RECORD #329

TITLE: HEALTH PHYSICS POSITION ON ALTERNATIVE CRITERIA PROPOSED BY NUMARC FOR TWO REGULATORY POSITIONS IN REGULATORY GUIDE 8.14

DF03 1/1

Ltr. Encl.

ADD: Dan Carter 1004

1 1

DEC 0 2 1993

MEMORANDUM FOR: Frederick C. Combs, Chief, IMOB, NMSS
Donald A. Cool, Chief, RPHEB, RES
James H. Joyner, Chief, FRSSB, DRSS, Region I
William E. Cline, Chief, RPEPB, DRSS, Region II
Cynthia D. Pederson, Chief, RPEPB, DRSS, Region III
Dwight Chamberlain, Acting Director, DRSS, Region IV
James H. Reese, Chief, RRPB, DRSS, Region V

FROM: LeMoine J. Cunningham, Chief
Radiation Protection Branch
Division of Radiation Safety
and Safeguards
Office of Nuclear Reactor Regulation

SUBJECT: HEALTH PHYSICS POSITION ON ALTERNATIVE CRITERIA PROPOSED BY NUMARC FOR TWO REGULATORY POSITIONS IN REGULATORY GUIDE 8.14

The subject health physics position document is provided for your information and is being made publicly available by placing it in the NRC Public Document Room. Two previous drafts of this position were sent to you for review. No reviewer suggested changes to the second draft and the enclosed position is essentially the same as that draft.

Original signed by LeMoine J. Cunningham

LeMoine J. Cunningham, Chief
Radiation Protection Branch
Division of Radiation Safety
and Safeguards
Office of Nuclear Reactor Regulation

Enclosure: As stated

Contact: John Buchanan
(301) 504-3184

DISTRIBUTION:

Central Files, P1 37	PDR, LL6	PRPB R/F	PRPB S/F, NUMARC
LJCunningham	FCongel	TEssig	JWigginton
JBuchanan	DCarter	PMcKee	RErickson
CJones, 6H3	SSherbini, 6H3	SWeiss, 11B20	RAnderson, TTC
JLieberman, 7H5	WBateman, 17G21	CHehl, RI	DNellis, NLS139
SMcGuire, NLS139	JPStohr, RII	BMurray, RIV	WAxelson, RIII
RScarano, RV	T. D. Murphy, EW 439		

OFC	PRPB:DRSS	RPB:DRSS:SC	RPB:DRSS:BC	
NAME	JBUCHANAN	JWIGGINTON	LCUNNINGHAM	
DATE	12/02/93	12/02/93	12/2/93	

OFFICIAL RECORD COPY Document Name:NEUTHPPO.FNL

9312130391 XA

Enclosure

Health Physics Position

Alternative Criteria Proposed by NUMARC for Two Regulatory Positions in Regulatory Guide 8.14

The following question, and the basis for the question, are contained in the attached August 31, 1993 letter from John F. Schmitt, NUMARC, to Frank J. Congel, U. S. NRC. As indicated in that letter, NUMARC believed that some of the criteria in the guide that are provided in terms of quarterly neutron dose limits are not consistent with the revised Part 20, which establishes a system of annual dose limits. NUMARC proposed to multiply these numerical criteria in the guide by a factor of four to convert them to annual doses.

Question

In the interim period until Regulatory Guide 8.14 is revised, is it acceptable to the NRC staff for NRC licensees to use the alternative criteria shown in bracketed italics in the following two regulatory positions from Regulatory Guide 8.14, Rev., 1?

> Regulatory Position C.1.c "Calculated neutron dose equivalent in place of neutron dosimeter. If the individual is not likely to receive a neutron dose equivalent in excess of 100 mrem in a quarter [*400 mrem in a year*] but would still have to have some sort of monitoring under § 20.202 (e.g., gamma monitoring) [*§ 20.1502 (e,g., deep dose equivalent monitoring*], a personnel neutron dosimeter may be omitted. The neutron dose equivalent should then be estimated by the methods in regulatory position C.1.b above. This procedure is discussed in more detain in regulatory position C.3 of Regulatory Guide 8.4."
>
> Regulatory Position C.1.e "Negligible neutron dose equivalent. If the neutron dose equivalent is not likely to exceed 30 mrem per quarter, or 10 mrem per quarter for individuals under 18 years of age [*120 mrem per year, or 40 mrem per year for individuals under 18 years of age*], neutron dosimeters may be omitted and the neutron dose equivalent assumed to be zero. The determination that an individual is not likely to receive a neutron dose equivalent of 30 mrem per quarter should not be based on previous NTA film badge readings since NTA film is not sufficiently sensitive to detect this dose equivalent rate."

Answer

No, the use of the proposed alternative criteria shown above is not acceptable. The criteria given in Guide 8.14, Rev. 1, should continue to be used until the guide is revised.

The reason for this position is, essentially, that the criteria that NUMARC proposes to change are based on measurement capabilities for neutron dosimetry and not on the time period to which the regulatory dose limits apply; therefore, it is inappropriate to increase the values of these numerical criteria by a factor of four merely because quarterly dose limits have been changed to annual dose limits. A more extensive discussion of the NUMARC proposal, and the basis for our response follows.

NUMARC, in its August 31, 1993 letter, has not taken exception to the numerical criterion of 300 mrem in a quarter in the first paragraph of Regulatory Position C.1 of the guide, even though that criterion position is expressed in terms of dose in a quarter. The first paragraph of Regulatory Position C.1 of Regulatory Guide 8.14, Rev. 1, includes the following statement:

> Neutron dosimeters should be worn whenever the neutron dose equivalent is likely to exceed 300 mrem in a quarter (the minimum sensitivity required of a dosimeter in paragraph 4.1 of the standard).

Paragraph 4.1 of ANSI N319-1976 reads as follows:

> The dosimetry system shall be capable of detecting a minimum quarterly dose equivalent of 300 mrem. Therefore, the lower limit of detection for the dosimetry system shall be no greater than 300 mrem divided by the number of dosimetry periods per quarter. For the purpose of this standard, the limit of detection of the dosimetry system is considered to be that value of neutron dose equivalent for which the neutron responses of a set of ten or more dosimeters identically exposed will have a standard deviation of no greater then 50%.

Thus, Regulatory Position C.1 in the regulatory guide, although expressed in terms of a dose equivalent of 300 mrem in a quarter, is clearly based on the measurement capability of the dosimetry system.

The two positions in the guide to which NUMARC does take exception are alternatives to, and thus are closely related to, the basic position in the first paragraph of Regulatory Position C.1. The 100 mrem in a quarter criterion of Regulatory Position C.1.c is one-third of the 300-mrem criterion and the 30 mrem criterion of Regulatory Position C.1.e is one-tenth of the 300-mrem criterion. All of these positions are based on the measurement capability of the dosimetry system. Therefore, the fact that the Part 20 dose limits have changed from a quarterly to an annual basis is not a valid reason for increasing the values of the numerical criteria in Regulatory Positions C.1.c and C.1.e.

The NRC staff believes that Regulatory Guide 8.14, Rev. 1, needs to be revised. As a result of the major revision of 10 CFR Part 20, some conforming changes need to be made to the regulatory references in the guide. However, the guide's primary technical reference, ANSI N319-1976, "Personnel Neutron Dosimeters (Neutron Energies Less Than 20 MeV)," is currently being revised by

a working group of the Health Physics Society's Standards Committee and the staff does not believe that Regulatory Guide 8.14 should be revised until the revision of ANSI N319 has been completed and approved by ANSI. (ANSI N319-1976 was reaffirmed, but not revised, in 1984.) The process of revising ANSI N319 is expected to take several years to complete. When ANSI N319 and Regulatory Guide 8.14 are revised, the numerical criteria in these documents may change and it is unlikely that these criteria will continue to be expressed in terms of dose per quarter. In the process of revising these documents, improvements in neutron measurement capabilities since ANSI N319 and Regulatory Guide 8.14 were issued (in 1976 and 1977, respectively) will need to be considered. For example, ANSI N13.11-1983, which is the standard used in the NVLAP accreditation program for personnel dosimeters [10 CFR 20.2501(c)], includes an implied lower limit of measurement capability for neutron dosimetry of 50 mrem per neutron dose measurement (rather than the 300-mrem criterion of the guide); see Table I, test category VIII, and §§ 3.6 of the standard. As another example, the relatively new superheated drop, "bubble", neutron dosimeters are reported to have a lower limit of detection of 1 mrem (G. Riel et al., *IEEE Transactions on Nuclear Science*, Vol. 28, No. 2, pages 494-496, April 1991). Furthermore, although Regulatory Position C.1.a of Regulatory Guide 8.14, Rev. 1, includes the statement that albedo neutron dosimeters generally are believed to be more sensitive than required by the ANSI standard, scientists at the National Bureau of Standards (now the National Institute of Standards and Technology), after analyzing measurements with personnel dosimeters and portable instruments for determining neutron dose equivalent at nuclear power plants, have recommended that both TLD albedo dosimeters and remmeters be retained for estimating dose equivalent to workers at nuclear power plants (NUREG/CR-3400, August 1983). Thus, it appears unlikely that numerical criteria that represent measurement capabilities will be substantially increased in a future revision of Regulatory Guide 8.14.

Attachment

NUCLEAR MANAGEMENT AND RESOURCES COUNCIL

1776 Eye Street, N.W. • Suite 300 • Washington, DC 20006-3706
(202) 872-1280

August 31, 1993

Mr. Frank J. Congel, Director
Division of Radiation Protection
and Emergency Preparedness
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Congel:

In a public meeting on August 25, 1993, we met with members of your staff and discussed the application and use of NRC Regulatory Guide 8.14, Revision 1, "*Personnel Neutron Dosimeters*," after implementation of the revised 10 CFR Part 20. It was agreed in the meeting that some of the criteria in the regulatory guide, that are provided in terms of quarterly neutron doses, are not consistent with the revised Part 20, which establishes a system of annual dose limits. Therefore licensees utilizing the criteria in the regulatory guide could have to uniquely assess neutron doses on a quarterly basis, while assessing other dose categories on an annual basis in accordance with the rule.

We understand that the regulatory guide's primary technical reference, ANSI N319-1976, is subject to revision in the near future, and therefore to pursue revision of the guide to conform with the revised rule at this time would not be efficient. However, we believe that in the interim until the guide is revised, licensees utilizing the regulatory guide should have the flexibility to adapt the quarterly criteria in the guide to equivalent annual criteria in order to more readily conform with the system of annual dose limits in the revised rule. The adapted values would not modify dose limits or requirements for the use of methods to maintain doses as low as is reasonably achievable (ALARA). Therefore, use of the adapted values will not change the level of health and safety of the workers, as established by Part 20.

Discussion was held during the meeting to determine an efficient process by which the NRC staff may evaluate and respond to our proposal to provide licensees the option to

employ adapted, annual-based criteria when applying the regulatory guide after revised Part 20 implementation. It was agreed at the meeting that NUMARC would submit a question with a proposed approach to resolving the issue, which we have enclosed for your review and response. If you or your staff have any questions regarding this matter, please do not hesitate to contact Ralph Andersen or me.

Sincerely,

John F. Schmitt
Manager
Operations, Management and
Support Services Division

JFS/RLA
Enclosure

Enclosure

Use of Adapted Criteria from Regulatory Guide 8.14

Background

Regulatory Guide 8.14, Revision 1, "*Personnel Neutron Dosimeters*," provides guidance on the use of personnel neutron dosimeters. Section C.1 of the guide, entitled "When Neutron Dosimeters Should Be Worn," includes criteria and methods that provide alternatives to using individual monitoring devices to determine personnel neutron doses. The criteria in the guide are specified on the basis of prospectively assessing the neutron dose equivalent that an individual is likely to receive in a calendar quarter, which is consistent with the system of quarterly dose limits in the current 10 CFR Part 20.

The revised Part 20 establishes a system of annual dose limits and includes determining individual monitoring requirements on the basis of prospectively assessing the dose, by category, that an individual is likely to receive in a calendar year. Accordingly, after implementing the revised Part 20, licensees utilizing this regulatory guide's approach would continue prospectively assessing neutron doses on a quarterly basis in order to satisfy the criteria in the regulatory guide taken *verbatim* in current form, while performing all other prospective assessments of dose categories on an annual basis, consistent with the revised Part 20.

This situation of inconsistency between the rule and the regulatory guidance will exist because the guide has not yet been revised to reflect the changes in the rule. It is our understanding that this situation has been recognized by the NRC staff, who plan to consider the guide for revision following updating of the guide's primary technical reference, ANSI N319-1976, "*Personnel Neutron Dosimeters (Neutron Energies Less Than 20 MeV)*," expected within the next several years.

Question

In the interim period until the regulatory guide is revised, is it acceptable to the NRC staff that two of the guide's criteria (specifically applied on a per quarter basis) be adapted by licensees utilizing this regulatory guide to support prospectively assessing neutron doses on an annual basis, consistent with the revised Part 20? Note

that the other criteria in the guide could be used "as is." The criteria involved and the proposed adapted values (in bracketed italics), are as follows:

> Regulatory Position C.1.c **"Calculated neutron dose equivalent in place of neutron dosimeter. If the individual is not likely to receive a neutron dose** equivalent in excess of 100 mrem in a quarter [*400 mrem in a year*] but would still have to have some sort of monitoring under § 20.202 (e.g., gamma monitoring) [*§ 20.1502 (e.g., deep dose equivalent monitoring)*], a personnel neutron dosimeter may be omitted. The neutron dose equivalent should then be estimated by the methods in regulatory position C.1.b above. This procedure is discussed in more detail in regulatory position C.3 of Regulatory Guide 8.4."
>
> Regulatory Position C.1.e **"Negligible neutron dose equivalent. If the neutron** dose equivalent is not likely to exceed 30 mrem per quarter, or 10 mrem per quarter for individuals under 18 years of age [*120 mrem per year, or 40 mrem per year for individuals under 18 years of age*], neutron dosimeters may be omitted and the neutron dose equivalent assumed to be zero. The determination that an individual is not likely to receive a neutron dose equivalent of 30 mrem per quarter should not be based on previous NTA film badge readings since NTA film is not sufficiently sensitive to detect this dose equivalent rate."

Conclusion

The proposed annual-based adapted values have been calculated by multiplying by a factor of 4 the quarterly criteria that are in the regulatory guide and are therefore equivalent to what is currently permitted by the guide. The adapted values apply to determining acceptable methods for the monitoring (and potentially the recording and reporting) of neutron doses, as do the current criteria in the guide. The adapted values do not modify dose limits or requirements for the use of methods to maintain doses as low as is reasonably achievable (ALARA). Therefore, use of the adapted values will not change the level of protection of health and safety of the workers, as established by Part 20. The adapted values will provide licensees with added flexibility to avoid maintaining a unique schedule (i.e., quarterly) for prospective assessments of neutron doses that is more restrictive than the annual schedule for prospective assessments allowed by the revised Part 20.