



Monticello Nuclear Generating Plant  
2807 West County Road 75  
Monticello, MN 55362-9637

Operated by Nuclear Management  
Company LLC

April 19, 2001

US Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

**MONTICELLO NUCLEAR GENERATING PLANT**  
Docket No. 50-263 License No. DPR-22

**LER 2001-005**

**Ten Minute Torus Cooling Design Assumption Not Achievable**

A Licensee Event Report for this occurrence is attached. This report contains no new NRC commitments.

Contact Patrick Burke, Project Manager, at (763) 295-1661 if you require further information.

Byron Day  
Plant Manager  
Monticello Nuclear Generating Plant

c: Regional Administrator - III NRC  
NRR Project Manager, NRC

Sr. Resident Inspector, NRC  
Minnesota Department of Commerce

Attachment

IE22

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

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TITLE (4)  
Ten Minute Torus Cooling Design Assumption Not Achievable

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
02	19	2001	2001	- 005	- 00	04	19	2001	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9) N	POWER LEVEL (10) 100	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)			
		20.2201(b)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
		20.2201(d)	20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(x)
		20.2203(a)(1)	50.36(c)(1)(i)(A)	50.73(a)(2)(iv)(A)	73.71(a)(4)
		20.2203(a)(2)(i)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)
		20.2203(a)(2)(ii)	50.36(c)(2)	X 50.73(a)(2)(v)(B)	OTHER Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iii)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	
		20.2203(a)(2)(iv)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)	
		20.2203(a)(2)(v)	50.73(a)(2)(i)(B)	50.73(a)(2)(vii)	
		20.2203(a)(2)(vi)	50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)	
		20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)	

LICENSEE CONTACT FOR THIS LER (12)

NAME Patrick Burke	TELEPHONE NUMBER (Include Area Code) (763) 295-1661
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
D	BO			N					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (if yes, complete EXPECTED SUBMISSION DATE).	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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**ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)  
 On February 19, 2001 with the reactor operating at 100% power, the Monticello Nuclear Generating Plant (MNGP) staff determined that there was reasonable doubt that plant operators could manually establish torus cooling following a DBA LOCA within the 10 minute design assumption. The containment cooling system was declared inoperable. To restore operability, a dedicated operator was stationed in the control room with the sole purpose of initiating torus cooling during a LOCA.

Following an unrelated reactor shutdown on February 25, 2001, a solution team was assembled to study torus cooling issues and recommend corrective actions. The team determined that the plant procedures used to initiate torus cooling were not streamlined for emergency conditions and were not written with the purpose of satisfying the 10 minute design assumption. On March 15, 2001 with the reactor shutdown, the solution team was evaluating operator actions to support torus cooling. It was determined by a calculation of post-accident drywell conditions that the potential for flashing of the fuel zone reactor water level reference leg during a DBA LOCA, although slight, was more probable than had been previously thought. This flashing could further delay operator actions to initiate torus cooling.

Prior to startup on April 2, 2001, a modification to relocate nearly all of the fuel zone instrument reference leg piping from the drywell to the reactor building was completed. In addition, changes were made to the torus cooling procedures to directly support the 10 minute requirement and the operators were trained on these changes.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

Description

On February 19, 2001 with the reactor operating at 100% power, the Monticello Nuclear Generating Plant (MNGP) staff determined that there was reasonable doubt that plant operators could manually establish torus cooling<sup>1</sup> following a DBA LOCA within the 10 minute design assumption used in the containment analyses. The practical time available for operator action time to establish torus cooling was closer to 6.5 minutes due to the need to completely reflood prior to transferring an RHR pump from injection mode to torus cooling mode. This is due to an EDG loading limitation specific to certain BWRs including MNGP. Because of the relative complexity of the torus cooling evolution under accident conditions, the operations staff raised doubts as to whether the torus cooling could be completed after the core is reflooded in this compressed operating time by the normal operating control room complement. The Limiting Condition for Operation (LCO) described in Technical Specification 3.5.C was entered, and the containment cooling system was declared inoperable. To restore operability, a dedicated operator was stationed in the control room with the sole purpose of initiating torus cooling during a LOCA, and the containment cooling system was declared operable.

Following an unrelated reactor shutdown on February 25, 2001, a solution team was assembled to study torus cooling issues and recommend long term corrective actions. The team found that this condition appears to have existed since the initial licensing of the plant. The team also determined that the plant procedures that implemented this manual action were not streamlined for emergency conditions and were not written with the explicit purpose of satisfying the 10 minute design assumption. In addition, the design of the motor coolers for the RHRSW pump required a manual action to open local motor cooling valves outside the control room prior to starting the pump. Prior to startup on April 2, 2001, changes were made to the operating procedures to reduce the time to initiate torus cooling. These changes included incorporation of the results of a previous calculation that had determined that the manual action of opening the RHRSW pump motor cooling valves could be delayed for at least 20 minutes.

On March 15, 2001 with the reactor shutdown, the solution team was evaluating operator actions to support torus cooling. It was determined by a calculation of post-accident drywell conditions that the potential for fuel zone reference leg flashing during a DBA LOCA, although slight, was more probable than had been previously thought. This flashing was unlikely to cause gross changes in reactor level indication, however any reduction in fuel zone level reliability could further delay the time to establish torus cooling following a DBA LOCA. There was no immediate operability impact for the fuel zone level instruments<sup>2</sup> with the reactor in a shutdown condition. Because EOPs require specific operator actions at a reactor water level of 2/3 core height, there is an increased need to assure clear and unambiguous indication of water level under LOCA conditions. Prior to startup on April 2, 2001, a modification to relocate a significant portion of fuel zone instrument reference leg piping from the drywell to the mild conditions of the reactor building was completed. This will reduce the potential for ambiguity due to reference leg flashing.

<sup>1</sup> EIIS System Code BO

<sup>2</sup> EIIS System Code AD

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

**Event Analysis**

**Analysis of Reportability**

The torus cooling manual initiation conditions and the fuel zone level indication condition are being reported as required by 10CFR50.73(a)(2)(v)(B) as conditions that could have prevented the fulfillment of the safety function of structures or systems that are needed to remove residual heat. In this case the combination of procedural and design deficiencies, which include the design of the fuel zone level indication, contributed to a condition whereby a safety system could have failed to perform its intended function. This safety system is manually initiated.

**Safety Significance**

Sensitivity studies were performed to determine the safety significance of this event. The results of these studies indicate that this event has a very low safety significance.

General Electric performed a sensitivity study on the effect of delaying torus cooling post-LOCA using the methodology used to establish the current licensing basis for containment parameters. This study showed that delaying torus cooling from ten minutes to fifteen minutes post-LOCA has an insignificant effect on the containment parameters of interest (i.e. pressure, temperature). A PRA analysis on the effect of delaying torus cooling was also conducted. In the PRA model, placing torus cooling in service within 24 hours from accident initiation is considered a success, and therefore the model is not sensitive to delays in initiating torus cooling on the order of minutes following a LOCA.

Cause

An investigation team that includes an independent root cause specialist is analyzing this event. The apparent causes of these conditions are as follows: 1) certain design basis requirements were not reflected in operating procedures, and 2) inadequate controls on the selection and verification of design assumptions.

Corrective Actions

**Short Term**

The operating procedures were revised to assure that torus cooling could be established within 10 minutes of a DBA LOCA. The torus cooling procedures were validated on the plant simulator under simulated DBA LOCA conditions. All licensed operators were evaluated in their ability to successfully complete time critical torus cooling actions. Training is being provided for all operating crews prior to assuming the watch in the plant. This training includes training on 2/3 core height determination and reactor water level indication response following a DBA LOCA.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

Corrective Actions (continued)

The MNGP EOPs were revised to include a statement for operators to establish containment cooling as soon as possible once adequate core cooling has been confirmed. The EOP bases were revised to reference design basis assumptions for torus cooling times. Training on these procedures is being provided for all operating crews prior to assuming the watch in the plant.

The fuel zone reference leg piping for both divisions were moved from the drywell to the reactor building prior to startup on April 2, 2001. Software changes were made to the fuel zone level indication screen in the Safety Parameter Display System (SPDS) to support operator actions during DBA LOCA conditions.

The plant staff reviewed certain accidents and licensing basis events to identify time critical operator actions. Improvements were made as needed to reinforce and control design basis assumptions.

Long Term

Condition reports have been written for the conditions identified herein. Findings and actions are being entered into the Corrective Action Program for disposition.

NMC is considering changes to extend the design assumption for torus cooling initiation to at least 15 minutes. The torus cooling evolution is being further evaluated for changes to simplify operator actions. These changes include elimination of the need to bypass certain non-safety related interlocks.

Failed Component Identification

None

Similar Events

SIL 299, *High Drywell Temperature Effect on Reactor Vessel Water Level Instrumentation*, identified the reference leg flashing potential for water level instrumentation in the drywell. The MNGP safeguards level instrumentation reference legs were subsequently moved from the drywell to the reactor building. The MNGP review of this SIL, however, did not result in a modification to move the fuel zone instrumentation reference legs. This is mainly due to the previous requirement for containment flooding with reactor water level below the Top of Active Fuel (TAF). Under DBA LOCA conditions, the emergency procedures would have directed the operators to initiate containment flooding regardless of fuel zone flashing as TAF would not have been physically achievable.

Since SIL 299 was issued, changes were made to the MNGP Emergency Operating Procedures that direct specific operator actions at a reactor water level of 2/3 core height. These changes have made the accuracy of the fuel zone level instrumentation more critical. Although the need for a modification to the fuel zone reference leg was identified in 1997, proper priority was not assigned to correcting this condition.