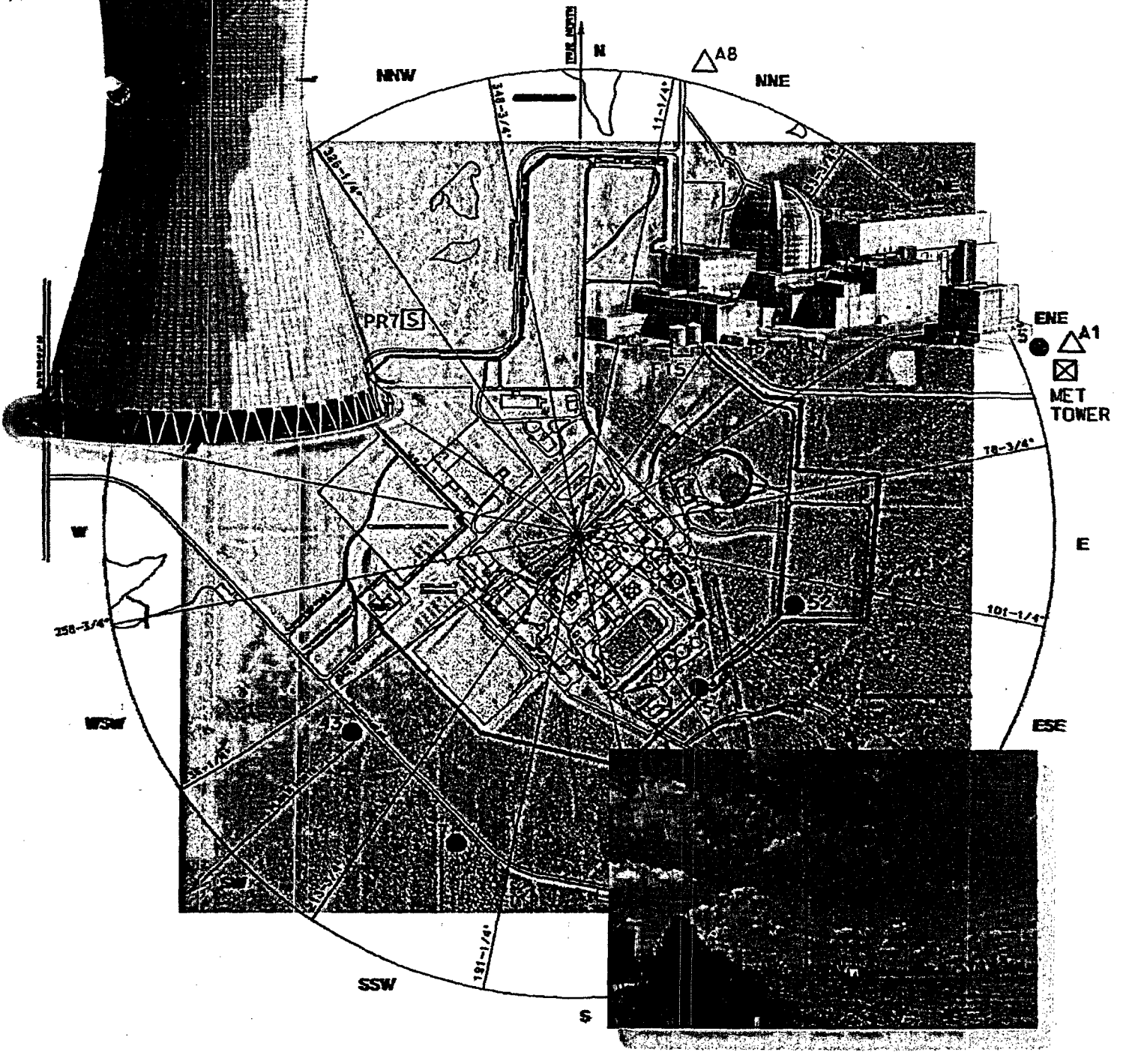
2005 Callaway Plant

Radioactive Effluent Release Report



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Docket no. 50-483

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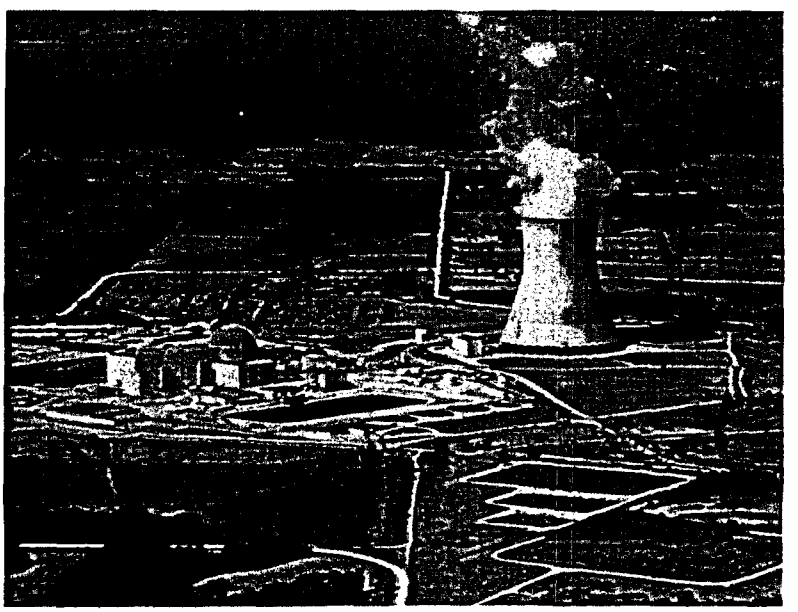
1.0 Introduction

This report describes the Union Electric Co. Callaway Plant radioactive effluent releases for 2005. It is submitted in accordance with Section 5.6.3 of the Callaway Plant Technical Specifications.

A summary of radioactivity released in liquid and gaseous effluents and solid waste shipped and/or buried from the Callaway Plant during the period from January 1, 2005 to December 31, 2005 is presented.

All liquid and gaseous effluents discharged during this reporting period complied with federal regulations and the limits in the Offsite Dose Calculation Manual (ODCM). Any exceptions are noted in this report.



2.1 Regulatory Limits

The Radiological Effluent Control (REC) limits applicable to the release of radioactive material in liquid and gaseous effluents are provided below.

Fission and Activation Gases (Noble Gases)

The dose rate due to radioactive noble gases 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 total 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.

Radioiodine, Tritium, and Particulates

The dose rate due to Iodine-131 and 133, tritium and all radionuclides in particulate form with half-lives greater than eight (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 and 133, tritium, and all radionuclides in particulate form with half-lives greater than eight (8) days in gaseous effluents released 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.

Liquid Effluent

The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to ten times the concentrations specified in Appendix B, Table 2, Column 2 of 10CFR20 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-04 microcuries/ml total activity.

The dose or dose commitment to an Individual from radioactive materials in liquid effluents released to unrestricted areas shall be limited:

a. During any calendar quarter to less than or equal to 1.5 mrem to the total body and 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.

Uranium Fuel Cycle Sources

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 total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem.

2.2 Average Energy

This requirement is not applicable to the Callaway Plant radiological effluent monitoring program since the release rate limits for fission and activation gases in gaseous effluent are not based on the average energy of the radionuclide mixture.

2.3 Measurements and Approximations of Total Radioactivity

Radionuclide concentrations in liquid and gaseous effluents were obtained by effluent sampling and radiological analysis in accordance with the requirements of Final Safety Analysis Report Table 16.11-1 and Table 16.11-4.

Gamma spectroscopy was the primary analysis technique used to determine the radionuclide composition and concentration of liquid and gaseous effluents. Liquid composite samples were analyzed for Sr-89, Sr-90, Fe-55, Ni-63, and transuranic nuclides by Environmental Inc. - Midwest Laboratory. Gaseous composite samples were analyzed for Sr-89 and Sr-90 nuclides by Environmental Inc. - Midwest Laboratory. Tritium and gross alpha were measured for both liquid and gaseous effluents using liquid scintillation counting and gas flow proportional counting techniques, respectively.

The total radioactivity in effluent releases was determined from the measured concentrations of each radionuclide present and the total volume of effluents discharged.

2.4 Batch Releases

Summary information relating to batch releases of gaseous and liquid effluents to the environment from the Callaway Plant during this year is presented below.

LIQUID

	UNITS	JAN-JUN	JUL-DEC
Number of batch releases:	——	55	73
Total time period for batch releases:	Minutes	28,940	30,134
Maximum time period for batch releases:	Minutes	3,067	719
Average time period for batch releases:	Minutes	526	413
Minimum time period for batch releases:	Minutes	362	98
Average Missouri River flow during periods of effluent release to the river[1] :	ft^3/sec	89,155	45,023

GASEOUS

	UNITS	JAN - JUN	JUL - DEC
Number of batch releases:	——	32	25
Total time period for batch releases:	Minutes	4,580	17,493
Maximum time period for batch releases:	Minutes	1,741	1,816
Average time period for batch releases:	Minutes	143	700
Minimum time period for batch releases:	Minutes	28	30

[1] E-mail, S. Ternes, United States Department of the Interior - Geological Survey - Water Resources Division dated January 30, 2006

2.5 Abnormal Releases

LIQUID

Number of releases: 1

Total Activity released: 928 microCuries

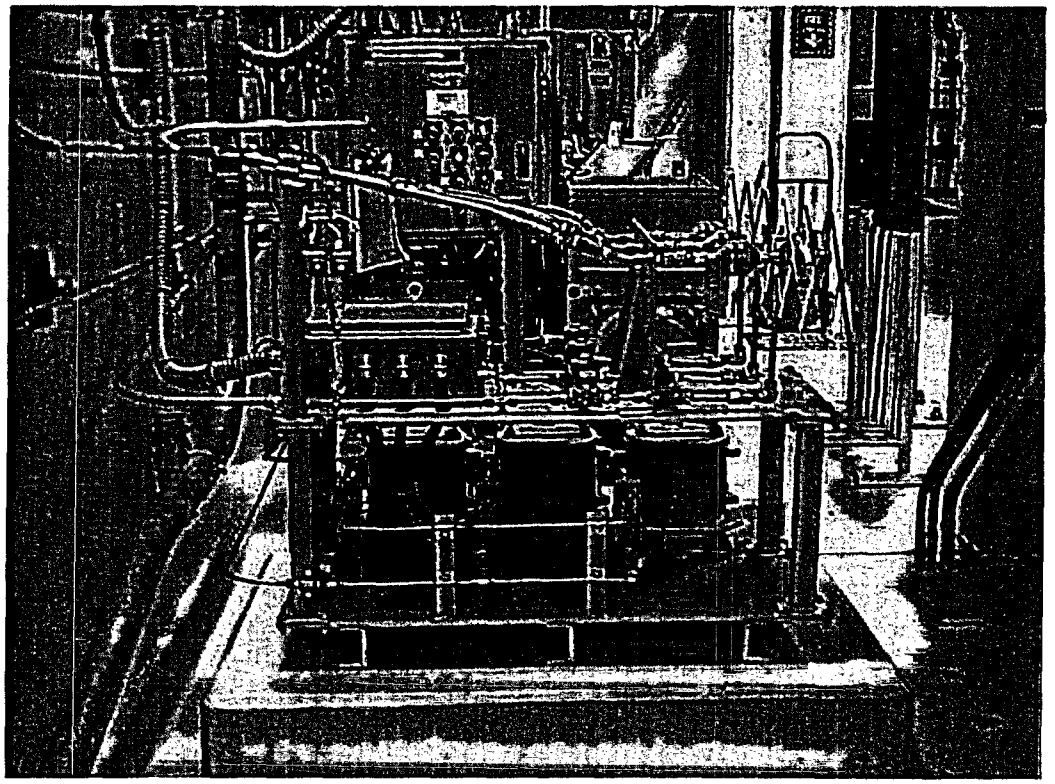
GASEOUS

Number of releases: 1

Total Activity released: 23.4 Curies

3.0 Summary of Gaseous Radioactive Effluents

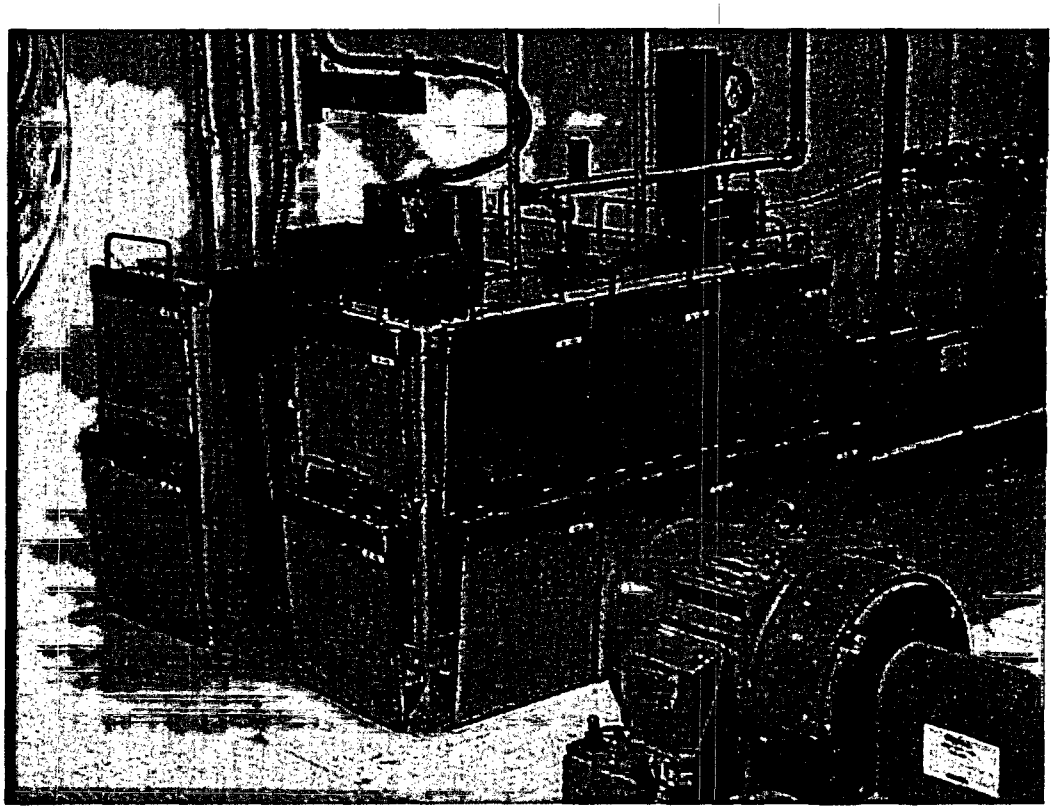
The quantity of radioactive material released in gaseous effluents during the year is summarized in Tables 1A and 1B. During 2005, all gaseous effluents were considered as ground level releases.



Gaseous effluents from the plant are continuously monitored. Instrumentation provides on-line and grab sampling for iodine, particulates, and noble gas.

4.0 Summary of Liquid Radioactive Effluents

The quantity of radioactive material released in liquid effluents during the year is summarized in Tables 2A and 2B. During 2005, there was no continuous release of liquid effluent from the plant.



Liquid effluents from the plant are continuously monitored. Shown is a liquid radiation monitor shielded by lead to increase its sensitivity for sampling discharged water.

5.0 Solid Wastes

The quantities of radioactive material released in shipments of solid waste for burial and irradiated fuel transported from the site during the year are summarized in Table 3. The total quantity and radioactivity reported in Table 3 for each waste type was for waste buried and includes wastes buried by waste processors after volume reduction. The activity and fractional abundance of each nuclide was determined for each waste type based upon radiochemical analysis by an independent laboratory. The curie concentration of each nuclide listed in Table 3 was determined as the product of the fractional abundance and the total curies buried. Those nuclides which comprise at least 1% of the total activity for a particular waste type are presented in Table 3.

6.0 Related Information

6.1 Unplanned Releases

Unplanned releases are:

1) Inadvertent or accidental releases of radioactive material.
2) Releases of radioactive material via normal pathways without a release permit, proper authorization, or proper sampling and analysis.
3) Releases which are conducted in such a manner as to result in significant deviation from the requirements of the release permit.

Auxiliary Boiler Contamination

On April 10, 1998, during a refueling outage, radioactivity was detected in the Auxiliary Boiler feed water system. The boiler was flushed and cleaned several times in an attempt to decontaminate the unit. Small amounts of contamination remained in the sludge. During subsequent operation of the boiler small amounts of contamination leached from the sludge and were detected in the boiler water.

An investigation was performed to locate the source of the contamination. No mispositioned valves or leaks were identified. The results of sampling different system components were inconclusive, but may indicate a small leak in the SLWE heat exchanger. During refueling operations, the concentration of radioactive nuclides in the SLWE system can be a factor of 1000 times higher than normal operations. The size of the leak may be small enough to only be recognized when these high concentrations are present. Increased monitoring was initiated in an attempt to identify the source of the contamination. No additional contamination was identified.

A 10CFR50.59 evaluation concluded that the resulting dose to a Member of the Public from the release of radioactive material to the environment would be a small fraction of the regulatory dose limits. Therefore, continued operation of the Auxiliary Boiler would not pose any significant safety or environmental concern.

The Auxiliary Boiler was operated intermittently during 2005. The maximum total body dose to a Member of the Public from these releases was 4.11 E-05 mrem during 2005. This is negligible compared to the quarterly and annual effluent control limits. The activity released from the Auxiliary Boiler during 2005 is included in Tables 1A, 1B, 5, 6 and 7.

6.1 Unplanned Releases (continued)

Intermittent Releases from the Cooling Tower (NRC Information Notice 2004-05)

During investigation of NRC Information Notice 2004-05, sample results revealed intermittent levels of tritium in the cooling tower basin (CAR 200403826). It was determined that the tritium found in cooling tower samples was a result of recirculation of liquid effluents (CAR 200403826).

An evaluation of the dose impact was performed assuming releases from the cooling tower were elevated. The total activity released from the cooling tower in 2005 was determined to be 23.4 Curies of tritium. The total dose to the Member of the Public was calculated to be 3.28E-03 mrem.

Discharge Line Leak

In January 2005, it was identified that the plant discharge line had ruptured in a field on Union Electric property near the Missouri River. The rupture occurred near a cement crossing created to facilitate movement of replacement Steam Generators. The total activity released in the vicinity of the break was determined to be 928 microCuries (CAR 200500214).

6.2 Changes to the Offsite Dose Calculation Manual

Changes to APA-ZZ-01003

Minor changes were made in 2005 to APA-ZZ-01003, the Callaway Offsite Dose Calculation Manual (ODCM).

Section 5.1 of APA-ZZ-01003 was revised to remove an invalid requirement that a REMP contract lab performing direct radiation analyses is required to participate in the Environmental Measurements Laboratory Quality Assessment Program or equivalent. Additional guidance on REMP contract lab participation in Interlaboratory Comparisons was also added to section 5.1 (CAR 200500891).

Reference to Regulatory Guide 4.15, Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment, was added to provide supporting documentation for contract lab Interlaboratory Comparison requirements (CAR 200500891).

Health Physics Calculation HPCI 87-10, Methodology for Calculating the Response of Gross NaI(Tl) Monitors to Liquid Effluent Streams, was revised to add normalization and standardization factors to the Effluent Management System software for radionuclides listed in Table 2.1 that were not included in the original calculation (CAR 200501509).

Section 4.1.3.1.4 was added to describe direct radiation dose from the newly constructed Old Steam Generator Storage Facility to a Member of the Public.

Section 4.1.2 was revised to describe the sources of direct radiation from "outside storage tanks" to "storage of radioactive material".

Section 4.1.3.1.2 was revised to describe direct dose calculations in support of Modification 03-1008, Equipment Hatch Platform and Missile Shield Modification. Reference to Health Physics Calculation 06-01, Equipment Hatch Platform and Missile Shield Modification Direct Dose Calculation to the Member of the Public, was added to reference direct dose calculation to the Member of the Public from Modification 03-1008.

Section 4.1.3.1.3 was revised to describe direct dose calculations from the Radwaste Yard RAM storage and Stores II.

Changes to FSAR-SP Chapter 16.11

No changes were made in 2005 to the Final Safety Analysis Report - Standard Plant Chapter 16.11, Offsite Dose Calculation Manual - Radioactive Effluent Controls (ODCM-RECs).

6.3 Major Changes to Radwaste Systems

During 2005, there were no major plant changes to Radwaste systems.

6.4 Land Use Census Changes

No changes were identified that required a change to the location of the nearest resident yielding the highest calculated dose commitment.

6.5 Inoperability of Effluent Monitoring Instrumentation

During 2005 all effluent monitoring instrumentation was OPERABLE within limits specified in ODCM-REC sections 16.11.1.3 and 16.11.2.4.

One related exception in 2005 was failure of Primary Met Tower 60-10m Delta-T instrumentation (CAR 200503749), later described in section 7.0, Meteorological Data.

6.6 Instances of Liquid Holdup Tanks or Waste Gas Decay Tanks Exceeding Technical Specification Limits

All liquid tanks and waste gas decay tanks were within limits specified in ODCM-REC sections 16.11.1 and 16.11.2 during the reporting period.

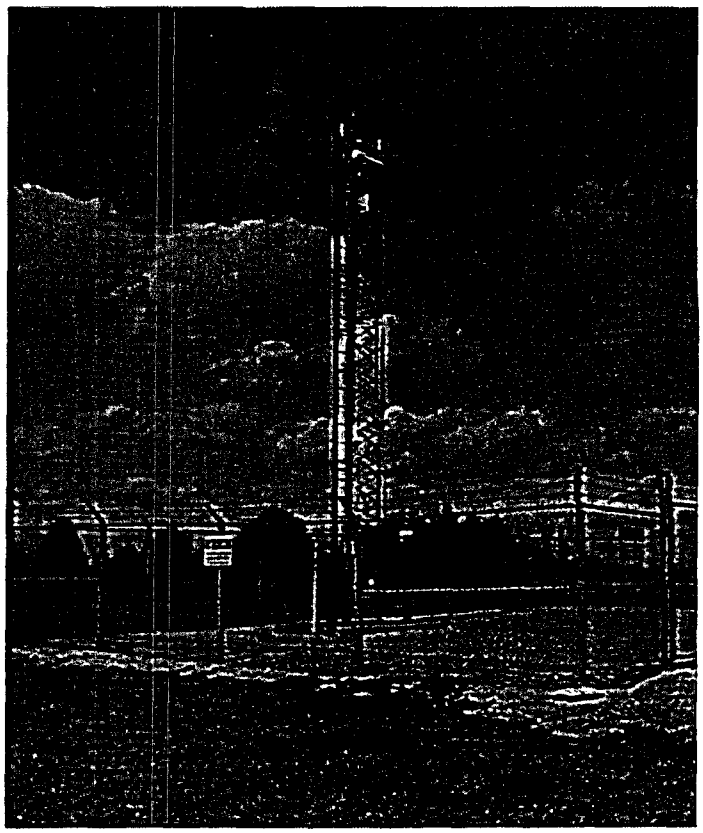
7.0 Meteorological Data

The on-site meteorological data for 2005 is presented in Table 4. The data are presented as Cumulative Joint Frequency Distributions of wind speed and wind direction by atmospheric stability class for the 10 and 60 meter tower elevations.

All meteorological data for each day of the year were reviewed, analyzed, and validated by a boundary layer meteorologist. Data validations are performed on the 15 minute averages which are then used to create the hourly averages.

Valid data recovery for 2005 was greater than 90% for all required parameters. Specific valid recovery rates for the year are listed as follows:

60mWS	99.7%
60mWD	99.7%
60m sigma-theta	99.2%
60m-10m delta-T	92.9%
10mWS	99.9%
10mWD	99.9%
10m sigma-theta	99.9%
10mT	99.9%



Pictured is the Secondary Meteological Tower. This station obtains measurements at a height of 10 meters, and provides backup data for the Primary Meteological Tower readings at 10, 60, and 90 meters.

Mercury Wetted Relay Failure on 60-10m Delta-T Channel

The biggest problem encountered during 2005 affecting valid data capture was a mercury wetted relay failure on the Primary Met Tower 60-10m delta-T channel (CAR 200503749). In late May an unusual lapse rate pattern was noted by the contract meteorologist in his review of the 15 min averaged data. Inspection of the 5 sec data values for the channel by the system engineer showed that although the 60-10m delta-T data were showing reasonable diurnal patterns, the raw data appeared to be filtered or damped (lower than normal standard deviations). The data anomaly was visible in the real time 5 sec data, but rather hidden in the 15 minute and hourly averages.

Engineering's initial investigation determined that the meteorological instruments were functioning normally, and the problem appeared to be a communication problem with the plant computer. Job 05105573 troubleshot and corrected the communication problem. The cause was attributed to a mercury wetted relay not making good contact on the analog-to-digital (A/D) input card for the plant computer. The input cards were removed and mechanically agitated to recoat the contacts with mercury.

Plant Computer and Communications Link Failures

Plant computer problems resulted in the loss of data several times during the year, but the data losses were quite minimal. Occasionally the system showed spikes (usually "open" channel values) in the raw 5 sec data. These were attributed to communications link failures due to the momentary or short term power failures (and switching to backup power). The system engineer provided a listing of these occurrences to the meteorologist and any affected data averages were invalidated.

Evaluation of Primary Met Tower Anchors

As part of modification MP 04-1020A to upgrade Callaway's meteorological monitoring system, Engineering contracted with Tower Systems, Inc. to perform an inspection of the Primary Met Tower structure and anchors. The purpose of this inspection was to verify the long term structural reliability of the tower and its anchors if it is to be retrofit with new instrumentation and elevators.

This inspection was performed on 12/5/05 by Job 05110411/500. The initial results of the inspection indicated that there was some degradation of the anchor rods near the concrete slabs in which they were embedded. The anchors were replaced on March 18, 2006.

8.0 Assessment of Doses

Assessment of doses to the maximum exposed individual from gaseous and liquid effluents released was performed in accordance with the ODCM as described in the following sections. For all airborne effluents released from the Callaway Plant during 2005, the annual dose to the maximum exposed individual was less than 1% of the Radiological Effluent Control Limits presented in Section 2.1 of this report.

For all liquid effluents, the annual dose to the maximum exposed individual was less than 1.0% of the Radiological Effluent Control Limits presented in Section 2.1 of this report.

8.1 Dose at the Site Boundary from Gaseous Effluents

The dose at the Site Boundary was due to plume exposure from noble gases, ground plane exposure, and inhalation. It was conservatively assumed that a hypothetical maximum exposed individual was present at the Site Boundary location with the most limiting atmospheric dispersion (based on actual meteorological conditions for the year). Dose was conservatively calculated using a child as the critical age group.

The dose from gaseous effluents at the Site Boundary for 2005 is presented in Table 5.

8.2 Dose to the Member of the Public

The Member of the Public is considered to be a real individual, not occupationally associated with the plant, who uses portions of the plant site for recreational or other purposes not associated with plant operation. This individual's utilization of areas both inside and outside the Site Boundary was characterized for this calculation and is described in the ODCM.

To evaluate total dose from the Uranium Fuel Cycle to any Member of the Public, the critical Member of the Public within the Site Boundary, and the Nearest Resident were each evaluated.

Dose at the Nearest Resident from Gaseous Effluent

The dose to the Nearest Resident was due to plume exposure from noble gases, ground plane exposure, and inhalation and ingestion. Dose was calculated at the nearest actual residence with the most limiting atmospheric dispersion (based on actual meteorological conditions for the year). It was conservatively assumed that each ingestion pathway (meat, milk, and vegetation) existed at this location. Dose was conservatively calculated assuming the child as the critical age group. Dose from activities within the Site Boundary was negligible and not included in this calculation.

The doses to the Nearest Resident for 2005 are presented in Table 5.

Dose to the Member of the Public from Activities within the Site Boundary

Based on the land use within the Site Boundary, the Member of the Public with the highest dose was a farmer. Dose from farming activities within the Site Boundary was due to direct radiation exposure, plume exposure from noble gases, ground plane exposure, and inhalation. The current tenant farmer estimates spending 1100 hours per year working within the Site Boundary area. Dose was calculated using the adult as the critical age group.

Dose to the Member of the Public from activities within the Site Boundary is presented in Table 6.

8.3 Total Dose Due to the Uranium Fuel Cycle

Since there are no other Uranium Fuel Cycle facilities within 8 kilometers of the Callaway Plant, the total dose to the most likely exposed Member of the Public resulted from direct radiation exposure and radioactive effluents from the Callaway Plant itself.

The total dose to the Member of the Public (Table 7) was the sum of the dose due to activities within the Site Boundary (Table 6) and the dose due to gaseous effluents at his residence. It was conservatively assumed that each food ingestion pathway exists at his residence and that the adult is the critical age group.

The total dose from the Uranium Fuel Cycle is presented in Table 7.

8.4 Dose Due to Liquid Effluents

Dose due to liquid effluents includes contributions from the maximum exposed individual's consumption of fish and recreational activities. An adult was considered the maximum exposed individual in this assessment.

It is conservatively assumed that the hypothetical maximum exposed individual obtained his entire annual fish intake from near the plant discharge.

Table 1A Semiannual Summation of Gaseous Releases

All Airborne Effluents

TABLE 1A

SEMIANNUAL SUMMATION OF GASEOUS RELEASES
ALL AIRBORNE EFFLUENTS

QUARTERS 1 AND 2, 2005

TYPE OF EFFLUENT	UNITS	FIRST QUARTER	SECOND QUARTER	EST TOTAL ERROR % (a)
A. FISSION AND ACTIVATION GASES				
1. TOTAL RELEASE	CURIES	9.13E+00	2.59E+00	20
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	1.17E+00	3.29E-01	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	
B. RADIOIODINES				
1. TOTAL IODINE-131	CURIES	0.00E+00	4.55E-08	23
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	0.00E+00	5.79E-09	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	
C. PARTICULATES				
1. PARTICULATE (HALF-LIVES > 8 DAYS)	CURIES	2.31E-05	3.17E-05	30
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	2.96E-06	4.04E-06	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	
4. GROSS ALPHA RADIOACTIVITY	CURIES	1.25E-07	2.07E-07	
D. TRITIUM				
1. TOTAL RELEASE	CURIES	6.70E+00	7.34E+00	14
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	8.62E-01	9.34E-01	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	

(a) Safety Analysis Calculation 87-063-00, January 6, 1988

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TABLE 1A

SEMIANNUAL SUMMATION OF GASEOUS RELEASES
ALL AIRBORNE EFFLUENTS

QUARTERS 3 AND 4, 2005

TYPE OF EFFLUENT	UNITS	THIRD QUARTER	FOURTH QUARTER	EST TOTAL ERROR % (a)
A. FISSION AND ACTIVATION GASES				
1. TOTAL RELEASE	CURIES	1.95E+01	3.33E+00	20
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	2.45E+00	4.19E-01	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	
B. RADIOIODINES				
1. TOTAL IODINE-131	CURIES	3.94E-08	5.81E-08	23
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	4.96E-09	7.31E-09	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	
C. PARTICULATES				
1. PARTICULATE (HALF-LIVES > 8 DAYS)	CURIES	1.14E-05	5.45E-05	30
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	1.43E-06	6.86E-06	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	
4. GROSS ALPHA RADIOACTIVITY	CURIES	1.98E-07	5.48E-07	
D. TRITIUM				
1. TOTAL RELEASE	CURIES	9.17E+00	8.94E+00	14
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	1.15E+00	1.13E+00	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	

(a) Safety Analysis Calculation 87-063-00, January 6, 1988

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Table 1B Semiannual Airborne Continuous and Batch Releases, Ground Level Releases

Fission Gases, Iodines, and Particulates

TABLE 1B

SEMIANNUAL AIRBORNE CONTINUOUS AND BATCH RELEASES
GROUND LEVEL RELEASES
FISSION GASES, IODINES, AND PARTICULATES

QUARTERS 1 AND 2, 2005

		CONTINUOUS RELEASES		BATCH RELEASES	
NUCLIDE	UNITS	FIRST QUARTER	SECOND QUARTER	FIRST QUARTER	SECOND QUARTER
1. FISSION GASES					
AR-41	CURIES	2.94E-02	1.09E-01	9.45E-02	4.35E-02
XE-133	CURIES	2.85E-01	9.99E-01	1.96E-03	1.87E-03
XE-135	CURIES	1.25E-01	4.00E-01	2.96E-05	2.92E-05
KR-85	CURIES	0.00E+00	0.00E+00	4.11E+00	0.00E+00
KR-85M	CURIES	1.33E-02	4.95E-02	0.00E+00	0.00E+00
KR-87	CURIES	3.07E-02	1.15E-01	0.00E+00	0.00E+00
KR-88	CURIES	3.82E-02	1.42E-01	0.00E+00	0.00E+00
XE-135M	CURIES	5.31E-02	1.08E-01	0.00E+00	0.00E+00
XE-138	CURIES	1.75E+00	1.33E-01	0.00E+00	0.00E+00
XE-131M	CURIES	2.61E+00	4.89E-01	0.00E+00	0.00E+00
TOTAL FOR PERIOD	CURIES	4.93E+00	2.55E+00	4.20E+00	4.54E-02
2. IODINES					
I-133	CURIES	5.62E-08	0.00E+00	2.89E-08	3.37E-09
I-132	CURIES	1.77E-05	0.00E+00	1.33E-08	0.00E+00
I-131	CURIES	0.00E+00	4.55E-08	0.00E+00	0.00E+00
TOTAL FOR PERIOD	CURIES	1.78E-05	4.55E-08	4.23E-08	3.37E-09
3. PARTICULATES					
MO-99	CURIES	0.00E+00	0.00E+00	7.05E-07	2.45E-07
TC-99M	CURIES	0.00E+00	0.00E+00	7.05E-07	2.45E-07
CS-134	CURIES	0.00E+00	0.00E+00	4.96E-06	1.42E-06
CS-137	CURIES	5.17E-08	0.00E+00	4.93E-06	1.22E-06
CO-60	CURIES	0.00E+00	0.00E+00	7.29E-06	1.72E-05
CE-141	CURIES	0.00E+00	0.00E+00	1.29E-06	4.49E-07
CO-58	CURIES	0.00E+00	0.00E+00	3.12E-06	1.09E-06
SB-125	CURIES	0.00E+00	2.80E-07	0.00E+00	0.00E+00
CD-109	CURIES	0.00E+00	9.63E-06	0.00E+00	0.00E+00
CE-144	CURIES	0.00E+00	0.00E+00	0.00E+00	5.86E-09
PR-144	CURIES	0.00E+00	0.00E+00	0.00E+00	5.86E-09
TE-132	CURIES	0.00E+00	0.00E+00	0.00E+00	1.06E-09
ALPHA	CURIES	1.25E-07	2.07E-07	0.00E+00	0.00E+00
TOTAL FOR PERIOD	CURIES	1.76E-07	1.01E-05	2.30E-05	2.18E-05

Page 1 of 2

TABLE 1B (continued)

SEMIANNUAL AIRBORNE CONTINUOUS AND BATCH RELEASES
GROUND LEVEL RELEASES
FISSION GASES, IODINES, AND PARTICULATES

QUARTERS 1 AND 2, 2005

		CONTINUOUS RELEASES		BATCH RELEASES	
NUCLIDE	UNITS	FIRST QUARTER	SECOND QUARTER	FIRST QUARTER	SECOND QUARTER
4. TRITIUM					
H-3	CURIES	5.66E+00	6.99E+00	1.04E+00	3.55E-01

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TABLE 1B

SEMIANNUAL AIRBORNE CONTINUOUS AND BATCH RELEASES
GROUND LEVEL RELEASES
FISSION GASES, IODINES, AND PARTICULATES

QUARTERS 3 AND 4, 2005

		CONTINUOUS RELEASES		BATCH RELEASES	
NUCLIDE	UNITS	THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
1. FISSION GASES					
AR-41	CURIES	2.87E-02	0.00E+00	1.18E-01	2.05E-02
XE-133	CURIES	2.06E+00	0.00E+00	2.65E-03	4.16E-04
XE-135	CURIES	6.01E-01	0.00E+00	7.60E-05	0.00E+00
KR-85	CURIES	3.86E+00	0.00E+00	1.24E+01	2.51E+00
KR-85M	CURIES	3.22E-02	0.00E+00	0.00E+00	0.00E+00
KR-87	CURIES	5.65E-02	0.00E+00	7.55E-05	0.00E+00
KR-88	CURIES	7.58E-02	0.00E+00	0.00E+00	0.00E+00
XE-135M	CURIES	1.31E-01	0.00E+00	0.00E+00	0.00E+00
XE-138	CURIES	7.62E-02	0.00E+00	0.00E+00	0.00E+00
XE-131M	CURIES	0.00E+00	7.72E-01	1.12E-03	2.55E-02
XE-133M	CURIES	9.37E-03	0.00E+00	0.00E+00	0.00E+00
TOTAL FOR PERIOD	CURIES	6.92E+00	7.72E-01	1.25E+01	2.55E+00
2. IODINES					
I-133	CURIES	0.00E+00	0.00E+00	2.22E-05	4.44E-08
I-132	CURIES	0.00E+00	0.00E+00	1.17E-07	2.73E-06
I-131	CURIES	0.00E+00	0.00E+00	3.94E-08	5.81E-08
TOTAL FOR PERIOD	CURIES	0.00E+00	0.00E+00	2.24E-05	2.84E-06
3. PARTICULATES					
MO-99	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC-99M	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	CURIES	0.00E+00	0.00E+00	4.10E-08	0.00E+00
CS-137	CURIES	0.00E+00	0.00E+00	0.00E+00	3.89E-08
CO-60	CURIES	0.00E+00	0.00E+00	8.55E-07	3.49E-05
CE-141	CURIES	0.00E+00	0.00E+00	4.60E-08	0.00E+00
CO-58	CURIES	0.00E+00	0.00E+00	3.93E-06	1.54E-05
SB-125	CURIES	5.14E-07	4.29E-07	0.00E+00	0.00E+00
CD-109	CURIES	0.00E+00	1.66E-06	1.04E-06	0.00E+00
CE-144	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PR-144	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TE-132	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-124	CURIES	0.00E+00	0.00E+00	2.92E-09	0.00E+00
CR-51	CURIES	0.00E+00	0.00E+00	1.88E-06	1.65E-06
MN-54	CURIES	0.00E+00	0.00E+00	1.34E-07	2.40E-07
NB-95	CURIES	0.00E+00	0.00E+00	1.74E-06	1.87E-07

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TABLE 1B (continued)

SEMIANNUAL AIRBORNE CONTINUOUS AND BATCH RELEASES
GROUND LEVEL RELEASES
FISSION GASES, IODINES, AND PARTICULATES

QUARTERS 3 AND 4, 2005

		CONTINUOUS RELEASES		BATCH RELEASES	
NUCLIDE	UNITS	THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
3. PARTICULATES					
ZR-95	CURIES	0.00E+00	0.00E+00	1.21E-06	0.00E+00
CO-57	CURIES	0.00E+00	0.00E+00	0.00E+00	1.15E-08
ALPHA	CURIES	1.98E-07	5.48E-07	0.00E+00	0.00E+00
TOTAL FOR PERIOD	CURIES	7.12E-07	2.64E-06	1.09E-05	5.24E-05
4. TRITIUM					
H-3	CURIES	8.47E+00	8.65E+00	7.01E-01	2.96E-01

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Table 2A Semiannual Summation of Liquid Releases

All Liquid Effluents

TABLE 2A

SEMIANNUAL SUMMATION OF LIQUID RELEASES
ALL LIQUID EFFLUENTS

QUARTERS 1 AND 2, 2005

TYPE OF EFFLUENT	UNITS	FIRST QUARTER	SECOND QUARTER	EST TOTAL ERROR % (a)
A. FISSION AND ACTIVATION PRODUCTS				
1. TOTAL RELEASE [NOT INCLUDING TRITIUM, GASES, ALPHA]	CURIES	2.53E-03	4.24E-03	20
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	6.55E-09	1.55E-08	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	
B. TRITIUM				
1. TOTAL RELEASE	CURIES	3.53E+02	5.14E+02	14
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	9.16E-04	1.88E-03	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	
C. DISSOLVED AND ENTRAINED GASES				
1. TOTAL RELEASE	CURIES	1.50E-03	3.80E-03	27
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	3.89E-09	1.39E-08	
D. GROSS ALPHA RADIOACTIVITY				
1. TOTAL RELEASE	CURIES	0.00E+00	7.14E-04	29
E. WASTE VOLUME RELEASED (PRE-DILUTION)	GAL	2.93E+06	2.13E+06	10
F. VOLUME OF DILUTION WATER USED	GAL	9.88E+07	7.02E+07	10

(a) Safety Analysis Calculation 87-063-00, January 6, 1988

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Table 2A Semiannual Summation of Liquid Releases

All Liquid Effluents

TABLE 2A

SEMIANNUAL SUMMATION OF LIQUID RELEASES
ALL LIQUID EFFLUENTS

QUARTERS 3 AND 4, 2005

TYPE OF EFFLUENT	UNITS	THIRD QUARTER	FOURTH QUARTER	EST TOTAL ERROR % (a)
A. FISSION AND ACTIVATION PRODUCTS				
1. TOTAL RELEASE [NOT INCLUDING TRITIUM, GASES, ALPHA]	CURIES	7.90E-03	4.45E-03	20
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	2.01E-08	1.45E-08	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	
B. TRITIUM				
1. TOTAL RELEASE	CURIES	3.94E+02	3.10E+01	14
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	1.00E-03	1.01E-04	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	
C. DISSOLVED AND ENTRAINED GASES				
1. TOTAL RELEASE	CURIES	1.25E-02	4.33E-04	27
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	3.18E-08	1.41E-09	
D. GROSS ALPHA RADIOACTIVITY				
1. TOTAL RELEASE	CURIES	5.97E-04	5.75E-04	29
E. WASTE VOLUME RELEASED (PRE-DILUTION)	GAL	3.50E+06	2.91E+06	10
F. VOLUME OF DILUTION WATER USED	GAL	1.00E+08	7.83E+07	10

(a) Safety Analysis Calculation 87-063-00, January 6, 1988

Page 1 of 1

Table 2B Semiannual Liquid Continuous & Batch Releases

Totals for Each Nuclide Released

TABLE 2B

SEMIANNUAL LIQUID CONTINUOUS AND BATCH RELEASES
TOTALS FOR EACH NUCLIDE RELEASED

QUARTERS 1 AND 2, 2005

		CONTINUOUS RELEASES		BATCH RELEASES	
NUCLIDE	UNITS	FIRST QUARTER	SECOND QUARTER	FIRST QUARTER	SECOND QUARTER
1. ALL NUCLIDES					
CO-58	CURIES	0.00E+00	0.00E+00	3.49E-04	7.29E-05
CO-60	CURIES	0.00E+00	0.00E+00	3.02E-04	1.46E-04
CS-134	CURIES	0.00E+00	0.00E+00	5.07E-05	3.20E-05
CS-137	CURIES	0.00E+00	0.00E+00	8.62E-05	8.32E-05
H-3	CURIES	0.00E+00	0.00E+00	3.53E+02	5.14E+02
NI-63	CURIES	0.00E+00	0.00E+00	8.00E-04	8.54E-04
SB-125	CURIES	0.00E+00	0.00E+00	9.17E-04	1.73E-03
SB-124	CURIES	0.00E+00	0.00E+00	1.86E-06	0.00E+00
CR-51	CURIES	0.00E+00	0.00E+00	1.39E-05	0.00E+00
RU-103	CURIES	0.00E+00	0.00E+00	3.44E-06	0.00E+00
XE-133	CURIES	0.00E+00	0.00E+00	1.50E-03	3.80E-03
I-131	CURIES	0.00E+00	0.00E+00	1.36E-06	0.00E+00
ALPHA	CURIES	0.00E+00	0.00E+00	0.00E+00	7.14E-04
NI-63	CURIES	0.00E+00	0.00E+00	0.00E+00	1.32E-03
TOTALS FOR PERIOD	CURIES	0.00E+00	0.00E+00	3.53E+02	5.14E+02

Page 1 of 1

Table 2B Semiannual Liquid Continuous & Batch Releases

Totals for Each Nuclide Released

TABLE 2B

SEMIANNUAL LIQUID CONTINUOUS AND BATCH RELEASES
TOTALS FOR EACH NUCLIDE RELEASED

QUARTERS 3 AND 4, 2005

		CONTINUOUS RELEASES		BATCH RELEASES	
NUCLIDE	UNITS	THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
1. ALL NUCLIDES					
CO-58	CURIES	0.00E+00	0.00E+00	2.41E-04	2.63E-03
CO-60	CURIES	0.00E+00	0.00E+00	4.17E-04	2.58E-04
CS-134	CURIES	0.00E+00	0.00E+00	5.60E-05	2.04E-04
CS-137	CURIES	0.00E+00	0.00E+00	1.70E-04	2.40E-04
H-3	CURIES	0.00E+00	0.00E+00	3.94E+02	3.10E+01
NI-63	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125	CURIES	0.00E+00	0.00E+00	4.57E-03	6.41E-04
SB-124	CURIES	0.00E+00	0.00E+00	0.00E+00	1.33E-05
CR-51	CURIES	0.00E+00	0.00E+00	0.00E+00	5.21E-05
RU-103	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-133	CURIES	0.00E+00	0.00E+00	1.18E-02	4.32E-04
I-131	CURIES	0.00E+00	0.00E+00	1.05E-04	0.00E+00
ALPHA	CURIES	0.00E+00	0.00E+00	5.97E-04	5.75E-04
NI-63	CURIES	0.00E+00	0.00E+00	2.23E-03	2.53E-04
TE-129	CURIES	0.00E+00	0.00E+00	4.52E-05	0.00E+00
XE-131M	CURIES	0.00E+00	0.00E+00	9.81E-05	0.00E+00
KR-85	CURIES	0.00E+00	0.00E+00	4.83E-04	0.00E+00
XE-133M	CURIES	0.00E+00	0.00E+00	8.16E-05	0.00E+00
MN-54	CURIES	0.00E+00	0.00E+00	5.94E-06	0.00E+00
MO-99	CURIES	0.00E+00	0.00E+00	2.93E-05	0.00E+00
TC-99M	CURIES	0.00E+00	0.00E+00	2.93E-05	0.00E+00
CO-57	CURIES	0.00E+00	0.00E+00	3.69E-06	0.00E+00
XE-135	CURIES	0.00E+00	0.00E+00	3.22E-06	1.77E-06
AM-241	CURIES	0.00E+00	0.00E+00	2.35E-07	1.98E-05
NP-237	CURIES	0.00E+00	0.00E+00	4.58E-08	3.85E-06
TE-127	CURIES	0.00E+00	0.00E+00	0.00E+00	1.36E-04
TOTALS FOR PERIOD	CURIES	0.00E+00	0.00E+00	3.94E+02	3.10E+01

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Table 3 Solid Waste & Irradiated Fuel Shipments 2005

A. SOLID WASTE BURIED (DOES NOT INCLUDE IRRADIATED FUEL)

1. TYPE OF WASTE	UNITS	PERIOD JAN - JUN	PERIOD JUL - DEC	EST. TOTAL ERROR (%)
a. Spent resins, filter sludges	m^3	1.69	0	
evaporator bottoms, etc.	Ci	17.78	0	±25%
b. Dry compressible waste,	m^3	38.08	6.27	
contaminated equipment, etc.	Ci	6.50	0.51	±25%
c. Irradiated components,	m^3	0	0	
control rods, etc.	Ci	0	0	±25%
d. Other (describe)	m^3	0	0	
	Ci	0	0	±25%

2. ESTIMATE OF MAJOR NUCLIDE COMPOSITION (by Type of Waste)

		PERIOD JAN - JUN		PERIOD JUL - DEC	
	Nuclide	% Abundance	Curies	% Abundance	Curies
a.	Fe-55	25.70	4.57	NA	NA
	Co-58	21.71	3.86	NA	NA
	Ni-63	16.01	2.85	NA	NA
	Co-60	8.40	1.49	NA	NA
	Cs-137	6.87	1.22	NA	NA
	Nb-95	6.12	1.09	NA	NA
	Cs-134	5.27	0.94	NA	NA
	Zr-95	4.64	0.82	NA	NA
	Cr-51	1.90	0.34	NA	NA
	Mn-54	1.61	0.29	NA	NA
	Sb-125	1.03	0.18	NA	NA

		PERIOD JAN - JUN		PERIOD JUL - DEC	
	Nuclide	% Abundance	Curies	% Abundance	Curies
b.	Fe-55	34.98	2.27	34.98	0.178
	Co-58	16.38	1.07	16.38	0.084
	Cs-137	13.03	0.85	13.03	0.066
	Ni-63	12.26	0.80	12.26	0.063
	Co-60	7.77	0.51	7.77	0.040
	Nb-95	4.51	0.29	4.51	0.023
	Mn-54	3.85	0.25	3.85	0.020
	Cs-134	3.77	0.25	3.77	0.019
	Zr-95	2.30	0.15	2.30	0.012
	Sb-125	0.42	0.03	0.42	0.002
	Sn-113	0.31	0.02	0.31	0.002

3. SOLID WASTE DISPOSITION:

Number of Shipments	Mode of Transportation	Destination	Class of Solid Waste Shipped	Type of Container
18*	Truck	Duratek	A	LSA
1*	Cask	Duratek	B	LSA
1*	Cask	Studsvik	A	LSA
1*	Cask	Studsvik	B	LSA

* Sent to waste processors for volume reduction before burial.

4. SOLIDIFICATION AGENT:

None used.

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
0		

Table 4 Meteorological Data

Averages Using Hourly Averaged Data

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:09.02

Meteorological Data
Averages Using Hourly Averaged Data

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

		UNITS	VALUES	% GOOD DATA
Stability Class		A - G	E	93%
Total Precipitation		CM.	7.40E+01	99%
10 Meter Level:	Wind Speed	Meter/Sec	2.80E+00	100%
	Wind Direction	Degrees	2.14E+02	100%
	Wind Direction Variability	Degrees	1.42E+01	100%
	Reference Temperature	Degrees C	1.33E+01	100%
	Dewpoint	Degrees C	6.83E+00	100%
60 Meter Level:	Wind Speed	Meter/Sec	4.99E+00	100%
	Wind Direction	Degrees	2.20E+02	100%
	Wind Direction Variability	Degrees	9.04E+00	99%
	Dewpoint	Degrees C	NONE	0%
	Temperature Difference 60 - 10	Degrees C	1.01E-02	93%

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Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:10.56

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: A

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	3	31	24	3	0	0	61
NNE	9	41	6	3	0	0	59
NE	6	38	11	0	0	0	55
ENE	16	40	4	0	0	0	60
E	9	27	16	2	0	0	54
ESE	11	39	14	1	0	0	65
SE	22	101	17	0	0	0	140
SSE	17	122	48	7	0	0	194
S	23	91	76	21	0	0	211
SSW	16	90	58	5	1	0	170
SW	20	88	72	3	3	0	186
WSW	12	26	21	1	0	0	60
W	8	44	29	6	0	0	87
WNW	2	35	44	13	0	0	94
NW	4	25	53	8	3	0	93
NNW	5	25	31	10	0	0	71
TOT	183	863	524	83	7	0	1660

Hours of Calm Data: 1
Hours of Invalid Data: 0

Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:10.56

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: B

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	17	13	0	0	0	31
NNE	4	13	11	0	0	0	28
NE	4	14	2	0	0	0	20
ENE	4	16	5	0	0	0	25
E	1	4	7	1	0	0	13
ESE	4	10	4	0	0	0	18
SE	4	10	2	0	0	0	16
SSE	4	13	11	1	0	0	29
S	1	11	10	2	0	0	24
SSW	4	9	5	0	0	0	18
SW	4	8	6	2	0	0	20
WSW	1	14	1	1	0	0	17
W	1	13	7	0	0	0	21
WNW	3	21	8	5	0	0	37
NW	1	20	18	2	0	0	41
NNW	2	7	9	2	0	0	20
TOT	43	200	119	16	0	0	378

Hours of Calm Data: 0
Hours of Invalid Data: 0

Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:10.56

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: C

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	4	14	3	3	0	0	24
NNE	4	12	5	0	0	0	21
NE	8	16	2	0	0	0	26
ENE	4	12	5	0	0	0	21
E	0	4	10	1	0	0	15
ESE	1	7	11	0	0	0	19
SE	2	14	12	0	0	0	28
SSE	1	12	15	0	0	0	28
S	2	13	8	3	0	0	26
SSW	0	7	7	0	0	0	14
SW	2	9	9	0	1	0	21
WSW	5	10	3	1	0	0	19
W	2	8	15	2	0	0	27
WNW	4	12	19	3	0	0	38
NW	3	11	19	2	1	0	36
NNW	3	12	17	4	0	0	36
TOT	45	173	160	19	2	0	399

Hours of Calm Data: 1
Hours of Invalid Data: 0

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Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:10.56

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: D

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	22	140	104	15	1	0	282
NNE	31	155	36	2	0	0	224
NE	40	127	18	0	0	0	185
ENE	27	90	27	1	0	0	145
E	23	66	42	7	0	0	138
ESE	16	48	42	0	0	0	106
SE	15	57	81	2	0	0	155
SSE	10	69	50	6	0	0	135
S	12	25	23	8	0	0	68
SSW	6	27	21	4	0	0	58
SW	11	33	14	15	1	0	74
WSW	11	28	11	10	4	0	64
W	13	25	83	14	0	0	135
WNW	19	46	71	13	1	0	150
NW	29	76	69	16	2	0	192
NNW	40	137	142	17	0	0	336
TOT	325	1149	834	130	9	0	2447

Hours of Calm Data: 22
Hours of Invalid Data: 0

Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:10.56

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: E

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	23	53	2	0	0	0	78
NNE	37	41	6	0	0	0	84
NE	36	22	0	0	0	0	58
ENE	35	38	4	0	0	0	77
E	21	43	7	0	0	0	71
ESE	20	44	4	0	1	0	69
SE	24	119	48	0	0	0	191
SSE	33	158	74	5	0	0	270
S	22	117	77	8	0	0	224
SSW	32	56	32	2	0	0	122
SW	19	39	13	0	0	0	71
WSW	32	50	13	0	0	0	95
W	32	65	21	0	0	0	118
WNW	42	68	11	0	0	0	121
NW	58	84	21	1	0	0	164
NNW	24	65	23	1	0	0	113
TOT	490	1062	356	17	1	0	1926

Hours of Calm Data: 38
Hours of Invalid Data: 0

Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:10.56

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: F

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	20	19	0	0	0	0	39
NNE	38	17	0	0	0	0	55
NE	24	5	0	0	0	0	29
ENE	17	2	0	0	0	0	19
E	20	6	0	0	0	0	26
ESE	29	7	0	0	0	0	36
SE	56	79	7	0	0	0	142
SSE	61	220	11	0	0	0	292
S	36	97	20	0	0	0	153
SSW	26	43	1	0	0	0	70
SW	37	40	0	0	0	0	77
WSW	34	14	1	0	0	0	49
W	39	15	0	0	0	0	54
WNW	34	15	0	0	0	0	49
NW	42	25	0	0	0	0	67
NNW	19	21	0	0	0	0	40
TOT	532	625	40	0	0	0	1197

Hours of Calm Data: 68
Hours of Invalid Data: 0

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Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:10.56

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: G

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	49	5	0	0	0	0	54
NNE	30	1	0	0	0	0	31
NE	22	0	0	0	0	0	22
ENE	8	0	0	0	0	0	8
E	4	0	0	0	0	0	4
ESE	15	0	0	0	0	0	15
SE	19	14	3	0	0	0	36
SSE	56	85	3	0	0	0	144
S	17	13	0	0	0	0	30
SSW	35	11	0	0	0	0	46
SW	24	12	0	0	0	0	36
WSW	10	2	0	0	0	0	12
W	9	0	0	0	0	0	9
WNW	15	2	0	0	0	0	17
NW	15	4	0	0	0	0	19
NNW	28	6	0	0	0	0	34
TOT	356	155	6	0	0	0	517

Hours of Calm Data: 95
Hours of Invalid Data: 0
Hours of Good Data: 8749 = 99.9% of Total Hours

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Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:11.95

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: A

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	19	28	5	0	0	54
NNE	3	29	14	6	0	0	52
NE	5	32	22	0	0	0	59
ENE	5	48	8	1	0	0	62
E	3	19	17	5	1	0	45
ESE	4	25	31	1	1	0	62
SE	7	78	49	1	0	0	135
SSE	4	78	75	15	7	0	179
S	7	53	89	53	13	0	215
SSW	3	53	71	32	5	3	167
SW	13	42	87	54	5	4	205
WSW	4	15	24	15	3	0	61
W	2	21	37	11	14	0	85
WNW	1	10	36	47	12	4	110
NW	2	21	25	32	14	4	98
NNW	2	20	21	15	9	1	68
TOT	67	563	634	293	84	16	1657

Hours of Calm Data: 0
Hours of Invalid Data: 4

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Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:11.95

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: B

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	9	18	2	0	0	30
NNE	2	12	6	7	0	0	27
NE	2	10	5	0	0	0	17
ENE	1	15	9	1	0	0	26
E	0	4	8	2	0	0	14
ESE	1	6	8	0	0	0	15
SE	1	7	3	1	0	0	12
SSE	1	13	10	6	1	0	31
S	0	5	7	9	1	0	22
SSW	1	7	5	5	2	0	20
SW	2	7	8	4	1	0	22
WSW	1	5	9	3	1	0	19
W	0	2	14	3	0	0	19
WNW	1	9	16	11	5	1	43
NW	1	7	18	7	6	1	40
NNW	1	3	9	5	1	0	19
TOT	16	121	153	66	18	2	376

Hours of Calm Data: 1
Hours of Invalid Data: 1

Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:11.95

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: C

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	8	7	1	2	0	19
NNE	2	7	10	1	0	0	20
NE	3	13	10	0	0	0	26
ENE	3	6	11	1	0	0	21
E	0	3	8	1	1	0	13
ESE	0	1	21	0	0	0	22
SE	1	4	15	5	0	0	25
SSE	0	4	17	7	0	0	28
S	0	7	10	6	3	0	26
SSW	1	2	8	6	0	0	17
SW	0	4	8	7	1	1	21
WSW	3	2	9	4	1	0	19
W	3	6	5	5	7	2	28
WNW	2	6	12	12	7	2	41
NW	0	3	11	19	5	1	39
NNW	2	8	14	5	2	0	31
TOT	21	84	176	80	29	6	396

Hours of Calm Data: 0
Hours of Invalid Data: 4

Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:11.95

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: D

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	5	49	117	62	7	1	241
NNE	4	73	119	20	1	0	217
NE	15	105	69	7	0	0	196
ENE	8	31	90	19	1	0	149
E	8	29	80	20	6	0	143
ESE	4	24	70	17	0	0	115
SE	1	18	55	64	2	0	140
SSE	4	21	66	45	7	0	143
S	3	6	25	22	7	1	64
SSW	3	9	26	22	5	1	66
SW	6	12	28	18	7	12	83
WSW	2	11	19	13	10	7	62
W	0	14	12	68	21	6	121
WNW	7	17	29	65	27	7	152
NW	2	28	77	73	27	7	214
NNW	11	75	145	105	17	2	355
TOT	83	522	1027	640	145	44	2461

Hours of Calm Data: 2
Hours of Invalid Data: 6

Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:11.95

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: E

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	3	14	44	5	0	0	66
NNE	2	12	43	17	0	0	74
NE	3	23	37	1	0	0	64
ENE	3	20	49	11	1	0	84
E	3	15	68	14	0	0	100
ESE	2	9	56	10	0	1	78
SE	3	13	88	76	2	0	182
SSE	0	12	97	108	8	1	226
S	4	9	79	96	13	0	201
SSW	2	18	55	85	10	0	170
SW	2	17	43	36	5	0	103
WSW	1	18	35	22	1	0	77
W	4	15	42	65	4	0	130
WNW	4	14	50	44	0	0	112
NW	3	22	87	53	2	0	167
NNW	0	21	66	40	2	0	129
TOT	39	252	939	683	48	2	1963

Hours of Calm Data: 0
Hours of Invalid Data: 1

Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:11.95

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: F

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	7	23	7	0	0	37
NNE	2	3	26	13	0	0	44
NE	2	13	36	3	0	0	54
ENE	2	10	17	3	0	0	32
E	3	7	29	5	0	0	44
ESE	1	10	40	5	0	0	56
SE	1	9	74	25	0	0	109
SSE	0	15	104	74	0	0	193
S	0	14	111	51	1	0	177
SSW	0	13	66	81	0	0	160
SW	0	9	31	37	2	0	79
WSW	3	16	20	11	1	0	51
W	4	16	32	14	0	0	66
WNW	0	20	23	17	0	0	60
NW	1	16	23	9	0	0	49
NNW	0	7	25	18	0	0	50
TOT	19	185	680	373	4	0	1261

Hours of Calm Data: 2
Hours of Invalid Data: 2

Totals of Hours at Each Wind Speed & Direction

Union Electric - Callaway Plant

Report Date/Time: 19-APR-2006 16:41:11.95

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-2005 00:00:00.00 to 31-DEC-2005 23:59:59.00

Stability Class: G

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	3	8	6	0	0	17
NNE	1	7	15	4	0	0	27
NE	1	13	30	4	0	0	48
ENE	2	9	34	7	0	0	52
E	2	11	19	3	0	0	35
ESE	3	8	14	1	0	0	26
SE	0	9	15	5	0	0	29
SSE	0	11	30	21	3	0	65
S	2	12	53	11	0	0	78
SSW	0	4	41	18	0	0	63
SW	1	12	23	18	2	0	56
WSW	0	12	20	13	0	0	45
W	1	9	10	3	0	0	23
WNW	2	6	12	3	0	0	23
NW	1	1	10	1	0	0	13
NNW	0	1	5	3	0	0	9
TOT	16	128	339	121	5	0	609

Hours of Calm Data: 3
Hours of Invalid Data: 0
Hours of Good Data: 8731 = 99.7% of Total Hours

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TABLE 5

DOSE AT THE SITE BOUNDARY AND TO THE NEAREST RESIDENT
FROM GASEOUS EFFLUENTS

		SITE BOUNDARY		NEAREST RESIDENT	
		LOCATION: 2.20 km NNW		LOCATION: 2.90 km NNW	
		AGE GROUP: CHILD		AGE GROUP: CHILD	
ORGAN	UNITS	DOSE	% LIMIT(a)	DOSE	% LIMIT(b)
1. GAMMA AIR DOSE *	MRAD	1.21E-03	0.01	7.98E-04	N/A
2. BETA AIR DOSE *	MRAD	2.57E-03	0.01	1.69E-03	N/A
3. WHOLE BODY ***	MREM	1.36E-03	N/A	8.90E-04	N/A
4. SKIN ***	MREM	3.32E-03	N/A	2.18E-03	N/A
5. BONE **	MREM	2.14E-04	N/A	2.96E-04	0.00
6. LIVER **	MREM	1.36E-03	N/A	6.96E-03	0.05
7. TOTAL BODY **	MREM	1.35E-03	N/A	6.80E-03	0.05
8. THYROID **	MREM	1.36E-03	N/A	6.79E-03	0.05
9. KIDNEY **	MREM	1.35E-03	N/A	6.82E-03	0.05
10. LUNG **	MREM	1.37E-03	N/A	6.79E-03	0.05
11. GI-LLI **	MREM	1.35E-03	N/A	6.78E-03	0.05

* Dose from Noble Gases only

** Dose from Tritium, Radioiodines, and Particulates only

*** Dose from Noble Gases plus Ground Plane dose

(a) Annual dose limits of Offsite Dose Calculation Manual (APA-ZZ-01003) of 10 mrad gamma air dose and 20 mrad beta air dose.

(b) Annual dose limits of Offsite Dose Calculation Manual (APA-ZZ-01003) of 15 mrem to any organ from I-131, I-133, H-3 and particulate radionuclides with halflives greater than 8 days.

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TABLE 6

DOSE TO THE MEMBER OF THE PUBLIC FROM ACTIVITIES WITHIN THE SITE BOUNDARY

(MEMBER OF THE PUBLIC)

ORGAN	UNITS	EFFLUENT DOSE WITHIN THE SITE BOUNDARY	DIRECT RADIATION FROM THE UNIT	DIRECT RADIATION FROM OUTSIDE TANKS	DIRECT RADIATION FROM RAM STORAGE *	EFFLUENT DOSE FROM CLG TWR	TOTAL DOSE FOR THE YEAR
SKIN	mrem	6.91E-04	N/A	N/A	N/A	N/A	6.91E-04
BONE	mrem	5.85E-05	8.79E-03	7.54E-06	5.99E-03	N/A	1.48E-02
LIVER	mrem	3.67E-04	8.79E-03	7.54E-06	5.99E-03	1.95E-03	1.71E-02
TOTAL BODY	(mrem)	6.22E-04	8.79E-03	7.54E-06	5.99E-03	1.95E-03	1.74E-02
THYROID	mrem	3.67E-04	8.79E-03	7.54E-06	5.99E-03	1.95E-03	1.71E-02
KIDNEY	mrem	3.67E-04	8.79E-03	7.54E-06	5.99E-03	1.95E-03	1.71E-02
LUNG	mrem	3.70E-04	8.79E-03	7.54E-06	5.99E-03	1.95E-03	1.71E-02
GI-LLI	mrem	3.67E-04	8.79E-03	7.54E-06	5.99E-03	1.95E-03	1.71E-02

* Direct Radiation dose from Stores II, OSGSF, Modification 03-1008 (Equipment Hatch Platform and Missile Shield Modification), and from the RW storage area.

(Member of the Public)

TABLE 7

TOTAL DOSE DUE TO THE URANIUM FUEL CYCLE

(MEMBER OF THE PUBLIC)

ORGAN	UNITS	EFFLUENT DOSE AT RESIDENCE LOCATION	DOSE FROM ACTIVITIES IN SITE BOUNDARY	DOSE FROM CLG TWR H-3 AT NEAREST RESIDENCE	TOTAL DOSE TO THE MEMBER OF THE PUBLIC	% LIMITS *
SKIN	mrem	2.04E-03	6.91E-04	N/A	2.73E-03	0.01%
BONE	mrem	1.76E-04	1.48E-02	N/A	1.50E-02	0.06%
LIVER	mrem	4.24E-03	1.71E-02	1.33E-03	1.33E-03	0.01%
TOTAL BODY	mrem	4.98E-03	1.74E-02	1.33E-03	1.33E-03	0.01%
THYROID	mrem	4.18E-03	1.71E-02	1.33E-03	1.33E-03	0.00%
KIDNEY	mrem	4.19E-03	1.71E-02	1.33E-03	1.33E-03	0.01%
LUNG	mrem	4.18E-03	1.71E-02	1.33E-03	1.33E-03	0.01%
LIVER	mrem	4 20E-03	1.71E-02	1.33E-03	1.33E-03	0.01%

* Annual dose limits from 40 CFR 190.10(a) of 25 mrem whole body, 75 mrem to the thyroid, and 25 mrem to any other organ.

TABLE 8

Dose Due To Liquid Effluents
(Member of the Public)
2005

ORGAN	UNITS	DOSE	LIMIT *	% LIMIT
BONE	mrem	3.99E-03	10	0.04%
LIVER	mrem	6.87E-03	10	0.07%
TOTAL BODY	mrem	5.62E-03	3	0.19%
THYROID	mrem	2.42E-03	10	0.02%
KIDNEY	mrem	3.82E-03	10	0.04%
LUNG	mrem	2.84E-03	10	0.03%
GI-LLI	mrem	2.56E-03	10	0.03%