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U.S. Nuclear Regulatory Commission
Washington, DC 20555

Gentlemen:

This letter provides the Nuclear Management and Resources Council, Inc. (NUMARC)[1] comments on Draft Guide DG-8010, "Criteria for Monitoring and Methods for Summation of Internal and External Occupational Doses," in response to the Federal Register notice of March 5, 1992 (57 Fed. Reg. 7942). DG-8010 has received extensive and careful review by the nuclear power industry. The results of this review have been used to develop the enclosed comments.

We believe the guidance in DG-8010 will be helpful in determining individual monitoring requirements and appropriately summing external and internal radiation doses as required by the revised Part 20. However, the final guide should avoid unnecessary duplication of and conflicts with other proposed regulatory guidance, and the terminology and criteria it contains must be consistent with other guides and the revised Part 20. Our general comments enclosed give details on areas of duplication and conflict.

The guide's position on determining the need for internal monitoring should be expanded to allow credit to be taken for respiratory protection factors, if the respiratory protection program has been demonstrated to be effective. This change will more appropriately reflect the nuclear power industry experience of infrequent and minimal intakes and better align the guide with the NRC position on the use of respirator protection factors recently published in the "NRC Questions and Answers on 10CFR20 Implementation."

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[1] NUMARC is the organization of the nuclear power industry that is responsible for coordinating the combined efforts of all utilities licensed by the NRC to construct or operate nuclear power plants, and of other nuclear industry organizations, in all matters involving generic regulatory policy issues and on the regulatory aspects of generic operational and technical issues affecting the nuclear power industry. Every utility responsible for constructing or operating a commercial nuclear power plant in the United States is a member of NUMARC. In addition, NUMARC's members include major architect/engineering firms and all of the major nuclear steam supply system vendors.

We encourage the NRC to consider the enclosed comments in finalizing the guide. Our key points are that certain guidance should be expanded to more accurately reflect the provisions of the revised Part 20, while other guidance should be abbreviated or deleted if it is redundant or extraneous to the revised Part 20. Also, the single example of summing external and internal doses provided in the guide is overly complex and should be replaced by a number of simple examples to better illustrate the points in the guide. We are prepared to work with the staff to develop more illustrative examples.

We appreciate the opportunity to provide our input on this important document. Please contact Ralph Andersen, John Schmitt, or me if you would like to discuss our comments.

Sincerely,

Thomas E. Tipton

TET/RLA:sek
Enclosure

GENERAL COMMENTS

1. Duplication and Conflicts with other Regulatory Guides

Some of the information contained in this guide duplicates, and at times conflicts with, information that is contained in other proposed regulatory guides. Examples include the following:

a. The Introduction, Discussion, and Regulatory Position refer to "declared pregnant woman" and "dose to the embryo/fetus." This scope is more appropriately included in DG-8011, "Radiation Dose to the Embryo/Fetus," and should be deleted from this guide.

b. Regulatory Position C.1, "Monitoring", duplicates information that is included in the most recent publicly available version of DG-8007, "Instructions for Recording and Reporting Occupational Radiation Exposure." This information is more appropriately within the scope of DG-8010. It should be deleted from DG-8007.

c. Regulatory Position C.2.2, "Dose from Airborne Radioactive Material," both duplicates and conflicts with information that is more appropriately included in DG-8005, "Assessing External Radiation Doses from Airborne Radioactive Materials," and should be deleted from this guide.

d. Regulatory Positions C.3, "Determination of the Committed Effective Dose Equivalent," and C.4, "Determination of Organ-Specific Committed Dose Equivalents," duplicate information that is more appropriately included in DG-8009, "Interpretation of Bioassay Measurements," Regulatory Guide 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program," or DG-8003, "Air Sampling in the Workplace," and should be deleted from this guide.

Recommendation: Duplicate information among regulatory guides should be eliminated and reference(s) should be made to the appropriate regulatory guide(s) for information that is outside the scope of this guide. If duplication of information between regulatory guides is needed, the wording should be identical in each guide to prevent conflicts and eliminate confusion.

2. Terminology and Criteria

Some terminology and criteria which are used in the guide are not consistent with terminology and criteria in other related regulatory guides or with the revised Part 20. Examples include the following:

a. DG-8010 refers to "annual organ dose", while DG-8007 introduces the term "total organ dose equivalent (TODE)" to refer to the sum of the deep dose equivalent and committed dose equivalent received

by an organ in one year. The revised Part 20 does not use either term. Clarification is needed in the use of those terms (e.g., are they the same?).

b. DG-8010 refers to "shallow-dose equivalent" (meaning skin dose) and "extremity dose equivalent", while DG-8007 refers to "shallow-dose equivalent, whole body" and "shallow-dose equivalent, extremity." The revised Part 20 uses "shallow-dose equivalent to the skin" and "shallow-dose equivalent to an extremity."

c. DG-8010 refers solely to "eye dose equivalent", while DG-8007 also introduces the acronym "LDE" to represent eye dose equivalent to the lens of the eye and is intended to avoid confusion with "effective dose equivalent," which has the acronym "EDE." The new Part 20 uses the term "eye dose equivalent."

d. DG-8010 refers to "organ-specific committed dose equivalent", while DG-8007 and the revised Part 20 use "committed dose equivalent." It should be noted that by definition in the revised Part 20 "committed dose equivalent" is specific to an organ or tissue.

e. DG-8010 uses the criterion of 1.2 rem to initiate an evaluation of compliance with the 50 rem limit on the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye. DG-8007 uses the criterion of 1 rem. The revised Part 20 does not specify a criterion.

Recommendation: Regulatory Guides should be reviewed in their final form to ensure that terminology and criteria are used consistently between the guides and the revised Part 20. Also, if the terms used in the guidance are different than those used in the regulations, the difference needs to be explained and justified.

3. Use of Respiratory Protection Factors

DG-8010 states that in evaluating internal monitoring requirements, "the concentrations to be used ... are those of the ambient atmosphere before credit is taken for respiratory protection factors." This assumption is overly conservative for respiratory protection programs which are implemented in accordance with 10 CFR 20.1703 "Use of Individual Respiratory Protection Equipment," and Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection."

The criteria for acceptable respiratory protection programs which are specified in the regulatory documents include substantial measures to verify that expected respiratory protection factors are achieved including surveys, bioassay, testing of respirators immediately prior to

use, etc. Additional measures are routinely employed at nuclear power plants such as individual contamination monitoring, i.e., "frisking", immediately upon leaving contaminated areas and again at points of egress from the restricted area using sensitive whole body contamination monitors.

As noted in the "Regulatory Analysis for the Revision of 10 CFR Part 20," data which was reviewed between 1978 and 1983 indicates that less than 0.03% of the individuals monitored had measured body burdens in excess of 10% of the relevant annual limit on intake (ALI). In addition, industry data indicates that this low trend of measured body burdens has declined even further in more recent years.

The most recent set of "NRC Questions and Answers on 10 CFR 20 Implementation", states that if respiratory protection programs "include reasonable measures to verify that the expected degree of respiratory protection will be achieved" then credit may be taken for respiratory use with regards to the prospective evaluation of internal monitoring requirements. Respiratory protection programs in the nuclear power industry have been demonstrated to be effective in providing expected personnel protection against airborne radioactive materials. A prospective evaluation of whether or not individuals are likely to exceed 10% ALI should take into account the extensive documentation related to respiratory protection, and not be unrealistically restricted to assuming exposures to ambient air concentrations without taking credit for respiratory protection factors.

Recommendation: The guidance should state that if reasonable measures are used to verify the effectiveness of respiratory protection programs, then credit may be taken for appropriate respiratory protection factors in the evaluations of internal monitoring requirements.

4. Determination of Monitoring Requirements

Regulatory Position C.1 "Monitoring" provides a simplified overview for determining monitoring requirements and refers to four external dose types, " i.e., deep-dose equivalent, shallow-dose equivalent, eye dose equivalent, and extremity dose equivalent", and two internal dose types, "i.e., committed effective dose equivalent and organ-specific committed dose equivalent". In addition, the guide states that "in determining whether the monitoring threshold of 10% ALI is likely to be exceeded, intake by all pathways (inhalation, ingestion, and through the skin) must be considered."

The wording in the guide is ambiguous and appears to be inconsistent with the requirements in the revised Part 20 (20.1502). For clarity, the requirements have been tabulated below and we recommend that a similar format be included in the guide.

GENERAL COMMENTS

The use of individual monitoring devices for external dose is required as follows:

a. For adults who are likely to receive an annual dose in excess of the following (each evaluated separately):

   1. 0.5 rem deep-dose equivalent.

   2. 1.5 rems eye dose equivalent.

   3. 5 rems shallow-dose equivalent to the skin.

   4. 5 rems shallow-dose equivalent to any extremity.

b. For minors who are likely to receive an annual dose in excess of the following (each evaluated separately):

   1. 0.05 rem deep-dose equivalent.

   2. 0.15 rem eye dose equivalent.

   3. 0.5 rem shallow-dose equivalent to the skin.

   4. 0.5 rem shallow-dose equivalent to any extremity.

c. For declared pregnant women who are likely to receive an annual dose from occupational exposure in excess of 0.05 rem deep dose equivalent.

d. Individuals entering a high or very high radiation area.

Internal exposure monitoring (not necessarily individual monitoring devices) is required as follows:

a. For adults likely to receive in 1 year an intake in excess of 10% of the applicable ALIs for ingestion and inhalation.

b. For minors and declared pregnant women likely to receive in 1 year a committed effective dose equivalent in excess of 0.05 rem.

DG-8010 states that there are thresholds for individual monitoring requirements for organ-specific committed dose equivalents or for intakes through the skin, which is contrary to what is required by the revised Part 20 (20.1502). Note that only if internal monitoring has been determined to be required for an individual, then intakes through the skin need to be considered in summing external and internal doses (20.1202). There are no stated monitoring requirements in terms of organ-specific committed dose equivalent in the revised Part 20. In addition, the requirement for monitoring individuals who enter a high or very high radiation area has apparently been omitted from the Regulatory

Position in the draft guide. Finally, the individual monitoring requirements as described in the guide are oversimplified to the extent that clarification of the rule is not provided.

Recommendation: Regulatory Position C.1 "Monitoring" should be revised and expanded to ensure literal consistency with the revised Part 20 and to enhance understanding of the rule's requirements.

5. Determination of Maximum Dose in Non-Uniform Radiation Fields

Regulatory Position C.2.1 "Placement of Individual Monitoring Devices" describes methods for determining the maximum dose to parts of the body in non-uniform radiation fields. The guide states that in cases where more than one monitoring badge is used, "the maximum dose is the one that should be recorded." Without additional clarification, this wording may be subject to the overly conservative interpretation that each set of monitoring results should be considered separately.

The use of "multi-badging" to measure doses to different parts of the body of an individual in a substantially non-uniform radiation field is common at nuclear power plants. Such monitoring may include only a single use of multiple dosimetry or may be repeated over an extended period, e.g., over the duration of a plant outage. Typical practice is to separately track the doses to the different parts of the body through the entire monitoring period and then to assign the maximum accumulated dose to a specific part of the body as the recorded dose.

This practice is consistent with the revised Part 20 (20.1201(c)), which states that in demonstrating compliance with the annual limits, the assigned dose "must be for the part of the body receiving the highest exposure."

Recommendation: The guidance should be expanded to provide the flexibility in interpreting monitoring results throughout the entire monitoring period such that the assigned dose best represents the intent of the new Part 20.

6. Non-Required Monitoring

Regulatory Position C.1.4 "Monitoring Performed But Not Required..." includes discussion of the practice preferred by the NRC staff and provides examples of such monitoring which appear to be extraneous to the rule and the purpose of the regulatory guide.

Recommendation: All but the first two sentences of this section should be deleted, because the information does not provide guidance on any provisions of the revised Part 20.

GENERAL COMMENTS

7. Internal Dose Determination

Regulatory Positions C.3 and C.4 describe methods for internal dose determinations which are redundant with the scope of DG-8009. It has been recommended above that these sections be deleted and that this guide simply include references to other appropriate regulatory guides on internal dosimetry. The guidance in these sections is limited with regards to the revised Part 20 (20.1206) and is overly prescriptive in that it does not address the use of case-specific data by experienced health physics professionals employing accepted calculational methods and concepts.

Recommendation: If these sections are not eliminated and referenced to other regulatory guides, as recommended previously, then they should be broadened to encompass more appropriate concepts and methods for internal dosimetry such as those recommended by the International Commission on Radiological Protection (ICRP) and those described in the revised Part 20.

8. Example of Summation

No actual "methods" of summation are provided in the Regulatory Position. The guidance on summation appears to be provided through the example in Appendix A. However, the example material is inconsistent with the most recent publicly available revision to DG-8007. Also, the example is too complex in that it attempts to illustrate most of the major points of the guide in a single example.

Recommendation: Develop a number of simple examples which illustrate specific aspects of the guide and relate to the various applications which may be encountered by different licensee types. Ensure consistency with DG-8007 and other guides.

9. Compliance with Annual Dose Limits

Regulatory Position 1.2, "Evaluation of Likely Annual Occupational Dose", appropriately states that "the requirements in 10 CFR 20.1502 refer to each licensee" and that "each licensee makes the determination independently." However, the guide also states that "doses that may have been received during the year from employment by another licensee are not included in the determination of monitoring requirements." This statement is ambiguous and may lead to noncompliance through an erroneous interpretation.

Regardless of the determination of individual monitoring requirements in accordance with paragraph 20.1502 of the revised Part 20, paragraph 20.1201, "Occupational Dose Limits for Adults," requires that licensees "shall control the occupational dose to individual adults..." to the annual occupational dose limits. In the case of individuals who have received occupational dose in excess of 90% of an annual limit

previously during the year from occupational exposure, the determination of monitoring requirements to demonstrate compliance with annual limits may be at a threshold less than the 10% value described in the guide.

Recommendation: Revise the wording in this section to clarify the issue described above.

SPECIFIC COMMENTS

(Note: In the margin, P = page and S = section)

P-2
S-B

Reference in the first paragraph should be corrected from "10 CFR 20.1201" to "10 CFR 20.1202."

P-3
S-C.1.1

The sentence which refers to "workers or groups of workers who receive occupational dose but are not monitored..." appears to imply a requirement for documentation which is beyond the rule. Statements in the license application, area and environmental monitoring results, restricted area and controlled area limitations, etc., may serve as the basis for identifying workers who are "likely to exceed" an applicable limit and would be available as the basis for such determinations. However, it is not apparent that the rule requires "a written record or explanation" on a worker or group of workers basis for not providing monitoring. It is recommended that the last two sentences of this section be deleted.

P-4
S-C.1.3

This section is somewhat confusing and may imply requirements beyond the regulation. It is recommended that the section be revised to include a clear statement of the following points:

1. If a worker's exposure status changes from "not likely to exceed 10%" to "likely to exceed 10%" of an applicable limit (as defined in §20.1502), then:

   a. Monitoring of the type applicable to that limit is required.

   b. All previous monitored and recorded dose of that type for that year must be used in determining year-to-date dose.

   c. Unrecorded doses (i.e., not requiring monitoring) which may have been received at other licensed facilities need not be considered.

   d. A "best estimate" of previous occupational doses of that type which may have been received at the licensee's own facility, based on existing and available information, should be made and is acceptable for use in determining year-to-date dose.

2. If a worker's exposure status changes from "likely to exceed 10%" to "not likely to exceed 10%" of an applicable limit (as defined in § 20.1502), then:

SPECIFIC COMMENTS

a. Monitoring of the type applicable to that limit is no longer required.

b. Previous monitoring during the year of the type applicable to that limit (i.e., based on "likely to exceed" criteria) remains subject to the recording and reporting criteria in the revised Part 20.

P-5 S-C.1.5	This section should be expanded to clarify that thresholds for monitoring are decisionmaking criteria to be used in prospective evaluations of monitoring requirements and are not intended to be used as detection sensitivity criteria, which are more appropriately contained in consensus standards on detection instrumentation and techniques.
P-5 S-2	To provide clarity, add the following sentence to the first paragraph. "The deep dose equivalent is not to be added to the shallow-dose equivalent nor the eye dose equivalent."
P-6 S-C.2.1	The last paragraph refers to performing a "survey" to evaluate actual dose. Due to transient radiological conditions, a post-exposure survey is often not feasible. Greater clarity should be provided with wording similar to the following: "... an evaluation should be performed to estimate the dose. The results of the evaluation should be used, in addition to measured dose results, to assign the recorded dose."
P-6 S-C.2.2	As stated in the General Comments, this section should be deleted with reference made to the appropriate regulatory guide.
P-7 - 10 S-C.3 & C.4	As stated in the General Comments, these sections should be deleted with reference made to appropriate regulatory guides on internal dose assessment. If these sections are not deleted, they need to be identically consistent with the other related guides and also be expanded to refer to the use of ICRP and NCRP methods and the use of case-specific data as described in 10 CFR 20.1204.
Appendix A	As stated in the General Comments, this example is overly complex and inconsistent with the most recent publicly available version of DG-8007. The Appendix should be replaced with a number of specific examples which illustrate the key points in the guide.