14 |
| NW | 1 | 5 | 17 | 10 | 3 | 3 | 39 |
| NNW | 0 | 13 | 16 | 25 | 4 | 0 | 58 |
| VARIABLE | 16 | 1 | 2 | 0 | 0 | 0 | 19 |
| TOTAL | 63 | 173 | 288 | 224 | 39 | 6 | 793 |
| Periods of calm (hours): | 0 | | | | | | |
| Hours of missing data: | 3 | | | | | | |

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2017 00:00 to 31-DEC-2017 23:59

STABILITY CLASS **D**

ELEVATION:
10 m

| WIND DIRECTION | Wind Speed (mph) | | | | | | TOTAL |
|--------------------------|------------------|------|------|-------|-------|-----|-------|
| | 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | |
| N | 14 | 100 | 225 | 87 | 5 | 1 | 432 |
| NNE | 12 | 73 | 123 | 50 | 3 | 0 | 261 |
| NE | 13 | 52 | 52 | 9 | 1 | 0 | 127 |
| ENE | 16 | 55 | 49 | 2 | 0 | 0 | 122 |
| E | 21 | 88 | 23 | 2 | 0 | 0 | 134 |
| ESE | 30 | 119 | 28 | 0 | 0 | 0 | 177 |
| SE | 17 | 218 | 181 | 34 | 0 | 0 | 450 |
| SSE | 10 | 104 | 300 | 165 | 8 | 9 | 596 |
| S | 13 | 60 | 272 | 208 | 21 | 2 | 576 |
| SSW | 14 | 33 | 69 | 72 | 12 | 1 | 201 |
| SW | 20 | 35 | 32 | 30 | 0 | 0 | 117 |
| WSW | 10 | 21 | 10 | 4 | 3 | 0 | 48 |
| W | 6 | 18 | 19 | 4 | 1 | 0 | 48 |
| WNW | 3 | 28 | 48 | 11 | 1 | 0 | 91 |
| NW | 7 | 28 | 49 | 53 | 16 | 1 | 154 |
| NNW | 8 | 37 | 104 | 78 | 15 | 1 | 243 |
| VARIABLE | 83 | 28 | 8 | 1 | 0 | 0 | 120 |
| TOTAL | 297 | 1097 | 1592 | 810 | 86 | 15 | 3897 |
| Periods of calm (hours): | 5 | | | | | | |
| Hours of missing data: | 21 | | | | | | |

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2017 00:00 to 31-DEC-2017 23:59

STABILITY CLASS **E**

ELEVATION:
10 m

| WIND DIRECTION | Wind Speed (mph) | | | | | | TOTAL |
|--------------------------|------------------|------|------|-------|-------|-----|-------|
| | 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | |
| N | 10 | 38 | 44 | 4 | 0 | 0 | 96 |
| NNE | 3 | 21 | 15 | 0 | 0 | 0 | 39 |
| NE | 4 | 10 | 2 | 0 | 0 | 0 | 16 |
| ENE | 3 | 8 | 2 | 0 | 0 | 0 | 13 |
| E | 13 | 35 | 1 | 0 | 0 | 0 | 49 |
| ESE | 25 | 87 | 3 | 0 | 0 | 0 | 115 |
| SE | 36 | 309 | 122 | 1 | 0 | 0 | 468 |
| SSE | 21 | 211 | 224 | 7 | 0 | 0 | 463 |
| S | 20 | 60 | 90 | 5 | 0 | 0 | 175 |
| SSW | 21 | 53 | 45 | 13 | 0 | 0 | 132 |
| SW | 12 | 17 | 24 | 12 | 0 | 0 | 65 |
| WSW | 16 | 18 | 21 | 6 | 0 | 0 | 61 |
| W | 10 | 18 | 5 | 0 | 0 | 0 | 33 |
| WNW | 7 | 28 | 23 | 3 | 0 | 0 | 61 |
| NW | 13 | 57 | 28 | 1 | 0 | 0 | 99 |
| NNW | 3 | 21 | 17 | 2 | 0 | 0 | 43 |
| VARIABLE | 51 | 12 | 1 | 0 | 0 | 0 | 64 |
| TOTAL | 268 | 1003 | 667 | 54 | 0 | 0 | 1992 |
| Periods of calm (hours): | 5 | | | | | | |
| Hours of missing data: | 6 | | | | | | |

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2017 00:00 to 31-DEC-2017 23:59

STABILITY CLASS **F**

ELEVATION:
10 m

| WIND DIRECTION | Wind Speed (mph) | | | | | | TOTAL |
|--------------------------|------------------|-----|------|-------|-------|-----|-------|
| | 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | |
| N | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| NNE | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NE | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ENE | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| E | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| ESE | 2 | 3 | 0 | 0 | 0 | 0 | 5 |
| SE | 6 | 70 | 5 | 0 | 0 | 0 | 81 |
| SSE | 12 | 24 | 5 | 0 | 0 | 0 | 41 |
| S | 20 | 12 | 5 | 0 | 0 | 0 | 37 |
| SSW | 20 | 21 | 10 | 0 | 0 | 0 | 51 |
| SW | 26 | 11 | 12 | 0 | 0 | 0 | 49 |
| WSW | 13 | 17 | 10 | 0 | 0 | 0 | 40 |
| W | 3 | 14 | 5 | 0 | 0 | 0 | 22 |
| WNW | 6 | 13 | 2 | 0 | 0 | 0 | 21 |
| NW | 7 | 35 | 8 | 0 | 0 | 0 | 50 |
| NNW | 2 | 3 | 0 | 0 | 0 | 0 | 5 |
| VARIABLE | 30 | 0 | 0 | 0 | 0 | 0 | 30 |
| TOTAL | 147 | 225 | 62 | 0 | 0 | 0 | 434 |
| Periods of calm (hours): | 0 | | | | | | |
| Hours of missing data: | 0 | | | | | | |

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2017 00:00 to 31-DEC-2017 23:59

STABILITY CLASS

G

ELEVATION:
10 m

| WIND DIRECTION | Wind Speed (mph) | | | | | | TOTAL |
|--------------------------|------------------|-----|------|-------|-------|-----|-------|
| | 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | |
| N | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NNE | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| NE | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ENE | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| E | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ESE | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| SE | 3 | 7 | 1 | 0 | 0 | 0 | 11 |
| SSE | 4 | 1 | 0 | 0 | 0 | 0 | 5 |
| S | 8 | 2 | 0 | 0 | 0 | 0 | 10 |
| SSW | 11 | 9 | 6 | 0 | 0 | 0 | 26 |
| SW | 17 | 13 | 9 | 0 | 0 | 0 | 39 |
| WSW | 19 | 28 | 14 | 0 | 0 | 0 | 61 |
| W | 19 | 14 | 1 | 0 | 0 | 0 | 34 |
| WNW | 12 | 2 | 0 | 0 | 0 | 0 | 14 |
| NW | 7 | 30 | 1 | 0 | 0 | 0 | 38 |
| NNW | 2 | 0 | 0 | 0 | 0 | 0 | 2 |
| VARIABLE | 10 | 0 | 0 | 0 | 0 | 0 | 10 |
| TOTAL | 114 | 106 | 32 | 0 | 0 | 0 | 252 |
| Periods of calm (hours): | 0 | | | | | | |
| Hours of missing data: | 0 | | | | | | |

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2017 00:00 to 31-DEC-2017 23:59

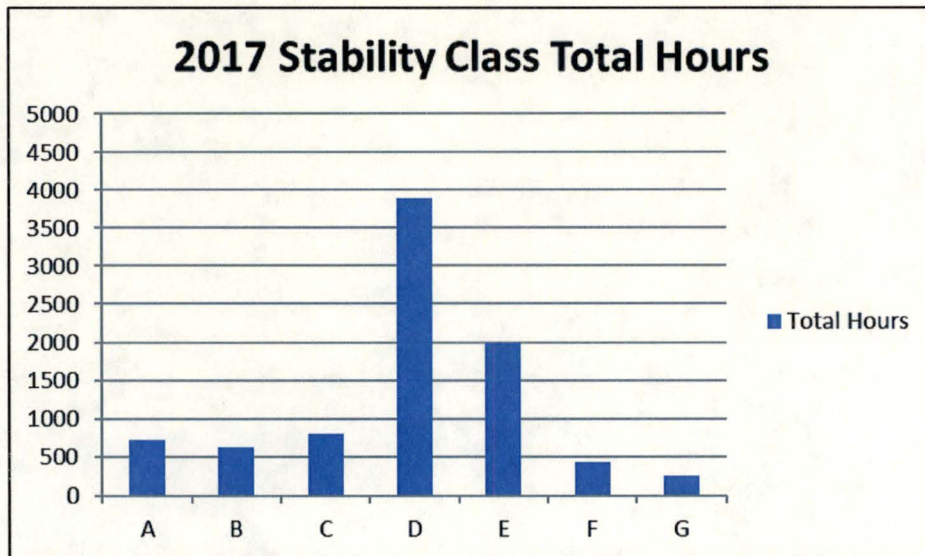
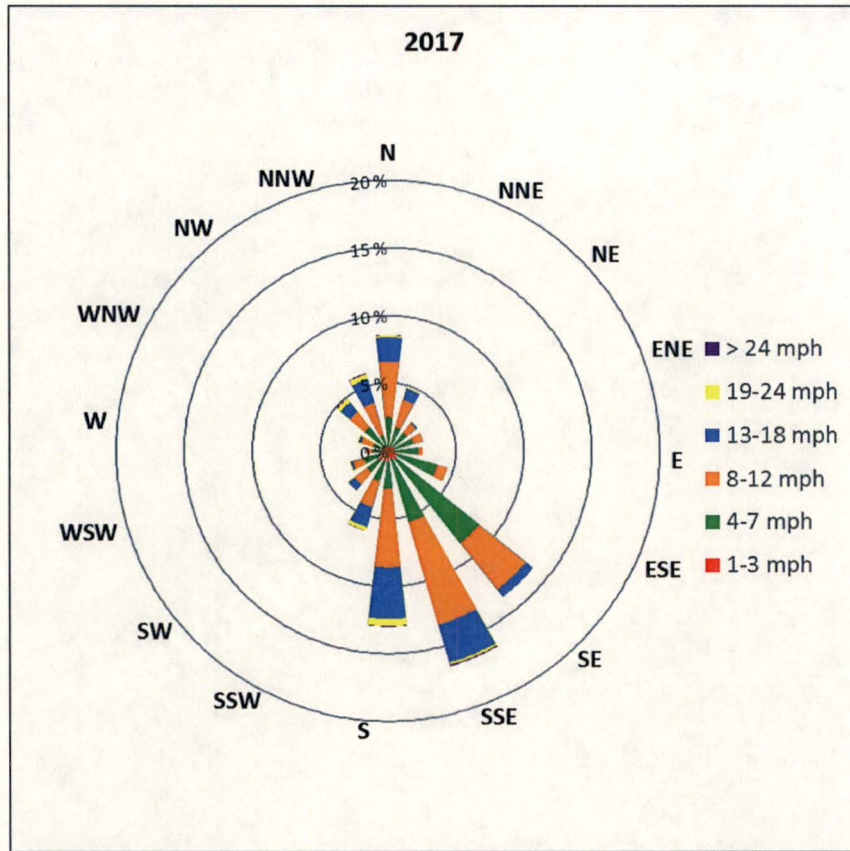
STABILITY CLASS

ALL

ELEVATION:
10 m

| WIND DIRECTION | Wind Speed (mph) | | | | | | TOTAL |
|--------------------------|------------------|------|------|-------|-------|-----|-------|
| | 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | |
| N | 32 | 183 | 356 | 159 | 13 | 2 | 745 |
| NNE | 29 | 131 | 179 | 76 | 6 | 0 | 421 |
| NE | 41 | 108 | 77 | 11 | 1 | 0 | 238 |
| ENE | 38 | 131 | 63 | 2 | 0 | 0 | 234 |
| E | 45 | 147 | 29 | 2 | 0 | 0 | 223 |
| ESE | 64 | 264 | 68 | 1 | 0 | 0 | 397 |
| SE | 67 | 683 | 385 | 59 | 0 | 0 | 1194 |
| SSE | 49 | 425 | 688 | 256 | 13 | 10 | 1441 |
| S | 66 | 176 | 505 | 334 | 45 | 5 | 1131 |
| SSW | 69 | 132 | 172 | 134 | 23 | 3 | 533 |
| SW | 78 | 95 | 100 | 52 | 1 | 0 | 326 |
| WSW | 59 | 103 | 75 | 15 | 4 | 0 | 256 |
| W | 39 | 67 | 36 | 5 | 5 | 0 | 152 |
| WNW | 28 | 73 | 79 | 19 | 4 | 0 | 203 |
| NW | 35 | 158 | 124 | 79 | 28 | 4 | 428 |
| NNW | 16 | 92 | 211 | 158 | 34 | 6 | 517 |
| VARIABLE | 209 | 42 | 12 | 1 | 0 | 0 | 264 |
| TOTAL | 964 | 3010 | 3159 | 1363 | 177 | 30 | 8703 |
| Periods of calm (hours): | 11 | | | | | | |
| Hours of missing data: | 46 | | | | | | |

2017 Wind Rose and Stability Class Graphs



Attachment 10.2
Atmospheric Dispersion (X/Q) and Deposition (D/Q)
Calculation Methodology Discussion

Introduction

CR-2013-001059 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 committed, 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 evaluation of our meteorological data included 6 years of data and meets the criteria.

Discussion

Meteorological data collected for the original FSAR, the NuBuild FSAR and historical Radiological 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. 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.

IR-2018-004071 was initiated to document the evaluation of prevailing wind directions for all stability classes over the calendar year 2017. This evaluation is performed annually in accordance with Chemistry Guideline 25 to ensure the predominant wind direction has not changed based on the last 5 years of meteorological data including the current year. The 2017 predominant wind direction (SSE) and stability class category (Pasquill Class D) did not change when compared with the five year rolling average which includes 2017. No recalculations of X/Q or D/Q values are required at this time.

Attachment 10.3

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.

Attachment 10.4 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.

Attachment 10.5

Errata from Previous Annual Radioactive Effluent Release Reports

1. The 2015 ARERR has a typographical error in Table 9.4 on page 30. The total tritium for the year was shown as 1.64e+01. It should have read 1.64E-01 Tritium value for the dose calculations was the correct value. AI-TR-2017-009339
2. The 2016 ARERR has an incorrect title on page 13 in the comments section. The title reads: "Total Body Dose due to Gaseous Activity Released Comments" and should read "Total Volume Liquid Effluents Released Comments" Comments in the box regarding the graph on page 13 were correct. IR-2018-001484