UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 25, 2001

MEMORANDUM TO: William D. Travers
Executive Director for Operations

FROM: Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

SUBJECT: CLOSEOUT OF WITS ITEM 200100030 - DIFFERING PROFESSIONAL OPINION CONCERNING THE START-UP OF D.C. COOK, UNITS 1 AND 2

The purpose of this memorandum is to inform senior management of the responses to the assignments associated with the subject WITS item undertaken by the Office of Nuclear Reactor Regulation (NRR). By memorandum dated April 2, 2001, NRR was requested to address documentation issues and recommendations from the Ad-Hoc Differing Professional Opinion (DPO) Panel Concerning the startup of D.C. Cook, Units 1 and 2. To address the documentation issues and the DPO Panel's recommendations, the Division of Licensing Project Management (DLPM) was tasked with leading the coordination with NRR and Region III to (1) review the documentation issues that the DPO Panel identified, and (2) review the issues related to possible inconsistencies in agency documentation and determine what changes, if any, are warranted. By memorandum dated May 17, 2001, NRR provided its plan and schedule as required by the April 2, 2001, memorandum and identified three actions NRR would address for the resolution of the subject WITS item.

The following are the three actions which NRR, in coordination with Region III, reviewed:

1. Provide clarification of how the staff's closure of Restart Action Matrix Item R.3.17, "Changes in Input Assumptions and the Updated Final Safety Analysis Report (UFSAR) for the Transient Mass Distribution (TMD) Analysis: Reconstitution of Sub-Compartment Blowdown Analysis and Assumption Resulted in Differential Pressures Higher than in the UFSAR (Ref. 16)," addressed the reconstitution of the subcompartment analysis.

2. Provide a detailed discussion of the staff's assessment of the inherent conservatisms in the licensee's TMD analysis and the licensee's use of verified as-built plant-specific information as inputs to its new TMD analysis.

3. Review and, if appropriate, update Revision 1 to Generic Letter 91-18, its attachment, and Manual Chapter 0350 to incorporate any changes due to (a) revised reactor oversight process, (b) revised Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59, and (c) new regulatory guides (RGs) that address implementation of the revised 10 CFR 50.59 (RG 1.187) and that clarify the 10 CFR 50.2 definition of design bases (RG 1.186).

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The detailed resolution is attached for each of the above identified concerns. If there are any questions concerning the resolution of any of the issues, please contact John Stang at 415-1345.

This completes NRR actions concerning WITS Item 200100030.

Attachment: Closeout of WITS Item 200100030

CLOSEOUT OF WITS ITEM 200100030 -

DIFFERING PROFESSIONAL OPINION

CONCERNING THE START-UP OF D.C. COOK, UNITS 1 AND 2

(1) Provide clarification of how the staff's closure of Restart Action Matrix Item (RAM) R.3.17, "Changes in Input Assumptions and the Updated Final Safety Analysis Report (UFSAR) for the Transient Mass Distribution (TMD) Analysis: Reconstitution of Sub-Compartment Blowdown Analysis and Assumption Resulted in Differential Pressures Higher than in the UFSAR (Ref. 16)," addressed the reconstitution of the subcompartment analysis.

The licensee identified deficient or missing calculations that were needed to demonstrate conformance with the UFSAR design requirements for certain containment structures. The majority of these issues were initially identified and placed in the D.C. Cook Nuclear Plant (D.C. Cook) corrective action process during the Expanded System Readiness Review (ESRR) that was performed by the licensee in early 1999. The TMD analyses and bounding structural evaluations were performed to address deficient or missing design-basis calculations. The TMD analyses, using the design-basis methodology, were performed again with reconstituted and revised input parameters, which yielded revised TMD output pressure loads. The revised TMD analyses outputs were then reviewed to determine their impact on the structural evaluations.

As a result of reviewing the TMD analyses outputs in May 2000, the licensee identified an increase in design pressures impacting certain internal structures. When the capabilities of the internal structure were reviewed in detail, the licensee identified a potential reduction of design-basis margins associated with the increases in postulated pressure loads.

On May 29, 2000, during an evaluation of concrete structures in the D.C. Cook Unit 2 containment, the licensee determined that a condition existed outside the design-basis of the plant. The licensee determined, based upon conservative, simplified evaluations, that some containment internal concrete subcompartment structural elements, specifically, certain walls and floors, did not meet the design load factor margin of 1.5 as described in the D.C. Cook UFSAR. As explained in the UFSAR, a design pressure load factor margin of 1.5 means that these structures are expected to be able to withstand, without failure, a 50-percent increase in pressure load above the worst-case pressure postulated in an area. The conservative simplified structural evaluations included the results of the revised postulated pressure loads derived from the reconstituted containment TMD analysis. The input parameters to the TMD analysis, principally related to the physical configuration of the containment, had been conservatively changed yielding higher TMD output pressure loads.

Unit 2 RAM Item No. 3.17 was assigned to the resolution of the degraded containment structural components. The Office of Nuclear Reactor Regulation (NRR) was assigned the lead for the review. NRR performed a technical review of the degraded containment structures as

ATTACHMENT

documented in a memorandum to John A. Grobe, Director, Division of Reactor Safety, Region III, from Suzanne C. Black, Deputy Director, Division of Licensing Project Management (DLPM), NRR (ADAMS Accession No. ML003722259). The memorandum was attached to the D.C. Cook Manual Chapter (MC) 0350 Internal Meeting Minutes for June 7 and June 8, 2000, as Enclosure 2 (ADAMS Accession No. ML003723627).

The memorandum provides NRR's basis and recommendation to the MC 0350 Panel that Unit 2 RAM Item No. 3.17 be closed. The Panel accepted NRR's recommendation and closed Unit 2 RAM Item No. 3.17, as documented in the June 7 and June 8, 2000, internal meeting minutes. These MC 0350 Panel meeting minutes are publicly available as are all the internal MC 0350 Panel meeting minutes.

Region III did not perform a specific inspection to close Unit 2 RAM Item 3.17. Inspections were performed to assess readiness of Unit 2 systems and containment for restart. Nuclear Regulatory Commission (NRC) Inspection Report 50-315/316-2000016 (ADAMS Accession No. ML003738003) documented closure of Unit 2 Case-Specific Checklist Item 13, "[Unit 2] Systems and Containment Readiness Assessments."

Unit 2 systems and containment readiness assessments were performed in two parts. One part addressed systems and containment problem discovery, and the second part addressed systems and containment final readiness review. Problem discovery was assessed as part of the ESRR and documented in NRC Inspection Reports 50-315/316-99002, 50-315/316-99003, 50-315/316-99006, and 50-315/316-99007. Systems and containment final readiness review was assessed as part of the Unit 2 Restart Readiness Assessment Team Inspection documented in NRC Inspection Report 50-315/316-2000003 (ADAMS Accession No. ML003723846), and as part of resident inspector activities documented in NRC Inspection Report 50-315/316-2000016.

Regarding the Unit 1 TMD analysis, NRR again had the lead and performed a technical review of Unit 1 RAM Item No. 8.1 as documented in a memorandum from John F. Stang, Senior Project Manager, Project Directorate III, Section 1, to Geoffrey E. Grant, Director, Division of Reactor Projects, Region III (ADAMS Accession No. ML003772099). The memorandum was attached to the D.C. Cook 0350 Internal Meeting Minutes for November 28 and December 1, 2000, as Attachment 1 (ADAMS Accession No. ML003774608). The memorandum provides NRR's basis and recommendation to the MC 0350 Panel that Unit 1 RAM Item 8.1 be closed. The Panel accepted NRR's recommendation and closed Unit 1 RAM Item 8.1 as documented in the November 28 and December 1, 2000, MC 0350 Panel internal meeting minutes. Again, as stated above, all internal MC 0350 Panel meeting minutes are publicly available.

Region III did not perform a specific inspection to close Unit 1 RAM Item 8.1. The inspectors evaluated the licensee's corrective actions for containment internal structural walls by performing field walkdowns of the Unit 1 containment internal structural walls and compared the results to the licensee's operability determination evaluation (ODE) as documented in their internal corrective action document. The inspectors determined that based upon the sample performed, the licensee's ODE was consistent with the as-installed configuration of the containment internal structure. The inspectors also compared the corrective actions for the accumulator fan room walls to the as-found field conditions in selected locations. The inspectors determined that the proposed or completed corrective actions were appropriate.

This information is described in NRC Inspection Report 50-315/316-2000023 (ADAMS Accession No. ML003781783).

The revised TMD analyses for Unit 1 and Unit 2 showed a change in the subcompartment pressures and results in containment structures whose design margins were less than that stated in the UFSAR but remained operable. Prior to restart of both units, the licensee performed ODEs to demonstrate that all containment structures would perform their intended function. At the request of the MC 0350 Panel Chairman, NRR reviewed the ODEs for the containment structure issues (Unit 2 RAM Item 3.17 and Unit 1 RAM Item 8.1). NRR found that each degraded containment structure would perform its intended function. As stated above, this was documented in the MC 0350 Panel internal meeting minutes.

(2) Provide a detailed discussion of the staff's assessment of the inherent conservatisms in the licensee's TMD analysis and the licensee's use of verified as-built plant-specific information as inputs to its new TMD analysis.

The Westinghouse TMD computer code is used for ice condenser containment subcompartment analysis. Subcompartment analysis is the nuclear industry term for the computation of pressure differences across various structures in the containment as a result of a high-energy line break. The TMD code also calculates the distribution of steam in the ice condenser containment as the air is displaced from the lower compartment to the upper compartment.

The table presented below summarizes the conservatisms in the TMD code. The bases for this table are: (1) the description of the code models given in WCAP-8077,[1] (2) the staff's safety evaluation report (SER) on the TMD code which is given in Section 6.2.1.1, "Containment Short-Term Pressure Response (SER)," of the D.C. Cook SER, dated September 10, 1973, and (3) an NRC internal report (containing Westinghouse-proprietary information), "CONTAIN Code Qualification Report/User Guide for Auditing Subcompartment Analysis Calculations."

Although it is possible to qualitatively predict the effect of the various parameters and models on the final result, as done in the table, it is not possible to quantify the amount of conservatism without sensitivity studies for a given problem and comparisons with data. The factors for which the impact is high and the conservatism is high tend to bound the data and, therefore, make the overall result conservative.

NRC Standard Review Plan (SRP) Section 6.2.1 allows a 40-percent margin requirement on the calculated pressure to be eliminated as long as as-built data are used in the subcompartment pressure calculations. The licensee confirmed that as-built data were used in the calculations. This is documented in a June 12, 2000, memorandum from S. Singh Bajwa, Director, Project

[1] "Ice Condenser Containment Pressure Transient Analysis Methods" (Proprietary) WCAP 8077 March 1973.

Directorate III, to John A. Grobe, Chairman, MC 0350 Panel for D. C. Cook. This is also confirmed in a June 9, 2000, memorandum to Claudia Craig, Chief, Section 1, Project Directorate III, from Kamal Manoly, Chief, Civil and Engineering Mechanics Section, Mechanical and Civil Engineering Branch, Division of Engineering (ADAMS Accession No. ML003723695). The NRR staff concurs that with the use of as-built data in the D.C. Cook licensee's new TMD analysis, the use of the 40-percent margin is not necessary.

Summary of Conservatism in the TMD Code

Assumption in TMD model	**Level of Importance**	**Level of Conservatism**
Mass and energy release from the high-energy line break model	H	H[2]
HEM flow model used for flow from the break compartment	H	H[3]
100 % Entrainment	H	H[4]
No heat loss to boundaries and internal structures	L-M	L
Temperature Flash Model	L-M	M[5]
Augmented Flow model not used	M-H	M-H[6]
Compression of air ignored	L-M	L-M

H=high M=medium L=low

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[2] SATAN code used for calculation of mass and energy releases from high-energy break. D. C. Cook staff SER dated September 10, 1973, says this is conservative (Safety Evaluation by the Directorate of Licensing, Docket Nos. 50-315 and 50-316, pp 6-25 to 6-26).

[3] Homogeneous equilibrium model method of calculating critical flow provides a lower bound to two phase critical flow rate. When applied to the flow from a compartment, this maximizes the pressure difference across the walls of the compartment.

[4] Entrainment of water droplets in flow between compartments is 100 percent. This is conservative because it maximizes the pressure differentials between the compartments. See Figure 1-25 in WCAP-8077 (Proprietary). Consistent with SRP Section 6.2.1.2.

[5] Incremental mass addition during a time step has not only flashed, but any residual water from this increment has transferred energy to the vapor region so that thermal equilibrium is reached between the liquid droplets and vapor region. The error associated with the temperature flash method tends to give a slightly higher containment pressure than the actual pressure.

[6] The augmented flow factor was proposed in WCAP-8077 as a way to increase critical flow through vents between compartments. This would decrease pressure difference and be nonconservative. The staff SER stated that the augmentation flow factor should not be used.

(3) Review and, if appropriate, update Revision 1 to Generic Letter (GL) 91-18, its attachment, and MC 0350 to incorporate any changes due to (a) revised reactor oversight process, (b) revised Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59, and (c) new regulatory guides (RGs) that address implementation of the revised 10 CFR 50.59 (RG 1.187) and that clarify the 10 CFR 50.2 definition of design bases (RG 1.186).

NRR has performed a review of the documentation issues and recommendations resulting from the Ad-Hoc DPO Panel Concerning the startup of D.C. Cook, Units 1 and 2.

NRR has performed a review of this issue as it relates to MC 0350 and has concluded that no further revision to MC 0350 is warranted at this time. MC 0350 was revised on March 16, 2000, and again on March 6, 2001, to make it consistent with the philosophy and policies of the reactor oversight process (ROP).

In the specific case of D.C. Cook, NRC exempted the licensee from being included in the ROP and continued regulatory oversight using the previous MC 0350 process. This action was in consideration of not changing the oversight process at D.C. Cook while the licensee was undertaking extensive design-basis reviews and corrective actions resulting from recent NRC team inspections. Currently, NRC is gradually shifting its regulatory oversight of D.C. Cook to the new ROP.

NRR prepared a proposed revision of the NRC Inspection Manual Part 9900 guidance in response to this request, which was circulated for internal review and comment by memorandum dated May 11, 2001. The areas in which changes were proposed are as follows:

- References and text to reflect issuance of revised 10 CFR 50.59 (e.g., RG 1.187 and deletion of unreviewed safety question terminology),
- Guidance now includes discussion of how 10 CFR 50.65(a)(4) (on maintenance activity risk assessments) relates to the overall resolution process,
- References to 10 CFR 50.2 definition of design bases (e.g., RG 1.186),
- Clarification provided that authority to continue operation may be limited by other regulatory actions (e.g., MC 0350),
- Clarification provided on Bases for Continued Operation as contrasted with Justification for Continued Operation (with reference to guidance on Notices of Enforcement Discretion), and
- References to current enforcement policy (under reactor oversight program).

Comments were generally supportive of the suggested changes to the guidance, and offered a number of editorial clarifications. NRR's plan for completion of this task includes publication of a proposed Regulatory Issue Summary (RIS) with this revised Part 9900 guidance as an attachment, which will supersede Revision 1 to GL 91-18. NRR plans to publish this RIS for public comment. NRR's schedule for issuance of the final RIS is late fall 2001.

The detailed resolution is attached for each of the above identified concerns. If there are any questions concerning the resolution of any of the issues, please contact John Stang at 415-1345.

This completes NRR actions concerning WITS Item 200100030.

Attachment: Closeout of WITS Item 200100030

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