

April 20, 2005

Mr. Joseph M. Solymossy  
Site Vice President  
Prairie Island Nuclear Generating Plant  
Nuclear Management Company, LLC  
1717 Wakonade Drive East  
Welch, MN 55089

SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1 & 2 - REQUEST  
FOR ADDITIONAL INFORMATION FOR USE OF GOTHIC 7 IN  
CONTAINMENT ANALYSES (TAC NOS. MC4245 AND MC4246)

Dear Mr. Solymossy:

By letter dated September 1, 2004, the Nuclear Management Company, LLC (NMC), submitted the license amendment request for use of GOTHIC 7 in containment response analyses, for the Prairie Island Nuclear Generating Plant.

A draft of the request for additional information (RAI) was e-mailed to Mr. Dale Vincent of Nuclear Management Company (NMC) on March 17, 2005 (ADAMS Accession No. ML050960560). In a telephone call on March 17, 2005, the U. S. Nuclear Regulatory Commission (NRC) staff discussed the subject RAIs with NMC and Westinghouse representatives. Your staff, Dale Vincent, agreed to provide your written response on the questions provided in the enclosure, within 30 days of the receipt of this letter. If you have any further questions, please feel free to contact me at (301) 415-8371.

Sincerely,

**/RA/**

Mahesh L. Chawla, Project Manager, Section 1  
Project Directorate III  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-282 and 50-306

Enclosure: Request for Additional Information

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION  
REGARDING THE USE OF GOTHIC 7 IN CONTAINMENT RESPONSE ANALYSES  
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1 AND 2  
DOCKET NOS. 50-282 AND 50-306

To complete the review, the Nuclear Regulatory Commission (NRC) staff has identified, in part, the need for additional information related to the information presented in WCAP-16219-P, "Development and Qualification of a GOTHIC Containment Evaluation Model for the Prairie Island Nuclear Generating Plants," April 2004. Please provide your written response to the following NRC staff questions:

- (1) A fog or mist has been observed in the vapor-air boundary layer between a cool surface and a heated bulk air-steam mixture. This mist can contribute to an increase in the sensible heat transfer through the vapor-air boundary layer and, in the GOTHIC model, the diffusion of the mist into the bulk atmosphere can result in a decrease in the containment pressure due to evaporation of the mist.

Although the formation of mist has been observed, for example Mori and Hijikata (Ref.1), its effect on containment pressure and temperature has not been measured. The NRC staff is not aware of any known direct measurements of the formation rate of the mist or of its impact on the heat transfer rate to the surface. In addition, the NRC staff is not aware of any data demonstrating the effect of mist in the vapor-air boundary layer on bulk atmosphere pressure. The GOTHIC 7.0 qualification report (Ref. 2), Section 5.10, discusses verification of this model in terms of comparison with experimental data. However, other codes have compared well with these same data without including this effect. In particular, the NRC CONTAIN 2.0 (Ref.3) code compares well with these data. Thus, while mist or fog in the vapor-air boundary layer has been observed under certain circumstances, the quantification of its effect is considered uncertain and not verified to the extent required for a phenomenon with a significant effect on licensing calculations. The NRC staff therefore believes that the mist formation model should not be used for licensing calculations. (See for example, ADAMS accession document ML032681050, September 29, 2003 letter "Kewaunee Nuclear Power Plant - Issuance of Amendment (TAC No. MB6408)," to T. Coutu, Kewaunee Nuclear Power Plant, Nuclear Management Company, LLC, from A.C. McMurtry, NRC).

Based on a review of the input decks presented in WCAP-16219-P, it appears that NMC proposed to use this mist formation model (and not to use the fog model), in part based on sample calculations presented with the mist formation model active.

For the NRC staff to reconsider the use of the mist formation model for licensing calculations, NMC needs to provide additional information demonstrating that the rate of the formation of the mist and its impact on the bulk containment atmosphere are known and can be quantified. Absent additional information, the NRC staff's previous conclusion that the mist formation model should not be used for licensing calculations will be applied to WCAP-16219-P.

- (2) The benchmark case for the main steamline break (MSLB) comparison to the CONTEMPT code uses the approved Uchida model for heat transfer and the approved 8 percent revaporization. NMC is requesting use of the mist diffusion layer model (MDLM) (Ref.4), with NRC limitations — the diffusion layer model (DLM), as an alternative to the Uchida model with revaporization, for steamline breaks.

For the MSLB licensing evaluation, does NMC plan to use both the accepted DLM model and the 8 percent revaporization at the same time? (WCAP-16219, Table 3-1 indicates the revaporization fraction is "N/A" for GOTHIC, however the input decks indicate a "default" is being used.) If so, NMC needs to justify the independence of the phenomena in the DLM model and the revaporization fraction used to account for the difference observed in an early containment test facility and the ability of containment codes to predict the experimental results.

- (3) The NRC staff would like NMC to provide, in electronic format (CD-ROM, 3.5-in floppy disk), the GOTHIC input models (the \*.GTH files) used in WCAP-16219. This would enable the NRC staff to perform its own sensitivity studies and assist us in better understanding GOTHIC.

#### References:

1. Yasuo Mori and Kunjo Hijikata, "Free Convective Condensation Heat transfer With Noncondensable Gas on a Vertical Surface," Int. J. Heat and Mass Transfer Vol 16 pp 2229-2240.
2. GOTHIC Containment Analysis Package Qualification Report Version 7.0 NAI 8907-09 Revision 6 July 2001.
3. Murata, K.K., et al., "Code Manual for CONTAIN 2.0: A Computer Code for Nuclear Reactor Containment Analysis," US NRC NUREG/CR-6533.
4. The NRC acceptable form of the mist diffusion layer model (MDLM) is now referred to as the diffusion layer model (DLM) in GOTHIC 7.1 Patch1 (QA), the original MDLM without the boundary layer mist formulation and without the film roughness enhancement.

Prairie Island Nuclear Generating Plant, Units 1 and 2

cc:

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