ENCLOSURE 1 CONTAINS PROPRIETARY INFORMATION
WITHHOLD FROM PUBLIC DISCLOSURE IN ACCORDANCE WITH 10 CFR 2.390

Monticello Nuclear Generating Plant
2807 W County Rd 75
Monticello, MN 55362

July 31, 2013

L-MT-13-070
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 License No. DPR-22

Subject: Maximum Extended Load Line Limit Analysis Plus License Amendment Request – Request for Additional Information Responses (TAC ME3145)

References:
1) Letter from T J O'Connor (NSPM), to Document Control Desk (NRC), "License Amendment Request: Maximum Extended Load Line Limit Analysis Plus," L-MT-10-003, dated January 21, 2010. (ADAMS Accession No. ML100280558)
2) Email from T Beltz (NRC) to J Fields (NSPM), "Monticello – MELLLA+ Review – Draft Requests for Additional Information (TAC No. ME3145).docx," dated April 9, 2013.

In Reference 1, Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, requested approval of an amendment to the Monticello Nuclear Generating Plant (MNGP) Renewed Operating License (OL) and Technical Specifications (TS). The proposed change would allow operation in the expanded Maximum Extended Load Line Limit Analysis Plus (MELLLA+) domain.

In Reference 2 the NRC provided a Request for Additional Information (RAI) pertaining to the quench front velocity in the TRACG model.

Enclosure 1 provides a report from General Electric – Hitachi (GEH) letter, GE-MNGP-AEP-3296R2, "GEH Response to RAI-3 Parts a-g and i." Enclosure 1 contains proprietary information.

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Enclosure 2 provides a non-proprietary copy of the Enclosure 1 RAI responses. The non-proprietary copy of the RAI responses is being provided based on the NRC's expectation that the submitter of the proprietary information should provide, if possible, a non-proprietary version of the document with brackets showing where the proprietary information has been deleted.

Enclosure 3 contains an affidavit executed to support withholding Enclosure 1 from public disclosure. Information in Enclosure 1 contains proprietary information as defined by 10 CFR 2.390. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the NRC and addresses with specificity the considerations listed in 10 CFR 2.390(b)(4). Accordingly, NSPM respectfully requests that the proprietary information in Enclosure 1 be withheld from public disclosure in accordance with 10 CFR 2.390(a)4, as authorized by 10 CFR 9.17(a)4.

Correspondence with respect to the copyright or proprietary aspects of GEH information or the supporting GEH affidavit in Enclosure 3 should be addressed to James F Harrison, Vice President, Regulatory Affairs, GE-Hitachi Nuclear Energy Americas LLC, 3901 Castle Hayne Road, Wilmington, NC 28401.

The supplemental information provided herein does not change the conclusions of the No Significant Hazards Consideration and the Environmental Consideration evaluations provided in Reference 1 for the MELLLA+ license amendment request.

In accordance with 10 CFR 50.91(b), a copy of this application supplement, without enclosures is being provided to the designated Minnesota Official.

Summary of Commitments

This letter makes no new commitments or revisions to existing commitments.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: July 31, 2013

Mark A. Schimmel
Site Vice-President
Monticello Nuclear Generating Plant
Northern States Power Company-Minnesota

Enclosures (3)

cc: Regional Administrator, Region III, USNRC (w/o enclosures)
Project Manager, Monticello Nuclear Generating Plant, USNRC
Resident Inspector, Monticello Nuclear Generating Plant, USNRC (w/o enclosures)
Minnesota Department of Commerce (w/o enclosures)

L-MT-13-070

ENCLOSURE 2

GE-MNGP-AEP-3296R2, ENCLOSURE 2

GEH RESPONSE TO RAI-3 PARTS A-G AND I

NON-PROPRIETARY

9 pages follow

ENCLOSURE 2

GE-MNGP-AEP-3296R2

GEH Response to RAI-3 Parts a-g and i

Non-proprietary Information - Class I (Public)

NON-PROPRIETARY NOTICE

This is a non-proprietary version of the Enclosure 1 of GE-MNGP-AEP-3296R2 which has the proprietary information removed. Portions of the document that have been removed are indicated by an open and closed bracket as shown here [[ ]].

RAI-3

Detailed Code Questions

a. *Please explain how TRACG differentiates between the quench front and the bulk liquid phase in any given node during ATWS-I conditions when heat is transferred from a hot rod to the liquid downstream of the quench front.*

Response

TRACG employs a one-dimensional two-fluid model in each fuel channel. Therefore there is one void fraction and one liquid temperature for each node. Heat transfer to the bulk liquid does vary between individual surfaces in the node, such as the surfaces for individual fuel rods, water rods and channel box. Heat transfer to the bulk liquid is calculated according to the heat transfer selection logic described in Section 6.6.2 of the TRACG Model Description LTR [3-1]. The sum of the heat transfer to the liquid from all the surfaces in the node is the net heat transfer to the bulk liquid. If a surface in a node contains a quench front, the quench front heat transfer is calculated as described in Section 6.6.13 of the TRACG Model LTR [3-1] and discussed in the response to RAI 2 in Reference 3-2. The quench front heat transfer is applied to the conduction solution for the surface containing the quench front, where it becomes an energy loss, and added as a source term to the net heat transfer to the bulk liquid in the node.

b. *In the response to RAI 2, the first term of Equation 2-2 describes heat transfer according to film boiling.*

Please explain how Equation 2-2 accounts for only part of a node being in film boiling.

Response

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c. *The response to RAI 2 states that "For conditions where the energy generation in the fuel is high, the net heat removal given by the difference between Equation 2-2 and the energy generation rate is reduced and the quenching is similarly slowed down."*

Please describe by what mechanism is the quench front "slowed down" in TRACG?

Response

RAI 2 of Reference 3-2 contains the statement: [[

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d. In the response to RAI 2, there is a discussion of Equation 2-3 that notes it is used for "conditions where the energy generation in the fuel rod is small."

Please explain how this expression changes if the energy generation is large, as may be the case during ATWS conditions.

Response

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Please see the response to RAI 3c above for conditions where the energy generation is large.

e. *1) Equation 2-5 relates the quench front heat transfer coefficient to reflood velocity which, according to the response to RAI 2, is derived from upstream liquid velocity. However, for non-LOCA scenarios such as ATWS-I, the cladding hot spot may be in a low void inverted annular film boiling (IAFB) regime with oscillatory flow conditions.*

Please explain how Equation 2-5 is applied to scenarios such as ATWS-I where upstream liquid velocity may be reversed.

Response

The quench front models in TRACG were developed for LOCA application.

For top down quenching, it is assumed that the quenching is by a falling film. The heat transfer coefficient used in the quench front model for top down quenching is [[ ]] as described in Section 6.6.13 of Reference 3-1.

For bottom reflood quenching the heat transfer coefficient used in the quench front model is the maximum of the above value and Equation 2-5 from Reference 3-2. Equation 2-5 from Reference 3-2 has been retained from TRAC-P1A [3-3] and TRAC-BD1 [3-4] and is based on based on Yu, Farmer and Coney [3-5].

For conditions with low void fractions and downward velocities, Equation 2-5 from Reference 3-2 is not applied and the falling film quench front model is conservatively applied.

2) Additionally, the quench front propagation would be well correlated with reflood velocity for oscillatory flow conditions where low void inverted annular flow can develop.

Please provide the basis for Equation 2-5 as applied to this type of situation.

Response

The basis for the application of Equation 2-5 from Reference 3-2 is described above and is given in Reference 3-5.

3) In the "Monticello Audit slides" presented to the staff during the audit (ADAMS Accession No. ML123400521), the GEH model was compared to oscillatory results from the Stern Lab tests. However, TRACG appeared to reduce the clad temperature and quench much faster than the data in the Stern Lab oscillatory dryout tests.

Please provide a description about why the reduction in clad temperature and quench occur faster in TRACG than in the Stern data occurs.

Response

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f. Equation 6.6-158 in the TRACG Model Description Topical Report is an expression that provides the heat transfer coefficient for bottom reflood. It is reportedly "based on an empirical correlation developed for TRAC-P1A based on FLECHT reflood data." The FLECHT data is referenced as:

> *J.O. Cermak, et al., PWR Full Length Emergency Cooling Heat Transfer (FLECHT) Group I Test Report, WCAP-7435, Westinghouse Electric Company, January 1970.*

Please provide clarification as to whether this statement is a carryover of the documentation for TRAC-P1A?

Is the TRACG source code for this equation based on the Yu, Farmer, and Coney data?

Response

Please see the response to RAI 3.e. Reference 116 in the TRACG Model LTR [3-1] is incorrect; it should be Reference 3-5. This will be corrected in the next revision of Reference 3-1.

g. A discussion about Equation 2-5 is included in the response to RAI 2. It is stated that the quench front heat transfer coefficient "is consistent with the observations in Reference 2-9." Reference 2-9 notes that in the evaluation of the Harwell data, the heat transfer coefficient in the vicinity of the advancing quench front was 10^5 Btu/hr-ft^2-F [5.6 x 10^5 W/m^2-K]. When a reflood velocity of 0.5 m/sec is applied to Equation 2-5, the result is a heat transfer coefficient of 1.6x10^7 W/m^2-K.

Please explain the inconsistencies between this result and the observation in Reference 2-9.

Response

There really is no inconsistency. Reference 2-9 (Thompson) of Reference 3-2 is for falling film rewetting. It shows heat transfer coefficients just behind the quench front on the order of 10^5 Btu/ft^2-hr-F, which in SI units is 6x10^5 W/m^2-K. TRACG uses a heat transfer coefficient of [[ ]] for the falling film quenching. [[

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For bottom reflood TRACG uses the model from References 3-4 and 3-5. The model is implemented as described in the TRAC-BD1 Model Description [3-4]:

$$h = \left(\frac{F_q}{\Delta T_q} \right)^2 \tag{3-5}$$

$\Delta T_q = T_o - T_\ell$ is the difference between the Leidenfrost temperature and the liquid temperature. In the above expression:

$$F_q = \alpha F_s \tag{3-6}$$

$$F_s = 4.24 \cdot 10^4 v_\ell^{0.15} \tag{3-7}$$

$$\alpha = \begin{cases} \left(1 + v_\ell \Delta T_q^2\right)^{0.13} & \text{for } (1 + v_\ell \Delta T_q^2) \le 40 \\ 0.4839\left(1 + v_\ell \Delta T_q^2\right)^{0.346} & \text{for } (1 + v_\ell \Delta T_q^2) > 40 \end{cases} \tag{3-8}$$

v_ℓ is the liquid velocity.

In the latter expression for α as described in Reference 3-4 and implemented within TRACG $\Delta T_q = T_o - T_\ell$ is used. An examination of the original paper by Yu, Farmer and Coney [3-5] has revealed that α should be calculated as:

$$\alpha = \begin{cases} \left(1 + v_\ell \Delta T_\ell^2\right)^{0.13} & \text{for } (1 + v_\ell \Delta T_\ell^2) \le 40 \\ 0.4839\left(1 + v_\ell \Delta T_\ell^2\right)^{0.346} & \text{for } (1 + v_\ell \Delta T_\ell^2) > 40 \end{cases} \tag{3-9}$$

where $\Delta T_\ell = T_{sat} - T_\ell$ is the amount of liquid subcooling.

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i. *The response to RAI 2 provides Equation 2-2 to describe total heat removal from the fuel. Please describe the distribution of heat transferred to the two phases in TRACG.*

Response

Please see the response to RAI 3b.

References:

3-1 GE Nuclear Energy, "TRACG Model Description," NEDE 32176P, Revision 4, January 2008.

3-2 Response to Monticello Nuclear Generating Plant – Draft Request for Additional information re: MELLLA+ License Amendment Request Review (TAC No. ME3145) – Revision 1, GE-MNGP-AEP-3223, December 14, 2012.

3-3 USNRC, "TRAC-P1A: An Advanced Best-Estimate Computer Program for PWR LOCA Analysis," NUREG/CR-0665, Los Alamos Scientific Laboratory, May 1979.

3-4 USNRC, "TRAC-BD1: An Advanced Best-Estimate Computer Program for Boiling Reactor Loss-of-Coolant Accident Analysis," NUREG/CR-2178, October 1981.

3-5 S. K. W. Yu, P. R. Farmer and M. W. Coney, "Methods and Correlations for the Prediction of Quenching Rates on Hot Surfaces," International Journal of Multiphase Flow, 3, 1977, pp. 415-443.

3-6 Presentations from the NRC Audit of Monticello MELLLA+ ATWS/I, October 24th and 25th, GE-MNGP-AEP-3211, October 30, 2012.

3-7 T. S. Thompson, "On the Process of Rewetting a Hot Surface by a Falling Liquid Film," Nuclear Engineering and Design Volume 31, Issue 2, January 1975, pp 234-245.

L-MT-13-070

ENCLOSURE 3

GENERAL ELECTRIC – HITACHI AFFIDAVIT FOR WITHHOLDING PROPRIETARY INFORMATION

3 pages follow

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, James F. Harrison, state as follows:

(1) I am the Vice President Fuel Licensing of GE-Hitachi Nuclear Energy Americas LLC (GEH), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosure 1 of GEH letter, GE-MNGP-AEP-3296R2, "GEH Response to MELLLA Plus Requests for Additional Information," dated July 19, 2013. The GEH proprietary information in Enclosure 1, which is entitled "GEH Response to RAI-3 Parts a-g and i," is identified by a dark red dotted underline inside double square brackets. [[This sentence is an example.{3}]]. In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit that provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the *Freedom of Information Act* (FOIA), 5 U.S.C. Sec. 552(b)(4), and the Trade Secrets Act, 18 U.S.C. Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for trade secrets (Exemption 4). The material for which exemption from disclosure is here sought also qualifies under the narrower definition of trade secret, within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975 F.2.d 871 (D.C. Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F.2.d 1280 (D.C. Cir. 1983).

(4) The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. Some examples of categories of information that fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over GEH or other companies.

b. Information that, if used by a competitor, would reduce their expenditure of resources or improve their competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.

c. Information that reveals aspects of past, present, or future GEH customer-funded development plans and programs, that may include potential products of GEH.

d. Information that discloses trade secret or potentially patentable subject matter for which it may be desirable to obtain patent protection.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to the NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, not been disclosed publicly, and not been made available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary or confidentiality agreements that provide for maintaining the information in confidence. The initial designation of this information as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure are as set forth in the following paragraphs (6) and (7).

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, who is the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or who is the person most likely to be subject to the terms under which it was licensed to GEH. Access to such documents within GEH is limited to a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary or confidentiality agreements.

(8) The information identified in paragraph (2) above is classified as proprietary because it contains results of an analysis performed by GEH to support the Monticello Maximum Extended Load Line Limit Analysis Plus (MELLLA+) license application. This analysis is part of the GEH MELLLA+ methodology. Development of the MELLLA+ methodology and the supporting analysis techniques and information, and their application to the design, modification, and processes were achieved at a significant cost to GEH.

The development of the evaluation methodology along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GEH asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

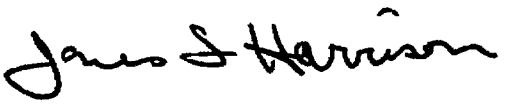
GE-Hitachi Nuclear Energy Americas LLC

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH. The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial. GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 19th day of July, 2013.



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