May 16, 2002

R. S. Lytton, Chairman
Ice Condenser Utility Group
c/o Duke Power
526 South Church Street
P. O. Box 1006
Charlotte, North Carolina 28201-1006

SUBJECT: ICE CONDENSER UTILITY GROUP TOPICAL REPORT NO. ICUG-001, *APPLICATION OF THE ACTIVE ICE MASS MANAGEMENT CONCEPT TO THE ICE CONDENSER ICE MASS TECHNICAL SPECIFICATION* - REQUEST FOR ADDITIONAL INFORMATION (TAC NOS. MB3379 AND MB3938)

Dear Mr. Lytton:

On behalf of the Ice Condenser Utility Group (ICUG), you submitted Topical Report No. ICUG-001 for review and approval by the U.S. Nuclear Regulatory Commission (NRC) on September 18, 2001. Subsequently, the Nuclear Energy Institute Technical Specification Task Force submitted to the NRC Technical Specification Travelers Form (TSTF) 429 for review and approval to implement the methodologies proposed in ICUG-001.

The NRC staff is in the process of reviewing these documents and has developed several questions to assist in this review. The questions are contained in the enclosed Request for Additional Information (RAI). The NRC staff has targeted August 2002 for completion of its review. Therefore, timely response to the RAI will expedite the staff's completion of the review. Should the ICUG have a need to discuss the RAI, please contact me at (301) 415-2010 or *rwh@nrc.gov.*

Original signed by

Ronald W. Hernan, Lead Project Manager
Ice Condenser Technical Specification Project
Project Directorate II, Section 2
Division of Reactor Project Management
Office of Nuclear Reactor Regulation

Enclosure: Request for Additional Information

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/RA/

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REQUEST FOR ADDITIONAL INFORMATION

ICE CONDENSER UTILITY GROUP TOPICAL REPORT NO. ICUG-001,

APPLICATION OF THE ACTIVE ICE MASS MANAGEMENT CONCEPT TO THE ICE

CONDENSER ICE MASS TECHNICAL SPECIFICATION

1. Page O-1, 2nd paragraph of the topical report indicated that the process of replenishing the ice baskets to restore ice bed mass based on the monitoring of varying sublimation rates during the cycle is the basis of the Active Ice Mass Management (AIMM) concept. The topical report also indicated that it will revise and maintain the Technical Specifications (TS) to accommodate AIMM methodology.

   A. How does the AIMM methodology relate to the improved TS?

   B. Please describe the typical AIMM methodology in ice management, for example, how the AIMM will monitor sublimation rates. Is monitoring continuous or periodic? If it is periodic, how often will it be? What criteria would be used in determining inadequate ice mass within some ice basket? During the operating cycle, what are the ice replenishment procedures immediately following an indication of inadequate ice mass within some ice baskets? Provide copies of these procedures.

   C. At the beginning of an operating cycle, what is the amount of ice to be added to the ice condenser by AIMM methodology to account for the sublimation? How does AIMM methodology determine this amount?

2. Describe how your proposed implementation of AIMM methodology will ensure that the ice inventory will remain adequate to mitigate accidents throughout the operating cycle.

3. Page O-2, last paragraph of the report indicated that the alternate sample basket is selected from the vicinity of the initial sample. The alternate selection criteria have been designed around the Radial Zone concept, in which baskets in the same Radial Zone generally have similar mass. Alternate selections are representative of initial selections as long as they have the same probability of being selected as an initial selection and can be expected to have similar characteristics as an initial selection.

   The staff finds that the alternate selection criteria were based on the assumptions of having similar mass and same probability of being selected. However, the baskets in the inner Zone C may not satisfy the above assumptions. First, it appears that the baskets in Radial Zone C (rows 7, 8, and 9) may not have similar mass. This is based on the staff's observation of Table 1-1 and Figure 1-2 of the report that significant differences in sublimation rates appear among rows 9, 8, and 7. Secondly, as shown in Table A-1 of the report, significantly more frozen ice baskets exist in row 9 than in rows 8 or 7. Therefore, a higher probability exists for selecting an alternate non-frozen basket from row 7 or 8 than for selecting a frozen basket in row 9. This is not consistent with the assumption that the alternate selection methodology "have the same probability of being selected as an initial selection and can be expected to have similar characteristics as an initial selection." Please provide an explanation of why these two deviations from the above assumptions of alternate selection criteria will or will not affect the accuracy of the weight measurement.

4. Page O-3, 3rd paragraph of the report indicated that the blowdown phase requirement stipulates a minimum mass of ice for each of the baskets so that a minimum amount of

Enclosure

ice is verified to be present. Further, the blowdown mass is based on the data from the original Westinghouse Waltz-Mill testing.

A. Explain how plant-specific minimum mass of ice for each of the baskets is derived from the blowdown data of the original Westinghouse Waltz-Mill testing. Provide the referred testing data and a description of the testing.

B. Provide a sample referenced Final Safety Analysis Report (FSAR) by giving a specific section in the FSAR for a specific plant.

5. Page I-1, 4th paragraph of the report stated that the minimum blowdown ice mass is required to prevent a "burn-through" of the ice bed. This could cause a chimney effect in one or more ice condenser bays, thereby providing a path for steam to bypass the ice in the bed and get into the upper containment without being condensed. The Ice Condenser Utility Group (ICUG) established the minimum ice mass requirement based on the minimum ice mass required during "blowdown" phase of a postulated accident.

   Why is the minimum ice based on the blowdown phase (<50 sec) only, instead of throughout the course of the accident? The peak containment pressure occurred much later (>1000 sec) than the end of blowdown following a design basis loss-of-coolant accident in an ice condenser containment. The "burn-through" could happen after blowdown phase and could affect the peak containment pressure. If ICUG assumes that post-blowdown burn-through has no impact on the peak containment pressure, please justify this assumption by analyses or testing data. A simple statement in the topical report and in the proposed TS Bases is not sufficient.

6. Technical Specification Travelers Form, TSTF-429, proposed B Surveillance Requirement 3.6.15.2, Insert D, 3rd paragraph states that any method chosen by the licensee will include procedural allowances for the accuracy of the method used. Please explain the "procedural allowances." Is there any calibration requirement included in the procedures for the method chosen?

7. On page *v*, under Sampling without replacement, the use of the term "sample population" is misleading. The leading sentence could be improved by wording as: "Taking samples from a parent population wherein each basket in the population can appear only once in the sample." Use of the term "sample population" persists throughout the topical report; consider revising it.

8. Table 2-1 gives statistics as obtained from 9,470 measurements by ICEMAN™ and shows that ICEMAN™, on the average, underestimates the true weight (measured by lifting) by 13 lbs. Because underestimates are conservative, they are acceptable. However, Table 2-1 should give a breakdown by radial row, as different radial rows typically have different means and, perhaps, different standard deviations.

9. On Page III-2, in the middle of the page under the radical sign, X_n should be X_i, an obvious misprint. Similarly, following the radical sign, change X_n to X_i and n-th sample to i-th sample.

10. Page III-2, last paragraph, is too vague. When is it appropriate to use Equation 3.1 or 3.2? How low must the accuracy be before Equation 3.1 is insufficient and needs to be replaced by Equation 3.2?

11. On page III-3, under Sample Size, the first parenthetical statement is inappropriate. There are several distributions that are bell-shaped and symmetric but are not normal.

12. On page III-7, under Note 2, below Table 3-1: if the error values are not equal to one-sigma, then what are they? Also Note 2, below Table 3-1, states that the given measurement random error is not the standard deviation. So, what is it?

13. Table 3-1, page III-7, gives the standard deviation for visual inspection random error as 300 lbs. This standard deviation is 20 times larger than that for the manual lifting. Since most measurements usually are within two standard deviations of the mean, the visual inspection would not appear to provide the necessary confidence level in meeting the 1071 lb minimum, single basket weight criterion. Please discuss why the visual inspection method is a viable option in determining ice mass.

14. On page III-15, Table 3-5, under Ice Mass Sampling Plan Recommendations, the recommendation for item 3, on sample expansion, is open to different interpretations. The recommendation should state the exact sample size expansion when one, two, or *x* number of light baskets are found.