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Monticello Nuclear Generating Plant
Docket 50-263
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Response to Second Request for Additional Information Related to Technical Specifications Change Request to Apply Alternative Source Term (AST) Methodology to Re-Evaluate the Fuel-Handling Accident (TAC No. MC3299), dated January 31, 2005

References:

1) NMC letter to NRC, “License Amendment Request: Selective Scope Application of an Alternative Source Term Methodology for Re-evaluation of the Fuel Handling Accident,” (L-MT-04-023) dated April 29, 2004.

2) NMC letter to NRC, “Supplement 1 to License Amendment Request: Selective Scope Application of an Alternative Source Term Methodology for Re-evaluation of the Fuel Handling Accident,” (L-MT-04-064) dated November 23, 2004, (TAC No. MC3299).

3) NRC letter to NMC, “Monticello Nuclear Generating Plant - Request for Additional Information Related to Technical Specifications Change Request to Apply Alternative Source Term (AST) Methodology to Re Evaluate the Fuel Handling Accident (TAC No. MC3299),” dated January 11, 2005.

4) NMC letter to NRC, “Response to Request for Additional Information Related to Technical Specifications Change Request to Apply Alternative Source Term (AST) Methodology to Re Evaluate the Fuel Handling Accident, dated January 11, 2005 (TAC No. MC3299),” (L-MT-05-001) dated January 20, 2005.

5) NRC letter to NMC, “Monticello Nuclear Generating Plant – Second Request for Additional Information Related to Technical Specifications Change Request to Apply Alternative Source Term (AST) Methodology to Re-Evaluate the Fuel-Handling Accident (TAC No. MC3299),” dated January 31, 2005.

On April 29, 2004, pursuant to 10 CFR 50.67 and 10 CFR 50.90, the Nuclear Management Company, LLC, (NMC) requested a selective scope application of an alternative source term (AST) to the fuel handling accident (FHA) for the Monticello Nuclear Generating Plant (MNGP) (Reference 1). NMC proposed to amend the MNGP licensing basis and Technical Specifications based on a revised FHA radiological consequence analysis with an AST. On November 23, 2004, NMC provided a supplemental letter discussing shutdown administrative controls for Secondary Containment, ventilation system and radiation monitor availability during refueling, and validation of the FHA radiological consequence analysis Control Room inleakage assumptions (Reference 2). The NRC staff requested additional information (RAI) on January 11, 2005 (Reference 3). NMC provided a response on January 20, 2005 (Reference 4). On January 31, 2005 (Reference 5) the NRC staff issued an RAI concerning meteorology and onsite and offsite atmospheric dispersion factors. Enclosure 1 provides the response to this RAI.

This letter contains no new commitments and no revisions to existing commitments.

Thomas J. Palmisano
Site Vice President, Monticello Nuclear Generating Plant
Nuclear Management Company, LLC

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Monticello, USNRC
Resident Inspector, Monticello, USNRC
Minnesota Department of Commerce

ENCLOSURE 1

RESPONSE TO SECOND REQUEST FOR ADDITIONAL INFORMATION RELATED TO TECHNICAL SPECIFICATIONS CHANGE REQUEST TO APPLY ALTERNATIVE SOURCE TERM METHODOLOGY TO RE-EVALUATE THE FUEL-HANDLING ACCIDENT

On April 29, 2004, pursuant to 10 CFR 50.67 and 10 CFR 50.90, the Nuclear Management Company, LLC, (NMC) requested a selective scope application of an alternative source term (AST) to the fuel handling accident (FHA) for the Monticello Nuclear Generating Plant (MNGP) (Reference 1). NMC proposed to amend the MNGP licensing basis and Technical Specifications based on a revised FHA radiological consequence analysis with an AST. On November 23, 2004, NMC provided a supplemental letter discussing shutdown administrative controls for Secondary Containment, ventilation system and radiation monitor availability during refueling, and validation of the FHA radiological consequence analysis Control Room inleakage assumptions (Reference 2). The NRC staff requested additional information (RAI) on January 11, 2005 (Reference 3). NMC provided a response on January 20, 2005 (Reference 4). On January 31, 2005 (Reference 5) the NRC staff issued an RAI concerning meteorology and onsite and offsite atmospheric dispersion factors. This enclosure provides the response to this RAI. The NRC questions or requests are shown in 'bold' text below and the NMC response is provided in 'standard' text immediately after.

Meteorological Measurements and Data

1. **Were comparisons made between the 1998 through 2002 hourly wind speed data in the ARCON96 format and the joint wind speed, wind direction and atmospheric stability (jfd) data used in the PAVAN calculations? U.S. Nuclear Regulatory Commission (NRC) staff estimate a slightly higher occurrence of calm winds when generating a jfd from the hourly data in comparison to the frequency in the jfds used in the PAVAN calculations. Further, the incidence of calms reported for 1980 in the Monticello Updated Final Safety Analysis Report (USAR) also appears to be higher than in the jfds used in the PAVAN calculations. Provide further detail of the comparisons made between the 1980 jfd wind speed and direction frequency data and the 1998 through 2002 jfds to support the statement on page 3 of calculation number 2004-01852 (CA-04-036) which asserts that "the new data are generally consistent with the USAR historical data."**

    Discussion of Differences in ARCON96 and PAVAN Data Generation

    In response to the question above, the ARCON96 (Reference 6) input files were compared with the PAVAN (Reference 7) joint frequency distribution input files. The comparison displayed minor differences due to the data selection process used to create the files.

    Meteorological data for MNGP is collected in data files created by the Meteorological Information and Dose Assessment System (MIDAS). The MNGP primary meteorological tower has two redundant trains of sensors, and data from both trains are stored in the MIDAS data files. The programs that generated the ARCON96 input data and PAVAN joint frequency distribution tables used the same MIDAS data files but each program used a slightly different data selection process.

The PAVAN joint frequency distribution tables created by the MIDAS software report data for only one instrument train. Annual joint frequency distribution data from the instrument train with the highest data recovery rate during the year of interest was utilized as input to PAVAN.

Conversely, the ARCON96 input data generation program accessed data from both instrument trains. The program reported data from one train unless the hourly data status code was "bad," in which case data from the alternate train were reported. The availability of the alternate train data for the ARCON96 files resulted in a higher data recovery rate. Therefore, the ARCON96 data reflect a slightly higher number of hours for calm winds as well as other wind categories when compared to the joint frequency distribution tables.

The ARCON96 input files and PAVAN joint frequency distribution table input files were compared; both were found to be representative of the unprocessed meteorological data for the period 1998 - 2002. Small differences in hours of missing data, calm winds, or particular stability classes were determined to be due to the data selection process described above.

Comparison Between the 1980 USAR and the 1998-2002 Meteorological Data

Some differences between the 1980 MNGP Updated Safety Analysis Report (USAR) meteorological data and the 1998-2002 meteorological data would be expected, given the following factors:

- The difference in sample size due to the longer sampling period for the 1998-2002 meteorological data.
- Potential changes to the microclimate at the site due to new construction, vegetation changes, etc., at the site and surrounding areas.
- Improvements in instrumentation and data recording. Meteorological instruments and data collection equipment were replaced in 1982 and 1983. The current ultrasonic wind sensors were installed in 2000.

The MNGP analyses for offsite (Reference 8) and onsite (Reference 9) post-accident atmospheric dispersion contain a comparison of 1980 meteorological data reported in the USAR with the 1998-2002 meteorological data used to generate new atmospheric dispersion factors in these calculations. This comparison consisted of an inspection of the USAR joint frequency distribution table of combined wind class data for the 100-meter level versus the 1998-2002 joint frequency distribution tables (combined wind class data for the 43 and

100-meter levels). The relative proportion of meteorological observations in each stability class for each data set was compared. The overall distribution is similar in both sets, with the majority of observations in stability classes D and E. This resulted in the statement that "the new data is generally consistent with the USAR historical data."

2. Did the Monticello onsite meteorological measurement program meet the recommendations of Regulatory Guide 1.23, "Onsite Meteorological Programs," from 1998 through 2002?

The MNGP onsite meteorological measurement program, as described below, met the recommendations of Regulatory Guide (RG) 1.23 from 1998 through 2002 with one exception. NMC calibrates the meteorological monitoring instrumentation at an annual frequency rather than the semi-annual calibration interval recommended by RG 1.23. The meteorological program was consistent with RG 1.23 for measured parameters, instrument siting, data recording, data reduction, instrument accuracy and maintenance. NMC is not committed to RG 1.23 at the MNGP.

The meteorological measurements program at MNGP consists of monitoring wind direction, wind speed, temperature, and precipitation. Recorded data are used to generate joint frequency distributions of wind direction, wind speed, and atmospheric stability class used to provide estimates of airborne concentrations of gaseous effluents and projected offsite radiation dose. The primary meteorological tower facility is located on the plant site; the surrounding area is maintained free of obstructions to preclude micro-scale influences. Thus, the meteorological data is representative of the overall site area.

The meteorological instrumentation meets the accuracy recommendations of RG 1.23. Data is collected at 5-second intervals and averaged into 15-minute averages; the 15-minute averages are used to compute hourly average data. Hourly averages are evaluated for consistency and to assure that the data reported were reasonable with respect to local conditions. The evaluation methodology and criteria are specified in MNGP procedures. Data is recorded in digital and analog formats.

RG 1.23 states that "meteorological instruments should be inspected and serviced at a frequency which will assure at least a 90 [percent] data recovery and which will minimize extended periods of instrument outage. The use of redundant sensors and/or recorders may be another acceptable means of achieving the 90 [percent] data recovery goal. The instruments should be calibrated at least semiannually."

Meteorological measurement instruments are calibrated annually. This is not in conformance with the semi-annual calibration interval recommendation in RG 1.23; however, calibration histories demonstrate that the instruments are routinely within tolerance. With an annual calibration frequency, better than

90 percent data recovery is attained from the measuring and recording system. A monthly inspection is also performed on the towers and instruments. This provides assurance that the instruments are functioning as expected and identifies problems between annual preventive maintenance and calibration activities. The MNGP meteorological monitoring system is redundant: the primary meteorological tower has two independent trains of meteorological sensors. MNGP also maintains a back-up meteorological tower with a single train of wind speed and direction sensors. Despite the longer calibration interval used at MNGP, the 90 percent data recovery goal described in Section C.5, "Instrument Maintenance and Servicing Schedules," in RG 1.23 is met.

Onsite χ/Qs

3. With regard to the April 29, 2004 letter on selective scope application of the AST, page 23 of Enclosure 1 states that the reactor vent "was determined to be the limiting and representative release point for the AST FHA [fuel-handling accident]." Staff notes that reference CA-04-037 which describes how estimates were made includes results from a number of calculations, some with higher atmospheric dispersion factors (χ/Q values) than that for the postulated release from the reactor vent to the control room. Please confirm that the only two relevant release/receptor pairs for the FHA are from the off-gas stack and the reactor building vent to the control room. Does this assessment include consideration of factors such as single-failure, loss of offsite power, open penetrations (e.g., personnel or equipment hatches), or possible intake to the technical support center.

Discussion of Relevant Release Receptor Pairs for the FHA

The relevant release/receptor pairs for the FHA are from the Offgas Stack and the Reactor Building (RB) vent to the Control Room intake. The referenced calculation for the onsite post-accident atmospheric dispersion analysis (Reference 9) includes atmospheric dispersion factors calculated for other design basis accidents, including several applicable to AST analyses other than the AST FHA analysis. These include:

- The Technical Support Center (TSC) intake χ/Q(1)
- The Reactor Building nearest wall χ/Q. This source was developed for use in the positive pressure period for the full-scope AST Loss of Coolant Accident evaluation.
- Turbine Building (TB) vent χ/Q. This source is not applicable since no significant release would be expected from the TB for the FHA.

1 The TSC intake serves the TSC Emergency Ventilation System, which is a filtered ventilation system (95 percent filtration efficiency for iodines and particulates). Although the TSC intake χ/Q would be larger than the CR intake, the filtered TSC intake receptor is bounded by the unfiltered CR intake receptor assumed in the FHA analysis.

Assessment of Other Factors in Determination of Release/Receptor Pairs for the AST Fuel Handling Accident

For the FHA analysis, no credit was taken for safety-related ventilation systems (and their associated radiation monitors) such as the Standby Gas Treatment (SBGT) System or Control Room Emergency Ventilation System. Therefore, these safety-related ventilation systems were assumed to be inoperable and consideration of the effects of single-failures and a loss of off-site power for these systems was not applicable under this analysis. The Reactor Building Ventilation System is a non-safety related ventilation system with non-essential power supplies, and as such will not operate in the event of a loss of off site power. With no Reactor Building ventilation, there would be minimal driving force for any release. Consideration was also given to the potential for release through other open penetrations, including the Reactor Building Railroad Door Airlock (which is the other significant Secondary Containment opening). A discussion of these cases is provided in a response to a similar question (on page 5 of Enclosure 1) in the previous RAI (Reference 4). Dispersal from the Reactor Building vent due to operation of the Reactor Building Ventilation System was determined to be the most limiting case.

In conclusion, the source/receptor pairs of interest for the AST FHA are from the Offgas Stack to the Control Room intake and from the Reactor Building vent to the Control Room intake. Of these pairs, the Reactor Building vent source provides a bounding value for the AST FHA analysis.

4. In the elevated release calculation, it appears that the effective stack height was input as the distance between the top of the stack and ground level rather than the distance between the top of the stack and the control room air intake. If this is the case, is the χ/Qs value for the release from the plant vent still limiting?

In the MNGP atmospheric dispersion calculations for the Control Room intake receptor, the effective stack height[(2)] was input as the distance between the top of the stack and ground level. The NRC staff's suggested procedure defines effective stack height as the distance between the top of the stack and the Control Room air intake.

In the MNGP calculation, the difference in elevation between the stack exit elevation and the CR intake (the "effective stack height" as referenced in the question) was accounted for by defining the stack full height consistent with the actual plant stack elevation and defining the CR intake elevation height as a terrain height.[(3)] For non-fumigation conditions, this procedure yields lower

2 PAVAN Card 7, Variable "HS"
3 PAVAN Card 14, Variable "HT"

atmospheric dispersion factors, than determined by the NRC staff's procedure, by less than 5 percent. For fumigation, this procedure yields results identical to those using the NRC staff's suggested procedure.

In the FHA calculation, the limiting release from the Secondary Containment is via the Reactor Building vent, and is modeled as a ground level release. Thus, the effective stack height has no impact on the calculated (ground level) atmospheric dispersion for the CR intake. As can be seen from Table 1, the ground level atmospheric dispersion factor used in the FHA analysis is limiting with respect to the elevated data, even considering a 5 percent increase in elevated χ/Qs.

Table 1 - Calculated Control Room Intake χ/Q

Release Description	CR χ/Q
Elevated release, fumigation	3.55 E-04
Elevated release, 0-2 hours	4.06 E-06
Ground level release, 0-2 hours	2.48 E-03

Offsite χ/Qs

5. What is the basis for use of wind measurements from the 43-meter level in the calculation of ground level χ/Q values from the plant vent to the exclusion area boundary (EAB) and low population zone (LPZ) rather than measurements taken at the 10-meter level? Are the χ/Q values calculated utilizing the 43-meter data more limiting than those using the 10-meter wind measurements?

The PAVAN computer program contains a subroutine ADJWND(4) that adjusts for the use of input wind measurement data from other than the release level for calculation of atmospheric dispersion factors. This option was used in the calculation of the MNGP EAB and LPZ atmospheric dispersion factors for the FHA. The correction is a function of the height above ground level at which the wind speed was measured(5) and the release point elevation. In the AST calculations for the FHA, the release point(6) was specified as 10 meters, i.e., as a ground level release.

4 Discussed on pages 8, 9, and 16 of NUREG/CR-2858.
5 PAVAN Card 7, Variable TOWERH (43 meters)
6 PAVAN Card 7, Variable HS (10 meters)

In response to this RAI, additional PAVAN atmospheric dispersion calculations were performed using 10-meter wind measurements. The resultant atmospheric dispersion factors were slightly higher than those calculated using adjusted 43-meter data for the time period of interest for the AST FHA calculation (0-2 hours):

Table 2 – Comparison of 10-Meter Versus Adjusted 43-Meter χ/Qs

	Adjusted 43-Meter χ/Q	10-Meter χ/Q	Difference (in percent)
EAB	7.47 E-04	7.51 E-04	0.54
LPZ	1.42 E-04	1.53 E-04	7.75

The magnitude of the difference in atmospheric dispersion factors in Table 2 illustrates that the 43-meter wind speed data (adjusted to 10-meters) reasonably approximates the 10-meter data.

The effect on the calculated EAB and LPZ doses for the FHA was determined by multiplying the calculated dose by the ratio of the 10-meter to 43-meter atmospheric dispersion factors. Doses increased by about 0.03 rem TEDE (Table 3). Even with this small increase, the EAB and LPZ doses are still well within the 6.3 rem TEDE limit specified by RG 1.183 for the AST FHA (Table 4). This difference in doses is negligible with respect to the AST regulatory acceptance limit. However, for conservatism NMC proposes to utilize the revised AST Refueling Accident doses (based on 10-meter wind speed data), in Table 4 as the FHA dose results.[7]

Table 3 – Effect on Calculated Dose for the 10-Meter Versus Adjusted 43-Meter χ/Qs

	Adjusted 43-Meter	10-Meter	Difference (in rem TEDE)
EAB	1.80	1.81	0.01
LPZ	0.343	0.370	0.03

7 Table 4 supercedes a portion of the results table provided in Section 5.4, “Fuel Handling Accident Results,” in Reference 1.

Table 4 – Revised AST Fuel Handling Accident Radiological Consequence Analysis Results

Refueling Accident Analysis Results	Offsite Dose (in rem TEDE)		Control Room Dose (in rem TEDE)
	EAB	LPZ	
Original AST Refueling Accident (43-meter data adjusted to 10-meter equivalent)	1.80	0.34	4.71
Revised AST Refueling Accident (10-meter data)	1.81	0.37	No Change
AST Regulatory Acceptance Limit (RG 1.183)	6.3	6.3	5.0

References:

1. NMC letter to NRC, “License Amendment Request: Selective Scope Application of an Alternative Source Term Methodology for Re-evaluation of the Fuel Handling Accident,” (L-MT-04-023) dated April 29, 2004.

2. NMC letter to NRC, “Supplement 1 to License Amendment Request: Selective Scope Application of an Alternative Source Term Methodology for Re-evaluation of the Fuel Handling Accident,” (L-MT-04-064) dated November 23, 2004, (TAC No. MC3299).

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6. U.S. NRC, NUREG/CR-6331 (PNNL-10521), Revision 1, “Atmospheric Relative Concentrations in Building Wakes,” dated May 1997.

7. U.S. NRC, NUREG/CR-2858 (PNL-4413), “PAVAN: An Atmospheric Dispersion Program for Evaluating Design Basis Accidental Releases of Radioactive Materials from Nuclear Power Stations,” dated November 1982.

8. MNGP Calculation CA-04-036, ”MNGP AST – Offsite Post-Accident Atmospheric Dispersion Analysis,” (includes Sargent & Lundy 10 CFR 50 Appendix B calculation review (S&L No. 2004-01852) and base Applied Analysis Corporation calculation MNGP-001).

9. MNGP Calculation CA-04-037, ”MNGP AST – CR/TSC Post-Accident Atmospheric Dispersion Analysis,” (includes Sargent & Lundy 10 CFR 50 Appendix B calculation review (S&L No. 2004-02100) and base Applied Analysis Corporation calculation MNGP-002).