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U. S. Nuclear Regulatory Commission  
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Donald C. Cook Nuclear Plant Units 1 and 2  
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

In accordance with Technical Specification 5.6.3, Indiana Michigan Power Company, the licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, is providing the Annual Radioactive Effluent Release Report as an enclosure to this letter. This report covers the period January 1, 2011, through December 31, 2011.

This letter contains no new or modified regulatory commitments. Should you have any questions, please contact Mr. Michael K. Scarpello, Regulatory Affairs Manager, at (269) 466-2649.

Sincerely,

Joel P. Gebbie  
Site Vice President

KMH/jmr

Enclosure

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ENCLOSURE TO AEP-NRC-2012-20  
DONALD C. COOK NUCLEAR PLANT UNITS 1 AND 2  
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

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## I. INTRODUCTION

This report discusses the radioactive discharges from Unit 1 and Unit 2 of the Donald C. Cook Nuclear Plant (CNP) during 2011. This is in accordance with the requirements of CNP Technical Specification 5.6.3.

The table below summarizes the pertinent statistics concerning the Plant's operation during the period from January 1, 2011, to December 31, 2011. The data in this table and the descriptive information on plant operation are based upon the respective Unit's Monthly Operating Reports, Performance Indicators and Control Room Logs for 2011.

Parameter	Unit 1	Unit 2
Gross Electrical Energy Generation (Megawatt Hour (MWH))	7,984,732	9,950,856
Unit Service Factor (Percent (%))	88.1	100.0
Unit Capacity Factor (Maximum Dependable Capacity (MDC)) Net (%)	85.5	102.2

Unit 1 entered the reporting period in Mode 1 at Nominal Full Power (NFP). Small power adjustments were made to facilitate main turbine valve testing throughout the year. The unit performed a downpower and manually tripped on March 12, 2011, entering a planned maintenance outage to perform hydrogen leak repairs on the Main Generator. The unit attained criticality on March 17, 2011, and attained NFP on March 19, 2011. The unit performed a normal downpower and manual trip to enter the refueling outage U1C24 on September 21, 2011. The unit attained criticality on October 25, 2011, and attained NFP on October 31, 2011. The unit exited the reporting period at NFP.

Unit 2 entered the reporting period in Mode 1 at NFP. Small power adjustments were made to facilitate main turbine valve testing throughout the year. The unit exited the reporting period at NFP.

## II. RADIOACTIVE RELEASES AND RADIOLOGICAL IMPACT ON MAN

Since a number of release points are common to both units, the release data from both units are combined to form this two-unit, Annual Radioactive Effluent Release Report. Appendix A1.1 through A2.4 of this report present the information in accordance with Section 5.6.3 of Appendix A to the Facility Operating Licenses, as specified in the Technical Specifications, Regulatory Guide 1.21, and 10 CFR Part 50, Appendix I.

The "MIDAS System" is a computer code that calculates doses due to radionuclides that were released from the CNP.

All liquid and gaseous releases were well within Offsite Dose Calculation Manual (ODCM) limits and Federal Limits.

There were no abnormal liquid releases and no abnormal gaseous releases in 2011.

### **Liquid Releases**

During 2011 there were 73 liquid batch releases performed. The number of liquid batch releases for the four quarters in 2011 was 17, 10, 26, and 20, respectively.

Estimated doses (in millirem) to maximally exposed individuals via the liquid release pathways are given in Appendix A1.2 of this report.

### **Gaseous Releases**

During the first quarter of 2011 there were 96 Containment Pressure Reliefs (CPR). During the second quarter there were 91 CPR. During the third quarter there was five batch releases from GDT, two containment purges, and 92 CPR. During the fourth quarter there was one batch release from GDT and 103 CPR. The CPR continue to be listed as batch releases as described in Nuclear Regulatory Commission Inspections 50-315/89017 (DRSS); 50-316/89016 (DRSS) for CNP, dated 6/13/1989. Doses continue to be calculated utilizing continuous criteria as allowed by NUREG-0133. There were a total of six GDT releases, two containment purges, and 382 CPR gaseous batch releases made during 2011.

In calculating the dose consequences for continuous and batch gaseous releases during 2011, the meteorological data measured at the time of the release were used.

The estimated doses (in millirem) to maximally exposed individuals via the gaseous release pathways are given in Appendix A1.2 of this report. For individuals that are within the site boundary, the occupancy time is sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the site boundary.

### **Solid Waste Disposition**

There were 17 shipments of radioactive waste made during 2011. These included shipments made from the site to various radioactive waste processors for ultimate disposal.

## III. **METEOROLOGICAL**

Appendices A2.1, A2.2, A2.3, and A2.4 of this report contain the cumulative joint frequency distribution tables of wind speed and wind direction, corresponding to the various atmospheric stability classes for the first, second, third and fourth quarters of 2011. Hourly meteorological data is available for review and/or inspection upon request.

## IV. **OFFSITE DOSE CALCULATION MANUAL (ODCM) CHANGES**

The Offsite Dose Calculation Manual, PMP-6010-OSD-001, was not revised during the report period.

V. **TOTAL DOSE**

Section 3.2.5 of the ODCM requires that the dose or dose commitment to a real individual from all uranium fuel cycle sources in Berrien County be limited to no more than 25 millirem to the total body or any organ (except the thyroid, which is limited to no more than 75 millirem) over a period of 12 consecutive months to show conformance with the requirements of 40 CFR Part 190. The maximum cumulative dose to an individual from liquid and gaseous effluents during 2011 was well within the ODCM limits. Measurements using thermoluminescent dosimeters (TLD) at 12 onsite stations indicate that the dose due to direct radiation is consistent with preoperational and current control (background) levels. This is fully evaluated in CNP's 2011 Annual Radiological Environmental Operating Report.

The annual dose to the maximum individual will be estimated by first, summing the quarterly total body air dose, the quarterly skin air dose, the quarterly critical organ dose from iodines and particulates (I&P), the quarterly total body dose from liquid effluents, the quarterly critical organ dose from liquid effluents, and the Radiological Environmental Monitoring Program onsite direct radiation TLD data. These quarterly values are summed with the annual C-14 dose and compared to the annual total body limit for conservative reasons. The table that follows here represents the above written description:

Dose (mrem)	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
I & P	2.08E-02	1.58E-02	5.95E-02	2.83E-02
Total Body Air	2.00E-04	3.20E-04	1.50E-03	5.80E-04
Skin	3.20E-04	5.20E-04	2.70E-03	1.10E-03
Liquid TB	1.04E-02	7.00E-03	1.66E-02	8.75E-03
Liquid Organ	1.04E-02	7.00E-03	1.66E-02	8.77E-03
C14 (Annual)				2.65E+00
Direct Radiation	0	0	0	0
Total	4.21E-02	3.06E-02	9.69E-02	2.70E+00
Grand Total Dose (Total Body or any other Organ) mrem				2.87E+00
Annual Dose Limit (mrem)				25
Percent of limit				1.15E+01

The following data reflects a comparison with 2009 annual dose data (the last year without calculating C-14 dose), 2011 annual dose data and 2011 annual dose data with C-14 added. This indicates that 2011 was a 'normal' single unit outage year with respect to radioactive effluents and allows for easier comparison. The table is presented as follows:

	Annual Dose (mrem)	% of limit
2009	2.60E-01	1.04
2011	2.17E-01	0.87
2011 with C-14	2.87	11.5

VI. **RADIATION MONITORS INOPERABLE GREATER THAN 30 DAYS**

There were no release pathways unmonitored for greater than 30 days.

## VII. NOTEWORTHY CONDITIONS IDENTIFIED IN 2011

While not a condition directly relating to CNP station performance, the March 2011 event in Fukushima, Japan deserves special attention, focusing on the details and how they relate to or impact CNP. This is intended as a high level discussion and is not intended as an in-depth report.

The Fukushima power station suffered an accident beyond its design basis, undergoing a massive earthquake followed by a very large tsunami (tidal wave) which caused significant damage to the entire region. The facility withstood the earthquake in relatively good condition considering the magnitude. The tsunami engulfed the nuclear station, damaging much of the safety equipment and resulting in a complete loss of power. The loss of power prevented cooling water from being provided to the reactor core and to stored spent fuel in adjacent spent fuel pools. The lack of cooling water resulted in fuel assembly damage that caused the release of large quantities of gaseous radioactive fission products. The eventual restoration of emergency power supplies allowed cooling water to be pumped into the reactors and spent fuel pools, but damage suffered from the earthquake (cracks, etc) allowed some of this cooling water bearing some radioactive fission products to leak out of the buildings and enter the neighboring ocean water. As of the time of this writing, the conditions at Fukushima have greatly improved with significant progress on maintaining the reactors in a "cold shutdown" configuration with releases of radioactive effluents being performed in a controlled and deliberate manner. The NRC (via SECY-11-0093) and the Japan Nuclear Energy Safety Organization (JNES) have released summaries of the events at Fukushima where more specific details can be found. An important fact identified in the reports was that no fatalities as a result of radiological exposure from the Fukushima event occurred, however the earthquake and tsunami left over 25,000 people dead or missing.

The majority of the released fission products were short lived gaseous isotopes as a result of the damaged fuel assemblies. While the number of curies released into the environment was very large, the short half lives has caused the majority to have decayed away within weeks of their release. Trace amounts of longer lived isotopes were detected over North America several weeks after the event, having been carried across the ocean via the jet stream and via storm fronts. The US nuclear industry commenced monitoring for these expected nuclides shortly after the Fukushima event, and CNP participated in this monitoring. Results of the monitoring were shared with the industry and the regulating agencies governing CNP. Only gaseous Iodine and Cesium isotopes impacted CNP, as the liquid releases into the ocean occurred into the Pacific and has no pathway to CNP.

CNP performed airborne and precipitation samples commencing on March 24, 2011 and maintained this until May 24, 2011. Observable traces of the Fukushima related Iodine-131 were found in precipitation samples on March 24<sup>th</sup>, and found on portable air samples taken near REMP locations on March 28<sup>th</sup>. Several regional nuclear stations detected cesium isotopes as well, mainly Cs-137. Results found by CNP were comparable to results observed at other nuclear stations within the region and were not attributable to licensed radioactive material from CNP or any other US nuclear station. An evaluation was performed which validated that CNP was not the source of the detectable I-131 found in samples collected on and offsite (AR# 2011-3838). These isotopes are not included in dose calculations contained within this report as they were not part of the legally released

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licensed material performed by CNP. The REMP program will continue to monitor the environment around CNP and will be an indicator of further impacts from Fukushima.

### **Carbon-14 Supplemental Information for the 2011 Annual Radioactive Effluent Release Report.**

Carbon-14 (C-14) has a 5730 year half-life and is a naturally occurring radionuclide produced by cosmic ray interactions in the atmosphere. C-14 is a relatively low energy beta emitter. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. C-14 is also produced in commercial nuclear reactors, but the amounts produced are much less than those produced naturally, from weapons testing, or coal burning power plants. The inventory of carbon-14 in Earth's biosphere is about 300 million Curies, of which most is in the oceans.

Since the NRC published Regulatory Guide 1.21, Revision 1, in 1974, the analytical methods for determining C-14 have improved. Coincidentally the radioactive effluents from commercial nuclear power plants over the same period have decreased to the point that C-14 is likely to be a principal radionuclide in gaseous effluents. Based on these reasons and a desire to adjust policy to align with international standards, the nuclear industry was required to report starting in 2010 the quantity and dose impact of C-14 here in the United States. This year's report will be the second report by CNP including C-14, but the dose will be reported both with and without C-14 so a comparison to 2009 can be made keeping in mind the differing standards.

The quantity of C-14 released to the environment can be estimated by use of a C-14 source term scaling factor based on power generation (Ref. RG 1.21, Rev 2). A recent study recommends a source term scaling factor of approximately 9.0 to 9.8 Curies/GWe-yr for a Westinghouse Pressurized Water Reactor (Ref. EPRI 1021106 "Estimation of Carbon-14 in Nuclear Plant Gaseous Effluents" December 23, 2010). A scaling factor of 9.4 Curies/GWe-yr was assumed for this report. Using this source term scaling factor and actual electrical generation (MWH) produced during 2011 results in a site total of 21.7 Curies released.

C-14 releases from PWRs occur primarily as a mix of organic carbon (methane) and inorganic (carbon dioxide). As a general rule, C-14 in the primary coolant is essentially all organic with a large fraction as gas. Any time the primary coolant is exposed to an oxidizing environment (during shutdown or refueling), a slow transformation from an organic to an inorganic species occurs. Various studies documenting measured C-14 releases from PWRs suggest an average 80% organic fraction with the remainder being carbon dioxide. This equates to 4.34 Curies released as carbon dioxide which is available for the food pathway through photosynthesis to vegetation.

Dose is calculated utilizing the methodology prescribed in RG 1.109, Appendix C with the vegetation dose being the most predominant. A 'p' factor of 0.33 is determined utilizing the 151 hours of batch gaseous releases performed during 2011 and the assumption that 70% of the C-14 released is from gaseous batch releases. A further reduction to the vegetation and leafy vegetable dose is warranted due to the limited growing season in Michigan, which was conservatively limited to nine months.

The final results indicated a calculated organ dose from C-14 to a child at the site boundary of 2.09 mrem to the bone and a whole body dose of 0.554 mrem, for a combined total C-14 dose of 2.65 mrem. This is less than the dose limit of 15 mrem/unit to any organ prescribed in 10 CFR 50, Appendix I, and the 40 CFR Part 190 limit of 25 mrem for total body and for any organ ( $\leq 75$  mrem for thyroid).

## VIII. CONCLUSION

Based on the information presented in this report, it is concluded that CNP Units 1 and 2 performed their intended design function with no demonstrable adverse affect on the health and safety of the general public.

2011 Effluent and Waste Disposal Annual Report

**SUPPLEMENTAL INFORMATION**

Facility: Donald C. Cook Nuclear Plant  
Licensee: Indiana Michigan Power Company

**1 REGULATORY LIMITS**

1.1 Noble Gases

The air dose in unrestricted areas due to noble gases released in gaseous effluents shall be limited to the following:

1.1.1 During any calendar quarter, to  $\leq 5$  mrad/unit for gamma radiation and  $\leq 10$  mrad/unit for beta radiation.

1.1.2 During any calendar year, to  $\leq 10$  mrad/unit for gamma radiation and  $\leq 20$  mrad/unit for beta radiation.

1.2 Iodines - Particulates

The dose to a member of the public from radioiodines, radioactive materials in particulate form, and radionuclides other than noble gases with half-lives greater than eight days in gaseous effluents released to unrestricted areas shall be limited to the following:

1.2.1 During any calendar quarter to  $\leq 7.5$  mrem/unit to any organ.

1.2.2 During any calendar year to  $\leq 15$  mrem/unit to any organ.

1.3 Liquid Effluents

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

1.3.1 During any calendar quarter to  $\leq 1.5$  mrem/unit to the total body and to  $\leq 5$  mrem/unit to any organ.

1.3.2 During any calendar year to  $\leq 3$  mrem/unit to the total body and to  $\leq 10$  mrem/unit to any organ.

## 2011 Effluent and Waste Disposal Annual Report

### 1.4 Total Dose

The dose or dose commitment to a real individual from all uranium fuel cycle sources is limited to  $\leq 25$  mrem to the total body or any organ (except the thyroid, which is limited to  $\leq 75$  mrem) over a period of 12 consecutive months.

## 2 **MAXIMUM PERMISSIBLE CONCENTRATIONS**

### 2.1 Gaseous Effluents

The dose rate due to radioactive materials released in gaseous effluents from the site shall be limited to the following:

2.1.1 For noble gases:  $\leq 500$  mrem/yr to the total body and  $\leq 3000$  mrem/yr to the skin.

2.1.2 For all radioiodines and for all radioactive materials in particulate form and radionuclides (other than noble gases) with half-lives greater than eight days:  $\leq 1500$  mrem/yr to any organ.

The above limits are provided to insure that radioactive material discharged in gaseous effluents will not result in the exposure of an individual in an unrestricted area to annual average concentrations exceeding the limits in 10 CFR Part 20, Appendix B, Table 2, Column 1.

### 2.2 Liquid Effluents

The concentration of radioactive material released at any time from the site to unrestricted areas shall be limited to 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  $2 \times 10^{-4}$   $\mu\text{Ci/ml}$  total activity.

**3 AVERAGE ENERGY**

The average energy ( $\bar{E}$ ) of the radionuclide mixture in releases of fission and activation gases as defined in Regulatory Guide 1.21, Appendix B, Section A.3 is not applicable because the limits used for gaseous releases are based on calculated dose to members of the public. Release rates are calculated using an isotopic mix from actual samples rather than average energy.

**4 MEASUREMENTS and APPROXIMATIONS of TOTAL RADIOACTIVITY**

4.1 Fission and Activation Gases

Sampled and analyzed on a 4096 channel analyzer and HpGe detector. Tritium analysis is performed using liquid scintillation counter.

4.2 Iodines

Sampled on iodine adsorbing media and analyzed on a 4096 channel analyzer and HpGe detector.

4.3 Particulates

Sampled on a glass filter and analyzed on a 4096 channel analyzer and HpGe detector. Sr-89 and Sr-90 analyses performed by offsite vendor.

4.4 Liquid Effluents

Sampled and analyzed on a 4096 channel analyzer and HpGe detector. Tritium analysis is performed using liquid scintillation counter. Fe-55, Sr-89 and Sr-90 analyses performed by offsite vendor. Ni-63 is also currently being analyzed by the offsite vendor in response to evaluation of the 10 CFR 61 sample results.

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**5 BATCH RELEASES**

5.1 Liquid

5.1.1 Number of batch releases:

17 releases in the 1<sup>st</sup> quarter, 2011  
10 releases in the 2<sup>nd</sup> quarter, 2011  
26 releases in the 3<sup>rd</sup> quarter, 2011  
20 releases in the 4<sup>th</sup> quarter, 2011

5.1.2 Total time period for batch releases:

22,662 minutes

5.1.3 Maximum time for a batch release:

376 minutes

5.1.4 Average time period for batch release:

311 minutes

5.1.5 Minimum time period for a batch release:

248 minutes

5.1.6 Average stream flow during periods of release of effluent into a flowing stream:

8.35E+5 gpm circulating water

2011 Effluent and Waste Disposal Annual Report

5.2 Gaseous

5.2.1 Number of batch releases:

96 releases in the 1<sup>st</sup> quarter, 2011  
91 releases in the 2<sup>nd</sup> quarter, 2011  
99 releases in the 3<sup>rd</sup> quarter, 2011  
104 releases in the 4<sup>th</sup> quarter, 2011

5.2.2 Total time period for batch releases:

9,035 minutes

5.2.3 Maximum time for a batch release:

355 minutes

5.2.4 Average time period for batch release:

22.9 minutes

5.2.5 Minimum time period for a batch release:

6 minutes

2011 Effluent and Waste Disposal Annual Report

**6 ABNORMAL RELEASES**

6.1 Liquid

6.1.1 Number of Releases:

<u>1<sup>st</sup> Quarter</u>	<u>2<sup>nd</sup> Quarter</u>	<u>3<sup>rd</sup> Quarter</u>	<u>4<sup>th</sup> Quarter</u>
0	0	0	0

6.1.2 Total activity released (Ci):

<u>1<sup>st</sup> Quarter</u>	<u>2<sup>nd</sup> Quarter</u>	<u>3<sup>rd</sup> Quarter</u>	<u>4<sup>th</sup> Quarter</u>
0	0	0	0

6.2 Gaseous

6.2.1 Number of Releases:

<u>1<sup>st</sup> Quarter</u>	<u>2<sup>nd</sup> Quarter</u>	<u>3<sup>rd</sup> Quarter</u>	<u>4<sup>th</sup> Quarter</u>
0	0	0	0

6.2.2 Total activity released (Ci):

<u>1<sup>st</sup> Quarter</u>	<u>2<sup>nd</sup> Quarter</u>	<u>3<sup>rd</sup> Quarter</u>	<u>4<sup>th</sup> Quarter</u>
0	0	0	0

2011 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

CONTINUOUS MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. FISSION GASES					
H3	Ci	4.64E+01	2.29E+01	2.85E+01	3.34E+01
KR85m	Ci	-----	-----	-----	-----
KR85	Ci	-----	-----	-----	-----
XE131m	Ci	-----	-----	-----	-----
XE133m	Ci	-----	-----	-----	-----
XE133	Ci	-----	-----	-----	-----
XE135	Ci	-----	-----	-----	-----
Total for Period	Ci	4.64E+01	2.29E+01	2.85E+01	3.34E+01
2. IODINES					
I131	Ci	-----	-----	-----	1.61E-05
I132	Ci	-----	-----	-----	1.88E-04
I133	Ci	-----	-----	-----	-----
Total for Period	Ci	-----	-----	-----	2.04E-04
3. PARTICULATES					
MN54	Ci	-----	-----	-----	-----
CO60	Ci	-----	-----	-----	-----
CS137	Ci	-----	-----	-----	-----
Total for Period	Ci	-----	-----	-----	-----

\* DENOTES SUPPLEMENTAL ISOTOPES

2011 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

BATCH MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. FISSION GASES					
H3	Ci	1.35E-02	8.02E-03	1.92E-02	2.48E-02
AR41	Ci	2.69E-01	3.39E-01	4.27E-01	3.90E-01
KR85	Ci	-----	-----	5.09E-01	5.76E-02
XE131M	Ci	-----	-----	4.76E-04	-----
XE133M	Ci	-----	-----	8.93E-05	-----
XE133	Ci	5.62E-02	1.13E-01	2.30E-01	1.54E-01
XE135	Ci	9.95E-05	1.61E-04	-----	1.63E-04
Total for Period	Ci	3.39E-01	4.60E-01	1.19E+00	6.26E-01
2. IODINES					
I131	Ci	-----	-----	-----	-----
I133	Ci	-----	-----	-----	-----
Total for Period	Ci	-----	-----	-----	-----
3. PARTICULATES					
* BR80	Ci	-----	-----	5.09E-05	-----
* BR82	Ci	-----	-----	1.48E-06	-----
Total for Period	Ci	-----	-----	5.24E-05	-----

\* DENOTES SUPPLEMENTAL ISOTOPES

2011 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
-----						
A. FISSION AND ACTIVATION GASES						
-----						
1. Total Release	Ci	3.26E-01	4.52E-01	1.17E+00	5.95E-01	11.4
-----						
2. Average release rate for period	uCi/sec	4.19E-02	5.75E-02	1.47E-01	7.49E-02	
-----						
3. Percent of applicable limit*	% Gamma Beta	6.30E-03 1.17E-03	1.22E-02 2.36E-03	5.22E-02 1.45E-02	1.85E-02 5.99E-03	
-----						
B. IODINES						
-----						
1. Total I-131	Ci	0.00E+00	0.00E+00	0.00E+00	1.61E-05	14.9
-----						
2. Average release rate for period	uCi/sec	0.00E+00	0.00E+00	0.00E+00	2.03E-06	
-----						
3. Percent of applicable limit*	%	0.00E+00	0.00E+00	0.00E+00	5.77E-06	
-----						
C. PARTICULATES						
-----						
1. Particulates with half lives > 8 days	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	11.2
-----						
2. Average release rate for period	uCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-----						
3. Percent of applicable limit*	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-----						
4. Gross alpha radioactivity	Ci	<7.92E-07	<7.19E-07	<8.09E-07	<6.10E-07	
-----						
D. TRITIUM						
-----						
1. Total Release	Ci	4.64E+01	2.29E+01	2.85E+01	3.34E+01	11.8
-----						
2. Average release rate for period	uCi/sec	5.97E+00	2.92E+00	3.59E+00	4.20E+00	
-----						
3. Percent of applicable limit*	%	3.40E-02	1.66E-02	2.04E-02	2.40E-02	
-----						

\* Applicable limits are expressed in terms of dose. See Appendices A1.2-1 through A1.2-4

2011 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
LIQUID EFFLUENTS  
CONTINUOUS MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
H3	Ci	5.15E-02	5.10E-02	1.75E-02	5.88E-03
CS137	Ci	-----	-----	-----	-----

BATCH MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
H3	Ci	3.56E+02	3.16E+02	7.36E+02	3.71E+02
CR51	Ci	-----	-----	-----	8.74E-06
MN54	Ci	9.29E-07	-----	-----	-----
FE55	Ci	-----	-----	-----	-----
CO58	Ci	4.01E-05	1.14E-05	5.04E-05	9.13E-05
CO60	Ci	4.64E-05	2.48E-05	8.33E-05	1.61E-04
NI63	Ci	-----	-----	-----	-----
ZN65	Ci	-----	-----	-----	-----
ZR95	Ci	-----	-----	-----	-----
NB95	Ci	-----	-----	-----	2.42E-06
MO99	Ci	-----	-----	-----	-----
TC99m	Ci	-----	-----	7.57E-07	-----
AG110m	Ci	-----	-----	1.79E-05	5.88E-06
SB124	Ci	-----	-----	-----	-----
SB125	Ci	1.62E-05	-----	-----	-----
CS134	Ci	-----	-----	-----	-----
CS137	Ci	-----	-----	2.33E-06	6.37E-06
*XE135	Ci	-----	-----	1.15E-04	8.68E-07
I133	Ci	-----	-----	9.15E-07	-----
*XE133	Ci	7.08E-06	1.70E-05	1.97E-03	1.34E-04
*XE133m	Ci	-----	-----	2.02E-05	-----

\* DENOTES SUPPLEMENTAL ISOTOPES

2011 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES  
BATCH MODE

	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
-----						
A. FISSION AND ACTIVATION PRODUCTS						
-----						
1. Total Release	Ci	1.04E-04	3.62E-05	1.56E-04	2.76E-04	18.4
-----						
2. Average diluted concentration during period	uCi/ml	7.77E-12	3.33E-12	5.72E-12	1.37E-11	
-----						
3. Percent of applicable limit	%	1.35E-04	8.12E-05	1.31E-04	3.25E-04	
-----						
B. TRITIUM						
-----						
1. Total Release	Ci	3.56E+02	3.16E+02	7.36E+02	3.71E+02	10.1
-----						
2. Average diluted concentration during period	uCi/ml	2.67E-05	2.91E-05	2.70E-05	1.84E-05	
-----						
3. Percent of applicable limit	%	2.67E+00	2.91E+00	2.70E+00	1.84E+00	
-----						
C. DISSOLVED AND ENTRAINED GASES						
-----						
1. Total Release	Ci	7.08E-06	1.70E-05	2.09E-03	1.34E-04	11.8
-----						
2. Average diluted concentration during period	uCi/ml	5.31E-13	1.57E-12	7.67E-11	6.65E-12	
-----						
3. Percent of applicable limit	%	2.66E-07	7.83E-07	3.84E-05	3.32E-06	
-----						
D. GROSS ALPHA RADIOACTIVITY TOTAL RELEASE	Ci	<9.89E-05	<5.82E-05	<1.51E-04	<1.16E-04	N/A
-----						
E. VOLUME OF WASTE RELEASED	Liters	2.99E+07	3.53E+07	1.72E+07	5.57E+06	2.00
-----						
F. VOLUME OF DILUTION WATER USED DURING PERIOD	Liters	7.68E+11	8.36E+11	5.99E+11	2.08E+11	3.48
-----						

2011 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES  
CONTINUOUS MODE

	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
-----						
A. FISSION AND ACTIVATION PRODUCTS						
-----						
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
-----						
2. Average diluted concentration during period	uCi/ml	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-----						
3. Percent of applicable limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-----						
B. TRITIUM						
-----						
1. Total Release	Ci	5.15E-02	5.10E-02	1.75E-02	5.88E-03	23.2
-----						
2. Average diluted concentration during period	uCi/ml	6.79E-11	6.18E-11	3.06E-11	3.13E-11	
-----						
3. Percent of applicable limit	%	6.79E-06	6.18E-06	3.06E-06	3.13E-06	
-----						
C. DISSOLVED AND ENTRAINED GASES						
-----						
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
-----						
2. Average diluted concentration during period	uCi/ml	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-----						
3. Percent of applicable limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-----						
D. GROSS ALPHA RADIOACTIVITY TOTAL RELEASE	Ci	0.00E+00	0.00E+00	0.00E+00	<8.94E-08	N/A
-----						
E. VOLUME OF WASTE RELEASED	Liters	7.65E+06	9.15E+06	4.14E+06	1.16E+06	2.00
-----						
F. VOLUME OF DILUTION WATER USED DURING PERIOD	Liters	5.15E+11	6.93E+11	3.21E+11	4.43E+10	3.48
-----						

## 2011 Effluent and Waste Disposal Annual Report Solid Waste and Irradiated Fuel Shipments

### Solid Waste Shipped Offsite for Burial or Disposal

1) Type of Waste	Unit	Estimated amount	Estimated Total Error, %
a) Spent resins, filters, sludge, evaporator bottoms, etc.	m <sup>3</sup> Curies	9.49E+00 1.47E+01	1.00E+00 3.75E+00
b) Dry compressible waste, contaminated equipment, etc.	m <sup>3</sup> Curies	3.75E+02 1.63E+01	1.00E+00 6.48E+00
c) Irradiated components, control rods, etc.	m <sup>3</sup> Curies		
d) Other (contaminated soil)	m <sup>3</sup> Curies		

### 2) Estimate of Principle Radionuclide Composition

a)	H-3	57 %	Co-58	3 %	Sb-125	2 %	Cs-137	1 %
	Mn-54	1 %	Co-60	12 %	Cs-134	1 %		
	Fe-55	11 %	Ni-63	11 %	C-14	1 %		
b)	Ni-59	2 %	Co-58	3 %	Cr-51	2 %		
	Mn-54	1 %	Co-60	34 %	Zr/Nb-95	2 %		
	Fe-55	39 %	Ni-63	15 %	Cs-137	1 %	Ag-110M	1 %
d)								

### 3) Solid Waste Disposition

No. of Shipments	Mode of Transportation	Destination
12	Truck	Memphis, TN
4	Truck	Erwin, TN
1	Truck	Kingston, TN

4) Type of Containers used for Shipment: Containers used are excepted packages, Type A, Sea Land, metal boxes, drums and high integrity containers (HICs).

5) Solidification Agent: There were no solidifications performed during this report period.

## 2011 Effluent and Waste Disposal Annual Report Yearly Release Rates

<b>GASES</b>		
Fission and Activation Gases	Total Release	2.54E+00 Curies
	Average Release Rate	8.03E-02 $\mu$ Ci/sec
	% of Applicable Limits*	$\gamma$ 2.37E-02 % $\beta$ 5.95E-03 %
Iodines	Total I-131 Release	1.61E-05 Curies
	Average Release Rate	5.08E-07 $\mu$ Ci/sec
	% of Applicable Limit*	5.77-06 %
Particulates	Total Release	0.00 Curies
	Average Release Rate	0.00 $\mu$ Ci/sec
	% of Applicable Limit*	0.00 %
<b>LIQUIDS</b>		
Fission and Activation Products	Total Release	5.72E-04 Curies
	Average Diluted Concentration	7.63E-12 $\mu$ Ci/ml
	% of Applicable Limits*	Total Body 7.13E-01 % Organ 2.14E-01 %

\* Applicable limits are expressed in terms of the annual 10 CFR 50, Appendix I, dose limits.

### Site Boundary and Nearest Residence Listing

The following distances were used in the calculation of the maximum individual doses:

<u>Sector</u>	<u>Direction</u>	<u>Boundary (Meters)</u>	<u>Nearest Residence (Meters)</u>
A	N	651	659
B	NNE	617	660
C	NE	789	943
D	ENE	1497	1747
E	E	1274	1716
F	ESE	972	1643
G	SE	629	1640
H	SSE	594	964
J	S	594	997
K	SSW	629	942

## Summary of Maximum Individual Doses

First Quarter 2011

<b>EFFLUENT</b>	<b>APPLICABLE ORGAN</b>	<b>ESTIMATED DOSE (mrem)</b>	<b>AGE GROUP</b>	<b>LOCATION DIST DIR (M) (Toward)</b>	<b>% OF APPLICABLE LIMIT</b>	<b>LIMIT (mrem) QTR</b>
Liquid	Total Body	1.04E-02	Child	Receptor 1	6.93E-01	1.5E+0
Liquid	GI - Tract	1.04E-02	Child	Receptor 1	2.08E-01	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	3.15E-04	Any Age	651 (N)	6.30E-03	5.0E+0
Noble Gas	Air dose (Beta-mrad)	1.17E-04	Any Age	651 (N)	1.17E-03	1.0E+1
Iodines and Particulates	Total Body	2.08E-02	Child	659 (N)	2.77E-01	7.5E+0

## Summary of Maximum Individual Doses

Second Quarter 2011

<b>EFFLUENT</b>	<b>APPLICABLE ORGAN</b>	<b>ESTIMATED DOSE (mrem)</b>	<b>AGE GROUP</b>	<b>LOCATION DIST DIR (M) (Toward)</b>	<b>% OF APPLICABLE LIMIT</b>	<b>LIMIT (mrem) QTR</b>
Liquid	Total Body	7.00E-03	Child	Receptor 1	4.67E-01	1.5E+0
Liquid	GI - Tract	7.00E-03	Child	Receptor 1	1.40E-01	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	6.11E-04	Any Age	594 (S)	1.22E-02	5.0E+0
Noble Gas	Air dose (Beta-mrad)	2.36E-04	Any Age	594 (S)	2.36E-03	1.0E+1
Iodines and Particulates	Total Body	1.58E-02	Child	659 (N)	2.11E-01	7.5E+0

## Summary of Maximum Individual Doses

Third Quarter 2011

<b>EFFLUENT</b>	<b>APPLICABLE ORGAN</b>	<b>ESTIMATED DOSE (mrem)</b>	<b>AGE GROUP</b>	<b>LOCATION DIST DIR (M) (Toward)</b>	<b>% OF APPLICABLE LIMIT</b>	<b>LIMIT (mrem) QTR</b>
Liquid	Total Body	1.66E-02	Child	Receptor 1	1.11E+00	1.5E+0
Liquid	Liver	1.66E-02	Child	Receptor 1	3.32E-01	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	2.61E-03	Any Age	651 (N)	5.22E-02	5.0E+0
Noble Gas	Air dose (Beta-mrad)	1.45E-03	Any Age	651 (N)	1.45E-02	1.0E+1
Iodines and Particulates	Total Body	5.95E-02	Child	659 (N)	7.93E-01	7.5E+0

## Summary of Maximum Individual Doses

Fourth Quarter 2011

EFFLUENT	APPLICABLE ORGAN	ESTIMATED DOSE (mrem)	AGE GROUP	LOCATION DIST DIR (M) (Toward)	% OF APPLICABLE LIMIT	LIMIT (mrem) QTR
Liquid	Total Body	8.75E-03	Child	Receptor 1	5.84E-01	1.5E+0
Liquid	Liver	8.77E-03	Child	Receptor 1	1.75E-01	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	9.24E-04	Any Age	651 (N)	1.85E-02	5.0E+0
Noble Gas	Air dose (Beta-mrad)	5.99E-04	Any Age	651 (N)	5.99E-03	1.0E+1
Iodines and Particulates	Thyroid	2.83E-02	Child	659 (N)	3.77E-01	7.5E+0

2011 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)  
Lower Limit of Detection = LLD

Date	MW-22D	MW-22M	MW-22S	MW-24D	MW-24M	MW-24S	MW-25D	MW-25M
01/05/2011							<LLD	<LLD
01/06/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD		
01/10/2011				<LLD	<LLD	<LLD		
01/13/2011	<LLD	8.62E-7	1.20E-6				<LLD	<LLD
01/17/2011	<LLD	<LLD	<LLD				<LLD	<LLD
01/24/2011	1.15E-6	<LLD						
01/27/2011	<LLD	<LLD	8.55E-7					
02/03/2011	<LLD	<LLD	<LLD					
02/07/2011				<LLD	<LLD	<LLD	<LLD	<LLD
02/10/2011	<LLD	<LLD	<LLD					
02/14/2011			<LLD					
02/17/2011	<LLD	<LLD	<LLD					
02/21/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD		
02/24/2011							<LLD	<LLD
03/04/2011	<LLD	<LLD	<LLD					
03/08/2011	<LLD	<LLD	<LLD	<LLD	<LLD	1.21E-6		
03/15/2011	<LLD	<LLD	<LLD					
03/22/2011				<LLD	<LLD	1.05E-6	<LLD	<LLD
03/28/2011				<LLD	<LLD	1.04E-6		
04/04/2011	<LLD	<LLD	<LLD	<LLD	<LLD	1.03E-6	<LLD	<LLD
04/11/2011				<LLD	<LLD	1.06E-6		
04/18/2011				<LLD	<LLD	<LLD		
04/29/2011				<LLD	<LLD	<LLD		
05/12/2011				<LLD	<LLD	<LLD	<LLD	<LLD
05/20/2011							<LLD	<LLD
05/23/2011							<LLD	<LLD
06/09/2011							<LLD	<LLD
06/16/2011							<LLD	<LLD
06/20/2011				<LLD	<LLD	<LLD		
06/24/2011	<LLD	<LLD	<LLD				<LLD	<LLD
06/27/2011			<LLD					
06/28/2011							<LLD	<LLD
07/08/2011							<LLD	<LLD
07/15/2011							<LLD	<LLD
07/22/2011							<LLD	<LLD
07/25/2011	<LLD	<LLD	<LLD				<LLD	<LLD
07/29/2011				<LLD	1.25E-6	<LLD		
08/01/2011				<LLD	1.21E-6	<LLD	<LLD	<LLD

(Note: Wells MW-22 through MW 27 are multi-port wells installed in the Fall of 2009, with three sample points placed at different depths. S= Shallow M= Middle D= Deep.)

(Note: A "\*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2011 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)  
Lower Limit of Detection = LLD

MW-22D through MW-25M continued

Date	MW-22D	MW-22M	MW-22S	MW-24D	MW-24M	MW-24S	MW-25D	MW-25M
08/09/2011							<LLD	<LLD
08/17/2011							<LLD	<LLD
08/25/2011	<LLD	<LLD	<LLD	<LLD	1.23E-6	<LLD	<LLD	<LLD
08/30/2011							8.61E-7	<LLD
09/16/2011							<LLD	<LLD
09/25/2011							9.72E-7	<LLD
09/29/2011	<LLD	<LLD	<LLD	1.16E-6	<LLD	<LLD		
10/01/2011							1.03E-6	<LLD
10/05/2011							1.11E-6	<LLD
10/09/2011							1.29E-6	<LLD
10/15/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD		
10/21/2011							1.27E-6	<LLD
10/23/2011							1.19E-6	<LLD
11/04/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	9.92E-7	<LLD
11/09/2011							1.28E-6	<LLD
11/11/2011							9.63E-7	<LLD
11/14/2011							<LLD	<LLD
11/18/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	9.61E-7	<LLD
11/21/2011							9.04E-7	<LLD
11/23/2011							<LLD	<LLD
12/02/2011							9.24E-7	<LLD
12/05/2011							<LLD	<LLD
12/15/2011							1.14E-6	<LLD
12/20/2011							1.43E-6	<LLD
12/27/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	1.18E-6	<LLD

(Note: Wells MW-22 through MW 27 are multi-port wells installed in the Fall of 2009, with three sample points placed at different depths. S= Shallow M= Middle D= Deep.)

(Note: A "\*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2011 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)  
Lower Limit of Detection = LLD

Date	MW-25S	MW-26D	MW-26M	MW-26S	MW-27D	MW-27M	MW-27S
01/04/2011					1.03E-6	9.94E-7	1.59E-6
01/05/2011	<LLD	<LLD	<LLD	8.63E-7			
01/06/2011					1.59E-6	8.55E-7	1.17E-6
01/10/2011		<LLD	<LLD	<LLD	9.98E-7	1.18E-6	1.23E-6
01/13/2011	<LLD				1.32E-6	1.04E-6	1.74E-6
01/17/2011	1.51E-6				1.75E-6	1.37E-6	1.46E-6
01/19/2011		1.23E-6	<LLD	8.57E-7	1.55E-6	1.09E-6	1.59E-6
02/07/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
02/24/2011	<LLD	<LLD	<LLD	<LLD	1.28E-6	<LLD	<LLD
03/22/2011	<LLD	1.11E-6	<LLD	<LLD	1.49E-6	<LLD	<LLD
04/04/2011	<LLD	1.57E-6	<LLD	<LLD	<LLD	<LLD	<LLD
05/12/2011	<LLD	1.99E-6	<LLD	<LLD	<LLD	<LLD	<LLD
05/16/2011		1.90E-6 *					
05/20/2011	<LLD		<LLD	<LLD	<LLD	<LLD	<LLD
05/23/2011	<LLD	1.44E-6	<LLD	<LLD	<LLD	<LLD	<LLD
06/09/2011	<LLD	1.15E-6	<LLD	<LLD	<LLD	<LLD	<LLD
06/16/2011	<LLD	1.46E-6	<LLD	<LLD	<LLD	<LLD	<LLD
06/24/2011	<LLD	1.38E-6	<LLD	<LLD	<LLD	<LLD	<LLD
06/28/2011	<LLD	1.62E-6	<LLD	<LLD	<LLD	<LLD	<LLD
07/08/2011	<LLD	1.58E-6	<LLD	<LLD	<LLD	<LLD	<LLD
07/15/2011	<LLD	1.57E-6	<LLD	<LLD	<LLD	<LLD	<LLD
07/22/2011	<LLD	1.52E-6	<LLD	<LLD	<LLD	<LLD	<LLD
07/25/2011	<LLD	1.40E-6	<LLD	<LLD	<LLD	<LLD	<LLD
08/01/2011	<LLD	1.12E-6	<LLD	<LLD	<LLD	<LLD	<LLD
08/09/2011	8.95E-7	1.23E-6	<LLD	<LLD	<LLD	<LLD	<LLD
08/17/2011	<LLD	8.73E-7	<LLD	<LLD	<LLD	<LLD	<LLD
08/25/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
08/30/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
09/16/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
09/26/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
10/01/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
10/05/2011	<LLD	<LLD	9.64E-7	<LLD	<LLD	<LLD	<LLD
10/09/2011	<LLD	<LLD	1.20E-6	<LLD	<LLD	<LLD	<LLD
10/21/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
10/23/2011	<LLD	<LLD	1.32E-6	<LLD	<LLD	<LLD	<LLD

(Note: Wells MW-22 through MW 27 are multi-port wells installed in the Fall of 2009, with three sample points placed at different depths. S= Shallow M= Middle D= Deep.)

(Note: A "\*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2011 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)  
Lower Limit of Detection = LLD

MW-25S through MW-27S continued

Date	MW-25S	MW-26D	MW-26M	MW-26S	MW-27D	MW-27M	MW-27S
11/04/2011	<LLD	8.64E-7	2.41E-6	<LLD	<LLD	<LLD	<LLD
11/09/2011	<LLD	<LLD	3.11E-6*	<LLD			
11/11/2011	<LLD		3.61E-6	<LLD		<LLD	<LLD
11/12/2011		<LLD			<LLD		
11/14/2011	<LLD	<LLD	3.54E-6	<LLD	<LLD	<LLD	<LLD
11/18/2011	<LLD	<LLD	3.46E-6	<LLD			
11/19/2011					<LLD	<LLD	<LLD
11/21/2011	<LLD	<LLD	2.91E-6	<LLD	<LLD	<LLD	<LLD
11/23/2011	<LLD	<LLD	3.11E-6	<LLD	<LLD	<LLD	<LLD
12/02/2011	<LLD	<LLD	1.77E-6	<LLD	<LLD	<LLD	<LLD
12/05/2011	<LLD	<LLD	1.44E-6	<LLD			
12/09/2011					<LLD	<LLD	<LLD
12/15/2011	<LLD	<LLD	1.06E-6	<LLD	<LLD	<LLD	<LLD
12/20/2011	<LLD	<LLD	8.75E-7	<LLD	<LLD	<LLD	<LLD
12/27/2011	<LLD	<LLD	8.89E-7	<LLD	<LLD	<LLD	<LLD

(Note: Wells MW-22 through MW 27 are multi-port wells installed in the Fall of 2009, with three sample points placed at different depths. S= Shallow M= Middle D= Deep.)

(Note: A "\*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2011 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)  
Lower Limit of Detection = LLD

Date	MW-23S	MW-23D	MW-23M
06/23/2011	<LLD	<LLD	<LLD

(Note: Wells MW-22 through MW 27 are multi-port wells installed in the Fall of 2009, with three sample points placed at different depths. S= Shallow M= Middle D= Deep.)

(Note: A "\*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2011 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)  
Lower Limit of Detection = LLD

Date	W-9	W-10	W-11	W-12	W-13	W-14	W-15	OW-1
01/06/2011					<LLD	1.77E-6	<LLD	
01/11/2011							<LLD	
01/13/2011						2.02E-6		
01/17/2011						1.56E-6		
01/21/2011			9.62E-7	<LLD	<LLD			
01/24/2011			3.26E-6	1.76E-6				
01/25/2011					<LLD	<LLD	<LLD	
01/27/2011			1.20E-6	<LLD	<LLD	1.18E-6		
02/01/2011		<LLD	<LLD	<LLD	<LLD	1.40E-6		
02/07/2011			<LLD					
02/08/2011	<LLD			<LLD	<LLD	<LLD	<LLD	
02/10/2011			<LLD	<LLD	<LLD			
02/14/2011			<LLD	<LLD	<LLD	<LLD		
02/17/2011			<LLD	<LLD	<LLD			
02/21/2011			<LLD	<LLD	<LLD	<LLD	<LLD	
03/04/2011			<LLD	<LLD	<LLD			
03/05/2011						<LLD		
03/08/2011							<LLD	
03/09/2011			<LLD	<LLD	<LLD	<LLD		
03/15/2011			<LLD	<LLD	<LLD	<LLD		
03/22/2011							<LLD	
03/28/2011							<LLD	
04/04/2011							<LLD	
04/07/2011					<LLD	<LLD		
04/08/2011			<LLD	<LLD				
04/11/2011							<LLD	
04/18/2011							<LLD	
04/29/2011							<LLD	
05/04/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD		
05/05/2011							<LLD	
05/12/2011							<LLD	
06/20/2011							<LLD	
06/27/2011			<LLD	<LLD				
06/29/2011					<LLD	<LLD		
07/25/2011			<LLD	<LLD				
07/26/2011					<LLD	<LLD	<LLD	
08/01/2011	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD		
08/15/2011			<LLD	<LLD	<LLD	<LLD		
09/29/2011		<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	
10/15/2011			<LLD	<LLD	<LLD	<LLD	<LLD	
11/01/2011					<LLD	<LLD		

(Note: A "\*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2011 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)  
Lower Limit of Detection = LLD

W-9 through OW-1 continued

Date	W-9	W-10	W-11	W-12	W-13	W-14	W-15	OW-1
11/02/2011	<LLD	<LLD	<LLD	<LLD			<LLD	
11/18/2011			<LLD		<LLD	<LLD	<LLD	
12/27/2011					<LLD	<LLD		
12/28/2011							<LLD	
12/30/2011			<LLD					

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)  
Lower Limit of Detection = LLD

Date	W-1	W-2	W-3	W-4	W-5	W-6	W-7	W-8
02/01/2011		1.10E-6					<LLD	
02/04/2011					<LLD			<LLD
02/08/2011	<LLD			<LLD	<LLD	<LLD		
05/03/2011		<LLD	<LLD					<LLD
05/04/2011	<LLD						<LLD	
05/06/2011				9.55E-7	<LLD	1.1E-6		
08/01/2011	<LLD						<LLD	
08/02/2011		<LLD	<LLD					<LLD
08/03/2011				1.33E-6	1.17E-6	8.91E-7		
11/01/2011	<LLD		<LLD				<LLD	
11/02/2011		<LLD						<LLD
11/03/2011				9.42E-7	<LLD			
11/05/2011						<LLD		

(Note: A "\*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2011 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)  
Lower Limit of Detection = LLD

Date	SG-1	SG-2	SG-4	SG-5	OW-4	MW-20	MW-21	95-11A
01/17/2011							<LLD	
01/24/2011						<LLD	<LLD	
01/27/2011							<LLD	
01/28/2011						<LLD		
02/01/2011	<LLD	<LLD	<LLD	<LLD		<LLD	<LLD	
02/08/2011						<LLD	<LLD	
02/11/2011						<LLD	<LLD	
02/14/2011						<LLD	<LLD	
02/17/2011						<LLD	<LLD	
02/21/2011						<LLD	<LLD	
03/04/2011						<LLD	<LLD	<LLD
03/08/2011						<LLD	<LLD	
03/14/2011								<LLD
03/15/2011						<LLD	<LLD	
04/01/2011								<LLD
04/07/2011						<LLD	<LLD	
04/11/2011								<LLD
05/03/2011	<LLD	<LLD	<LLD	<LLD				
05/04/2011						<LLD	<LLD	
06/30/2011						<LLD	<LLD	
07/25/2011						<LLD	<LLD	
08/01/2011						<LLD	<LLD	
08/02/2011	<LLD	<LLD	<LLD	<LLD				
08/15/2011						<LLD	<LLD	
09/29/2011						<LLD	<LLD	
10/28/2011	<LLD	<LLD	<LLD	<LLD			<LLD	
11/01/2011						<LLD		
11/02/2011							<LLD	
11/15/2011					<LLD			
11/18/2011	<LLD	<LLD	<LLD	<LLD		<LLD	<LLD	
11/23/2011					<LLD			
11/30/2011								<LLD
12/30/2011	<LLD	<LLD	<LLD	<LLD		<LLD	<LLD	

(Note: A "\*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

## 2011 GPI Sample Data

### Analysis of the Sample Data

The Groundwater Protection Initiative (GPI) Sample Data for 2011 indicates no groundwater contamination in excess of the reporting threshold of  $2.00\text{E-}5$  uCi/mL for tritium. Gamma spectroscopy was performed on all Radiological Environmental Monitoring Program wells quarterly. Those results are not actual GPI results so are not included here, but are part of CNP's 2011 Annual Radiological Environmental Operating Report that is submitted to the Nuclear Regulatory Commission. There were no positively identified radionuclides from plant effluents detected in any of the quarterly well samples other than the expected tritium values associated with documented plant events and recapture tritium from licensed radioactive gaseous release points.

The LLD value used for counting of the samples varied between  $8.38\text{E-}7$  and  $9.72\text{E-}7$  uCi/mL, depending on which scintillation counter was used. This is well below the required minimum LLD value of  $2.00\text{E-}6$  uCi/mL.

Values found above the LLD were not abnormal, unexpected, or inconsistent with past sampling history. The samples observed above LLD were expected results from the release of tritiated water into the Absorption Pond, a licensed pathway and part of plant design, or the result of recapture deposition of tritium from licensed radioactive gaseous release points.

Specifically, tritium results greater than LLD were the results of the 2009 release of radioactive effluent to the Absorption Pond as documented in AR 848816 and the 2009 version of this report or from the recapture of tritium from gaseous effluents. Wells MW-22, MW-24, MW-25, MW-26, MW-27, W-15, W-11, W-12, W-13 and W-14 are positioned to monitor Absorption Pond percolation. The groundwater transit of the tritium from the Absorption Pond mirrors the expected travel predicted by hydrogeologic studies. Wells W-2, W-4, W-5, and W-6 results continue to reflect the recapture of tritium from legally released gaseous effluents and are closely monitored for changes indicating some other condition. Wells located inside the Protected Area of the plant are subject to recapture deposition of tritium and show occasional sample results above LLD values following rainfalls and snow melt.

The sample data indicates that no radioactive spills or unidentified leaks have occurred in 2011 impacting groundwater. The sample results indicate proper well placement to ensure the protection of the groundwater and early identification of any abnormal conditions involving groundwater. This is validated by the demonstrated ability to monitor percolation from the Absorption Pond, with flow direction and behavior acting as described in the plant licensing documents.

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1/1/11 - 3/31/11  
STABILITY CLASS: A DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	1	32	24	0	0	0	57
NNE	1	18	6	0	0	0	25
NE	1	12	7	3	0	0	23
ENE	1	16	3	0	0	0	20
E	0	11	1	0	0	0	12
ESE	1	11	3	0	0	0	15
SE	0	14	12	0	0	0	26
SSE	2	30	5	0	0	0	37
S	1	9	12	2	0	0	24
SSW	0	2	4	0	0	0	6
SW	0	24	21	1	0	0	46
WSW	1	8	12	0	0	0	21
W	2	10	1	0	0	0	13
WNW	1	8	0	0	0	0	9
NW	0	13	0	0	0	0	13
NNW	0	61	20	0	0	0	81
TOTAL	12	279	131	6	0	0	428

---

PERIODS OF CALM(HOURS): 0  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 90

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1/1/11 - 3/31/11  
STABILITY CLASS: B DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	1	16	13	0	0	0	30
NNE	0	6	0	0	0	0	6
NE	2	3	2	0	0	0	7
ENE	1	9	5	0	0	0	15
E	1	7	2	0	0	0	10
ESE	1	2	1	0	0	0	4
SE	2	4	1	0	0	0	7
SSE	2	14	1	0	0	0	17
S	2	5	4	1	0	0	12
SSW	0	3	1	1	0	0	5
SW	0	2	6	0	0	0	8
WSW	2	4	3	0	0	0	9
W	1	1	3	0	0	0	5
WNW	0	3	2	0	0	0	5
NW	0	7	0	0	0	0	7
NNW	2	6	5	0	0	0	13
TOTAL	17	92	49	2	0	0	160

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PERIODS OF CALM(HOURS): 0  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 90

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1/1/11 - 3/31/11  
STABILITY CLASS: C DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	4	29	4	0	0	0	37
NNE	4	8	0	0	0	0	12
NE	6	5	1	0	0	0	12
ENE	2	8	3	0	0	0	13
E	2	6	4	0	0	0	12
ESE	2	6	1	0	0	0	9
SE	3	5	2	0	0	0	10
SSE	4	7	0	0	0	0	11
S	1	22	3	2	0	0	28
SSW	1	11	3	1	0	0	16
SW	2	11	3	0	0	0	16
WSW	0	9	13	1	0	0	23
W	0	11	3	0	0	0	14
WNW	2	7	1	0	0	0	10
NW	2	17	0	0	0	0	19
NNW	1	8	2	0	0	0	11
TOTAL	36	170	43	4	0	0	253

---

PERIODS OF CALM(HOURS): 0  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 90

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1/1/11 - 3/31/11  
STABILITY CLASS: D DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	12	56	7	0	0	0	75
NNE	17	20	1	0	0	0	38
NE	15	17	2	0	0	0	34
ENE	9	32	6	0	0	0	47
E	12	26	14	0	0	0	52
ESE	5	33	11	0	0	0	49
SE	9	34	22	0	0	0	65
SSE	15	24	5	0	0	0	44
S	6	65	26	6	0	0	103
SSW	1	35	25	3	0	0	64
SW	3	28	25	3	0	0	59
WSW	2	15	16	0	0	0	33
W	8	31	9	0	0	0	48
WNW	4	37	14	0	0	0	55
NW	11	53	6	0	0	0	70
NNW	9	31	13	0	0	0	53
TOTAL	138	537	202	12	0	0	889

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PERIODS OF CALM(HOURS): 0  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 90

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1/1/11 - 3/31/11  
STABILITY CLASS: E DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	9	2	0	0	0	0	11
NNE	14	0	0	0	0	0	14
NE	17	9	0	0	0	0	26
ENE	21	6	0	0	0	0	27
E	10	11	0	0	0	0	21
ESE	7	4	0	0	0	0	11
SE	13	16	0	0	0	0	29
SSE	4	8	0	0	0	0	12
S	5	23	13	2	0	0	43
SSW	0	3	1	2	0	0	6
SW	0	3	3	0	0	0	6
WSW	0	0	3	0	0	0	3
W	0	2	1	0	0	0	3
WNW	2	8	0	0	0	0	10
NW	1	3	0	0	0	0	4
NNW	2	3	3	0	0	0	8
TOTAL	105	101	24	4	0	0	234

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PERIODS OF CALM(HOURS): 0  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 90

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1/1/11 - 3/31/11  
STABILITY CLASS: F DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	0	0	0	0	0	0	0
NNE	2	0	0	0	0	0	2
NE	5	0	0	0	0	0	5
ENE	2	2	0	0	0	0	4
E	5	2	0	0	0	0	7
ESE	11	0	0	0	0	0	11
SE	6	0	0	0	0	0	6
SSE	9	4	0	0	0	0	13
S	5	6	0	0	0	0	11
SSW	0	1	0	0	0	0	1
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	2	0	0	0	0	0	2
WNW	2	0	0	0	0	0	2
NW	0	0	0	0	0	0	0
NNW	5	0	2	0	0	0	7
TOTAL	54	15	2	0	0	0	71

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PERIODS OF CALM(HOURS): 0  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 90

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1/1/11 - 3/31/11  
STABILITY CLASS: G DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	0	0	0	0	0	0	0
NNE	2	0	0	0	0	0	2
NE	0	0	0	0	0	0	0
ENE	2	0	0	0	0	0	2
E	4	0	0	0	0	0	4
ESE	6	0	0	0	0	0	6
SE	9	0	0	0	0	0	9
SSE	4	0	0	0	0	0	4
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	4	0	0	0	0	0	4
WNW	1	0	0	0	0	0	1
NW	1	0	0	0	0	0	1
NNW	1	0	0	0	0	0	1
TOTAL	34	0	0	0	0	0	34

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PERIODS OF CALM(HOURS): 0  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 90

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1/1/11 - 3/31/11  
STABILITY CLASS: All DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	27	135	48	0	0	0	210
NNE	40	52	7	0	0	0	99
NE	46	46	12	3	0	0	107
ENE	38	73	17	0	0	0	128
E	34	63	21	0	0	0	118
ESE	33	56	16	0	0	0	105
SE	42	73	37	0	0	0	152
SSE	40	87	11	0	0	0	138
S	20	130	58	13	0	0	221
SSW	2	55	34	7	0	0	98
SW	5	68	58	4	0	0	135
WSW	5	36	47	1	0	0	89
W	17	55	17	0	0	0	89
WNW	12	63	17	0	0	0	92
NW	15	93	6	0	0	0	114
NNW	20	109	45	0	0	0	174
TOTAL	396	1194	451	28	0	0	2069

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PERIODS OF CALM(HOURS): 0  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 90

Hours are not adjusted for Daylight Savings Time

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 4/1/11 - 6/30/11  
STABILITY CLASS: A DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	6	33	4	0	0	0	43
NNE	4	4	0	0	0	0	8
NE	1	6	3	0	0	0	10
ENE	3	16	3	0	0	0	22
E	2	7	4	3	0	0	16
ESE	2	17	4	0	0	0	23
SE	1	29	9	3	0	0	42
SSE	2	25	7	0	0	0	34
S	3	10	17	4	1	0	35
SSW	1	7	14	0	0	0	22
SW	1	25	30	0	0	0	56
WSW	1	38	23	1	0	0	63
W	8	24	2	0	0	0	34
WNW	1	21	4	0	0	0	26
NW	9	29	0	0	0	0	38
NNW	23	77	9	0	0	0	109
TOTAL	68	368	133	11	1	0	581

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PERIODS OF CALM(HOURS): 4  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 78

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 4/1/11 - 6/30/11  
STABILITY CLASS: B DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	3	2	0	0	0	0	5
NNE	2	0	0	0	0	0	2
NE	2	0	1	0	0	0	3
ENE	1	2	0	1	0	0	4
E	0	2	2	0	0	0	4
ESE	0	1	1	0	0	0	2
SE	1	4	1	0	0	0	6
SSE	3	2	0	0	0	0	5
S	0	5	7	0	1	0	13
SSW	0	5	2	0	0	0	7
SW	0	7	2	0	0	0	9
WSW	2	1	2	0	0	0	5
W	3	4	1	0	0	0	8
WNW	3	4	0	0	0	0	7
NW	1	6	0	0	0	0	7
NNW	2	8	0	0	0	0	10
TOTAL	23	53	19	1	1	0	97

PERIODS OF CALM(HOURS): 4  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 78

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 4/1/11 - 6/30/11  
STABILITY CLASS: C DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	1	8	0	0	0	0	9
NNE	4	4	0	0	0	0	8
NE	2	3	0	0	0	0	5
ENE	1	3	0	0	0	0	4
E	0	2	1	0	0	0	3
ESE	0	5	0	0	0	0	5
SE	1	6	4	1	0	0	12
SSE	1	1	0	0	0	0	2
S	0	0	3	0	0	0	3
SSW	0	1	3	0	0	0	4
SW	1	4	1	0	0	0	6
WSW	0	5	2	0	0	0	7
W	2	2	2	0	0	0	6
WNW	3	3	1	0	0	0	7
NW	4	0	0	0	0	0	4
NNW	3	7	0	0	0	0	10
TOTAL	23	54	17	1	0	0	95

---

PERIODS OF CALM(HOURS): 4  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 78

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 4/1/11 - 6/30/11  
STABILITY CLASS: D DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	26	40	3	0	0	0	69
NNE	15	14	1	0	0	0	30
NE	12	6	2	0	0	0	20
ENE	2	8	5	2	0	0	17
E	4	20	15	2	0	0	41
ESE	4	26	15	0	0	0	45
SE	10	41	11	0	0	0	62
SSE	7	14	2	0	0	0	23
S	5	24	12	3	0	0	44
SSW	4	17	15	5	0	0	41
SW	6	14	12	0	0	0	32
WSW	9	18	11	0	0	0	38
W	6	13	13	0	0	0	32
WNW	10	11	1	0	0	0	22
NW	12	12	1	0	0	0	25
NNW	21	25	4	0	0	0	50
TOTAL	153	303	123	12	0	0	591

---

PERIODS OF CALM(HOURS): 4  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 78

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 4/1/11 - 6/30/11  
STABILITY CLASS: E DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	16	31	0	0	0	0	47
NNE	10	10	1	0	0	0	21
NE	12	8	0	0	0	0	20
ENE	14	11	4	0	0	0	29
E	19	14	4	2	0	0	39
ESE	19	21	3	0	0	0	43
SE	12	23	3	0	0	0	38
SSE	11	20	4	0	0	0	35
S	5	31	6	2	0	0	44
SSW	2	16	6	1	0	0	25
SW	6	13	5	2	0	0	26
WSW	2	13	3	0	0	0	18
W	4	11	1	0	0	0	16
WNW	5	5	0	0	0	0	10
NW	3	0	0	0	0	0	3
NNW	10	2	0	0	0	0	12
TOTAL	150	229	40	7	0	0	426

---

PERIODS OF CALM(HOURS): 4  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 78

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 4/1/11 - 6/30/11  
STABILITY CLASS: F DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	7	1	0	0	0	0	8
NNE	9	0	0	0	0	0	9
NE	14	2	0	0	0	0	16
ENE	8	0	0	0	0	0	8
E	10	3	0	0	0	0	13
ESE	19	0	0	0	0	0	19
SE	13	3	0	0	0	0	16
SSE	10	1	0	0	0	0	11
S	8	8	2	0	0	0	18
SSW	3	0	0	0	0	0	3
SW	4	1	0	0	0	0	5
WSW	2	0	0	0	0	0	2
W	2	1	0	0	0	0	3
WNW	2	1	0	0	0	0	3
NW	5	0	0	0	0	0	5
NNW	8	0	0	0	0	0	8
TOTAL	124	21	2	0	0	0	147

---

PERIODS OF CALM(HOURS): 4  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 78

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 4/1/11 - 6/30/11  
STABILITY CLASS: G DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	1	0	0	0	0	0	1
NNE	6	0	0	0	0	0	6
NE	9	1	0	0	0	0	10
ENE	24	1	0	0	0	0	25
E	25	1	0	0	0	0	26
ESE	10	0	0	0	0	0	10
SE	20	2	1	0	0	0	23
SSE	26	1	0	0	0	0	27
S	8	1	0	0	0	0	9
SSW	5	0	0	0	0	0	5
SW	3	0	0	0	0	0	3
WSW	3	0	0	0	0	0	3
W	3	0	0	0	0	0	3
WNW	5	0	0	0	0	0	5
NW	5	0	0	0	0	0	5
NNW	4	0	0	0	0	0	4
TOTAL	157	7	1	0	0	0	165

---

PERIODS OF CALM(HOURS): 4  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 78

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 4/1/11 - 6/30/11  
STABILITY CLASS: ALL DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	60	115	7	0	0	0	182
NNE	50	32	2	0	0	0	84
NE	52	26	6	0	0	0	84
ENE	53	41	12	3	0	0	109
E	60	49	26	7	0	0	142
ESE	54	70	23	0	0	0	147
SE	58	108	29	4	0	0	199
SSE	60	64	13	0	0	0	137
S	29	79	47	9	2	0	166
SSW	15	46	40	6	0	0	107
SW	21	64	50	2	0	0	137
WSW	19	75	41	1	0	0	136
W	28	55	19	0	0	0	102
WNW	29	45	6	0	0	0	80
NW	39	47	1	0	0	0	87
NNW	71	119	13	0	0	0	203
TOTAL	698	1035	335	32	2	0	2102

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PERIODS OF CALM(HOURS): 4  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 78

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 7/1/11 - 9/30/11  
STABILITY CLASS: A DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	33	85	1	0	0	0	119
NNE	5	8	0	0	0	0	13
NE	2	4	0	0	0	0	6
ENE	3	3	0	0	0	0	6
E	6	5	0	0	0	0	11
ESE	11	10	0	0	0	0	21
SE	10	13	0	0	0	0	23
SSE	3	9	0	0	0	0	12
S	6	28	8	1	0	0	43
SSW	2	39	9	0	0	0	50
SW	5	56	18	0	0	0	79
WSW	4	22	2	0	0	0	28
W	16	25	0	0	0	0	41
WNW	26	15	1	0	0	0	42
NW	30	14	0	0	0	0	44
NNW	66	61	1	0	0	0	128
TOTAL	228	397	40	1	0	0	666

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PERIODS OF CALM(HOURS): 9  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 5

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 7/1/11 - 9/30/11  
STABILITY CLASS: B DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	3	4	4	0	0	0	11
NNE	1	3	0	0	0	0	4
NE	1	0	0	0	0	0	1
ENE	2	1	0	0	0	0	3
E	3	1	0	0	0	0	4
ESE	1	0	0	0	0	0	1
SE	1	2	0	0	0	0	3
SSE	1	1	0	0	0	0	2
S	2	2	0	0	0	0	4
SSW	3	4	2	0	0	0	9
SW	2	7	0	0	0	0	9
WSW	0	0	0	0	0	0	0
W	1	2	0	0	0	0	3
WNW	2	0	0	0	0	0	2
NW	4	0	0	0	0	0	4
NNW	4	1	0	0	0	0	5
TOTAL	31	28	6	0	0	0	65

---

PERIODS OF CALM(HOURS): 9  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 5

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 7/1/11 - 9/30/11  
STABILITY CLASS: C DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	5	4	0	0	0	0	9
NNE	4	1	0	0	0	0	5
NE	0	1	0	0	0	0	1
ENE	1	0	0	0	0	0	1
E	1	1	0	0	0	0	2
ESE	0	2	0	0	0	0	2
SE	0	1	0	0	0	0	1
SSE	1	1	0	0	0	0	2
S	1	2	1	0	0	0	4
SSW	1	3	0	0	0	0	4
SW	2	3	0	0	0	0	5
WSW	0	1	0	0	0	0	1
W	0	1	0	0	0	0	1
WNW	2	1	0	0	0	0	3
NW	3	1	0	0	0	0	4
NNW	4	0	0	0	0	0	4
TOTAL	25	23	1	0	0	0	49

---

PERIODS OF CALM(HOURS): 9  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 5

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 7/1/11 - 9/30/11  
STABILITY CLASS: D DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	21	17	13	0	0	0	51
NNE	6	4	0	0	0	0	10
NE	7	2	0	0	0	0	9
ENE	3	0	0	0	0	0	3
E	7	3	0	0	0	0	10
ESE	7	6	0	0	0	0	13
SE	6	12	0	0	0	0	18
SSE	6	3	0	0	0	0	9
S	3	10	3	0	0	0	16
SSW	3	17	9	0	0	0	29
SW	3	11	5	0	0	0	19
WSW	2	2	1	0	0	0	5
W	5	2	2	0	0	0	9
WNW	0	1	1	1	0	0	3
NW	6	0	0	0	0	0	6
NNW	19	3	0	0	0	0	22
TOTAL	104	93	34	1	0	0	232

---

PERIODS OF CALM(HOURS): 9  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 5

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 7/1/11 - 9/30/11  
STABILITY CLASS: E DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	34	14	2	0	0	0	50
NNE	37	2	0	0	0	0	39
NE	28	3	0	0	0	0	31
ENE	11	1	0	0	0	0	12
E	21	5	0	0	0	0	26
ESE	30	14	0	0	0	0	44
SE	17	1	0	0	0	0	18
SSE	18	8	0	0	0	0	26
S	18	36	1	0	0	0	55
SSW	10	25	4	0	0	0	39
SW	8	19	4	0	0	0	31
WSW	9	7	0	0	0	0	16
W	9	12	0	0	0	0	21
WNW	12	2	0	0	0	0	14
NW	7	4	1	0	0	0	12
NNW	14	12	3	0	0	0	29
TOTAL	283	165	15	0	0	0	463

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PERIODS OF CALM(HOURS): 9  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 5

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 7/1/11 - 9/30/11  
STABILITY CLASS: F DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	7	3	0	0	0	0	10
NNE	18	0	0	0	0	0	18
NE	19	0	0	0	0	0	19
ENE	30	0	0	0	0	0	30
E	38	0	0	0	0	0	38
ESE	23	1	0	0	0	0	24
SE	24	0	0	0	0	0	24
SSE	32	2	0	0	0	0	34
S	30	7	0	0	0	0	37
SSW	15	6	0	0	0	0	21
SW	11	3	0	0	0	0	14
WSW	6	0	0	0	0	0	6
W	11	0	0	0	0	0	11
WNW	8	0	0	0	0	0	8
NW	4	0	0	0	0	0	4
NNW	7	0	0	0	0	0	7
TOTAL	283	22	0	0	0	0	305

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PERIODS OF CALM(HOURS): 9  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 5

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 7/1/11 - 9/30/11  
STABILITY CLASS: G DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	3	0	0	0	0	0	3
NNE	6	0	0	0	0	0	6
NE	31	0	0	0	0	0	31
ENE	32	0	0	0	0	0	32
E	40	0	0	0	0	0	40
ESE	36	0	0	0	0	0	36
SE	62	0	0	0	0	0	62
SSE	74	0	0	0	0	0	74
S	53	1	0	0	0	0	54
SSW	35	1	0	0	0	0	36
SW	8	0	0	0	0	0	8
WSW	7	0	0	0	0	0	7
W	3	0	0	0	0	0	3
WNW	8	0	0	0	0	0	8
NW	7	0	0	0	0	0	7
NNW	7	0	0	0	0	0	7
TOTAL	412	2	0	0	0	0	414

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PERIODS OF CALM(HOURS): 9  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 5

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 7/1/11 - 9/30/11  
STABILITY CLASS: ALL DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	106	127	20	0	0	0	253
NNE	77	18	0	0	0	0	95
NE	88	10	0	0	0	0	98
ENE	82	5	0	0	0	0	87
E	116	15	0	0	0	0	131
ESE	108	33	0	0	0	0	141
SE	120	29	0	0	0	0	149
SSE	135	24	0	0	0	0	159
S	113	86	13	1	0	0	213
SSW	69	95	24	0	0	0	188
SW	39	99	27	0	0	0	165
WSW	28	32	3	0	0	0	63
W	45	42	2	0	0	0	89
WNW	58	19	2	1	0	0	80
NW	61	19	1	0	0	0	81
NNW	121	77	4	0	0	0	202
TOTAL	1366	730	96	2	0	0	2194

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PERIODS OF CALM(HOURS): 9  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 5

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 10/1/11 - 12/31/11  
STABILITY CLASS: A DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	3	20	0	0	0	0	23
NNE	0	5	0	0	0	0	5
NE	1	5	0	0	0	0	6
ENE	0	5	0	0	0	0	5
E	0	9	0	0	0	0	9
ESE	0	2	0	0	0	0	2
SE	1	8	0	0	0	0	9
SSE	1	23	7	0	0	0	31
S	1	20	27	7	1	0	56
SSW	0	6	9	2	0	0	17
SW	2	17	6	0	0	0	25
WSW	2	18	14	0	0	0	34
W	4	14	12	0	0	0	30
WNW	2	12	3	0	0	0	17
NW	4	15	1	0	0	0	20
NNW	7	13	0	0	0	0	20
TOTAL	28	192	79	9	1	0	309

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PERIODS OF CALM(HOURS): 1  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 0

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 10/1/11 - 12/31/11  
STABILITY CLASS: B DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	1	1	0	0	0	0	2
NNE	2	3	0	0	0	0	5
NE	0	2	0	0	0	0	2
ENE	0	0	0	0	0	0	0
E	0	1	0	0	0	0	1
ESE	0	2	0	0	0	0	2
SE	1	2	0	0	0	0	3
SSE	1	5	1	0	0	0	7
S	2	4	12	6	0	0	24
SSW	0	2	2	0	0	0	4
SW	0	4	1	0	0	0	5
WSW	0	5	1	0	0	0	6
W	1	0	4	1	0	0	6
WNW	0	1	2	0	0	0	3
NW	0	2	0	0	0	0	2
NNW	3	2	0	0	0	0	5
TOTAL	11	36	23	7	0	0	77

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PERIODS OF CALM(HOURS): 1  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 0

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 10/1/11 - 12/31/11  
STABILITY CLASS: C DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

---

WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	0	7	1	0	0	0	8
NNE	2	2	0	0	0	0	4
NE	1	5	1	0	0	0	7
ENE	0	2	0	0	0	0	2
E	0	2	0	0	0	0	2
ESE	1	1	0	0	0	0	2
SE	3	2	0	0	0	0	5
SSE	1	6	0	0	0	0	7
S	1	4	8	2	0	0	15
SSW	0	3	1	2	0	0	6
SW	1	3	0	0	0	0	4
WSW	0	2	2	0	0	0	4
W	0	3	6	0	0	0	9
WNW	0	4	0	0	0	0	4
NW	2	1	0	0	0	0	3
NNW	1	2	1	0	0	0	4
TOTAL	13	49	20	4	0	0	86

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PERIODS OF CALM(HOURS): 1  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 0

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 10/1/11 - 12/31/11  
STABILITY CLASS: D DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-4	4-8	8-13	13-19	19-25	>25	
N	14	48	28	0	0	0	90
NNE	14	59	4	0	0	0	77
NE	19	28	2	0	0	0	49
ENE	7	9	2	0	0	0	18
E	6	14	2	0	0	0	22
ESE	7	8	0	0	0	0	15
SE	10	11	5	0	0	0	26
SSE	7	29	17	0	0	0	53
S	5	57	72	33	0	0	167
SSW	6	35	45	6	0	0	92
SW	4	12	18	2	0	0	36
WSW	2	15	28	1	0	0	46
W	3	38	25	0	0	0	66
WNW	9	41	31	1	0	0	82
NW	8	37	12	0	0	0	57
NNW	18	61	16	2	0	0	97
TOTAL	139	502	307	45	0	0	993

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PERIODS OF CALM(HOURS): 1  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 0

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 10/1/11 - 12/31/11  
STABILITY CLASS: E DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	7	5	16	3	0	0	31
NNE	8	3	2	0	0	0	13
NE	9	3	0	0	0	0	12
ENE	6	3	0	0	0	0	9
E	13	6	0	0	0	0	19
ESE	4	2	0	0	0	0	6
SE	14	14	4	0	0	0	32
SSE	26	44	5	0	0	0	75
S	14	71	31	3	0	0	119
SSW	8	8	9	0	0	0	25
SW	4	8	3	0	0	0	15
WSW	2	4	6	0	0	0	12
W	2	7	1	0	0	0	10
WNW	1	5	1	0	0	0	7
NW	1	4	2	0	0	0	7
NNW	2	16	12	0	0	0	30
TOTAL	121	203	92	6	0	0	422

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PERIODS OF CALM(HOURS): 1  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 0

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 10/1/11 - 12/31/11  
STABILITY CLASS: F DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	4	0	0	0	0	0	4
NNE	3	0	0	0	0	0	3
NE	7	0	0	0	0	0	7
ENE	7	1	0	0	0	0	8
E	10	0	0	0	0	0	10
ESE	15	0	0	0	0	0	15
SE	17	3	0	0	0	0	20
SSE	33	8	0	0	0	0	41
S	8	8	0	0	0	0	16
SSW	1	2	0	0	0	0	3
SW	1	0	0	0	0	0	1
WSW	1	0	0	0	0	0	1
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	1	0	0	0	0	0	1
NNW	1	0	0	0	0	0	1
TOTAL	109	22	0	0	0	0	131

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PERIODS OF CALM(HOURS): 1  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 0

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 10/1/11 - 12/31/11  
STABILITY CLASS: G DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	1	0	0	0	0	0	1
NNE	5	0	0	0	0	0	5
NE	13	0	0	0	0	0	13
ENE	33	0	0	0	0	0	33
E	21	0	0	0	0	0	21
ESE	19	0	0	0	0	0	19
SE	41	0	0	0	0	0	41
SSE	32	0	0	0	0	0	32
S	14	4	0	0	0	0	18
SSW	1	0	0	0	0	0	1
SW	1	0	0	0	0	0	1
WSW	1	0	0	0	0	0	1
W	2	0	0	0	0	0	2
WNW	0	0	0	0	0	0	0
NW	1	0	0	0	0	0	1
NNW	0	0	0	0	0	0	0
TOTAL	185	4	0	0	0	0	189

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PERIODS OF CALM(HOURS): 1  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 0

SITE: AEP COOK

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 10/1/11 - 12/31/11  
STABILITY CLASS: ALL DT/DZ  
ELEVATION: SPEED:SP10M DIRECTION:DIR10M LAPSE:DT60M

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WIND SPEED (MPH)

WIND DIRECTION	1-4	4-8	8-13	13-19	19-25	>25	TOTAL
N	30	81	45	3	0	0	159
NNE	34	72	6	0	0	0	112
NE	50	43	3	0	0	0	96
ENE	53	20	2	0	0	0	75
E	50	32	2	0	0	0	84
ESE	46	15	0	0	0	0	61
SE	87	40	9	0	0	0	136
SSE	101	115	30	0	0	0	246
S	45	168	150	51	1	0	415
SSW	16	56	66	10	0	0	148
SW	13	44	28	2	0	0	87
WSW	8	44	51	1	0	0	104
W	12	62	48	1	0	0	123
WNW	12	63	37	1	0	0	113
NW	17	59	15	0	0	0	91
NNW	32	94	29	2	0	0	157
TOTAL	606	1008	521	71	1	0	2207

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PERIODS OF CALM(HOURS): 1  
VARIABLE DIRECTION: 0  
HOURS OF MISSING DATA: 0

Hours are not adjusted for Daylight Savings Time

OFF-SITE DOSE CALCULATION MANUAL CHANGES

The Off-Site Dose Calculation Manual, PMP-6010-OSD-001, was not revised during this reporting period.