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RECORD #41

TITLE: Errors in Dose Assessment Computer Codes and Reporting ...
Under 10 CFR Part 21

FICHE: 31809-128

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

July 10, 1985

IE INFORMATION NOTICE NO. 85-52: ERRORS IN DOSE ASSESSMENT COMPUTER CODES AND REPORTING REQUIREMENTS UNDER 10 CFR PART 21

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or a construction permit (CP).

Purpose:

The purposes of this information notice are to alert licensees (1) of errors in a dose assessment computer code supplied by a vendor, and (2) that, in general, computer codes can be considered basic components under the requirements of Part 21, and errors that can lead to substantial radiation exposures would be considered reportable under 10 CFR 21. It is expected that recipients will review the information for applicability to their facilities and consider actions, if appropriate, to preclude a problem at their facilities. Licensees are also encouraged to share this information with their vendors. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or response is required.

Description of Circumstances:

The NRC staff recently evaluated an event where errors were found in computer software supplied by Nuclear Data, Inc. (ND) for predicting offsite doses at San Onofre. Attachment 1 provides further details of the San Onofre event, including the cause and effect of the computer error. Although notification was made via INPO's electronic "notepad", this information was prepared to ensure that all potentially affected licensees are aware of the problem.

In the past, licensees and vendors appear to have been diligent in reporting non-conservative errors in computer software used to perform design calculations. However, NRC staff conversations with licensees in regard to the San Onofre problem have indicated that some licensees believe, in general, that errors in vendor supplied computer software used for offsite dose assessments are not reportable under 10 CFR 21. However, such errors may be reportable in some circumstances. This particular error was not reportable under 10 CFR Part 21 because the error led to substantially overestimating calculated offsite doses. However, if the error had been non-conservative and caused significant underestimation of offsite doses, then this could have (theoretically) led to

radiation exposures exceeding the guidelines found in NUREG-0302 (Rev. 1) regarding the exposure levels associated with substantial safety hazards. Attachment 2 repeats the pertinent guidelines (NUREG-0302, Rev. 1) for determining when a substantial safety hazard exists.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the Regional Administrator of the appropriate regional office or this office.



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Attachments:

1. Description of San Onofre Event
2. Guidelines For Determining Whether a Substantial Safety Hazard Exists
3. List of Recently Issued IE Information Notices

DESCRIPTION OF SAN ONOFRE EVENT

During a recent emergency preparedness exercise at San Onofre, NRC Region V personnel noted large differences between the results of the offsite dose calculations made by the licensee and the region. With the licensee and Region V using the same input parameters (radiological source term and meteorological conditions), offsite doses calculated by the region were an order of magnitude less than the licensee's estimations. The NRC staff recognizes that there is no "standard code" for calculating offsite doses. Because of modeling assumptions and complexities, large differences in resultant doses can exist when comparing two codes with both codes still correctly considered to be error-free. However, when they examined their code for internal accuracy, the licensee noted the problems discussed below.

The licensee found errors in the dose assessment computer programs, supplied by ND, used to estimate environmental doses for both routine operations and emergency operations. Coordinating with ND, the licensee corrected these errors and notified other licensees via INPO's electronic "notepad." The vendor-supplied computer program DISP (main program for calculating atmospheric dispersion) had an inherent error, which led to predicting less atmospheric dispersion (dilution) than the code should have calculated, hence leading to an overestimation of the effect of a radioactive gaseous release (by a factor of approximately 10 for emergency doses).

During an emergency situation, overestimating or underestimating the dose due to code errors could lead to potential confusion. During an emergency situation protective action decisionmaking would be based principally on plant conditions. However, dose projection calculations do influence such decisions. Therefore, the calculations need to meet accuracy expectations to be useful. Given the levels of real-time technical oversight and review by local governmental authorities and Federal agencies, including independent dose estimations, it is not likely that a protective actions decision by the local authorities would be based solely on the licensee dose projection.

Staff discussions with the San Onofre licensee and another licensee indicated that some licensees believe such software errors are simply not reportable. However, NRC staff maintains that such errors are reportable in some circumstances as a material defect.

If errors result in substantially underestimating or overestimating offsite doses, it could possibly result in inappropriate protective actions. An error that substantially underpredicts offsite doses (non-conservative) would certainly be reportable under 10 CFR 21. This underestimation could possibly cause a delay or deferral of a protective action which could clearly lead to the unnecessary exposure to a person in an unprotected area, thereby creating a "substantial safety hazard." An error that substantially overpredicts (conservative) is not strictly reportable under 10 CFR 21, since it is very unlikely that such an overestimation could result in personnel radiation exposures exceeding the referenced guidelines. However, given the potential non-radiological negative impact from unnecessary protective actions that could result from overly conservative dose estimates, licensees should continue to cooperate with vendors and share information concerning common problems with generic computer codes. Staff guidance on the amount of radiation exposure that can be considered to represent a substantial safety hazard is provided in NUREG-0302 (Rev. 1) (see Attachment 2).

Guidelines For Determining Whether A "Substantial Safety
Hazard" Exists*

1. A substantial safety hazard means the loss of a safety function to the extent there is a major reduction in the degree of protection provided to public health and safety. Note that the term "public health and safety" includes both members of the public and licensee workers/employees.
2. From a radiological perspective, a criterion for determining whether substantial safety hazard exists includes "moderate exposure to, or release of, licensed material."
 - a. Guidelines for determining what "moderate exposure to..." means:
 - o Greater than 25 rem wholebody
(or its equivalent to other body parts) to occupationally exposed workers
 - o Exposure of 0.5 rem wholebody
(or its equivalent to other body parts)
to an individual in an unrestricted area
 - b. Guidelines for determining what "...release of, licensed material." means:
 - o Release of materials in amounts reportable under the provisions of 10 CFR Part 20, §20.403(b)(2)

*Taken from NUREG-0302 (Rev.1), "Remarks Presented (Questions/Answers Discussed) at Public Regional Meeting To Discuss Regulations (10 CFR Part 21) for Reporting of Defects and Noncompliance," October 1977.

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
85-51	Inadvertent Loss Or Improper Actuation Of Safety-Related Equipment	7/10/85	All power reactor facilities holding an OL or CP
85-50	Complete Loss Of Main And Auxiliary Feedwater At A PWR Designed By Babcock & Wilcox	7/8/85	All power reactor facilities holding an OL or CP
85-49	Relay Calibration Problem	7/1/85	All power reactor facilities holding an OL or CP
85-48	Respirator Users Notice: Defective Self-Contained Breathing Apparatus Air Cylinders	6/19/85	All power reactor facilities holding an OL or CP, research, and test reactor, fuel cycle and Priority 1 material licensees
85-47	Potential Effect Of Line-Induced Vibration On Certain Target Rock Solenoid-Operated Valves	6/18/85	All power reactor facilities holding an OL or CP
85-46	Clarification Of Several Aspects Of Removable Radio-active Surface Contamination Limits For Transport Packages	6/10/85	All power reactor facilities holding an OL
85-45	Potential Seismic Interaction Involving The Movable In-Core Flux Mapping System Used In Westinghouse Designed Plants	6/6/85	All power reactor facilities holding an OL or CP
85-44	Emergency Communication System Monthly Test	5/30/85	All power reactor facilities holding an OL

OL = Operating License
CP = Construction Permit