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MONTICELLO NUCLEAR GENERATING PLANT

Offsite Radiation Dose Assessment for January 1, - December 31, 2002

An assessment of radiation dose due to releases from the Monticello Nuclear Generating Plant during 2002 was performed in accordance with the Offsite Dose Calculation Manual (ODCM). Computed doses were well below the 40 CFR 190 Standards and 10 CFR Part 50, Appendix I Guidelines.

Offsite dose calculation formulas and meteorological data from the Offsite Dose Calculation Manual were used in making this assessment. Source terms were obtained from the Radioactive Effluent Release Report for 2002.

Offsite Dose from Gaseous Releases (ODCM -08.01 section 2.1.3)

Computed dose due to gaseous releases are reported in Table 1. Critical receptor location and pathways for organ dose are reported in Table 2. Whole body and organ dose due to gaseous releases are a small percentage of Appendix I Guidelines.

Offsite Dose From Liquid Releases (ODCM -08.01 section 2.1.3)

There were no liquid releases this report period and therefore there is no dose contribution due to liquid releases.

Dose to Individuals Due to Their Activities Inside the Site Boundary (ODCM -08.01 section 2.1.3)

Computed dose to the whole body, skin and organ (thyroid), are reported in Table 1. There are several groups of concern, construction work on the cooling towers and XCEL Energy Company transmission and distribution crews working in the substation. Use of a very conservative assumption of 40 hours/week spent inside the site boundary by these groups would conservatively represent the most exposed individual. The annual whole body, skin and organ dose was computed using plant stack and reactor building vent X/Q and D/Q values for the number 11 cooling tower location (a bounding location due to predominant wind direction and nearness to the release points) as input to the GASPARE code. This computed dose was reduced by the factor of 40/168 to account for limited occupancy.

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Dose to the Likely Most Exposed Member of the General Public from Reactor Releases and Other Nearby Uranium Fuel Cycle Sources (ODCM -08.01 section 2.1.4)

There are no other uranium fuel facilities in the vicinity of the Monticello site. The only artificial source of exposure to the general public in addition to the plant effluent releases is from direct radiation of the reactor and the steam turbines.

Environmental TLDs were used to provide data on direct and skyshine radiation dose and the GASPARE code was used to provide data on dose from airborne pathways. The net dose from the TLDs was added to the GASPARE dose data for locations of off site residences and personnel with activities inside the site boundary. This data indicates that the annual whole body and organ dose to each of these locations is less than 23 millirem. (see pages 5 and 6 for details)

Therefore, the likely most exposed member of the general public will not receive an annual radiation dose from reactor effluent releases and all other fuel cycle activities in excess of 40 CFR 190 standards of 25 millirem to the whole body, 75 millirem to the thyroid, and 25 millirem to any other organ.

Changes in Land Use and Non Obtainable Milk or Vegetable Samples
(ODCM -08.01 sections 2.1.8 and 2.1.9)

There were no changes in land use resulting in significant increases in calculated doses. Milk samples were unavailable at sample location M-28 (Hoglund Farm) from 7/24/02 to 10/16/02 due to the farm being temporarily out of business. Land use census results show that there were no other indicator sample locations to replace this farm. Milk production and sampling has resumed at the Hoglund farm starting 10/30/02. There were no vegetable samples that could not be obtained during this reporting period.

Table 1

Offsite Radiation Dose Assessment - Monticello

PERIOD: January 1, through December 31, 2002

GASEOUS RELEASES	DOSE	10 CFR 50 Appendix I Guidelines
Maximum Site Boundary Gamma Air Dose (mrad/year)	0.001	10
Maximum Site Boundary Beta Air Dose (mrad/year)	0.002	20
Maximum Off-Site Dose to Any Organ (mrem/year)	0.014	15
Maximum Dose to the Likely Most Exposed Member of the General Public (mrem/year)		
Whole Body	0.006	5
Skin	0.008	15
Organ (Thyroid)	0.014	15
LIQUID RELEASES	DOSE	10 CFR 190 LIMITS
Maximum Off-Site Dose (mrem)		
Whole Body	0	3
Organ	0	10
GASEOUS RELEASES	DOSE	10 CFR 190 LIMITS
Maximum Dose to Individuals due to their Activities Inside the Site Boundary (mrem)		
Whole Body	0.014	25
Thyroid	0.018	75
Any Other Organ (Skin)	0.016	25

Table 2

**Offsite Radiation Dose Assessment - Monticello
Supplemental Information**

PERIOD: January 1, through December 31, 2002

GASEOUS RELEASES		
Maximum Site Boundary Dose Location (from Reactor Building Vents)		
Sector	SSE	
Distance (miles)	0.40	
Number 11 Cooling Tower		
Sector	NE	
Distance from Plant Stack (miles)	0.09	
Distance from Reactor Building Vents	0.13	
Critical Receptor Location		
Sector	SSW	
Distance from Reactor Building Vents (miles)	0.60	
Pathways	Plume, Ground, Inhalation, Vegetable	
Age Group	CHILD	
Organ	THYROID	
LIQUID RELEASES		
St. Paul Drinking Water Intake Location (No Liquid Releases)		
Pathways	Drinking Water	Drinking Water, Fish
Age Group	Infant	Adult
Organ	Whole Body	GI Tract
Dilution Factor (drinking water)	7:1	7:1

Bases for Radiation Dose Statements

40 CFR 190 Limits for Annual Dose Equivalent

Whole Body – 25 mrem Thyroid – 75 mrem Any Other Organ – 25 mrem

Critical Receptor Locations

Maximum Organ Dose – 0.6 miles SSW
Maximum Site Boundary TLD – 1.3 miles NE

Maximally Exposed Individuals

A. Maximum Offsite Dose from Airborne Effluents (Calculated by GASPAR program)

Whole Body:	0.014 mrem
Thyroid:	0.018 mrem
Any Other Organ:	0.016 mrem

B. Dose from Shine

<u>TLD</u>	<u>Location</u>	<u>Mean Reading (mrem/91 days)</u>	<u>Standard Deviation</u>
Controls	4 quadrants @ 90° separation	15.1	0.31 (4 sites all >10 mile distance)
M-09A	0.6 miles SSW	14.8	0.78 (in direction of Critical Receptor)
M-03A	1.3 miles NE	17.4	2.01 (maximum site boundary TLD)

The difference (D) between the indicator and control TLDs, the standard deviation of D, and the limits for D at the 90% confidence level are as follows:

<u>TLD</u>	<u>D</u>	<u>Std Dev</u>	<u>90% Conf</u>	<u>Limits at 90% Confidence</u>
M-09A	-0.29	0.84	1.39	-1.68 < D < 1.09
M-03A	2.33	2.03	3.35	-1.01 < D < 5.68

M-09A – Because zero is in the interval, there may be no difference between the indicator and control TLDs. At the 90% confidence level, the difference is no greater than 1.09 mrem per 91 days, or approximately 4.36 mrem/year.

M-03A – Because zero is in the interval, there may be no difference between the indicator and control TLDs. At the 90% confidence level, the difference is no greater than 5.68 mrem per 91 days, or approximately 22.72 mrem/year.

C. Maximum Total Dose

Annual Dose from effluents to any individual, regardless of location, will be no more than:

Whole Body:	0.014 mrem
Thyroid:	0.018 mrem
Other Organs:	0.016 mrem

Annual Direct Dose will be no more than: 22.72 mrem

Therefore, the maximum dose quantities for comparison to 49 CFR 190 limits are (mrem/year):

	<u>Dose</u>	<u>Limit</u>
Whole Body:	22.86	25
Thyroid:	22.90	75
Any Other Organ:	22.88	25

Bypass of Offgas Storage Building for Greater than Seven Days

The offgas storage system was bypassed 12/14/01 for plant startup following the 2001 refueling outage per plant startup procedures and as allowed in ODCM-03.01, Section 2.4.1.A: "In accordance with T.S.6.8.D.6, the OFF-GAS TREATMENT SYSTEM SHALL be in operation whenever the Main Condenser Air Ejector system is in operation except during Plant Startup or Plant Shutdown."

ODCM-03.01, Section 2.4.3 Action states: "With gaseous waste being discharged for more than seven (7) days with an average holdup time of less than 50 hours, document and report IAW ODCM-01.01, Section 2.4.1.C." The ODCM action statement was entered when the air ejector system was placed in service on 12/14/01.

Following plant startup, post-recombiner offgas flow was at an abnormally high level (approx. 35 SCFM) due to high main condenser air leakage. At this leakage rate, the storage system could not meet the ODCM-required average holdup time of 50 hours. On 12/21/01 the seven-day action period was exceeded, which requires documentation per ODCM-01.01, Section 2.4.1.C: "Noncompliance with a CONTROL and associated ACTION, or a Surveillance Requirement SHALL be documented in the annual "Radioactive Effluent Release Report" covering the period of the noncompliance."

An investigation was initiated shortly after plant startup to determine the source of excessive air leakage. This investigation included identification of possible leakage pathways and systematic helium leak testing of relevant portions of the plant by both plant personnel and a vendor experienced in leakage inspections. One leakage source (packing leak) was found on 12/15 while the plant was at low power. Following an exhaustive search in steam areas the plant ascended to full power and the investigation was restricted to radiologically accessible areas, which did not include most of the condenser room and feedwater heater area. When no significant air leakage was discovered in accessible areas, plant reactor power was reduced to 70% to allow further investigation in the condenser and feedwater heater areas, including retesting of components using helium leak detection and manual checking of possible leaking isolation valves. During this evolution the major leakage source (leaking valve) was found and corrected on 1/12/02.

Condenser air leakage then dropped to approximately 10 SCFM. The offgas storage system was placed in service 1/13/02, returning the plant to compliance with the ODCM requirement of greater than 50 hours holdup time.

Cause: The offgas storage system was unable to maintain the required holdup time due to high condenser air leakage. There were two major sources:

- 1) Low-pressure feedwater heater dump valve packing leak, 5 cfm.
- 2) Low-pressure feedwater heater drain valve, 15 cfm. The valve had been closed hand-tight per plant pre-start valve checklist, and required use of a valve wrench to fully close (an additional handwheel quarter turn). The drain line for this valve joins a common drain line with numerous inputs. It is presumed that one of these inputs opens to an area inaccessible to inspection and testing, since it was not found during the exhaustive helium leak detection investigation. The drain line inputs are not shown on plant drawings.

Corrective Actions: The condenser leakage investigation and resulting corrective actions are documented in Condition Report 20018244. Immediate corrective actions consisted of repair of the feedwater heater dump valve packing leak and full closure of the feedwater heater drain valve, eliminating the major sources of condenser air leakage and

allowing return of the offgas storage system to service. Current air inleakage is consistent with historical trends.

A work order was written to repair the feedwater heater drain valve, which prevents recurrence of major inleakage from this source. This work will be performed during the next refueling outage.

Significance: During the period of storage system bypass, release rates were higher than historical. The Gamma air dose was about 30% higher than for the same period of the year 2001 Gamma air dose. The doses for the first quarter 2002 were compared to the doses for the first quarter 2001. The Beta and Particulates, Iodines, and Tritium doses for the first quarter 2002 were similar to the corresponding doses for the first quarter 2001. The gamma air dose for the first quarter 2002 increased from .03% of the 5 mrad limit to .04% of the 5 mrad limit. The doses for the first quarter 2002 were within historical values and did not impose upon the health and safety of the public.