

May 14, 2002

Mr. Michael R. Kansler
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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON APPLICATION FOR
EXEMPTION FROM THE DEFINITION OF TOTAL EFFECTIVE DOSE
EQUIVALENT - ARKANSAS NUCLEAR ONE, UNITS 1 AND 2; GRAND GULF
NUCLEAR STATION; INDIAN POINT NUCLEAR STATION, UNITS 1, 2, AND 3;
JAMES A. FITZPATRICK NUCLEAR POWER PLANT; PILGRIM NUCLEAR
POWER STATION; RIVER BEND STATION; AND WATERFORD STEAM
ELECTRIC STATION, UNIT 3 (TAC NOS. MB3456, MB3457, MB3488, MB3439,
MB3440, MB3479, MB3489, MB3476, MB3477, MB3486)

Dear Mr. Kansler:

By application dated July 20, 2001, you requested an exemption from the definition of total effective dose equivalent. (Also, by letter dated November 19, 2001, you adopted the July 20, 2001, application for Indian Point Nuclear Station, Units 1 and 2). The Nuclear Regulatory Commission (NRC) staff has reviewed the application. In order for the staff to continue its review, the staff requires a response to the enclosed request for additional information (RAI).

The contents of the RAI have been discussed with Mr. J. Kelly of your staff, and a response time frame of 30 days from the date of this letter was agreed to. The NRC staff appreciates your efforts in regard to this matter.

Sincerely,

/RAI

Thomas W. Alexion, Project Manager, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-313, 368, 416, 003, 247, 286, 333, 293, 458, and 382

Enclosure: RAI

cc w/encl: See next page

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Docket Nos. 50-313, 368, 416, 003, 247, 286, 333, 293, 458, and 382

Enclosure: RAI

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION
ENTERGY REQUEST FOR EXEMPTION FROM
THE DEFINITION OF TOTAL EFFECTIVE DOSE EQUIVALENT (TEDE)

1. The response to Question 1 in Attachment 2 to the July 20, 2001, letter appears to conflict with the exemption request in the body of the letter itself. Verify that Entergy intends to estimate effective dose equivalent (not deep-dose equivalent) with the EPRI method referenced, when you are demonstrating compliance with 10 CFR 20.1201(a)(1)(i) using the requested alternate definition of TEDE. Also verify that compliance with the limit on total organ dose will be demonstrated using deep-dose equivalent (as specified in 10 CFR 20.1201(a)(1)(ii) and 20.1201(c)) instead of as stated in your response.
2. Your July 20, 2001, letter states that the EPRI method is applicable to "all radiation exposure situations" (see Attachment 1, page 3) and requests approval to use the weighted two-badge algorithm (A3)* when "there is expected to be a significant difference between the deep-dose equivalent [DDE] and the effective dose equivalent [EDE]." However, the algorithms used in the EPRI method for estimating EDE were developed for directional, broad parallel beam gamma exposures. They are not valid for all non-uniform exposures situations (i.e., high dose gradient exposures such as diving in proximity to irradiated fuel). Verify that the method will only be applied in those situations that approximate exposure to directional parallel gamma beams (e.g., no significant dose-rate gradient across the space occupied by the body, ignoring the shielding of the body itself).

* Since the one-badge (A1) "algorithm" discussed in the EPRI documents is consistent with dosimetry practices allowed under the current regulation, no exemption from Part 20 is needed.
3. Your response to the question above need not discuss body-to-dosimeter self shielding, since it is covered by your response in the July 20, 2001, letter (Question 2 in Attachment 2), to ensuring that at least one dosimeter "see" the major exposure source at all times. However, the statement in this response that "job-specific Radiation Work Permits will require the worker to move about to ensure this requirement is met" seems impractical. Please clarify.
4. Verify that the front and back dosimeters used in the A3 method of assessing EDE will be calibrated to read DDE at the point of measurement.
5. The published paper, "Two Methods For Examining Angular Response of Personnel Dosimeters," by P. Plato, et. al. (Reference 5.13 in the July 20, 2001, letter), provides evidence that the Panasonic UD-802 dosimeter, currently in use in the Entergy system, has angular dependent response characteristics suitable to support the EPRI algorithms. Is the Entergy request narrowly restricted to the use of the UD-802 dosimeter? If not, commit to using dosimeters that have an angular response at least as good as that described in the paper, "A Study of the Angular Dependence Problem in Effective Dose Equivalent Assessment," by X. Xu, et. al. (Reference 5.7 in the July 20, 2001, letter).

6. The guidelines for implementation of the EPRI methodology for assessing EDE in Reference 5.8 in the July 20, 2001, letter are vague as to whether the EPRI algorithms (specifically A3) are valid for assessing EDE from point sources (or hot particles) on or near the surface of the body. Therefore, it is unclear if assessing EDE from external point sources is included in the Entergy request. The information in Volumes 1 and 2 of EPRI TR-101909 (July 20, 2001, letter, References 5.4 and 5.6, respectively), is insufficient for the staff to conclude that the A3 method is valid for assessing EDE from point sources in all cases. Verify that Entergy does not intend to use this method for assessing EDE from point sources on or near the surface of the body or provide the following information.
 - 6.1 The "true" EDE (calculated by Monte Carlo method) values resulting from point source exposures, provided in Tables 5, 6 and 7 of Volume 1, are not based on the organ weighting factors given in Part 20 and therefore not appropriate for demonstrating compliance with the requirement in 20.1201(a)(1)(i). The geometry of these calculations is constrained to locations on the trunk of the body (from 6 cm to 61cm above the point the legs join the body). It is easy to describe an exposure situation, outside the bounds of these calculations, where a point source (i.e., located on the inside of upper thigh) would result in a significant EDE. Describe how a conservative EDE, consistent with the definition in Part 20, will be assessed for all exposures to point sources located on, or near, the surface of the entire body.
 - 6.2 The data in Table 9 of Volume 2 is too limited to demonstrate that the EDE values assessed with the EPRI methodology are valid for hot particle exposures. The geometry of the exposure situation, discussed in 6.1 above, is further restricted such that the two dosimeters are located either at the hip or mid-torso, with the point sources located at the same height (e.g., in the same plane cutting horizontally through the body) as the dosimeters. No information is provided on how the calculated, or indicated, EDE varies as the source is moved up or down the body away from the plane of the dosimeters. The ratio of the EDE calculated by the A3 method to the "true" EDE, is presented for just five grid locations radially around the body in each dosimeter plane. The potential for self shielding of both dosimeters from the point source is not addressed since the source grid locations evaluated are not on the surface of the body. Provide data that demonstrates that the EDE calculated with the A3 method is a conservative (e.g., the ratio of the calculated to "true" EDE is greater than or equal to one) estimate of the EDE for all point source locations on, or near, the surface of the entire body.
7. Verify that the values for parallel beam sources, in units of "E-15 rad-cm squared per photon," as stated in EPRI TR-101909, Volume 2, Table 8, are off by 5 orders of magnitude, and will not be used specifically for calculating EDE in a real exposure situation.

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