UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

April 4, 1997

NRC INFORMATION NOTICE 97-15: REPORTING OF ERRORS AND CHANGES IN LARGE-BREAK LOSS-OF-COOLANT ACCIDENT EVALUATION MODELS OF FUEL VENDORS AND COMPLIANCE WITH 10 CFR 50.46(a)(3)

Addressees

All holders of operating licenses or construction permits for nuclear power reactors and all reactor fuel vendors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees about two recent staff findings related to the review of large-break (LB) loss-of-coolant accident (LOCA) emergency core cooling system (ECCS) analysis evaluation model changes and also to remind licensees and reactor fuel vendors of the requirements contained in Section 50.46(a)(3) of Title 10 of the Code of Federal Regulations [10 CFR 50.46(a)(3)] concerning the reporting of ECCS cooling model changes and errors. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

Recently identified changes and errors in Siemens Power Corporation (SPC, formerly Exxon Nuclear) and General Electric (GE) LBLOCA analysis models have led to a series of 30-day reports and 10 CFR 50.72 reports as required by 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors."

SPC LBLOCA ECCS Evaluation Model Changes

The SPC LBLOCA ECCS model, TOODEE2, was approved by the NRC staff to meet the requirements of 10 CFR 50.46 in a letter dated July 8, 1986 [Accession number 8607150319], from D. M. Crutchfield (NRC) to G. Ward (Exxon). In 1991, SPC had made changes to the NRC-approved fuel cooling test facility (FCTF) reflood heat transfer coefficient correlation used in TOODEE2.

During August 1995, the NRC met with SPC about the LBLOCA ECCS evaluation model. As a result of that meeting, the staff sent a letter to SPC, dated November 13, 1995 [9511150211], that identified problems concerning changes in the TOODEE2 computer code

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updated on 4/8/97

specifically related to the 1991 changes to the NRC-approved FCTF reflood heat transfer coefficient correlation and the significance of the code changes. The staff then requested in a letter dated March 13, 1996 [9603150002], that SPC formally submit to the staff for its review and approval all model revisions and corrections implemented in TOODEE2 since the staff's approval of the code in July 1986.

On June 2, 1996, SPC submitted topical report XN-NF-82-20, "EXEM/PWR Large Break LOCA ECCS TOODEE2 Updates," Revision 1, Supplement 5 [9606260239], which described the updates made in the TOODEE2 computer code between 1986 and 1991. TOODEE2 is part of the evaluation model used by SPC for pressurized-water reactors. The staff has completed its review of this report and has concluded that the proposed LBLOCA-ECCS model (i.e., the 1991 model) is not acceptable and the previously approved model (i.e., the 1986 model) contains an unacceptable error. This information was formally communicated to SPC in a safety evaluation enclosed in a letter dated November 29, 1996 [9612040294].

After concluding that the 1991 model was unacceptable, the staff met with SPC and those licensees using SPC's LBLOCA evaluation model on October 16, 1996, to discuss the unacceptable error in the 1986 model. The staff also requested and received information from the licensees that demonstrated that they were in compliance with 10 CFR 50.46 (see meeting summary dated November 5, 1996 [9611140318]).

Public Service Electric & Gas (PSE&G) Audit of GE

During a recent licensee-conducted quality assurance (QA) audit of the fuel vendor (GE - Wilmington, North Carolina), PSE&G, the licensee of Hope Creek Nuclear Generating Station, identified a weakness in GE's tracking of errors and changes in the LOCA evaluation models. Between 1990 and 1995, information sent to the licensee indicated that there had been no known impact on the calculated peak cladding temperature (PCT). Earlier in 1996, two impacts had been reported by GE to the licensee and when reviewing the handling of this information during the audit, three additional impacts not previously reported to the licensee were discovered, dating back to 1990, 1992, and 1993. In addition, the audit determined that GE had not been tracking the cumulative impact of errors and changes on the PCT as expected by the licensee. The cumulative PCT impact was previously known to be 35 °F (19 °C); however, on the basis of the errors identified during the audit, the value is now raised to 100 °F (56 °C) exceeding the 50 °F (28 °C) reporting threshold. The licensee's recalculated PCT still remains below the ECCS acceptance criteria of 2200 °F (1200 °C).

In a letter to the NRC dated February 17, 1997 [9703060067], GE characterized the licensee-identified weakness as an issue of timeliness of notifications to utilities of errors and changes in the LOCA evaluation models. Furthermore, notification about changes or errors identified during the 1990 to 1995 period were provided by GE on an annual basis. Because notification by GE to boiling-water reactor BWR licensees on individual impacts less than 50 °F (28 °C) were not provided as they occurred, the BWR licensees did not have the required information to fully comply with the requirements of 10 CFR 50.46 [specifically the requirement to report within 30 days a cumulative PCT impact greater than 50 °F (28 °C)].

Discussion

Although the LOCA analyses are performed by the fuel vendors, licensees are responsible for compliance with the regulations related to the LOCA analysis, that is, 10 CFR 50.46(a). Section 50.46(a)(1)(i) requires licensees to calculate ECCS cooling performance with an acceptable evaluation model. The staff's recent interactions with the licensees using the SPC's LBLOCA methodology (the review experience of the SPC LOCA evaluation model changes) and the Hope Creek QA audit indicate that licensees may not be closely monitoring the work of their respective fuel vendors. When the error in the 1986 model was discovered and when SPC changed the TOODEE2 code in 1991, the resulting changes in the PCT were, in some cases, significant, and the responsible licensees were not aware of the significant changes. "Significant" is defined in 10 CFR 50.46(a)(3)(i) as follows: "a significant change or error is one which results in a calculated peak fuel cladding temperature different by more than 50°F from the temperature calculated for the limiting transient using the last acceptable model, or is a cumulation of changes and errors such that the sum of the absolute magnitudes of the respective temperature changes is greater than 50 °F."

Licensees may not be performing adequate assessments of errors when they are aware of them. Furthermore, licensees' audits of SPC's evaluation model changes appear to have been ineffective in identifying the technical inadequacy of the changes. It should be noted that 10 CFR 50.46 allows fuel vendors or licensees to make evaluation model changes without the staff's prior approval; however, the licensees are responsible for identifying any deficiencies in the change process and reporting them to the NRC staff accordingly. In addition, the licensee determines whether the changes are significant.

It also appears that licensees may not be monitoring the cumulative effect of the evaluation model changes. In a given year, the impact of the evaluation model change may be less than 50 °F (28 °C) on the limiting PCT calculated with the last acceptable model and hence the change is not significant. But the impact of the evaluation model changes over several years together can exceed 50 °F (28 °C) and, therefore, will be reportable as significant.

Section 50.46 places the responsibility for the reporting of evaluation model changes on the limiting PCT calculated with the last acceptable model on the licensees. Some licensees have apparently considered that the annual notifications sent by the fuel vendor are sufficient to meet the requirements under 10 CFR 50.46(a)(3)(ii). Specifically, "the applicant or licensee shall report the nature of the change or error and its estimated effect on the limiting ECCS analysis to the Commission at least annually as specified in §50.4. If the change or error is significant, the applicant or licensee shall provide this report within 30 days...." The notifications submitted by the fuel vendors will not satisfy these reporting requirements; however, licensees are allowed to refer to the vendor's annual notifications. As stated in 10 CFR Part 50, Appendix B, Section VII, "The effectiveness of the control of quality by contractors and subcontractors shall be assessed by the applicant or designee at intervals consistent with the importance, complexity, and quantity of the product or services."

In summary, licensees are reminded that to meet the ECCS acceptance criteria their responsibilities include:

(1) Section 50.46(a)(1)(i) requires licensees to calculate ECCS cooling performance with an acceptable evaluation model.

(2) Section 50.46(a)(3)(ii) requires licensees to report changes and/or errors and their estimated effects on the limiting ECCS analysis to the Commission at least annually, and if the change or error is significant, the licensee shall provide this report within 30 days.

(3) Individual licensees are responsible to assess effectiveness of the control of quality of ECCS evaluation models provided by the vendors as required by Part 50, Appendix B. Meaningful technical audits may be necessary to meet Appendix B.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Theodore R Quay for

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Office of Nuclear Reactor Regulation

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LIST OF RECENTLY ISSUED NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
97-14	Assessment of Spent Fuel Pool Cooling	03/28/97	All holders of OLs or CPs for nuclear power reactors
97-13	Deficient Conditions Associated with Protective Coatings at Nuclear Power Plants	03/24/97	All holders of OLs or CPs for nuclear power reactors
97-12	Potential Armature Binding in General Electric Type HGA Relays	03/24/97	All holders of OLs or CPs for nuclear power reactors
92-27, Supp. 1	Thermally Induced Accelerated Aging and Failure of ITE/ Gould A.C. Relays Used in Safety-Related Applications	03/21/97	All holders of OLs or CPs for nuclear power reactors
97-11	Cement Erosion from Containment Subfoundations at Nuclear Power Plants	03/21/97	All holders of OLs or CPs for nuclear power reactors
97-10	Liner Plate Corrosion in Concrete Containments	03/13/97	All holders of OLs or CPs for power reactors
97-09	Inadequate Main Steam Safety Valve (MSSV) Setpoints and Performance Issues Associated with Long MSSV Inlet Piping	03/12/97	All holders of OLs or CPs for nuclear power reactors

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CP = Construction Permit

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original signed by T.R. Quay

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Tech Editor has reviewed and concurred on 12/18/96
DOCUMENT NAME: 97-15.IN

OFC	TECH CONTACTS	C:SXRB:DSSA	C:PECB:DRPM	D:DRPM
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DATE	1/14/97	3/07/97	03/21/97	3/31/97

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Siemens was given opportunity to comment on this IN. Their comments were received via a memo to S. Koenick dated 2/17/1997 (accession # 9703060067).

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