September 29, 2003

Mr. Thomas Coutu
Site Vice President
Kewaunee Nuclear Power Plant
Nuclear Management Company, LLC
N490 Highway 42
Kewaunee, WI 54216-9511

SUBJECT: KEWAUNEE NUCLEAR POWER PLANT - ISSUANCE OF AMENDMENT (TAC NO. MB6408)

Dear Mr. Coutu:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 169 to Facility Operating License No. DPR-43 for the Kewaunee Nuclear Power Plant. This amendment consists of changes to the Updated Safety Analysis Report (USAR) in response to your application dated September 30, 2002, as supplemented July 24 and September 26, 2003.

The amendment authorizes changes to the USAR to allow the use of an upgraded computer code for design-basis accident containment integrity analyses called Generation of Thermal-Hydraulic Information for Containment (GOTHIC) version 7.0p2 (GOTHIC 7) with noted conditions.

A copy of our related safety evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next regular biweekly Federal Register notice.

Sincerely,

/RA/

Anthony C. McMurtray, Senior Project Manager, Section 1,
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-305

Enclosures: 1. Amendment No. 169 to License No. DPR-43
2. Safety Evaluation

cc w/encls: See next page

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PD 3-1 r/f	ACRS
OGC	PLouden, RIII
THarris	

***Provided SE input by memo**
ADAMS ACCESSION NUMBER: ML032681050 ***See previous concurrence**

OFFICE	PM:PD3-1	LA:PD3-1	SC:SPSB/SC*	OGC*	SC:PD3-1
NAME	AMcMurtray	THarris	RDennig	Uttal NLO w/chngs	LRaghavan
DATE	09/29/03	09/29/03	09/24/03	9/29/03	09/29/03

OFFICIAL RECORD COPY

Kewaunee Nuclear Power Plant

cc:

John Paul Cowan
Chief Nuclear Officer
Nuclear Management Company, LLC
27780 Blue Star Memorial Highway
Cover, MI 49043

Kyle Hoops
Plant Manager
Kewaunee Nuclear Power Plant
N490 Highway 42
Kewaunee, WI 54216-9511

Garry Harrington
Manager, Regulatory Affairs
Kewaunee Nuclear Power Plant
N490 Highway 42
Kewaunee, WI 54216-9511

David Molzahn
Nuclear Asset Manager
Wisconsin Public Service Corporation
600 N. Adams Street
Green Bay, WI 54307-9002

Thomas Webb
Nuclear Asset Manager
Wisconsin Public Service Corporation
600 N. Adams Street
Green Bay, WI 54307-9002

Resident Inspectors Office
U. S. Nuclear Regulatory Commission
N490 Hwy 42
Kewaunee, WI 54216-9510

Regional Administrator
Region III
U. S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, IL 60532-4351

Jonathan Rogoff, Esquire
General Counsel,
Nuclear Management Company, LLC
700 First Street
Hudson, WI 54016

Larry L. Weyers
Chairman, President and CEO
Wisconsin Public Service Corporation
600 North Adams Street
Greey Bay, WI 54307-9002

David Zellner
Chairman - Town of Carlton
N2164 County B
Kewaunee, WI 54216

Sarah Jenkins
Electric Division
Public Service Commission of Wisconsin
PO Box 7854
Madison, WI 53707-7854

NUCLEAR MANAGEMENT COMPANY, LLC

DOCKET NO. 50-305

KEWAUNEE NUCLEAR POWER PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 169
License No. DPR-43

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Nuclear Management Company, LLC (the licensee), dated September 30, 2002, as supplemented July 24 and September 26, 2003, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, by Amendment No. 169 , Facility Operating License No. DPR-43 is hereby amended to authorize the licensee's use of an upgraded computer code for design-basis accident containment integrity analyses called Generation of Thermal-Hydraulic Information for Containment (GOTHIC) version 7.0p2 (GOTHIC 7) with the following conditions:

   A. The height effect scaling factor λ_h applied to the heat and mass transfer analogy, shall not be used for the Kewaunee licensing calculations.

   B. The Gido-Koestel (G-K) correlation shall not be used for Kewaunee licensing calculations.

C. The inclusion of mist in the mist diffusion layer model (MDLM) shall not be used for Kewaunee licensing calculations.

In addition,

D. It is not necessary to apply the proposed bias term to the mist diffusion layer model for Kewaunee licensing calculations.

E. It is not necessary to use a combination of Uchida and MDLM for the containment heat structures. MDLM may be used for heat transfer to all structures for Kewaunee licensing calculations.

The amendment is applicable only to Kewaunee for application to containment integrity and environmental qualification calculations.

The authorization is granted, as set forth and evaluated in the associated safety evaluation by the Commission's Office of Nuclear Reactor Regulation dated September 24, 2003.

The licensee shall update the Updated Safety Analysis Report to reflect this change, as authorized by this amendment, and in accordance with 10 CFR 50.71(e).

3. This license amendment is effective as of the date of its issuance, and is to be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

L. Raghavan, Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Date of Issuance:

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO AMENDMENT NO. 169 TO FACILITY OPERATING LICENSE NO. DPR-43

NUCLEAR MANAGEMENT COMPANY, LLC

KEWAUNEE NUCLEAR POWER PLANT

DOCKET NO. 50-305

1.0 INTRODUCTION

By application dated September 30, 2002, as supplemented by letters dated July 23 and September 26, 2003, the Nuclear Management Company (NMC or the licensee) requested changes to the Kewaunee Nuclear Power Plant (KNPP) Final Safety Analysis Report (FSAR). Specifically, the proposed changes would revise the licensing basis from GOTHIC 6.0 (version 6.0a) to GOTHIC 7.0 (version 7.0p2). The supplemental letters contained clarifying information and did not change the initial no significant hazards consideration determination and did not expand the scope of the original *Federal Register* notice.

In a September 10, 2001, letter to the license, the Nuclear Regulatory Commission (NRC) approved the use of the GOTHIC 6.0 computer code for the calculation of containment response to design-basis accidents, specifically, the loss-of-coolant accidents (LOCA) and the main steamline break. In its September 30, 2002, application, the licensee stated that GOTHIC 7.0 will be used for the same purposes that were noted in the GOTHIC 6.0 approval. The licensee also stated that the principal difference between GOTHIC 6.0 and GOTHIC 7.0 is a mist diffusion layer model (MDLM), although several other changes were discussed.

2.0 REGULATORY EVALUATION

Section 1.8 of the Updated Safety Analysis Report (USAR) states that the KNPP was designed and constructed to comply with the licensee's understanding of the intent of the Atomic Energy Commission (AEC) General Design Criteria (GDC) as proposed on July 10, 1967.

For this amendment request, the relevant general design criteria are KNPP GDC 10 and GDC 41. GDC 10 states:

> Containment shall be provided. The containment structure shall be designed to sustain the initial effects of gross equipment failures, such as a large coolant boundary break, without loss of integrity and, together with other engineered safety features as may be necessary, to retain for as long as the situation requires the functional capability to protect the public.

GDC 41 states:

> Engineered safety features such as emergency core cooling and containment heat removal systems shall provide sufficient performance capability to accommodate partial loss of installed capacity and still fulfill the required safety function. As a minimum, each engineered safety feature shall provide this required safety function assuming a failure of a single active component.

The NRC Standard Review Plan[1] provides guidance on the calculation of containment design-basis accidents.

The NRC staff concludes that the analytical methods proposed by the licensee, GOTHIC 7.0, with the conditions discussed later in this safety evaluation report, together with the methods previously approved in the NRC staff's September 10, 2001, letter, satisfy KNPP GDCs 10 and 41. GOTHIC 7.0, with the conditions noted in this safety evaluation, conservatively calculate the conditions in containment following design basis accidents, taking credit for the KNPP engineered safety features.

These methods are different in some respects from those of the Standard Review Plan. In particular, the heat transfer is calculated using the heat and mass transfer analogy which differs from the Standard Review Plan. The use of the heat and mass transfer analogy is accepted engineering practice and is acceptable for the application proposed for the KNPP.

3.0 TECHNICAL EVALUATION

The NRC staff made use of the relevant portions of GOTHIC[2] code documentation in this review.

3.1 GOTHIC 6.0 Licensing Basis

The calculation methods using GOTHIC 6.0 approved by the staff's September 10, 2001, letter have the following characteristics:

> Mass and Energy Release
>
> The mass and energy of the break flow from the reactor coolant system for LOCA is calculated using NRC-approved Westinghouse methods.

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1 Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, LWR Edition, US Nuclear Regulatory Commission, NUREG-0800, July 1981.

2 GOTHIC Containment Analysis Package Version 7.0 Technical Manual NAI 8907-06, Numerical Applications, Inc., Revision 12, July 2001.

The mass and energy break flow from a ruptured main steamline (main steamline break accident) is calculated using KNPP methods that were approved as documented in the NRC's September 10, 2001, letter. These methods model water entrainment in the break flow as a function of break size and power level.

The licensee has not proposed changing these methods.

Containment Volume

The containment is modeled as a single, lumped parameter volume (licensee letter dated April 13, 2001). The licensee has not proposed changing the containment models.

Heat Transfer to Structures

The Tagami correlation is used for condensation heat and mass transfer during blowdown, and the Uchida correlation is used for post-blowdown. These correlations provide a conservative estimate of the heat transfer from the containment atmosphere to structures within the containment.

The calculation of heat transfer to structures constitutes the major change proposed by the licensee.

Engineered Safety Features

Both the KNPP containment fan coil and containment spray systems are modeled. The licensee has not proposed changing these models.

Break Droplet Size

The GOTHIC 6.0 computer code assumes the liquid portion of the break flow consists of droplets and recommends a drop size of 100µ.

The GOTHIC approach to distributing the two-phase break flow in containment is different than that used in older containment codes which use the pressure flash or the temperature flash assumptions.

The licensee has not proposed changing these methods.

Sump Heat Transfer

Interfacial heat transfer between the sump and the containment atmosphere is neglected. This is conservative since it eliminates condensation of steam on the pool surface. The licensee has proposed a change to the modeling of heat transfer from the sump.

3.2 Proposed GOTHIC 7.0 Licensing Basis

The licensee proposes to change to the GOTHIC 7.0 code. The licensee's September 30, 2002, application proposes changes to the KNPP model using GOTHIC 7.0. These include:

- A spray drop size based on containment spray nozzle specifications. The previous model used a very small drop size to obtain a 100 percent spray efficiency. The licensee states that the proposed model, using a larger drop size, achieves near 100 percent efficiency.

- The LOCA and main steamline break models include heat sinks for the floors. The GOTHIC 6.0 model did not include heat transfer from the floors before the floor is flooded or heat transfer from the water surface. In the proposed model, the liquid vapor interface area is set to the floor surface area so that once the floor is flooded, it affects the condensation of the vapor in the containment atmosphere.

- For main steamline break calculations, the Uchida heat transfer correlation is used from time zero. Although the licensee proposes using the MDLM, the licensee proposes applying the Uchida correlation to some containment surfaces[3].

- Limited contact of steam with the floor until the floor starts to flood.

Table 4 of the September 30, 2002, application shows that these model changes produce negligible changes in the calculated peak pressure and temperature for both the LOCA and the main steamline break. The NRC staff concludes that these changes are reasonable and acceptable. Their effects are negligible; therefore, they will not be discussed further.

3.3 Mist Diffusion Layer Model

The most significant difference between GOTHIC 6.0 and GOTHIC 7.0 is the addition of the MDLM and the modeling of heat transfer. This is described in the GOTHIC 7.0 Technical Manual[4]. This manual states that the mist diffusion layer model calculates the condensation rate and the sensible heat transfer rate using the heat-and-mass transfer analogy.

Condensation of steam on a vertical cold surface results in a water film which flows down the surface to the containment floor. The presence of air, a noncondensable gas, results in the buildup of an air-rich boundary layer between the film and the bulk atmosphere. This boundary layer can significantly reduce the condensation rate since the steam must diffuse through this layer to condense on the water film. This air-rich boundary layer also reduces the sensible heat transfer (heat transfer not due to a phase change).

The MDLM calculates the condensation rate and sensible heat transfer rate using the heat and mass transfer analogy. Use of the heat and mass transfer analogy is accepted engineering

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3 George, T. L., Support for GOTHIC Containment Analysis for the Kewaunee Nuclear Power Plant, Summary Report, NAI-1105-04 Rev 2, August 2002. (Table 6 of NAI-1105-04 Rev 2)

4 GOTHIC Containment Analysis Package Version 7.0, Technical Manual NAI 8907-06, Numerical Applications, Inc., Revision 12, July 2001.

practice[5]. In addition, the MDLM includes the formation of a mist or fog (small liquid droplets) near the cold wall. The presence of this mist has been noted by several experimenters and analysts. These include Mori and Hijikata[6]. They proposed heat transfer models to calculate the heat transfer coefficient for condensation on a vertical cold wall for a weight fraction range of one to 99 percent of a vapor in the presence of a noncondensable gas (e.g., air). Their model included the presence of droplets in the boundary layer. The model calculated heat transfer which asymptotically approaches free convection at the outer edge of the boundary layer and condensation at the liquid film flowing along the wall. Mori and Hijikata's paper also presented a photograph of a cylinder on whose outer surface condensation was occurring. Droplets can be seen in the boundary layer. Brouwers and Chester and Brouwers[7] also proposed a condensation heat transfer model using film theory which takes the presence of droplets in the boundary layer into account. Steinmeyer[8] describes fog formation and its implications for industrial equipment.

Thus, the presence of mist in the boundary layer of a condensing fluid in the presence of a noncondensable gas is a recognized phenomenon.

GOTHIC 7.0 employs a "simplified" model which incorporates mist in the calculated heat and mass transfer. The model appears to be unique among those examined by the NRC staff since it also includes the movement of the mist to the bulk atmosphere. In other models, the mist was assumed confined to the boundary layer. The movement of the mist to the bulk atmosphere from the boundary layer affects the pressure and temperature in the containment by the addition of liquid to the containment atmosphere. The GOTHIC model empirically determines the fraction of the mist which migrates to the wall. A portion of the remainder migrates to the bulk vapor. Migration of the mist to the bulk has no significant effect if the bulk atmosphere is saturated.

Attached to the licensee's September 30, 2002, letter is a report by Numerical Applications, Incorporated (NAI), the developers of the GOTHIC code series, which discusses the application of the GOTHIC 7.0 MDLM to the KNPP containment design-basis accident calculations. Figure

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5 Bird, R.B., Stewart, W.E., and Lightfoot, E.N., "Transport Phenomena", John Wiley and Sons, New York, 1960.

6 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.

7 Brouwers, H. J. H. and Chesters, A. K., "Film Models for Transport Phenomena with Fog Formation: The Classical Film Model," International Journal of Heat and Mass Transfer," Vol 35, pp. 1-11.

Brouwers, H. J. H., "Film Models for Transport Phenomena with Fog Formation: The Fog Film Model," International Journal of Heat and Mass Transfer," Vol 35, pp. 13-28.

8 Steinmeyer, D.E., "Fog Formation in Partial Condensers, "Chemical Engineering Progress, Volume 68, No. 71, July 1972.

1 of this report shows good agreement between the MDLM and data from several sources,[9 10 11 12] as well as with the basic theory of condensation on a vertical surface developed by Nusselt[13] (which does not include the effect of noncondensables). Then, "to provide additional conservative margin," the licensee derived a statistically-based factor such that there is a 95 percent probability that a calculated heat transfer coefficient will be less than the measured heat transfer coefficient of any test case within the validation range for this set of data. The reduction factor, to be multiplied by the calculated heat transfer coefficient, is 0.717. Figure 2 of the NAI report shows that almost all predicted values of the data points, when corrected by this factor, are below the measured value.

Since all the experiments chosen by the licensee involved saturated conditions or conditions close to saturation, the NRC staff requested the licensee to compare GOTHIC 7.0 with the results of an experiment with significant superheat. This is the PHEBUS experiment. It is described in an NRC report[14]. This report provides a comparison of the experimental results with calculations using the NRC containment computer code CONTAIN 2.0[15]. The CONTAIN 2.0 predictions of the PHEBUS data were good. The licensee responded to the NRC staff's request in a July 24, 2003, letter. The GOTHIC 7.0 predictions of the PHEBUS data were also good. The NRC supplied the input data to the licensee for this calculation.

GOTHIC 7.0 also uses the Gido-Koestel heat transfer correlation[16]. The licensee did not

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[9] Uchida H., A. Oyama and Y. Togo, "Evaluation of Post-Incident Cooling Systems of Light Water Power Reactors, U. of Tokyo, International Conference on Peaceful Uses of Atomic Energy, New York, 1965.

[10] R.C. Schmitt, G.E. Bingham, J.A. Norberg, "Simulated DBA Tests of the Carolina Virginia Tube Reactor Containment - Final Report," Idaho Nuclear Corp., December 1970.

[11] Huhtiniemi, I.K. and Corradini, M.L., "Condensation in the Presence of Noncondensable Gases," Nuclear Engineering and Design, Volume 141, pp. 429-446, 1993.

[12] Dehbi, A.A., "The Effects of Noncondensable Gases on Steam Condensation Under Turbulent Natural Convection Conditions," PhD. Thesis, Massachusetts Institute of Technology, February 1991.

[13] Bird, R.B., Stewart, W.E., and Lightfoot, E.N., "Transport Phenomena", John Wiley and Sons, New York, 1960.

[14] Tills, J., Notafranceso, A., and Murata, K., "An Assessment of CONTAIN 2.0: A Focus on Containment Thermal Hydraulics (Including Hydrogen Distributions)," Office of Regulatory Research, NRC, SMSAB-02-02, July 2002.

[15] Murata, K.K., et al., "Code Manual for CONTAIN 2.0: A Computer Code for Nuclear Reactor Containment Analysis," NRC, NUREG/CR-6533.

[16] Gido, R.G., and Koestel, A., "Containment Condensing Heat Transfer," Second International Topical Meeting on Nuclear Reactor Thermal Hydraulics, Santa

propose to use this correlation for KNPP calculations. This correlation is intended to be applicable to “large-scale containment heat sinks.” The correlation differentiates between turbulent film heat transfer on large vertical surfaces and laminar film heat transfer on small vertical surfaces. The correlation includes the effect of condensate film surface waves on large vertical surfaces and the effect this has on the heat and mass transfer at the containment wall. The waves form as a result of turbulence in the liquid film flow. This roughening of the film flow due to waves occurs in natural circulation, not forced circulation. This wave phenomenon has also been studied by various investigators[17] [18] and its effect on increasing heat transfer has been recognized, although the data are from small scale separate effects tests. The staff has performed sensitivity calculations which demonstrate that this “roughening” of the liquid film produces a significant heat transfer benefit and has a significant effect on containment pressure.

The NAI report also discussed the application of GOTHIC 7.0 and the mist layer diffusion model to KNPP design-basis accident calculations. The licensee proposed to apply the MDLM to the following surfaces within containment: the containment cylinder wall, the containment dome, the reactor vessel liner, the refueling canal steel and other walls. All other surfaces, except floors, would use the Uchida heat transfer coefficient (except for partially uncovered floors which use the SPLIT Option in GOTHIC 7.0 which was intended for that application).

Since the calculations the licensee intends to perform with GOTHIC 7.0 include containment design-basis accident calculations which are part of the KNPP licensing basis, they must be conservative. That is, they must overestimate the expected pressures and temperatures which result from a postulated LOCA or main steamline break accident.

In addition, the more important a model is in determining the final result, the more accurate and better formulated that model should be. The NRC staff has reviewed the mist diffusion layer model and has determined that the model is acceptable with several exceptions. The exceptions are: (1) the use of an adjustment to the heat transfer to account for the formation of waves on the surface of the condensate film flowing along solid surfaces, and (2) the modeling of the effect of mist (small liquid droplets) on heat transfer in the boundary layer next to the flowing liquid film and the effect of the diffusion of this mist to the bulk containment atmosphere on the containment pressure.

3.4 Waves in the Condensate Film

The Gido-Koestel correlation was developed as a “mechanistic heat transfer model that is valid

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Barbara, California, January 1983.

[17] Park, S.K., et al., “Condensation of Pure Steam and Steam-Air Mixture with Surface Waves of Condensate on a Vertical Wall,” Int. J. of Multiphase Flow, Vol. 22, No. 5, pp 893-908.

[18] H.C. Kang and M.H. Kim, “Effect of Noncondensables Gas and Wavy Interface on the Condensation Heat Transfer in a Nearly Horizontal Plate,” Nuclear Engineering and Design, Vol. 149, pp 313-321.

for large-scale containment heat sinks[19]." The correlation consists of two equations, one valid for turbulent natural convection and the other for forced convection. The natural convection correlation contains a factor for the height of the compartment to the 5/7th power. This dependence is to account for the effect of the structure (waviness) of the liquid film on heat and mass transfer.

GOTHIC 7.0 defines a scaling factor λ_h which accounts for the effect of film velocity on heat and mass transfer and is a function of the height of the vertical surface. This is the same empirical dependence, with a different exponent, as that used in the Gido-Koestel correlation. Although the licensee does not propose to use the Gido-Koestel correlation, the licensee proposes to use this height scaling factor. By using this factor, the licensee is assuming the same functional relationship for a multiplier with the heat and mass transfer analogy as is used in the Gido-Koestel correlation. The NRC staff finds no basis for this.

While the NRC staff acknowledges the enhancement of heat transfer due to waves on the film surface due to turbulence, the NRC staff does not have confidence in this formulation. References cited previously (e.g., Park, et al.) show that the enhancement of heat transfer due to turbulence is a function of the vapor Reynolds number and the film Reynolds number. The simple dependence on height is an empirical simplification. NRC staff sensitivity studies, using GOTHIC 7.0, show that the height dependence has a significant effect on the containment pressure. It is not clear that such a large effect would really occur. CONTAIN 2.0, the NRC containment computer code does not contain such a model and it also compares well, assuming a smooth film interface, with the same data used in the GOTHIC 7.0 validations. In addition, the available data which demonstrates the effect of waves on the condensate film surface are from small scale separate effects tests. Application to large surfaces has not been demonstrated. Therefore, the NRC staff finds that the height dependence should not be applied to the mist diffusion layer model for licensing calculations.

Since the Gido-Koestel correlation also contains this height dependence, it also shall not be used for licensing calculations.

3.5 Mist in the Vapor-Air Boundary Layer

As discussed in the "INTRODUCTION," under suitable conditions, 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 7.0 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, its effect on containment pressure and temperature has not been measured. The licensee's July 24, 2003, letter states that "there are no known direct measurements of the formation rate [of the mist] or of its impact on the heat transfer rate to the surface." The NRC staff concurs. In addition, the NRC staff is not aware of

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19 Gido, R.G., and Koestel, A., "Containment Condensing Heat Transfer," Second International Topical Meeting on Nuclear Reactor Thermal Hydraulics," Santa Barbara, California, January 1983.

any data demonstrating the effect of mist in the vapor-air boundary layer on bulk atmosphere pressure. The GOTHIC 7.0 qualification report,[20] Section 5.10, discusses verification of this model in terms of comparison with experimental data. However, other codes have compared well with these data without including this effect. In particular, the NRC CONTAIN 2.0 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 concludes that the mist formation model shall not be used for licensing calculations.

3.6 Calculation of a Conservative Bias

As discussed above, the licensee calculated a conservative bias so that 95 percent of the MDLM predictions would lie below the corresponding data. Although this adds conservatism to the final results, the NRC staff does not consider it necessary to apply this factor since there is sufficient conservatism (1) in the mass and energy input calculations, (2) in the use of GOTHIC 7.0 without the waviness correction and without considering mist formation in the boundary layer, (3) with the initial assumptions and boundary conditions assumed in the KNPP design-basis analyses approved in the staff’s September 10, 2001 letter, and (4) since credit is taken only for natural convection rather than for the more effective forced convection which would be present for a portion of the accidents considered.

In general, the NRC has not previously required the use of such a conservative factor.

3.7 Use of the Uchida Heat Transfer Correlation

The licensee has proposed to use the MDLM for some surfaces and the Uchida correlation for others as shown in Table 6 of NAI-1105-04, Revision 2, which is attached to the licensee’s September 30, 2002, amendment. The Uchida correlation has been widely used in licensing calculations. However, its use is not required and it would be acceptable to apply the MDLM to all surfaces.

3.8 Applicability

The methods proposed by the licensee’s September 30, 2002, amendment, evaluated above, revise some aspects of the containment calculational methods previously approved by the NRC for KNPP in a September 10, 2001, safety evaluation report, but they also use many of the initial and boundary conditions and other assumptions previously approved by the NRC. Thus, the conclusions of this safety evaluation with respect to GOTHIC 7.0 are applicable only to the Kewaunee Nuclear Power Plant.

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[20] GOTHIC Containment Analysis Package Qualification Report, Version 7.0, NAI 8907-09, Revision 6, July 2001.

3.9 Conclusion

The use of the GOTHIC 7.0 computer code for KNPP design-basis containment calculations is acceptable without the use of the height factor λ_h, without the inclusion of mist (fog) in the vapor-air boundary layer and without the use of the Gido-Koestel heat transfer correlation. In addition, the use of the 95 percent multiplier proposed in the licensee's September 30, 2002, amendment is not required. The mist diffusion layer model may be applied to all surfaces within containment. The changes proposed by the license, with these restrictions, are acceptable for showing compliance with KNPP GDCs 10 and 41.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Wisconsin State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

This amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluent that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding (67 FR 66011). Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

6.0 CONCLUSION

The NRC staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: R. Lobel

Date: September 29, 2003