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June 16, 2009

L-MT-09-042
10 CFR 50.90

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

Monticello Nuclear Generating Plant
Docket 50-263
Renewed Facility Operating License
License No. DPR-22

Monticello Extended Power Uprate: Response to NRC Reactor Inspection Branch Request for Additional Information (RAI) dated March 20, 2009 (TAC No. MD9990)

References:
1. NSPM letter to NRC, License Amendment Request: Extended Power Uprate (L-MT-08-052) dated November 5, 2008, (Accession No. ML083230111)
2. Email P. Tam (NRC) to G. Salamon, K. Pointer (NSPM) dated March 20, 2009, Monticello - Draft RAI from Reactor Inspection Branch re: proposed EPU amendment (TAC No. MD9990)

Pursuant to 10 CFR 50.90, the Northern States Power Company, a Minnesota corporation (NSPM), requested in Reference 1 an amendment to the Monticello Nuclear Generating Plant (MNGP) Renewed Operating License (OL) and Technical Specifications (TS) to increase the maximum authorized power level from 1775 megawatts thermal (MWt) to 2004 MWt.

On March 20, the U.S. Nuclear Regulatory Commission (NRC) Reactor Inspection Review Branch provided four requests for additional information (RAIs) described in Reference 2. Enclosure 1 provides the NSPM response.

In accordance with 10 CFR 50.91, a copy of this letter is being provided to the designated Minnesota Official.

Summary of Commitments

There are no new commitments contained in this letter and no existing commitments are revised by this letter.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on June 16, 2009.

Timothy J. O'Connor
Site Vice President, Monticello Nuclear Generating Plant
Northern States Power Company - Minnesota

Enclosure

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

ENCLOSURE 1

NSPM RESPONSE TO REACTOR INSPECTION BRANCH RAIs DATED MARCH 20, 2009

NRC RAI No. 1

The Safety Analysis Report [SAR] for the Monticello Constant Power Uprate, dated October 2008, page 2-343, indicates that an analysis predicts only a 3 percent increase in dose rates at the high pressure (HP) turbine due to increased N-16 in the steam entering the turbine. This is somewhat lower than analysis provided for similar uprates at other BWRs in the U.S.

NRC RAI No. 1(a)

Provide a detailed description of this analysis and input parameters. Include the main steam transient time, from the reactor head to the HP-LP turbine crossover line under full power CLTP [current licensed thermal power] conditions; and the corresponding transient time under full power EPU conditions.

NSPM RESPONSE

The prediction of a 3 percent increase in dose rates was unintentionally misleading as used in this paragraph. Three percent refers to the increase in dose rates due to reduced transit and decay times only, and does not include the effect of increased hydrogen injection and the resulting increase in N-16 production in proportion to the increase in Feedwater flow rate of 14.8 percent. If this was included, as was done for the shine evaluation on page 2-344 of the SAR, the result would be 18.2 percent (1.148 x 1.03).

A Microsoft Excel spreadsheet was used to estimate the changes for various plant areas based on the effect of steam transit time and N-16. The estimates were made by scaling original license thermal power (OLTP) transit times to various components from existing Calculation CA 67-086, first to CLTP, and then to EPU conditions, and then computing the difference in N-16 decay time to compute a change in radiation level. The results are shown below, and the percent change EPU column is relative to CLTP.

	TRANSIT Time CA-67-086	Time OLTP sec	N-16 OLTP micro-Ci/gm	Flow OLTP lb/hr	Time CLTP sec	Flow CLTP lb/hr	N-16 CLTP micro-Ci/gm	Time EPU sec	Flow EPU lb/hr	N-16 EPU micro-Ci/gm	% Change EPU %	
Vessel to Steam stop	0	0	6.15E+01	6.78E+06	0.00	7.26E+06	6.11E+01	0.00	8.32E+06	6.00E+01	-1.70%	
	2.05321	2.05321	5.04E+01	6.44E+06	1.95	6.77E+06	5.05E+01	1.59	8.32E+06	5.14E+01	1.84%	
MSL Steam Chase to Stop Valves	0.49	2.05321	5.04E+01	6.44E+06	1.95	6.77E+06	5.05E+01	1.59	8.32E+06	5.14E+01	1.84%	
HP Turbine	1.12	2.68321	4.74E+01	6.44E+06	2.55	6.77E+06	4.76E+01	2.08	8.32E+06	4.91E+01	2.95%	
	1.14	2.70321	4.73E+01	6.44E+06	2.57	6.77E+06	4.76E+01	2.09	8.32E+06	4.90E+01	2.99%	
Moisture Separator	1.53	3.09321	4.55E+01	6.04E+06	2.96	6.32E+06	4.58E+01	2.41	7.74E+06	4.75E+01	3.62%	
	3.44	5.00321	3.78E+01	6.04E+06	4.78	6.32E+06	3.84E+01	3.91	7.74E+06	4.11E+01	7.04%	
LP Turbine	4.04	5.60321	3.57E+01	5.40E+06	5.34	5.67E+06	3.63E+01	4.33	7.00E+06	3.94E+01	8.45%	
	4.07	5.63321	3.56E+01	5.40E+06	5.37	5.67E+06	3.62E+01	4.35	7.00E+06	3.93E+01	8.50%	
Condenser	4.07	5.63321	3.56E+01	6.43E+06	5.36	6.76E+06	3.63E+01	4.35	8.34E+06	3.93E+01	8.48%	
	4.11	5.67321	3.54E+01	6.43E+06	5.40	6.76E+06	3.61E+01	4.38	8.34E+06	3.92E+01	8.55%	
#15 FWH	2.18	3.74321	4.28E+01	3.63E+05	3.36	4.05E+05	4.41E+01	2.55	5.33E+05	4.68E+01	6.30%	
	6.81	8.37321	2.73E+01	3.63E+05	7.51	4.05E+05	2.94E+01	5.71	5.33E+05	3.45E+01	17.10%	
#14 FWH	4.88	6.44321	3.29E+01	7.89E+05	6.17	8.25E+05	3.35E+01	5.19	9.79E+05	3.62E+01	8.07%	
	8.48	10.04321	2.32E+01	7.89E+05	9.61	8.25E+05	2.40E+01	8.09	9.79E+05	2.73E+01	13.94%	
SJAE Steam	0	1.56321	5.29E+01	7.00E+03	1.33	8.20E+03	5.36E+01	0.90	1.22E+04	5.50E+01	2.58%	
	9.1	10.66321	2.18E+01	7.00E+03	9.10	8.20E+03	2.52E+01	6.12	1.22E+04	3.31E+01	31.40%	
OG	4.11	5.67321	2.29E+05	8.00E+02	5.67	8.00E+02	2.45E+05	5.67	8.00E+02	3.28E+05	33.76%	0.8 factor described in USAR 12.3.2.2.2
	121	122.56321	2.66E+00	8.00E+02	122.56	8.00E+02	2.45E+05	122.56	8.00E+02	3.28E+05	33.76%	
Hotwell	4.11	5.67321	7.12E+00	6.43E+06	5.40	6.76E+06	7.23E+00	4.38	8.34E+06	7.85E+00	8.55%	0.2 factor described in USAR 12.3.2.2.2
	202.75	25.02	1.08E+00	6.43E+06	182.38	6.76E+06	2.44E-07	158.13	8.34E+06	2.53E-06	938.50%	
				Rerate Heat Balance		Rerate Heat Balance			Heat Balance AA06-291 R0			

NRC RAI No. 1(b)

It is the staff's understanding that the steam crossover line from the HP to LP turbines is the major source of N-16 gamma radiation shine from BWR turbine buildings. Verify that this is the case for Monticello or provide the transient time information in 1.a. above from the reactor head to the turbine building component determined to be the major gamma source.

NSPM RESPONSE

In general, the dose changes due to N-16 in the equipment above grade will be the most significant factor in skyshine although radiation scatter from other sources may be present. The equipment above grade at MNGP includes steam piping, turbines, feedwater heaters, the upper portions of moisture separators, and the transition between the turbines and condenser. The largest increase due to reduced transit and decay time (17.1 percent) and increased N-16 production (14.8 percent) is at the outlet of the 15 Feedwater Heaters and is 34.4 percent (1.171 x 1.148).

NRC RAI No. 2

The Safety Analysis Report for the Monticello Constant Power Uprate, dated October 2008, page 2-344, indicates that "EPU may result in a maximum skyshine source dose rate increase of up to 34.4 percent" and that this results in a maximum increase in offsite dose due to sky shine at EPU conditions of less than 6 mrem/yr.

NRC RAI No. 2(a)

Resolve the apparent discrepancy between the 3 percent increase stated on page 2-343 and the 34.4 percent increase stated on page 2-344.

NSPM RESPONSE

See discussion under the response to RAI No. 1(a).

NRC RAI No. 2(b)

Describe how Monticello currently demonstrates that the annual dose to the maximum exposed member of the public meets the 25 mrem/yr requirement of 40 CFR 190.

NSPM RESPONSE

The 2006 Annual Radiological Operating Report for MNGP reported the results of radiation monitoring for the plant. The report stated:

> *Ambient radiation was measured in the general area of the site boundary, at an outer ring 4 - 5 mi [miles] distant from the plant, at special interest areas and at four control locations. The means were similar for both inner and outer rings (16.5 and 15.6 mRem/91 days, respectively). The mean for the control locations was 15.7 mRem/91 days. Dose rates measured at the inner and outer ring locations were similar to those observed from 1991 through 2005. No plant effect on ambient gamma radiation is indicated.*

The data is provided in Table 1 on the following page. The conclusion in the report is that there is no plant effect on ambient gamma radiation. This would support an estimate that skyshine changes due to EPU will not have any impact on measured dose rates offsite.

The data shows a maximum difference between the inner and outer ring mean of all locations of 1.1 mrem for a quarter. If this is taken as a measure of skyshine, it represents a maximum of 4.4 mrem per year at current conditions. Scaling this result by 34.4 percent is less than 6 mrem/yr. This is considered a conservative upper bound for offsite dose to skyshine at EPU conditions.

From Table 2 it can be seen that the average exposure due to gaseous emissions and liquid effluents to an individual are less than a total of 1 mrem per year. Adding this to the skyshine estimate of 6 mrem/yr is a total of 7 mrem. As a result, it is concluded that the maximum potential dose to any member of the public will remain well within the 40 CFR 190 limit of 25 mrem/yr.

Table 1: Ambient Gamma Radiation as Measured by Thermoluminescent Dosimetry, Average Quarterly Dose Rates, Inner vs. Outer Ring Locations

Year	Inner Ring	Outer Ring
	Dose rate (mRem/qtr)	
1991	15.2	15.8
1992	15.1	15.1
1993	15.6	15.9
1994	14.6	14
1995	14.4	13.6
1996	14	13.5
1997	13.3	12.8
1998	15	14.4
1999	15.1	14.3
2000	15.1	14.5
2001	14.3	13.7
2002	15.9	14.8
2003	15.6	15
2004	16	15.4
2005	15.6	15.2
2006	16.5	15.6
Average	15.5125	14.8125

Table 1A below compares the mean for all locations in both the inner and outer rings and the mean of the peak location in each ring for the last 11 years. The maximum difference between the inner and outer ring peak locations is 1.7 mrem/qtr. If this is taken as skyshine, as done above, it represents a maximum of 6.8 mrem/yr at current conditions. Scaling this by 34.4 percent results in a maximum projected upper bound for offsite dose due to skyshine of 9.1 mrem/yr. Adding this to the average exposure from Table 2 of 1 mrem/yr results in a total of approximately 10 mrem/yr maximum potential dose to any member of the public. This is well within the 40 CFR 190 limit of 25 mrem/yr.

Table 1A Off Site Ambient Gamma Radiation as Measured by TLD at the Peak Inner and Outer Ring Locations Compared to the Mean of all Locations in Each Ring

Year	Inner Ring Mean All Locations (mr/qtr)	Inner Ring Peak Location Mean (mr/qtr)	Outer Ring Mean All Locations (mr/qtr)	Outer Ring Peak Location Mean (mr/qtr)
1997	13.3	14.1	12.8	14.8
1998	15.0	16.4	14.4	15.9
1999	15.1	17.0	14.3	15.9
2000	15.1	16.9	14.5	16.2
2001	14.3	16.0	13.7	15.0
2002	15.9	17.4	14.8	16.2
2003	15.6	17.6	15.0	16.2
2004	16.0	18.4	15.4	16.7
2005	15.6	17.4	15.2	16.5
2006	16.5	18.6	15.6	17.0
2007	16.1	18.1	15.1	16.5
Average Mean	15.3	17.1	14.6	16.1

Table 2: Offsite Radiation Dose Assessments from 2001 through 2006

Source: Annual Radioactive Effluent Release Reports for MNGP	10 CFR 50 Appendix I Limits								10 CFR 20		
	10	20	15	5	15	15	3	10	100		
	Gaseous Releases						Liquid Releases		Gaseous Releases		
	Max Site Boundary Gamma		Organ	Maximum Dose to Most Likely Exposed Member of General Public (1)			Max Offsite Dose		Max Dose to Individuals due to Activities Inside Site Boundary (1)		
	Gamma	Beta		Whole Body	Skin	Thyroid	Whole Body	Organ	Whole Body	Thyroid	Max Organ (Skin)
	mrad/yr	mrad/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem	mrem	mrem	mrem	mrem
2001	3.00E-03	4.00E-03	1.10E-02	6.00E-03	7.00E-03	1.10E-02	1.61E-05	1.72E-04	1.20E-02	1.40E-02	1.50E-02
2002	1.00E-03	2.00E-03	1.40E-02	6.00E-03	8.00E-03	1.40E-02	0.00E+00	0.00E+00	1.40E-02	1.80E-02	1.60E-02
2003	2.20E-02	1.70E-02	4.70E-02	3.90E-02	7.30E-02	4.70E-02	2.45E-07	5.55E-07	2.00E-02	3.00E-02	3.00E-02
2004	1.30E-02	1.00E-02	3.70E-02	2.20E-02	3.70E-02	3.70E-02	1.94E-10	1.94E-10	9.00E-03	1.10E-02	9.00E-03
2005	3.00E-03	3.00E-03	2.50E-02	1.60E-02	2.50E-02	2.50E-02	0.00E+00	0.00E+00	1.50E-02	1.60E-02	1.90E-02
2006	1.00E-03	1.00E-03	1.40E-02	8.00E-03	6.00E-03	9.00E-03	0.00E+00	0.00E+00	8.00E-03	8.00E-03	1.00E-02
Averages	7.17E-03	6.17E-03	2.47E-02	1.62E-02	2.60E-02	2.38E-02	2.72E-06	2.88E-05	1.30E-02	1.62E-02	1.65E-02

Note 1: Maximum doses are calculated using the GASPAR code to provide data from the airborne pathways combined with the maximum site boundary doses.

NRC RAI No. 2(c)

What is the nominal annual dose (allowing for variations from year to year) to the maximum exposed member of the public from Monticello operations under CLTP conditions? What are the contributions to this dose from N-16 shine, Nobel Gas, and other plant effluents?

NSPM RESPONSE

See the NSPM response to RAI No. 2(b).

NRC RAI No. 3

The Safety Analysis Report for the Monticello Constant Power Uprate, dated October 2008, page 2-343, Table 2.10-2, indicates a possible increase in localized dose rates in the Balance-of-Plant (BOP) of up to 1130% under EPU conditions. Verify that these increases do not change the radiation zoning of the BOP spaces.

NSPM RESPONSE

Post shutdown dose rates are primarily driven by the deposition of activation, corrosion, and fission products in Balance Of Plant (BOP) equipment and piping. The change of deposition sources at EPU is driven by increased moisture carryover, increased activation due to core neutron flux, and increased generation of erosion/corrosion products due to flow increases. Carryover of radioactivity increases as a function of moisture carryover. For this evaluation it is assumed that moisture carryover will increase from 0.05 percent to 0.5 percent at EPU, an increase by a factor of 10. It is also assumed that the generation of erosion/corrosion products in coolant increases in proportion to power (13 percent). A worst case net change is estimated as the product of these two increases (a factor of 1.13 (13 percent power uprate) times 10 (moisture carryover increase) or an 1130 percent increase).

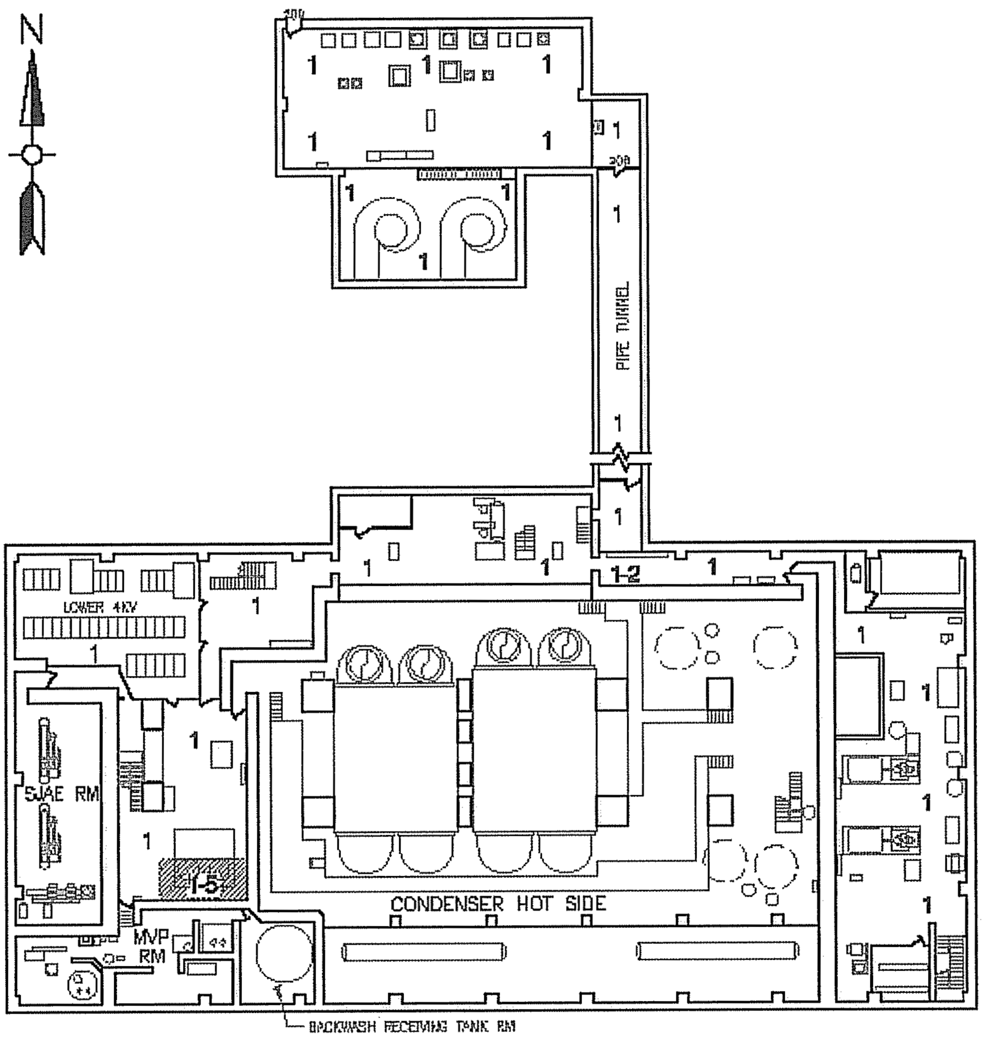
If this worst case increase in shutdown dose rates were to occur, there are four zones in the Turbine Building that could go from a 40 hour occupancy (dose less than 1 mr/hr) to as little as a 5 hour occupancy (dose less than 12 mr/hr). Three zones are locations within the reactor feedwater and lube oil reservoir corridor and the fourth is the feedwater pipe and cable penetration area, which are not normally occupied areas. The remaining areas affected by this potential increase are in steam piping locations in the condenser hot side area which is inaccessible during operation.

These areas are all located on the east end of the 911 foot Elevation, the attached dose map shows the general area dose as 1 mr/hr. Actual operating surveys, taken at full CLTP with normal hydrogen injection flowrates, show the general area dose is 0.2 mr/hr maximum. The increase of 1130 percent would result in a general area dose rate of 2.2 mr/hr, which is still considered acceptable since this is not a continuously occupied area, and it would not affect access to the other normally accessible areas of the Turbine Building.

This increase is also considered acceptable because it is a theoretical worst case estimation. Post-shutdown doses are normally very low. In most areas they are significantly less than detectable with radiation survey equipment and even this large increase will not prevent access for normal operation or maintenance. In addition, as stated on PUSAR page 2-343, this build up would occur over time and plant surveys should provide prompt detection of these conditions. Periodic and pre-maintenance surveys and monitoring are used to detect these changing conditions. Work planning and training enable workers respond to these conditions and maintain radiation exposures ALARA.

TURBINE BUILDING - ELEVATION 911'-0"

HIGHER THAN SURROUNDING GENERAL AREA DOSE RATES
(ALL DOSE RATES ARE IN MREM/HR)



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NRC RAI No. 4

The Safety Analysis Report for the Monticello Constant Power Uprate, dated October 2008, on page 2-340, within Table 2.9-1, indicates the dose consequences in the Control Room and the Technical Support Center, from a design-basis loss-of-coolant accident under EPU conditions, as 3.80 rem and 0.83 rem, respectively. Verify that these results include direct radiation exposure from plant systems containing the accident source term, consistent with the assumptions in NUREG-0737, item II.B.2. If not, demonstrate that the direct radiation dose rates for these two vital areas meet the GDC-19 dose criteria, as specified in NUREG-0737, item II.B.2.

NSPM RESPONSE

The Control Room and Technical Support Center (TSC) total calculated doses include a component due to direct shine dose from plant systems and the reactor building as required by NUREG-0737 Item II.B.2. The shine contribution for the Control Room is 0.771 Rem of the total 3.8 Rem and the TSC is 0.0939 Rem of the total 0.83 Rem.