INDIANA MICHIGAN POWER
An AEP Company
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Indiana Michigan Power
Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106
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April 30, 2023

AEP-NRC-2023-19
10 CFR 50.36(a)

Docket Nos.: 50-315
50-316

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Unit 1 and 2
2022 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 Units 1 and 2, is providing as the enclosure to this letter, the Annual Radioactive Effluent Release Report. This report covers the period January 1, 2022, through December 31, 2022.

This letter contains no new or modified regulatory commitments. Should you have any questions, please contact me at (269) 466-2649.

Sincerely,

Michael K. Scarpello
Regulatory Affairs Director

OAF/sjh

Enclosure: Donald C. Cook Nuclear Plant Units 1 and 2 - 2022 Annual Radioactive Effluent Release Report

c: EGLE – RMD/RPS
J. B. Giessner – NRC Region III
NRC Resident Inspector
R. M. Sistevaris – AEP Ft. Wayne,
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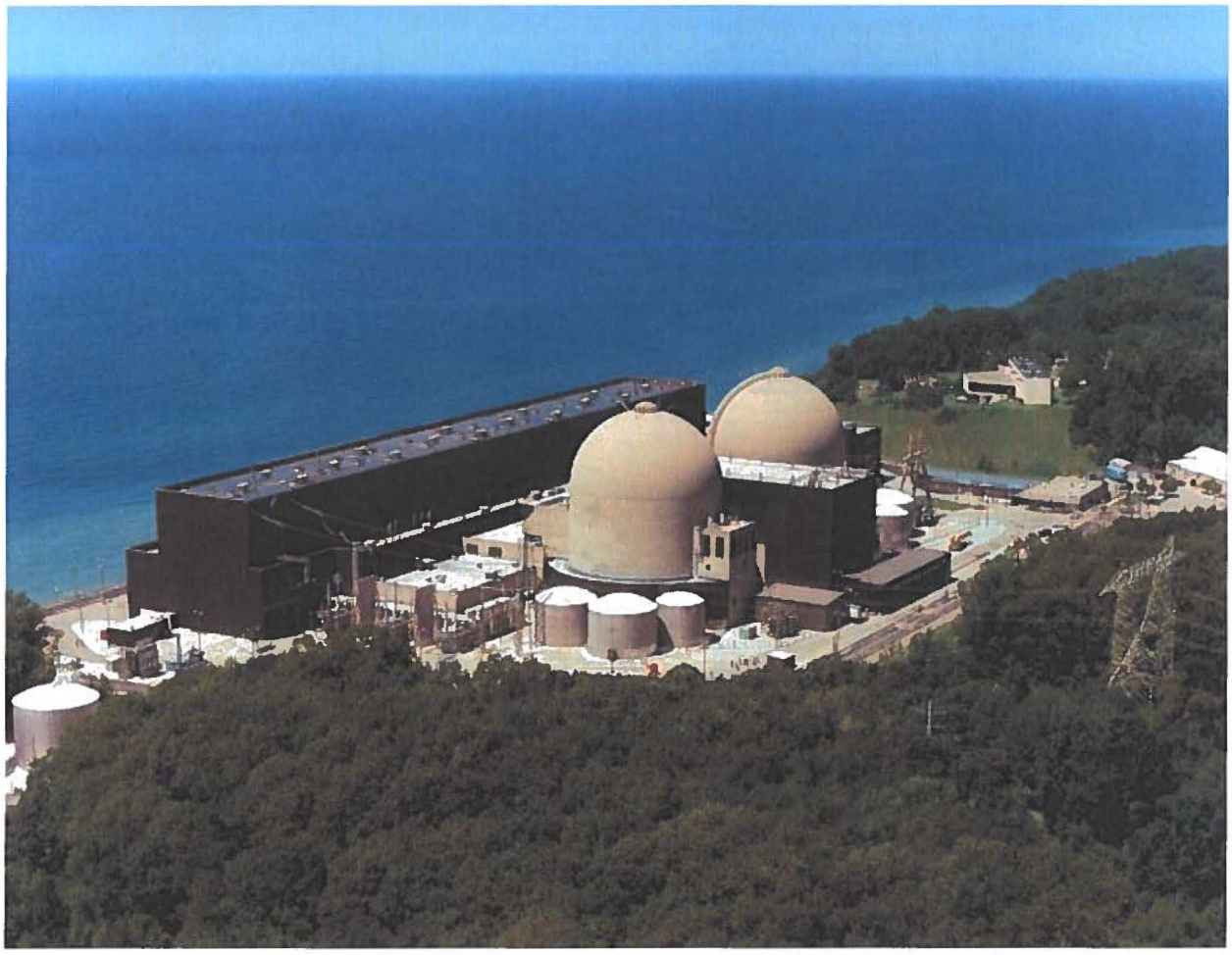
ENCLOSURE to AEP-NRC-2023-19

Donald C. Cook Nuclear Plant Units 1 and 2
2022 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

INDIANA MICHIGAN POWER

An AEP Company

COOK PLANT



Donald C. Cook Nuclear Plant Units 1 and 2

2022 Annual Radioactive Effluent Release Report

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LIST OF APPENDICES

I. INTRODUCTION

This report discusses the radioactive discharges from Unit 1 and Unit 2 of the Donald C. Cook Nuclear Plant (CNP) during 2022. This is in accordance with the requirements of CNP Technical Specification (TS) 5.6.3.

The table below summarizes the pertinent statistics concerning the Plant's operation during the period from January 1, 2022, to December 31, 2022. 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 2022.

Parameter	Unit 1	Unit 2
Gross Electrical Energy Generation (Megawatt Hour (MWH))	7,791,813	9,355,756
Unit Service Factor (Percent (%))	82.2	88.8
Unit Capacity Factor (Maximum Dependable Capacity (MDC)) Net (%)	83.1	88.6

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 normal downpower and was manually tripped on April 2, 2022, entering refueling outage U1C31. The unit attained criticality on May 22, 2022, and was manually tripped due to high vibrations on the Main turbine on May 24, 2022. The unit attained criticality on May 29, 2022 returned to NFP on June 2, 2022. The unit had an automatic reactor trip on August 28, 2022 due to a reactor coolant pump tripping off. The unit attained criticality on September 4, 2022. The unit reached NFP on September 5, 2022. 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 performed a normal downpower and was manually tripped on October 1, 2022, entering refueling outage U2C27. The unit attained criticality on November 8, 2022, and had an automatic reactor trip from high steam generator water levels. The unit attained criticality on November 11, 2022 and attained NFP on November 15, 2022. 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 (ARERR). 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 or gaseous releases in 2022. There were no spills or leaks of radioactive liquids requiring voluntary notifications per the Industry Groundwater Protection Initiative or site procedures.

The Independent Spent Fuel Storage Installation (ISFSI) impacts are included with Unit 1 and Unit 2 statistics. The ISFSI cask system does not create any radioactive materials or have any radioactive waste treatment systems. Therefore, specific operating procedures for the control of radioactive effluents are not required. Technical Specifications for the HI-Storm 100 Cask System, Specification 3.1.1, Multi-Purpose Canister (MPC), provides assurance that there are not radioactive effluents from the ISFSI.

Liquid Releases

During 2022 there were 99 liquid batch releases performed. The number of liquid batch releases for the 1st, 2nd, 3rd, and 4th quarters in 2022 were 16, 32, 32, and 19, respectively.

Estimated doses (in mrem) 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 2022 there were five batch release from Gas Decay Tanks (GDT) and 56 Containment Pressure Reliefs (CPR). During the second quarter there was one containment purge, one system tank vent, and 55 CPR. During the third quarter there were four batch releases from GDTs and 59 CPR. During the fourth quarter there was one batch release from GDTs, one containment purge, one system tank vent, and 49 CPR. The CPR continue to be listed as batch releases as described in Nuclear Regulatory Commission Inspections 50-315/89016 (DRSS); 50-316/89017 (DRSS) for CNP, dated June 13, 1989. Doses continue to be calculated utilizing continuous criteria as allowed by NUREG-0133. There was a total of ten GDT releases, two containment purges, two system tank vents, and 219 CPR gaseous batch releases made during 2022.

In calculating the dose consequences for continuous and batch gaseous releases during 2022, the meteorological data measured at the time of the release were used.

The estimated doses (in mrem) 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 22 shipments of radioactive waste made during 2022. 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 2022. Hourly meteorological data is available for review and/or inspection upon request.

IV. OFFSITE DOSE CALCULATION MANUAL (ODCM) CHANGES

The ODCM, 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 mrem to the total body or any organ (except the thyroid, which is limited to no more than 75 mrem) 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 2022 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 2022 Annual Radiological Environmental Operating Report. Additional TLD dosimetry installed by Radiation Protection department programs monitor dose received by individuals on site as visitors.

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 Carbon-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	1.19E-02	1.35E-02	2.77E-02	2.49E-02
Total Body Air	2.50E-04	4.70E-04	1.10E-03	3.70E-04
Skin	4.00E-04	7.60E-04	1.80E-03	5.90E-04
Liquid TB	2.81E-02	1.25E-02	2.33E-02	8.78E-03
Liquid Organ	2.81E-02	1.25E-02	2.33E-02	8.87E-03
Direct Radiation	0	0	0	0
Quarterly Dose Total	6.88E-02	3.97E-02	7.72E-02	4.35E-02
Sum of Quarter Doses				2.29E-01
C14 (Annual) Curies				1.84E+01
C14 (Annual) Dose				2.12E+00
Grand Total Dose (Total Body or any other Organ) mrem				2.35E+00
Annual Dose Limit (mrem)				25
Percent of limit				9.40E+00

The following data reflects a comparison with 2009 annual dose data (the last year without calculating C-14 dose), 2022 annual dose data, and 2022 annual dose data with C-14 added. This indicates that 2022 annual dose was 'typical' for a year regarding radioactive effluents. The table is presented as follows:

	Annual Dose (mrem)	% of limit
2009	2.60E-01	1.04
2022	2.29E-01	0.917
2022 with C-14	2.35E+00	9.40

VI. RADIATION MONITORS INOPERABLE GREATER THAN 30 DAYS

1-WRA-717, West Essential Service Water Rad Monitor was declared inoperable on June 21, 2022 when it failed a routine surveillance. Troubleshooting identified the problem as being a bad cable, but the lead time required to obtain a replacement was greater than 30 days. The cable was attained and replaced, resulting in 1-WRA-717 being restored to operable status on August 15, 2022.

2-DRA-300, Steam Generator Blowdown Rad Monitor was declared inoperable on July 26, 2022 due to a steam leak on the #1 Steam Generator sample line resulting in the line being isolated. Repairs were completed on the steam leak and 2-DRA-300 was returned to operable status on November 4, 2022.

The Radiation Monitor System has undergone an extensive replacement project to upgrade and modernize the equipment to support the expected operational lives of the two CNP units. This work completed in April of 2020. One effluent monitor pathway continues to have issues regarding this project with the background radiation levels due to the detector sensitivities. 12-RRS-1001(a)/ 1001(b) channels of the Waste Disposal liquid effluent monitors were declared inoperable on July 24, 2020, and required software changes in order to address the higher background detected due to the increased sensitivity. The actual room area radiation levels are relatively unchanged, but the new detectors are far more sensitive and capable of detecting much lower radiation levels. The software was

redeveloped and delivered to CNP in December, 2021, however this was not successful in restoring the monitors back to operability. The background radiation issue followed by a failed detector requiring replacement has kept these monitors inoperable through all of 2022. All releases on this pathway have been and remain in compliance with ODCM and any required compensatory actions. Additional actions to reduce the background radiation are also being scheduled in order to further alleviate the conditions. These detectors remained inoperable to the end of the year 2022.

On 4/20/2023, 12-RRS-1001 (b) channel was restored to operable following extensive periods of flushing and a passing channel operability test. This restores the monitoring on this pathway. The 1001 (a) channel is having a new detector installation scheduled.

There were no other release pathways with inoperable monitors for greater than 30 days.

VII. NOTEWORTHY CONDITIONS IDENTIFIED IN 2022

The Carbon-14 Supplemental Information section has been returned to this report following stakeholder feedback. The clarity on the Carbon-14 dose determinations was appreciated and ensured all stakeholders could properly evaluate where the majority of CNP public dose originates.

Carbon-14 Supplemental Information for the 2022 Annual Radioactive Effluent Release Report.

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 C-14 in Earth's biosphere is about 300 million Curies, of which most is in the oceans.

Since the U.S. Nuclear Regulatory Commission published Regulatory Guide (RG) 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. 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, Revision 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", dated 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 (in MWH) produced during 2022 results in a site total of 18.40 Curies produced.

C-14 releases from Pressurized Water Reactors (PWR) occur primarily as a mix of organic carbon (methane) and inorganic carbon (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, of which 70% is assumed to be released from gaseous batch releases. This equates to 2.58 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 predominant pathway. A 'p' factor of 0.33 is determined utilizing the time of batch gaseous releases performed during 2022 and the time available for photosynthesis in plants. 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 1.77 mrem to the bone and a whole body dose of 0.353 mrem, for a combined total C-14 dose of 2.12 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).

The C-14 dose is now the major contributor and will consistently be about 8-10 times higher than the pre-2010 calculations. This dose will only change with online power generation, so it will not alter significantly unless the plant is shutdown for an extended period.

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 effect on the health and safety of the general public.

IX. ERRATA

There is an errata document attached for the 2020 report. The revision of the ODCM that was attached had a change which was not margin marked per the Cook Plant Technical Specifications. The ODCM submitted is materially correct and no new information or changes have been made to what was attached; only the required margin marks were added. Affected pages have been attached in this report.

There are no other errata for the 2022 report.

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SUPPLEMENTS

Mirion 1-WRA713, 2-WRA-714

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Am-241	4.81E-10	1.07E+03
Ba-137m	2.79E-06	6.19E+06
Ba-139	8.02E-07	1.78E+06
Ba-140	1.31E-06	2.91E+06
Ce-141	1.34E-06	2.97E+06
Ce-143	2.18E-06	4.84E+06
Ce-144	2.54E-07	5.64E+05
Cm-242	7.56E-11	1.68E+02
Cm-244	5.06E-11	1.12E+02
Cs-134	7.26E-06	1.61E+07
Cs-136	8.68E-06	1.93E+07
Cs-137	2.63E-06	5.84E+06
I-131	3.45E-06	7.66E+06
I-132	9.53E-06	2.12E+07
I-133	3.35E-06	7.44E+06
I-134	9.04E-06	2.01E+07
I-135D	8.02E-06	1.78E+07
Kr-85	1.39E-08	3.09E+04
Kr-85m	2.81E-06	6.24E+06
Kr-87	2.68E-06	5.95E+06

Bq= Becquerel Note: 1

Mirion 1-WRA713, 2-WRA-714

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Kr-88	4.04E-06	8.97E+06
La-140	6.50E-06	1.44E+07
La-141	5.68E-08	1.26E+05
La-142	4.43E-06	9.83E+06
Mo-99	3.25E-06	7.22E+06
Nb-95	3.08E-06	6.84E+06
Nd-147	7.07E-07	1.57E+06
Np-239	1.90E-06	4.22E+06
Pr-143	3.78E-14	8.39E-02
Pr-144	7.41E-08	1.65E+05
Pu-238	6.62E-11	1.47E+02
Pu-239	4.97E-10	1.10E+03
Pu-240	6.93E-11	1.54E+02
Pu-241	1.18E-11	2.62E+01
Rb-86	2.56E-07	5.68E+05
Rh-103m	0.00E+00	0.00E+00
Rh-105	8.74E-07	1.94E+06
Rh-106	1.08E-06	2.40E+06
Ru-103	3.13E-06	6.95E+06
Ru-105	4.22E-06	9.37E+06
Sb-127	3.82E-06	8.48E+06

Mirion 1-WRA713, 2-WRA-714

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Sb-129	5.56E-06	1.23E+07
Sr-89	2.89E-10	6.42E+02
Sr-91	4.55E-06	1.01E+07
Sr-92	3.02E-06	6.70E+06
Tc-99m	2.37E-06	5.26E+06
Te-127	4.25E-08	9.44E+04
Te-127m	5.49E-10	1.22E+03
Te-129	3.87E-07	8.59E+05
Te-129m	1.32E-07	2.93E+05
Te-131m	6.53E-06	1.45E+07
Te-132	3.25E-06	7.22E+06
Xe-133	3.42E-09	7.59E+03
Xe-135	3.37E-06	7.48E+06
Y-90	3.83E-14	8.50E-02
Y-91	7.49E-09	1.66E+04
Y-92	8.13E-07	1.80E+06
Y-93	4.56E-07	1.01E+06
Zr-95	3.11E-06	6.90E+06
Zr-97	3.82E-06	8.48E+06

cps/(Bq/m3) = 2.22e+12 cpm/(µCi/cc)

Mirion 1-WRA-717, 2-WRA-718

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Am-241	7.29E-10	1.62E+03
Ba-137m	1.71E-05	3.80E+07
Ba-139	1.47E-06	3.26E+06
Ba-140	6.64E-06	1.47E+07
Ce-141	1.85E-06	4.11E+06
Ce-143	9.67E-06	2.15E+07
Ce-144	2.90E-07	6.44E+05
Cm-242	1.38E-10	3.06E+02
Cm-244	1.15E-10	2.55E+02
Cs-134	4.33E-05	9.61E+07
Cs-136	5.19E-05	1.15E+08
Cs-137	1.67E-05	3.71E+07
I-131	1.59E-05	3.53E+07
I-132	5.72E-05	1.27E+08
I-133	1.95E-05	4.33E+07
I-134	6.14E-05	1.36E+08
I-135D	4.15E-05	9.21E+07
Kr-85	7.94E-08	1.76E+05
Kr-85m	5.53E-06	1.23E+07
Kr-87	1.55E-05	3.44E+07

Mirion 1-WRA-717, 2-WRA-718

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Kr-88	2.45E-05	5.44E+07
La-140	4.13E-05	9.17E+07
La-141	4.33E-07	9.61E+05
La-142	2.90E-05	6.44E+07
Mo-99	7.11E-06	1.58E+07
Nb-95	1.98E-05	4.40E+07
Nd-147	3.34E-06	7.41E+06
Np-239	4.80E-06	1.07E+07
Pr-143	2.40E-13	5.33E-01
Pr-144	4.93E-07	1.09E+06
Pu-238	6.08E-11	1.35E+02
Pu-239	1.46E-09	3.24E+03
Pu-240	5.84E-11	1.30E+02
Pu-241	1.17E-11	2.60E+01
Rb-86	1.78E-06	3.95E+06
Rb-103m	0.00E+00	0.00E+00
Rh -10 5	3.54E-06	7.86E+06
Rh -106	6.25E-06	1.39E+07
Ru-103	1.74E-05	3.86E+07
Ru - 10 5	2.23E-05	4.95E+07
Sb-127	2.07E-05	4.60E+07

Mirion 1-WRA-717, 2-WRA-718

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Sb-129	3.56E-05	7.90E+07
Sr -89	1.93E-09	4.28E+03
Sr-91	2.85E-05	6.33E+07
Sr -92	2.20E-05	4.88E+07
Tc-99m	2.95E-06	6.55E+06
Te-127	2.08E-07	4.62E+05
Te-127m	3.25E-09	7.22E+03
Te-129	2.05E-06	4.55E+06
Te-129m	7.88E-07	1.75E+06
Te-131m	3.55E-05	7.88E+07
Te-132	9.88E-06	2.19E+07
Xe-133	4.99E-09	1.11E+04
Xe-135	1.25E-05	2.78E+07
Y-90	3.01E-13	6.68E-01
Y-91	5.46E-08	1.21E+05
Y-92	5.51E-06	1.22E+07
Y-93	2.19E-06	4.86E+06
Zr-95	1.90E-05	4.22E+07
Zr-97	2.36E-05	5.24E+07

Bq= Becquerel

Note: 1 cps/(Bq/m3) = 2.22e+12 cpm/(µCi/cc)

REVISION SUMMARY

Procedure No.: PMP-6010-OSD-001 Rev. No.: 27
Title: OFF-SITE DOSE CALCULATION MANUAL

Alteration	Justification
10 CFR 50.59 is not applicable to this procedure revision. Per definition in Attachment 1 of PMP-2010-PRC-002. This is an administrative procedure governing the conduct of facility operations. Changes to this document are made in accordance with Technical Specification 5.5.1 and implemented through 12-EA-6090-ENV-114, Effectiveness Review for ODCM/PCP Programs.	
Security review per PMP-2060-SEC-007 is not applicable to this procedure revision. All review responses of the pre-screening in Data Sheet 1 of PMP-2060-SEC-007 were "No" and peer reviewed per Step 3.3.1.	
Section 1.0 - Added note informing users that the revision reflects the completed RMS Project changes to upgrade the system to Mirion detectors.	This is an editorial change to ensure users understand that the transition of the RMS replacement project to the new Mirion equipment has completed, and old equipment referenced in past revisions were removed. GT-2020-0319
Revised Table of Contents and renumbered as needed; no margin marks used.	Multiple Sections and Attachments required updating of titles and/or updating the contents contained inside which lengthened the documentation. This altered page numbering throughout.
3.3.1- Revised the step to reflect the completed replacement of detectors (Mirion). Updated Attachment Titles as needed. Margin marks used on affected sub-steps.	Editorial correction to remove old equipment guidance now that the new detectors are installed. No changes to intent made, and Titles revisions made to reflect the changing attachments. Added Note to clarify the naming of RRS-1001-B/1021-B and explain why the difference existed from other plant documentation. Both are equivalent and point to the same single component.
3.3.2- Revised the step to reflect the completed replacement of detectors (Mirion). Updated Attachment Titles as needed. Margin marks used on affected sub-steps.	Editorial correction to remove old equipment guidance now that the new detectors are installed. No changes to intent made, and Titles revisions made to reflect the changing attachments
5.2- Removed Eberline references and re-lettered the step as needed.	Editorial correction to remove equipment references no longer applicable in this revision.

Office Information for Form Tracking Only - Not Part of Form

This is a free-form as called out in PMP-2010-PRC-002, Procedure Alteration, Review, and Approval.

REVISION SUMMARY

Procedure No.: PMP-6010-OSD-001 Rev. No.: 27

Title: OFF-SITE DOSE CALCULATION MANUAL

Alteration	Justification
Attachment 3.2- Rewritten to include Mirion information while removing old monitor data. Updated guidance and provided corrections on associated actions. No margin marks used.	Editorial correction to remove old equipment guidance now that the new detectors are installed as well as make clarifications on actions requiring independent samples taken. AR#2019-7934
Attachment 3.3- Rewritten to include Mirion information while removing old monitor data. Updated guidance and provided corrections on associated actions. No margin marks used.	Editorial correction to remove old equipment guidance now that the new detectors are installed as well as make clarifications on when alarm annunciations are expected to occur.
Attachment 3.4- Rewritten to include Mirion information while removing old monitor data. Updated guidance and provided corrections on associated actions. No margin marks used.	Editorial correction to remove old equipment guidance now that the new detectors are installed and updated equipment labels. Specific guidance updated for local display units and computer based data displays (PPC/RadServe). AR#2019-9650 , AR#2020-4600
Attachment 3.5- Rewritten to include Mirion information while removing old monitor data. Updated guidance and provided corrections on associated table notations. No margin marks used.	Editorial correction to remove old equipment guidance now that the new detectors are installed, adding updated equipment ID information. AR#2019-9650
Attachment 3.8- Rewritten to include Mirion information while removing old monitor data. No margin marks used.	Removed old Eberline detector instruments, with no changes made to MRP or flowrates as these remain unaffected by the RMS project.
Attachment 3.11- Removed old tables and notes pertaining to the Eberline monitors. No margin marks used.	Editorial correction to remove old equipment guidance, removing the old detector efficiency data.
Attachment 3.12- Removed old tables and notes pertaining to the Eberline monitors. Updated the detector efficiencies for DRA-300/DRA-353 for 4 pi shielding. No margin marks used.	Editorial correction to remove old equipment guidance, removing the old detector efficiency data. Updated the blowdown detector efficiencies for the new 4 pi shielding.

REVISION SUMMARY

Procedure No.: PMP-6010-OSD-001 Rev. No.: 27
Title: OFF-SITE DOSE CALCULATION MANUAL

Alteration	Justification
Attachment 3.13- Retitled the Attachment to remove reference to the old Eberline monitors. Removed old tables and notes pertaining to the Eberline monitors. No margin marks used.	Editorial correction to remove old equipment guidance, removing the old detector efficiency data.

REVISION SUMMARY

Procedure No.: PMP-6010-OSD-001 Rev. No.: 27
Title: OFF-SITE DOSE CALCULATION MANUAL

IMPLEMENTATION PLAN

Summary of Change
See Revision Summary for details.

Reason for Change
See Revision Summary for details.

Implementation Schedule
Procedure to be made effective following PORC and upon Plant Manager's approval.

Training Needs
N/A

Expiration Date
N/A

Required Basis Documents Update
None

Related Processes and Procedures
12-THP-6010-RPI-805, Radiation Monitoring System Setpoints
12-THP-6010-RPP-709, Radiation Monitoring System Liquid Effluent Alarm.
These procedures are being updated to reflect the new Mirion monitors and their efficiencies as noted in this procedure. Changes are being tracked by GTs entered in the Corrective Action Program.

Transition Plan
Attachments from previous revision of 12-THP-6010-OSD-001 may be used subject to the conditions described in PMP-2010-PRC-003. The actual equipment transition occurred with the previous revision, and this revision primarily is cleaning up the old uninstalled equipment references and guidance now that the Project has been RTO'd to Operations.

Related Equipment Modifications
Installation of new Mirion radiation monitors in both units per EC-53363 and EC-53364.

Communication Plan
Effective date of this revisions will be communicated via email to interested groups.

Special Tools, Aids, Permits, Etc.
N/A

Related Condition Reports
GT 2020-4600; GT-2020-0319; GT 2019-7934; AR-2019-9650

2022 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 ≤ 5 mrad/unit for gamma radiation and ≤ 10 mrad/unit for beta radiation.

1.1.2 During any calendar year, to ≤ 10 mrad/unit for gamma radiation and ≤ 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 ≤ 7.5 mrem/unit to any organ.

1.2.2 During any calendar year to ≤ 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 ≤ 1.5 mrem/unit to the total body and to ≤ 5 mrem/unit to any organ.

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

1.4 Total Dose

The dose or dose commitment to a real individual from all uranium fuel cycle sources is limited to ≤ 25 mrem to the total body or any organ (except the thyroid, which is limited to ≤ 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: ≤ 500 mrem/yr to the total body and ≤ 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: ≤ 1500 mrem/yr to any organ.

The above limits are provided to ensure 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 2×10^{-4} µCi/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 an 8192 channel analyzer and HpGe detector. Tritium analysis is performed using liquid scintillation counters.

4.2 Iodines

Sampled on iodine adsorbing media, and analyzed on an 8192 channel analyzer and HpGe detector.

4.3 Particulates

Sampled on a glass filter and analyzed on an 8192 channel analyzer and HpGe detector. Sr-89 and Sr-90 analyses are performed by offsite vendor.

4.4 Liquid Effluents

Sampled and analyzed on an 8192 channel analyzer and HpGe detector. Tritium analysis is performed using liquid scintillation counters. Fe-55, Sr-89 and Sr-90 analyses are performed by an offsite vendor. Ni-63 is also currently being analyzed by the offsite vendor in response to evaluation of the 10 CFR 61 sample results.

5 BATCH RELEASES

5.1 Liquid

5.1.1 Number of batch releases:

16 releases in the 1st quarter, 2022
32 releases in the 2nd quarter, 2022
32 releases in the 3rd quarter, 2022
19 releases in the 4th quarter, 2022

5.1.2 Total time period for batch releases:

32,467 minutes

5.1.3 Maximum time for a batch release:

668 minutes

5.1.4 Average time period for batch release:

328 minutes

5.1.5 Minimum time period for a batch release:

116 minutes

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

6.65E+5 gpm circulating water

5.2 Gaseous

5.2.1 Number of batch releases:

61 releases in the 1st quarter, 2022
57 releases in the 2nd quarter, 2022
63 releases in the 3rd quarter, 2022
52 releases in the 4th quarter, 2022

5.2.2 Total time period for batch releases:

15,606 minutes

5.2.3 Maximum time for a batch release:

354 minutes

5.2.4 Average time period for batch release:

67.0 minutes

5.2.5 Minimum time period for a batch release:

5 minutes

6 ABNORMAL RELEASES

6.1 Liquid

6.1.1 Number of Releases:

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
0	0	0	0

6.1.2 Total activity released (Ci):

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
0	0	0	0

6.2 Gaseous

6.2.1 Number of Releases:

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
0	0	0	0

6.2.2 Total activity released (Ci):

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
0	0	0	0

2022 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	1.60E+01	1.30E+01	1.43E+01	2.58E+01
AR41	Ci	--------	--------	--------	--------
KR85	Ci	--------	--------	--------	--------
XE133	Ci	--------	--------	--------	--------
XE135	Ci	--------	--------	--------	--------
XE131m	Ci	--------	--------	--------	--------
XE133m	Ci	--------	--------	--------	--------
XE135m	Ci	--------	--------	--------	--------
Total for Period	Ci	1.60E+01	1.30E+01	1.43E+01	2.58E+01
2. IODINES					
I131	Ci	--------	3.00E-05	5.62E-08	1.72E-06
I132	Ci	--------	--------	--------	--------
I133	Ci	--------	--------	--------	--------
Total for Period	Ci	--------	3.00E-05	5.62E-08	1.72E-06
3. PARTICULATES					
MN54	Ci	--------	--------	--------	--------
CO60	Ci	--------	--------	--------	--------
CS137	Ci	--------	--------	--------	--------
Total for Period	Ci	--------	--------	--------	--------

* DENOTES SUPPLEMENTAL ISOTOPES

2022 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	1.63E-01	2.16E-01	9.36E-02	1.70E-01
AR41	Ci	3.13E-01	2.24E-01	2.61E-01	1.94E-01
KR85	Ci	6.20E-03	--------	2.30E-03	4.38E-03
KR85m	Ci	--------	--------	--------	--------
KR87	Ci	--------	--------	--------	--------
KR88	Ci	--------	--------	--------	--------
XE133	Ci	1.64E-02	6.94E-03	6.02E-03	1.41E-02
XE135m	Ci	--------	4.06E-04	--------	--------
XE135	Ci	5.19E-04	8.72E-04	--------	--------
Total for Period	Ci	4.99E-01	4.48E-01	3.63E-01	3.80E-01
2. IODINES					
I131	Ci	--------	--------	--------	--------
I132	Ci	--------	--------	--------	--------
I133	Ci	--------	--------	--------	--------
I134	Ci	--------	--------	--------	--------
I135	Ci	--------	--------	--------	--------
Total for Period	Ci	--------	--------	--------	--------

* DENOTES SUPPLEMENTAL ISOTOPES

2022 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

BATCH MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
3. PARTICULATES					
CR51	Ci	--------	--------	--------	--------
CO58	Ci	--------	--------	--------	--------
CO60	Ci	--------	--------	--------	--------
NB95	Ci	--------	--------	--------	--------
Total for Period	Ci	--------	--------	--------	--------

* DENOTES SUPPLEMENTAL ISOTOPES

2022 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	2.18E-01	2.32E-01	2.70E-01	2.11E-01	18.9
2.	Average release rate for period	uCi/sec	2.80E-02	2.95E-02	3.40E-02	2.66E-02	
3.	Percent of applicable limit*	% Gamma	3.98E-03	8.10E-03	1.97E-02	6.15E-03	
		Beta	7.15E-04	1.43E-03	3.49E-03	1.09E-03	
B.	IODINES						
1.	Total I-131	Ci	0.00E+00	3.00E-05	5.62E-08	1.72E-06	15.1
2.	Average release rate for period	uCi/sec	0.00E+00	3.82E-06	7.07E-09	2.17E-07	
3.	Percent of applicable limit*	%	0.00E+00	1.09E-05	2.02E-08	6.18E-07	
C.	PARTICULATES						
1.	Particulates with half lives>8 days	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
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	<8.61E-07	<9.53E-07	<7.35E-07	<8.41E-07	
D.	TRITIUM						
1.	Total Release	Ci	1.60E+01	1.30E+01	1.43E+01	2.59E+01	20.7
2.	Average release rate for period	uCi/sec	2.06E+00	1.66E+00	1.80E+00	3.26E+00	
3.	Percent of applicable limit*	%	1.82E-02	9.46E-03	1.03E-02	1.86E-02	

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

2022 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS
CONTINUOUS MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
H3	Ci	1.41E-02	4.19E-06	--------	--------

BATCH MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
H3	Ci	8.36E+02	4.05E+02	9.00E+02	2.69E+02
CR51	Ci	--------	3.29E-06	--------	--------
MN54	Ci	--------	--------	2.46E-06	5.58E-07
CO57	Ci	--------	--------	--------	--------
CO58	Ci	--------	5.89E-05	1.10E-05	2.91E-05
CO60	Ci	3.58E-05	5.93E-05	4.06E-05	3.79E-05
NI63	Ci	1.86E-04	--------	--------	--------
ZN65	Ci	--------	--------	--------	--------
ZR95	Ci	--------	--------	--------	--------
NB95	Ci	--------	--------	--------	--------
MO99	Ci	--------	--------	--------	--------
TC99m	Ci	--------	1.88E-06	--------	3.18E-06
AG110m	Ci	--------	1.34E-06	--------	--------
SB124	Ci	--------	--------	--------	--------
SB125	Ci	1.03E-05	6.85E-06	2.25E-06	--------
CS134	Ci	--------	--------	--------	4.11E-07
CS137	Ci	--------	5.39E-07	--------	2.74E-05
I131	Ci	--------	--------	--------	--------
I133	Ci	--------	--------	--------	--------
*SN113	Ci	--------	--------	--------	--------
*XE133	Ci	1.37E-04	5.93E-05	1.02E-04	1.20E-04
*XE135	Ci	5.02E-06	--------	8.95E-07	--------
*XE133m	Ci	--------	--------	--------	4.19E-06

* DENOTES SUPPLEMENTAL ISOTOPES

2022 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	2.32E-04	1.32E-04	5.63E-05	9.86E-05	15.4
2.	Average diluted concentration during period	uCi/ml	1.51E-11	5.85E-12	2.17E-12	5.04E-12	
3.	Percent of applicable limit	%	9.15E-04	1.05E-04	5.49E-05	2.15E-04	
B.	TRITIUM						
1.	Total Release	Ci	8.36E+02	4.05E+02	9.00E+02	2.69E+02	10.1
2.	Average diluted concentration during period	uCi/ml	5.40E-05	1.79E-05	3.46E-05	1.38E-05	
3.	Percent of applicable limit	%	5.40E+00	1.79E+00	3.46E+00	1.38E+00	
C.	DISSOLVED AND ENTRAINED GASES						
1.	Total Release	Ci	1.42E-04	5.93E-05	1.03E-04	1.20E-04	5.5
2.	Average diluted concentration during period	uCi/ml	9.20E-12	2.63E-12	3.97E-12	6.15E-12	
3.	Percent of applicable limit	%	4.60E-06	1.31E-06	1.99E-06	3.07E-06	
D.	GROSS ALPHA RADIOACTIVITY TOTAL RELEASE	Ci	<1.51E-03	<1.79E-04	<1.05E-04	<1.77E-04	N/A
E.	VOLUME OF WASTE RELEASED	Liters	1.63E+07	1.93E+06	1.13E+06	1.91E+06	2.00
F.	VOLUME OF DILUTION WATER USED DURING PERIOD	Liters	7.30E+11	1.54E+11	2.60E+10	1.95E+10	3.48

2022 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	1.41E-02	4.19E-06	0.00E+00	0.00E+00	54.3
2.	Average diluted concentration during period	uCi/ml	2.08E-11	6.11E-15	0.00E+00	0.00E+00	
3.	Percent of applicable limit	%	2.08E-06	6.11E-10	0.00E+00	0.00E+00	
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	<1.04E-03	<4.57E-06	0.00E+00	0.00E+00	N/A
E.	VOLUME OF WASTE RELEASED	Liters	1.12E+07	4.92E+04	0.00E+00	0.00E+00	2.00
F.	VOLUME OF DILUTION WATER USED DURING PERIOD	Liters	6.77E+11	6.85E+11	0.00E+00	0.00E+00	3.48

2022 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^3 Curies	1.03E+01 1.95E+02	1.00E+00 3.75E+00
b) Dry compressible waste, contaminated equipment, etc.	m^3 Curies	5.50E+02 7.23E+00	1.00E+00 6.48E+00
c) Irradiated components, control rods, etc.	m^3 Curies		
d) Other (oil, soil, etc)	m^3 Curies		

2) Estimate of Principle Radionuclide Composition								
a)	H-3	4 %	Co-58	1 %	Sb-125	1 %	Cs-137	1.5 %
	Mn-54	0.5%	Co-60	15%	Cs-134	1 %		
	Fe-55	16%	Ni-63	58%	C-14	2 %		
b)	H-3	0.5 %	Co-58	1 %	Sb-125	1 %		
	Mn-54	2 %	Co-60	33%	Zr/Nb-95	0.5 %		
	Fe-55	47%	Ni-63	9%	Cs-137	5 %	C-14	1 %
d)								

3) Solid Waste Disposition		
No. of Shipments	Mode of Transportation	Destination
16	Truck	Oak Ridge, TN
6	Truck	Andrews, TX

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

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

2022 Effluent and Waste Disposal Annual Report Yearly Release Rates

GASES		
Fission and Activation Gases	Total Release	9.31E-01 Curies
	Average Release Rate	2.95E-02 µCi/sec
	% of Applicable Limits*	γ 1.89E-02 % β 3.36E-03 %
Iodines	Total I-131 Release	3.18E-05 Curies
	Average Release Rate	1.01E-06 µCi/sec
	% of Applicable Limit*	2.60E-01 %
Particulates	Total Release	0.00E+00 Curies
	Average Release Rate	0.00E+00 µCi/sec
	% of Applicable Limit*	0.00E+00 %
LIQUIDS		
Fission and Activation Products	Total Release	5.19E-04 Curies
	Average Diluted Concentration	6.34E-12 µCi/ml
	% of Applicable Limits*	Total Body 1.21E+00 % Organ 3.64E-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:

Sector	Direction	Boundary (Meters)	Nearest Residence (Meters)
A	N	651	659
B	NNE	617	660
C	NE	789	943
D	ENE	1497	1577
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 2022

EFFLUENT	APPLICABLE ORGAN	ESTIMATED DOSE (mrem)	AGE GROUP	LOCATION DIST DIR (M) (Toward)	% OF APPLICABLE LIMIT	LIMIT (mrem) QTR
Liquid	Total Body	2.81E-02	Child	Receptor 1	9.37E-01	1.5E+0
Liquid	Liver	2.81E-02	Child	Receptor 1	2.81E-01	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	3.97E-04	Any Age	651 (N)	3.97E-03	5.0E+0
Noble Gas	Air dose (Beta-mrad)	1.43E-04	Any Age	651 (N)	7.15E-04	1.0E+1
Iodines and Particulates	Total Body	1.19E-02	Child	659 (N)	7.93E-02	7.5E+0

Summary of Maximum Individual Doses

Second Quarter 2022

EFFLUENT	APPLICABLE ORGAN	ESTIMATED DOSE (mrem)	AGE GROUP	LOCATION DIST DIR (M) (Toward)	% OF APPLICABLE LIMIT	LIMIT (mrem) QTR
Liquid	Total Body	1.25E-02	Child	Receptor 1	4.17E-01	1.5E+0
Liquid	Liver	1.25E-02	Child	Receptor 1	1.25E-01	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	8.08E-04	Any Age	651 (N)	8.08E-03	5.0E+0
Noble Gas	Air dose (Beta-mrad)	2.86E-04	Any Age	651 (N)	1.43E-03	1.0E+1
Iodines and Particulates	Total Body	1.35E-02	Child	659 (N)	9.00E-02	7.5E+0

Summary of Maximum Individual Doses

Third Quarter 2022

EFFLUENT	APPLICABLE ORGAN	ESTIMATED DOSE (mrem)	AGE GROUP	LOCATION DIST DIR (M) (Toward)	% OF APPLICABLE LIMIT	LIMIT (mrem) QTR
Liquid	Total Body	2.33E-02	Child	Receptor 1	7.77E-01	1.5E+0
Liquid	GI-LLI	2.33E-02	Child	Receptor 1	2.33E-01	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	1.96E-03	Any Age	651 (N)	1.96E-02	5.0E+0
Noble Gas	Air dose (Beta-mrad)	6.97E-04	Any Age	651 (N)	3.49E-03	1.0E+1
Iodines and Particulates	Total Body	2.77E-02	Child	997 (S)	1.85E-01	7.5E+0

Summary of Maximum Individual Doses

Fourth Quarter 2022

EFFLUENT	APPLICABLE ORGAN	ESTIMATED DOSE (mrem)	AGE GROUP	LOCATION DIST DIR (M) (Toward)	% OF APPLICABLE LIMIT	LIMIT (mrem) QTR
Liquid	Total Body	8.78E-03	Child	Receptor 1	2.93E-01	1.5E+0
Liquid	Liver	8.87E-03	Child	Receptor 1	8.87E-02	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	6.14E-04	Any Age	651 (N)	6.14E-03	5.0E+0
Noble Gas	Air dose (Beta-mrad)	2.17E-04	Any Age	651 (N)	1.09E-03	1.0E+1
Iodines and Particulates	Total Body	2.49E-02	Child	659 (N)	1.66E-01	7.5E+0

2022 NEI GROUNDWATER PROTECTION INITIATIVE SAMPLE DATA

Analysis of the Sample Data

The Groundwater Protection Initiative (GPI) Sample Data for 2022 indicates no groundwater contamination in excess of the reporting threshold of 2.00E-5 uCi/mL for tritium. Gamma spectroscopy was performed on all Radiological Environmental Monitoring Program (REMP) wells quarterly. Those results are not actual GPI results so are not included in the ARERR, but are part of CNP's 2022 Annual Radiological Environmental Operating Report. There were no positively identified gamma radionuclides from plant effluents detected in any of the GPI well samples, and no wells with levels of tritium above detection limits.

The Lower Limit of Detection (LLD) value used for tritium counting of the samples was 9.45E-7 or 9.83E-7, depending on lab equipment used. This is well below the required maximum LLD value of 2.00E-6 uCi/mL per the ODCM.

One tritium sample was found above LLD for 2022, with the March 24th sample from well MW-28 showing 1.08e-6 uCi/mL. This is an expected result of snow melt/rain releasing recaptured tritium into the groundwater. Values found above the LLD are not abnormal, unexpected, or inconsistent with past sampling history. The samples observed above LLD historically 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. The 2022 results were within expected parameters considering the reduction in tritium released to the Absorption Pond and typical rainfall recapture of tritium experienced.

Wells located inside the Protected Area of the plant are subject to recapture deposition of tritium and may show occasional sample results above LLD values following rainfalls and snow melt. The results observed in 2022 continue to reflect normal expectations and behaviors as they relate to recaptured tritium for the weather conditions observed. It was a drier year resulting in less recaptured tritium, as shown by the single positive tritium sample result.

The sample data indicates that no radioactive spills or unidentified leaks have occurred in 2022 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 and recaptured tritium in precipitation, with flow direction and behavior acting as described in the plant licensing documents

2022 GPI Sample Data

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

Sample Date	W-1	W-2	W-3	W-4	W-5	W-6	W-7	W-8	W-9	W-10
1/10/2022										
1/14/2022	<LLD	<LLD	<LLD				<LLD	<LLD	<LLD	<LLD
1/21/2022										
2/15/2022				<LLD	<LLD	<LLD				
3/24/2022										
3/28/2022										
4/11/2022										
4/15/2022	<LLD	<LLD	<LLD				<LLD	<LLD	<LLD	<LLD
4/29/2022				<LLD	<LLD	<LLD				
5/12/2022										
5/13/2022										
7/14/2022										
7/15/2022	<LLD	<LLD	<LLD				<LLD	<LLD	<LLD	<LLD
7/16/2022										
7/19/2022										
7/20/2022				<LLD						
7/21/2022					<LLD					
7/22/2022						<LLD				
8/2/2022										
8/3/2022										
9/8/2022										
10/11/2022										
10/20/2022	<LLD	<LLD	<LLD				<LLD			<LLD
10/21/2022								<LLD	<LLD	
10/27/2022				<LLD	<LLD	<LLD				
10/28/2022										
12/20/2022										

(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).

2022 GPI Sample Data

Sample Date	W-11	W-12	W-13	W-14	W-15	EW-19	W-20	W-21	MW-28	MW-29
1/10/2022						<LLD				
1/14/2022			<LLD	<LLD	<LLD		<LLD	<LLD		
1/21/2022	<LLD	<LLD								
2/15/2022										
3/24/2022									1.08E-06	<LLD
3/28/2022										
4/11/2022						<LLD				
4/15/2022	<LLD	<LLD	<LLD	<LLD	<LLD		<LLD	<LLD		
4/29/2022										
5/12/2022									<LLD *	<LLD
5/13/2022										
7/14/2022						<LLD				
7/15/2022			<LLD	<LLD						
7/16/2022					<LLD					
7/19/2022	<LLD	<LLD								
7/20/2022										
7/21/2022										
7/22/2022										
8/2/2022									<LLD	
8/3/2022										<LLD
9/8/2022							<LLD *	<LLD		
10/11/2022						<LLD				
10/20/2022	<LLD	<LLD	<LLD	<LLD	<LLD					
10/21/2022										
10/27/2022										
10/28/2022									<LLD	<LLD
12/20/2022									<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).

2022 GPI Sample Data

Sample Date	MW-22S	MW-22M	MW-22D	MW-24S	MW-24M	MW-24D	MW-25S	MW-25M	MW-25D
1/10/2022									
1/14/2022									
1/21/2022									
2/15/2022									
3/24/2022							<LLD	<LLD	<LLD
3/28/2022	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD			
4/11/2022									
4/15/2022									
4/29/2022									
5/12/2022							<LLD	<LLD	<LLD
5/13/2022	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD			
7/14/2022									
7/15/2022									
7/16/2022									
7/19/2022									
7/20/2022									
7/21/2022									
7/22/2022									
8/2/2022									
8/3/2022									
9/8/2022									
10/11/2022									
10/20/2022									
10/21/2022									
10/27/2022									
10/28/2022	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
12/20/2022									

(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).

2022 GPI Sample Data

Sample Date	MW-26S	MW-26M	MW-26D	MW-27S	MW-27-M	MW-27D	SG-1	SG-2	SG-4	SG-5
1/10/2022										
1/14/2022										
1/21/2022							<LLD	<LLD	<LLD	<LLD
2/15/2022										
3/24/2022	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD				
3/28/2022										
4/11/2022										
4/15/2022							<LLD	<LLD	<LLD	<LLD
4/29/2022										
5/12/2022	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD				
5/13/2022										
7/14/2022										
7/15/2022										
7/16/2022										
7/19/2022							<LLD	<LLD	<LLD	<LLD
7/20/2022										
7/21/2022										
7/22/2022										
8/2/2022										
8/3/2022										
9/8/2022										
10/11/2022										
10/20/2022										
10/21/2022							<LLD	<LLD	<LLD	<LLD
10/27/2022										
10/28/2022	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD				
12/20/2022										

(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).

2022 GPI Sample Data

Sample Date	OW-1	OW-2	OW-4
1/10/2022			
1/14/2022			
1/21/2022			
2/15/2022			
3/24/2022			
3/28/2022			
4/11/2022			
4/15/2022			
4/29/2022			
5/12/2022			
5/13/2022			
7/14/2022			
7/15/2022			
7/16/2022			
7/19/2022			
7/20/2022			
7/21/2022			
7/22/2022			
8/2/2022			
8/3/2022			
9/8/2022	<LLD	<LLD	<LLD *
10/11/2022			
10/20/2022			
10/21/2022			
10/27/2022			
10/28/2022	<LLD	<LLD	<LLD
12/20/2022			

(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).

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2022 - 3/31/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Stability Class A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	0	16	0	0	0	0	16
NNE	0	2	0	0	0	0	2
NE	0	5	0	0	0	0	5
ENE	0	4	0	0	0	0	4
E	0	0	0	0	0	0	0
ESE	0	1	0	0	0	0	1
SE	0	3	6	0	0	0	9
SSE	0	3	11	0	0	0	14
S	0	0	3	0	0	0	3
SSW	0	0	1	0	0	0	1
SW	0	6	6	0	0	0	12
WSW	0	7	5	0	0	0	12
W	0	11	0	0	0	0	11
WNW	1	5	0	0	0	0	6
NW	2	13	3	0	0	0	18
NNW	1	15	5	0	0	0	21
Total	4	91	40	0	0	0	135

Calm Hours not Included above for : **Total Period** 4

Valid Hours for this Stability Class for: **Total Period** 135

Total Hours for Period 2160

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2022 - 3/31/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Stability Class B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	1	5	0	0	0	0	6
NNE	0	1	0	0	0	0	1
NE	0	2	0	0	0	0	2
ENE	0	2	0	0	0	0	2
E	0	2	1	0	0	0	3
ESE	0	1	0	0	0	0	1
SE	0	4	2	0	0	0	6
SSE	0	7	6	0	0	0	13
S	0	3	8	0	0	0	11
SSW	0	0	0	0	0	0	0
SW	0	4	3	0	0	0	7
WSW	0	5	4	0	0	0	9
W	0	0	0	0	0	0	0
WNW	0	5	0	0	0	0	5
NW	0	9	1	0	0	0	10
NNW	1	10	1	0	0	0	12
Total	2	60	26	0	0	0	88

Calm Hours not Included above for :	**Total Period**	4
Valid Hours for this Stability Class for:	**Total Period**	88
Total Hours for Period		2160

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2022 - 3/31/2022

Elevation: Speed: SP10M **Direction:** DIR10M **Lapse:** DT60M

Stability Class C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	0	4	0	0	0	0	4
NNE	2	3	0	0	0	0	5
NE	1	2	0	0	0	0	3
ENE	0	1	3	0	0	0	4
E	0	1	0	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	4	3	0	0	0	7
SSE	0	4	6	0	0	0	10
S	0	8	8	1	0	0	17
SSW	0	4	0	0	0	0	4
SW	0	13	2	0	0	0	15
WSW	0	5	1	0	0	0	6
W	0	3	0	0	0	0	3
WNW	2	4	0	0	0	0	6
NW	1	10	2	0	0	0	13
NNW	0	8	1	0	0	0	9
Total	6	74	26	1	0	0	107

Calm Hours not Included above for :	**Total Period**	4
Valid Hours for this Stability Class for:	**Total Period**	107
Total Hours for Period		2160

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2022 - 3/31/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Stability Class D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	13	53	8	0	0	0	74
NNE	31	46	0	0	0	0	77
NE	22	16	0	0	0	0	38
ENE	14	30	12	0	0	0	56
E	17	15	4	0	0	0	36
ESE	12	12	8	0	0	0	32
SE	12	29	20	1	0	0	62
SSE	20	26	15	0	0	0	61
S	5	66	36	17	0	0	124
SSW	3	38	37	8	0	0	86
SW	6	51	36	9	0	0	102
WSW	9	46	12	2	0	0	69
W	14	41	4	0	0	0	59
WNW	11	53	8	0	0	0	72
NW	20	94	13	0	0	0	127
NNW	16	95	18	0	0	0	129
Total	225	711	231	37	0	0	1204

Calm Hours not Included above for :	**Total Period**	4
Valid Hours for this Stability Class for:	**Total Period**	1204
Total Hours for Period		2160

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2022 - 3/31/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Stability Class E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	3	4	0	0	0	0	7
NNE	24	5	0	0	0	0	29
NE	8	2	0	0	0	0	10
ENE	15	4	0	0	0	0	19
E	19	7	0	0	0	0	26
ESE	13	10	0	0	0	0	23
SE	13	14	11	0	0	0	38
SSE	31	28	12	0	0	0	71
S	10	55	23	14	0	0	102
SSW	9	18	18	4	0	0	49
SW	5	30	7	0	0	0	42
WSW	1	9	1	0	0	0	11
W	1	4	0	0	0	0	5
WNW	1	2	0	0	0	0	3
NW	1	2	0	0	0	0	3
NNW	7	5	0	0	0	0	12
Total	161	199	72	18	0	0	450

Calm Hours not Included above for :	**Total Period**	4
Valid Hours for this Stability Class for:	**Total Period**	450
Total Hours for Period		2160

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2022 - 3/31/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class F Delta Temperature Moderately Stable

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	1	0	0	0	0	0	1
NE	3	0	0	0	0	0	3
ENE	4	0	0	0	0	0	4
E	9	0	0	0	0	0	9
ESE	13	0	0	0	0	0	13
SE	15	0	0	0	0	0	15
SSE	17	8	0	0	0	0	25
S	9	7	0	0	0	0	16
SSW	1	0	0	0	0	0	1
SW	4	0	0	0	0	0	4
WSW	0	0	0	0	0	0	0
W	2	0	0	0	0	0	2
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	1	0	0	0	0	0	1
Total	80	15	0	0	0	0	95

Calm Hours not Included above for : **Total Period** 4
Valid Hours for this Stability Class for: **Total Period** 95
Total Hours for Period 2160

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2022 - 3/31/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Stability Class G Delta Temperature Extremely Stable

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	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	7	1	0	0	0	0	8
E	9	0	0	0	0	0	9
ESE	5	0	0	0	0	0	5
SE	9	0	0	0	0	0	9
SSE	19	1	0	0	0	0	20
S	3	0	0	0	0	0	3
SSW	1	0	0	0	0	0	1
SW	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0
NNW	2	0	0	0	0	0	2
Total	57	2	0	0	0	0	59

Calm Hours not Included above for : **Total Period** 4

Valid Hours for this Stability Class for: **Total Period** 59

Total Hours for Period 2160

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record = 1/1/2022 - 3/31/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Delta Temperature

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	19	82	8	0	0	0	109
NNE	58	57	0	0	0	0	115
NE	34	27	0	0	0	0	61
ENE	40	42	15	0	0	0	97
E	54	25	5	0	0	0	84
ESE	43	24	8	0	0	0	75
SE	49	54	42	1	0	0	146
SSE	87	77	50	0	0	0	214
S	27	139	78	32	0	0	276
SSW	14	60	56	12	0	0	142
SW	15	104	54	9	0	0	182
WSW	11	72	23	2	0	0	108
W	17	59	4	0	0	0	80
WNW	15	69	8	0	0	0	92
NW	24	128	19	0	0	0	171
NNW	28	133	25	0	0	0	186
Total	535	1152	395	56	0	0	2138

Calm Hours not Included above for :	**Total Period**	4
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	18
Valid Hours for this Stability Class for:	**Total Period**	2138
Total Hours for Period		2160

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 4/1/2022 - 6/30/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Stability Class A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	14	41	0	0	0	0	55
NNE	1	1	0	0	0	0	2
NE	1	5	0	0	0	0	6
ENE	0	1	1	0	0	0	2
E	0	3	0	0	0	0	3
ESE	0	1	2	0	0	0	3
SE	0	5	19	0	0	0	24
SSE	0	13	7	2	0	0	22
S	0	5	3	0	0	0	8
SSW	0	15	4	1	0	0	20
SW	1	26	5	0	0	0	32
WSW	1	8	5	1	0	0	15
W	2	9	0	0	0	0	11
WNW	5	16	0	0	0	0	21
NW	2	29	0	0	0	0	31
NNW	16	63	1	0	0	0	80
Total	43	241	47	4	0	0	335

Calm Hours not Included above for :	**Total Period**	43
Valid Hours for this Stability Class for:	**Total Period**	335
Total Hours for Period		2184

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 4/1/2022 - 6/30/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	3	5	0	0	0	0	8
NNE	1	1	0	0	0	0	2
NE	0	0	0	0	0	0	0
ENE	0	3	0	0	0	0	3
E	0	5	0	0	0	0	5
ESE	0	3	0	0	0	0	3
SE	0	8	4	0	0	0	12
SSE	1	8	3	0	0	0	12
S	1	5	4	0	0	0	10
SSW	0	11	4	0	0	0	15
SW	0	9	2	0	0	0	11
WSW	0	4	1	0	0	0	5
W	0	4	0	0	0	0	4
WNW	0	2	0	0	0	0	2
NW	1	3	0	0	0	0	4
NNW	5	6	0	0	0	0	11
Total	12	77	18	0	0	0	107

Calm Hours not Included above for :	**Total Period**	43
Valid Hours for this Stability Class for:	**Total Period**	107
Total Hours for Period		2184

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 4/1/2022 - 6/30/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	3	3	0	0	0	0	6
NNE	1	1	0	0	0	0	2
NE	1	1	0	0	0	0	2
ENE	0	1	0	0	0	0	1
E	0	0	0	0	0	0	0
ESE	0	4	0	0	0	0	4
SE	1	8	2	0	0	0	11
SSE	0	6	1	0	0	0	7
S	0	4	5	0	0	0	9
SSW	1	4	3	1	0	0	8
SW	0	6	0	0	0	0	6
WSW	0	3	0	0	0	0	3
W	1	3	0	0	0	0	4
WNW	0	3	1	0	0	0	4
NW	3	1	0	0	0	0	4
NNW	8	6	0	0	0	0	14
Total	19	54	12	0	0	0	85

Calm Hours not Included above for : **Total Period** 43
Valid Hours for this Stability Class for: **Total Period** 85
Total Hours for Period 2184

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 4/1/2022 - 6/30/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	22	28	0	0	0	0	50
NNE	10	3	0	0	0	0	13
NE	8	15	2	0	0	0	25
ENE	4	11	3	0	0	0	18
E	11	22	2	0	0	0	35
ESE	14	33	5	0	0	0	52
SE	10	34	19	0	0	0	63
SSE	8	29	7	0	0	0	44
S	7	32	34	2	0	0	75
SSW	6	38	21	0	0	0	65
SW	9	41	22	0	0	0	72
WSW	7	36	3	0	0	0	46
W	11	17	0	0	0	0	28
WNW	9	14	2	0	0	0	25
NW	24	18	0	0	0	0	42
NNW	42	37	3	0	0	0	82
Total	202	408	123	2	0	0	735

Calm Hours not Included above for :	**Total Period**	43
Valid Hours for this Stability Class for:	**Total Period**	735
Total Hours for Period		2184

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 4/1/2022 - 6/30/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	27	5	0	0	0	0	32
NNE	17	9	0	0	0	0	26
NE	14	1	0	0	0	0	15
ENE	8	1	0	0	0	0	9
E	19	9	1	0	0	0	29
ESE	26	16	2	0	0	0	44
SE	24	39	9	0	0	0	72
SSE	19	28	11	0	0	0	58
S	15	55	13	5	0	0	88
SSW	15	28	2	0	0	0	45
SW	13	24	0	0	0	0	37
WSW	3	5	2	0	0	0	10
W	7	4	0	0	0	0	11
WNW	14	1	0	0	0	0	15
NW	18	3	0	0	0	0	21
NNW	28	12	0	0	0	0	40
Total	267	240	40	5	0	0	552

Calm Hours not Included above for : **Total Period** 43
Valid Hours for this Stability Class for: **Total Period** 552
Total Hours for Period 2184

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 4/1/2022 - 6/30/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	6	0	0	0	0	0	6
NNE	9	0	0	0	0	0	9
NE	7	0	0	0	0	0	7
ENE	8	0	0	0	0	0	8
E	12	0	0	0	0	0	12
ESE	22	0	0	0	0	0	22
SE	21	2	0	0	0	0	23
SSE	26	1	0	0	0	0	27
S	14	12	0	0	0	0	26
SSW	5	0	0	0	0	0	5
SW	4	0	0	0	0	0	4
WSW	1	0	0	0	0	0	1
W	4	0	0	0	0	0	4
WNW	2	0	0	0	0	0	2
NW	3	0	0	0	0	0	3
NNW	3	0	0	0	0	0	3
Total	147	15	0	0	0	0	162

Calm Hours not Included above for : **Total Period** 43
Valid Hours for this Stability Class for: **Total Period** 162
Total Hours for Period 2184

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 4/1/2022 - 6/30/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	0	0	0	0	0	0	0
NNE	2	0	0	0	0	0	2
NE	8	0	0	0	0	0	8
ENE	11	1	0	0	0	0	12
E	25	0	0	0	0	0	25
ESE	22	0	0	0	0	0	22
SE	28	2	0	0	0	0	20
SSE	19	0	0	0	0	0	19
S	22	0	0	0	0	0	22
SSW	9	0	0	0	0	0	9
SW	4	0	0	0	0	0	4
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	3	0	0	0	0	0	3
NW	1	0	0	0	0	0	1
NNW	3	0	0	0	0	0	3
Total	157	3	0	0	0	0	160

Calm Hours not Included above for : **Total Period** 43
Valid Hours for this Stability Class for: **Total Period** 160
Total Hours for Period 2184

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record = 4/1/2022 - 6/30/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Delta Temperature

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	75	82	0	0	0	0	157
NNE	41	15	0	0	0	0	56
NE	39	22	2	0	0	0	63
ENE	31	18	4	0	0	0	53
E	67	39	3	0	0	0	109
ESE	84	57	9	0	0	0	150
SE	84	98	53	0	0	0	235
SSE	73	85	29	2	0	0	189
S	59	113	59	7	0	0	238
SSW	36	96	34	1	0	0	167
SW	31	106	29	0	0	0	166
WSW	12	56	11	1	0	0	80
W	25	37	0	0	0	0	62
WNW	33	36	3	0	0	0	72
NW	52	54	0	0	0	0	106
NNW	105	124	4	0	0	0	233
Total	847	1038	240	11	0	0	2136

Calm Hours not Included above for :	**Total Period**	43
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	5
Valid Hours for this Stability Class for:	**Total Period**	2136
Total Hours for Period		2184

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 7/1/2022 - 9/30/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	17	47	0	0	0	0	64
NNE	4	1	0	0	0	0	5
NE	4	1	0	0	0	0	5
ENE	3	2	0	0	0	0	5
E	8	0	0	0	0	0	8
ESE	5	4	0	0	0	0	9
SE	1	1	0	0	0	0	2
SSE	2	14	0	0	0	0	16
S	1	31	7	0	0	0	39
SSW	4	33	5	0	0	0	42
SW	5	39	0	0	0	0	44
WSW	10	17	0	0	0	0	27
W	7	20	0	0	0	0	27
WNW	14	19	0	0	0	0	33
NW	22	16	0	0	0	0	38
NNW	39	43	0	0	0	0	82
Total	146	288	12	0	0	0	446

Calm Hours not Included above for : **Total Period** 153
Valid Hours for this Stability Class for: **Total Period** 446
Total Hours for Period 2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 7/1/2022 - 9/30/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	9	2	0	0	0	0	11
NNE	3	0	0	0	0	0	3
NE	1	0	0	0	0	0	1
ENE	4	0	0	0	0	0	4
E	3	1	0	0	0	0	4
ESE	2	0	0	0	0	0	2
SE	2	0	0	0	0	0	2
SSE	2	3	0	0	0	0	5
S	1	12	1	0	0	0	14
SSW	2	9	1	0	0	0	12
SW	2	6	0	0	0	0	8
WSW	2	3	0	0	0	0	5
W	2	3	0	0	0	0	5
WNW	3	1	0	0	0	0	4
NW	3	3	0	0	0	0	6
NNW	7	3	0	0	0	0	10
Total	48	46	2	0	0	0	96

Calm Hours not Included above for :	**Total Period**	153
Valid Hours for this Stability Class for:	**Total Period**	96
Total Hours for Period		2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 7/1/2022 - 9/30/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	5	3	0	0	0	0	8
NNE	4	0	0	0	0	0	4
NE	7	1	0	0	0	0	8
ENE	4	0	0	0	0	0	4
E	5	0	0	0	0	0	5
ESE	1	0	0	0	0	0	1
SE	1	0	0	0	0	0	1
SSE	3	3	0	0	0	0	6
S	2	13	3	1	0	0	18
SSW	2	8	1	0	0	0	11
SW	7	7	0	0	0	0	14
WSW	0	3	0	0	0	0	3
W	7	3	1	0	0	0	11
WNW	2	0	0	0	0	0	2
NW	5	1	0	0	0	0	6
NNW	8	1	0	0	0	0	9
Total	63	43	5	0	0	0	111

Calm Hours not Included above for : **Total Period** 153
Valid Hours for this Stability Class for: **Total Period** 111
Total Hours for Period 2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 7/1/2022 - 9/30/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Stability Class D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	34	22	0	0	0	0	56
NNE	15	1	0	0	0	0	16
NE	27	2	0	0	0	0	29
ENE	15	1	0	0	0	0	16
E	11	0	0	0	0	0	11
ESE	11	5	0	0	0	0	16
SE	11	6	0	0	0	0	17
SSE	21	5	0	0	0	0	26
S	17	68	5	0	0	0	90
SSW	14	40	10	0	0	0	64
SW	9	22	4	0	0	0	35
WSW	4	3	0	0	0	0	7
W	7	8	0	0	0	0	15
WNW	7	13	0	0	0	0	20
NW	14	12	0	0	0	0	26
NNW	27	5	0	0	0	0	32
Total	244	213	19	0	0	0	476

Calm Hours not Included above for : **Total Period** 153

Valid Hours for this Stability Class for: **Total Period** 476

Total Hours for Period 2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 7/1/2022 - 9/30/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Stability Class E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	44	7	0	0	0	0	51
NNE	31	0	0	0	0	0	31
NE	13	0	0	0	0	0	13
ENE	16	1	0	0	0	0	17
E	19	0	0	0	0	0	19
ESE	21	0	0	0	0	0	21
SE	18	2	0	0	0	0	20
SSE	30	1	0	0	0	0	31
S	42	43	2	0	0	0	87
SSW	35	15	2	1	0	0	53
SW	7	3	0	0	0	0	10
WSW	5	5	0	0	0	0	10
W	6	4	0	0	0	0	10
WNW	10	7	0	0	0	0	17
NW	14	2	0	0	0	0	16
NNW	18	5	0	0	0	0	23
Total	329	95	4	1	0	0	429

Calm Hours not Included above for : **Total Period** 153

Valid Hours for this Stability Class for: **Total Period** 429

Total Hours for Period 2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 7/1/2022 - 9/30/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	8	0	0	0	0	0	8
NNE	3	0	0	0	0	0	3
NE	9	0	0	0	0	0	9
ENE	15	0	0	0	0	0	15
E	17	0	0	0	0	0	17
ESE	16	0	0	0	0	0	16
SE	15	0	0	0	0	0	15
SSE	35	1	0	0	0	0	36
S	23	1	0	0	0	0	24
SSW	12	1	0	0	0	0	13
SW	4	0	0	0	0	0	4
WSW	1	0	0	0	0	0	1
W	2	0	0	0	0	0	2
WNW	3	0	0	0	0	0	3
NW	3	0	0	0	0	0	3
NNW	4	0	0	0	0	0	4
Total	170	3	0	0	0	0	173

Calm Hours not Included above for : **Total Period** 153
Valid Hours for this Stability Class for: **Total Period** 173
Total Hours for Period 2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 7/1/2022 - 9/30/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	2	0	0	0	0	0	2
NNE	0	0	0	0	0	0	0
NE	3	0	0	0	0	0	3
ENE	24	0	0	0	0	0	24
E	60	0	0	0	0	0	60
ESE	45	0	0	0	0	0	45
SE	47	0	0	0	0	0	47
SSE	56	0	0	0	0	0	56
S	52	0	0	0	0	0	52
SSW	18	0	0	0	0	0	18
SW	2	0	0	0	0	0	2
WSW	1	0	0	0	0	0	1
W	1	0	0	0	0	0	1
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
Total	311	0	0	0	0	0	311

Calm Hours not Included above for : **Total Period** 153
Valid Hours for this Stability Class for: **Total Period** 311
Total Hours for Period 2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record = 7/1/2022 - 9/30/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Delta Temperature

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	119	81	0	0	0	0	200
NNE	60	2	0	0	0	0	62
NE	64	4	0	0	0	0	68
ENE	81	4	0	0	0	0	85
E	123	1	0	0	0	0	124
ESE	101	9	0	0	0	0	110
SE	95	9	0	0	0	0	104
SSE	149	27	0	0	0	0	176
S	138	168	18	0	0	0	324
SSW	87	106	19	1	0	0	213
SW	36	77	4	0	0	0	117
WSW	23	31	0	0	0	0	54
W	32	38	1	0	0	0	71
WNW	39	40	0	0	0	0	79
NW	61	34	0	0	0	0	95
NNW	103	57	0	0	0	0	160
Total	1311	688	42	1	0	0	2042

Calm Hours not Included above for :	**Total Period**	153
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	13
Valid Hours for this Stability Class for:	**Total Period**	2042
Total Hours for Period		2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 10/1/2022 - 12/31/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	4	13	0	0	0	0	17
NNE	5	3	0	0	0	0	8
NE	0	2	0	0	0	0	2
ENE	1	0	0	0	0	0	1
E	0	1	0	0	0	0	1
ESE	1	5	0	0	0	0	6
SE	1	1	0	0	0	0	2
SSE	0	4	6	0	0	0	10
S	0	5	6	0	0	0	11
SSW	0	3	3	0	0	0	6
SW	0	15	2	0	0	0	17
WSW	1	7	0	0	0	0	8
W	0	3	0	0	0	0	3
WNW	0	3	2	0	0	0	5
NW	1	2	0	0	0	0	3
NNW	3	5	0	0	0	0	8
Total	17	72	19	0	0	0	108

Calm Hours not Included above for :	**Total Period**	23
Valid Hours for this Stability Class for:	**Total Period**	108
Total Hours for Period		2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 10/1/2022 - 12/31/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	0	2	0	0	0	0	2
NNE	1	0	0	0	0	0	1
NE	0	0	0	0	0	0	0
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	1	0	0	0	0	4
SSE	0	3	0	0	0	0	3
S	0	4	3	1	0	0	8
SSW	0	5	2	0	0	0	7
SW	2	4	2	0	0	0	8
WSW	0	4	1	0	0	0	5
W	0	1	0	0	0	0	1
WNW	0	4	1	0	0	0	5
NW	1	1	0	0	0	0	2
NNW	0	1	0	0	0	0	1
Total	8	35	9	1	0	0	53

Calm Hours not Included above for : **Total Period** 23
Valid Hours for this Stability Class for: **Total Period** 53
Total Hours for Period 2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 10/1/2022 - 12/31/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	1	2	0	0	0	0	3
NNE	0	0	0	0	0	0	0
NE	3	2	0	0	0	0	5
ENE	0	0	0	0	0	0	0
E	0	1	0	0	0	0	1
ESE	1	0	0	0	0	0	1
SE	1	5	0	0	0	0	6
SSE	0	8	3	0	0	0	11
S	0	3	10	0	0	0	13
SSW	1	4	2	0	0	0	7
SW	1	4	2	0	0	0	7
WSW	2	4	1	0	0	0	7
W	0	3	0	0	0	0	3
WNW	2	2	0	0	0	0	4
NW	4	0	0	0	0	0	4
NNW	1	3	0	0	0	0	4
Total	17	41	18	0	0	0	76

Calm Hours not Included above for :	Total Period	23
Valid Hours for this Stability Class for:	Total Period	76
Total Hours for Period		2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 10/1/2022 - 12/31/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	11	36	20	0	0	0	67
NNE	9	3	0	0	0	0	12
NE	10	1	0	0	0	0	11
ENE	10	8	0	0	0	0	18
E	14	34	7	0	0	0	55
ESE	11	32	13	0	0	0	56
SE	19	21	7	0	0	0	47
SSE	17	44	8	1	0	0	70
S	18	62	62	8	1	0	151
SSW	7	41	58	4	0	0	110
SW	7	48	30	0	0	0	85
WSW	4	43	30	0	0	0	77
W	11	31	24	0	0	0	66
WNW	13	29	18	0	0	0	60
NW	14	33	11	0	0	0	58
NNW	21	47	0	0	0	0	68
Total	196	513	288	13	1	0	1011

Calm Hours not Included above for :	**Total Period**	23
Valid Hours for this Stability Class for:	**Total Period**	1011
Total Hours for Period		2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 10/1/2022 - 12/31/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	17	8	17	0	0	0	42
NNE	13	3	0	0	0	0	16
NE	18	0	0	0	0	0	18
ENE	10	9	0	0	0	0	19
E	19	10	0	0	0	0	29
ESE	21	1	0	0	0	0	22
SE	23	12	4	0	0	0	39
SSE	37	65	6	2	0	0	110
S	25	80	62	0	0	0	167
SSW	5	12	18	0	0	0	35
SW	10	10	4	1	0	0	25
WSW	3	17	9	0	0	0	29
W	8	17	8	0	0	0	33
WNW	9	9	1	0	0	0	19
NW	8	7	2	0	0	0	17
NNW	10	10	2	0	0	0	22
Total	236	270	133	3	0	0	642

Calm Hours not Included above for :	**Total Period**	23
Valid Hours for this Stability Class for:	**Total Period**	642
Total Hours for Period		2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 10/1/2022 - 12/31/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class F Delta Temperature Moderately Stable

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	3	0	0	0	0	0	3
NE	5	0	0	0	0	0	5
ENE	6	0	0	0	0	0	6
E	10	0	0	0	0	0	10
ESE	11	0	0	0	0	0	11
SE	11	1	0	0	0	0	12
SSE	30	5	0	0	0	0	35
S	11	3	0	0	0	0	14
SSW	4	2	0	0	0	0	6
SW	1	0	0	0	0	0	1
WSW	0	0	4	0	0	0	4
W	0	0	22	1	0	0	23
WNW	0	0	5	0	0	0	5
NW	1	0	0	0	0	0	1
NNW	0	2	0	0	0	0	2
Total	94	13	31	1	0	0	139

Calm Hours not Included above for : **Total Period** 23
Valid Hours for this Stability Class for: **Total Period** 139
Total Hours for Period 2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 10/1/2022 - 12/31/2022
Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M
Stability Class G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	1	0	0	0	0	0	1
ENE	6	0	0	0	0	0	6
E	18	0	0	0	0	0	18
ESE	21	0	0	0	0	0	21
SE	38	0	0	0	0	0	38
SSE	32	0	0	0	0	0	32
S	22	1	0	0	0	0	23
SSW	5	0	0	0	0	0	5
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	2	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	144	1	2	0	0	0	147

Calm Hours not Included above for : **Total Period** 23
Valid Hours for this Stability Class for: **Total Period** 147
Total Hours for Period 2208

Site: AEP Cook

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record = 10/1/2022 - 12/31/2022

Elevation: **Speed:** SP10M **Direction:** DIR10M **Lapse:** DT60M

Delta Temperature

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	34	61	37	0	0	0	132
NNE	31	9	0	0	0	0	40
NE	37	5	0	0	0	0	42
ENE	33	19	0	0	0	0	52
E	61	48	7	0	0	0	116
ESE	67	39	13	0	0	0	119
SE	96	41	11	0	0	0	148
SSE	116	129	23	3	0	0	271
S	76	158	143	9	1	0	387
SSW	22	67	83	4	1	0	176
SW	21	81	40	1	0	0	143
WSW	10	75	45	0	0	0	130
W	19	55	56	1	0	0	131
WNW	24	47	27	0	0	0	98
NW	30	43	13	0	0	0	86
NNW	35	68	2	0	0	0	105
Total	712	945	500	18	1	0	2176

Calm Hours not Included above for :	**Total Period**	23
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	9
Valid Hours for this Stability Class for:	**Total Period**	2176
Total Hours for Period		2208

OFF-SITE DOSE CALCULATION MANUAL CHANGES

The Off-Site Dose Calculation Manual, PMP-6010-OSD-001, was not revised during this 2022 reporting period.