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SUBJECT: Provides addl info re updated high energy line break analysis, per 871122 & 23 telcon requests.

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Office of Nuclear Reactor Regulation
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Washington, DC 20555

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

Additional Information Related to Updated
High Energy Line Break Analysis

References: (a) NSP letter dated June 18, 1986, with attached NUTECH report, "Review of High Energy Line Analysis for the Monticello Nuclear Generating Plant"

(b) Monticello Updated Safety Analysis Report (USAR), Revision 5, June 1987, Appendix I, "Evaluation of High Energy Line Breaks Outside Containment"

(c) NSP letter dated September 25, 1987, "Additional Information Related to Updated High Energy Line Break Analysis"

The purpose of this letter is to provide additional information requested in two telephone conversations, 1) Ms Renee Li and Mr Dominic DiIanni of the NRC staff and Messrs Tom Parker and Ron Meyer of NSP on November 22, 1987, and 2) Ms Renee Li of the NRC staff and Mr Ron Meyer of NSP on November 23, 1987. The questions that were raised by Ms Li refer to the additional information that was previously provided by letter dated September 25, 1987 (Reference (c)).

Question 1

An inconsistency was noted in the criteria use for the selection of High Energy Lines. The selection criteria for high energy piping as stated in Appendix I of the Monticello Updated Safety says "High energy piping was assumed to be all piping with a normal operating temperature exceeding 200°F and the normal operating pressure exceeding 275 psig". This is inconsistent with the Giambuso criteria which considers all piping with a service temperature exceeding 200°F and design pressure exceeding 275 psig as high energy lines. Provide a description of the criteria used to select high energy lines for the subject analysis.

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Response

With one exception the criteria used for the selection of high energy lines was "operating temperature greater than 200°F and design pressure greater than 275 psig". This criteria is consistent with the criteria used in the original 1973 Monticello High Energy Line Break analysis. Section I.2-3 of Appendix I will be revised to reflect this selection criteria as part of the next annual update of the Monticello USAR.

Detailed design pressure data was not available for the Offgas system which required an exception to the above criteria. In this case operating temperature and operating pressure were used. No line in the Offgas system with a temperature above 200°F could be excluded from the list of high energy lines on the basis of operating pressure being below 275 psig. This assures that no conservatism in the analysis was lost by utilizing operating pressure, rather than design pressure data for high energy line identification.

Question 2

This question was a restatement of a question that was discussed in Reference (c). Section 3.7.2(4) of the report stated that "A jet discharging saturated steam, saturated water, or subcooled water with a fluid temperature greater than the saturation temperature at the surrounding environmental pressure was assumed to expand in a 10° half-angle cone,". This section also referred to Section 7.2 of ANSI/ANS-58.2-1980. The ANSI/ANS-58.2-1980 jet expansion model is consistent with the guidance provided in SRP 3.6.2 (1981) and is acceptable. However, it is noted that the licensee's jet expansion model was not fully consistent with the referenced ANSI report. Specifically, the 10° half-angle cone model is applicable to cases of saturated water or subcooled water blowdown. For the cases of steam or water-steam mixture, the Moody's expansion model described in Appendix C of the ANSI report should be used. Explain how the jet impingement analysis was performed and show that the analysis is at least as conservative as the original 1973 Monticello High Energy Line Break analysis.

Response

The criteria from the USAR reads as follows, "A jet discharging saturated steam, or a mixture of steam and water, with a fluid temperature greater than the saturation temperature at the surrounding environmental pressure, was assumed to expand in a 10° half-angle cone. Subcooled water or saturated water jets were characterized by a constant diameter jet (Section 7.2 -Reference I.8-10)." (reference I.8-10 refers to ANSI/ANS-58.2-1980).

The reference to ANSI/ANS-58.2-1980 was not included to justify a 10° half-angle cone expansion for jets of steam or steam-water mixtures.

This reference was made only to justify the conservative use of a constant diameter subcooled or saturated water jet. Jets of steam or steam-water mixtures were assumed to expand with a 10^{o} half-angle cone to be consistent with the 1973 Monticello High Energy Line Break analysis. In the 1973 analysis all jets were assumed to expand with a 10^{o} half-angle cone regardless of the state of the fluid in the piping.

Section I.2-6.2 of Appendix I, to the Monticello USAR will be revised to clarify the criteria used to evaluate the effects of jet impingement.

Question 3

If a jet of subcooled or saturate water was characterized by a constant diameter, what criteria was used to determine if a system or component would be a target for the jet.

Response

The selection of targets for the jet was performed in two ways:

1) A detailed compartment walk through was performed in each compartment that contained an identified postulated break in a high energy line. For all compartments (with the exception of the condenser bay and the area around the feedwater pumps) it was assumed that a jet would destroy all of the safe shutdown equipment in the compartment. No attempt was made to show that a jet would miss a close target. With this assumption made and all safe shutdown equipment considered destroyed, an analysis was performed to determine if a path to safe shutdown still existed. If a path to safe shutdown did not exist, modifications were made.

2) Jets in the condenser bay and feedwater pump area could not be assumed to destroy all equipment in the compartment due to compartment size. There was only one postulated break in the area of the feedwater pumps. The jet from this break would impact the ceiling above, which if failed, would cause a harsh environment for both division 1 and division 2 electrical power supplies. A jet impingement shield was installed on the ceiling above the postulated break. In the condenser bay, conservative engineering judgment was used to select jet targets. Compartment walk throughs were performed to survey the area around each postulated break location. These walk throughs were used to conservatively identify jet impingement targets which had even small probabilities of being hit by a jet. Once targets were identified, a safe shutdown analysis was performed as described above. Where a path to safe shutdown could not be identified, or

where one was of questionable reliability due to analysis uncertainties (ie jet target identification), steps were taken to maintain safe shutdown capability.

Please contact us if you have any questions related to the additional information that we have provided.

David Musolf
Manager - Nuclear Support Services

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c: Regional Administrator, Region III, NRC
NRC Sr Resident Inspector
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