

**Department of Energy
Office of Worker Protection Policy and Programs
Radiological Control Technical Position
RCTP 2004-01**

**Guidance on the Revision of Internal Radiation Dose Estimates in Response to
Updated Internal Dosimetry Methodologies**

Issue:

Periodic changes in methodologies for internal dose assessment have resulted in the need for Departmental guidance on various aspects of the revision of recorded assessments of internal dose.

Introduction:

The Office of Environment, Safety and Health (EH) has been requested to develop a Radiological Control Technical Position (RCTP) on the revision of internal radiation dose estimates in response to updated internal dosimetry methodologies. Specifically, EH has been asked to address the question of when is it appropriate or required to recalculate and update doses from previous recorded assessments using newer methods for assessing internal dose. In addition, EH has been requested to address considerations associated with the decision to recalculate internal doses such as the expected magnitude of the change, the records associated with the recalculation, the reports to current and former workers, the impact on compliance with dose limits, and the programmatic costs.

The methodologies of internal dose assessment are periodically changing and improving in response to better understanding of the metabolism of radioactive materials taken into the body and the health effects caused by these materials. There are also improved methods of determining the quantities of these materials taken into the body. As a result of such changes, recalculation of internal doses from past intakes of radioactive materials may result in internal dose assessments, which differ significantly from the previously recorded assessments of internal dose.

With the exception of specifying the tissue weighting factors¹ to be used, Title 10 Code of Federal Regulations Part 835 (10 CFR 835) does not limit the various methodologies used in the assessment of internal dose. Accordingly, DOE sites may update their methodologies for internal dose assessment in accordance with the latest accepted scientific knowledge.

In addition, because the tissue weighting factors currently recommended by the International Commission on Radiological Protection (ICRP) differ from the tissue weighting factors currently used by Federal agencies in the United States, it is possible Federal agencies may consider adopting updated values of tissue weighting factors. Thus, in the future it would be reasonable to expect DOE requirements for occupational radiation protection to change in response to advances in the understanding of radiation induced health effects in humans.

¹ Per 10 CFR 835.203(b) the tissue weighting factors specified in 10 CFR 835.2 must be used in determining effective dose equivalent from internal and external sources of radiation.

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Discussion:

Routine Recalculation of Internal Doses:

Federal regulation 10 CFR 835 establishes the basic requirements needed to protect DOE Federal and contract workers from radiation exposure. In developing these requirements the Department considers the latest national and international standards and recommendations available at the time and subjects these requirements to a process of public review and comment. To assist the departmental entities required to follow these requirements, the Department issues various guidance documents providing acceptable approaches for complying with these requirements. Based on advances in the knowledge base underlying the discipline of radiation protection, the Department periodically updates its system of radiation protection requirements and guidance. At these times DOE elements are required to comply with the new requirements.

With regard to the determination of internal doses, (with the exception of tissue weighting factors) 10 CFR 835 does not limit the various methodologies used in the assessment of internal dose. In this way DOE sites are free to update the internal dosimetry methodologies in accordance with the latest accepted advances in this area, such that workers are provided with internal dose estimates based on current internal dosimetry methodologies. The Department expects that advances adopted by DOE sites have normally been endorsed by national and international scientific organizations. It is not expected the DOE sites would always automatically decide to update previously completed internal dose assessments as they update internal dose methodologies. Such an endeavor could be expensive, require arbitrary decisions on how far in time to extend the recalculations, while not normally improving the level of protection for workers. Note the Internal Dosimetry Guide (DOE G 441.1-3) and the Internal Dosimetry Standard (DOE STD -1121-98) state the various elements of an internal dose assessment program should be documented so a record will exist of the methods used to determine internal doses. In the process of updating methodologies it is recommended that DOE sites should maintain close communication with cognizant DOE personnel.

In the case of changes in those aspects of 10 CFR 835 which affect the determination of internal dose, the same approach specified in the paragraph above applies. It is not expected that the DOE sites would update previously completed internal dose assessments as a result of a change in 10 CFR 835 unless specifically directed by DOE. For example, should 10 CFR 835 be amended to adopt the set of tissue weighting factors specified in ICRP Publication 60 (ICRP 60), an acceptable approach to compliance would be for DOE sites to update their internal dosimetry program to reflect the ICRP 60 tissue weighting factors, and to assess internal doses using the updated tissue weighting factors at some predetermined time. However, it is not expected that DOE sites recalculate all previously completed internal dose estimates performed at that site. Note the Department did not require recalculation of previous internal doses resulting from uranium intakes when it granted a DOE contractor an exemption from those requirements

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in 10 CFR 835 requiring the use of the specified tissue weighting factors, thus, permitting the use of the tissue weighting factors in ICRP 60 when calculating internal doses from uranium.

Case-by Case Recalculations of Internal Radiation Dose Estimates:

There may be unique and emergent situations in which a DOE site may consider reevaluating an internal dose estimate. Examples of such situations are a response to litigation, determination that an internal dose has been incorrectly estimated, or availability of new bioassay data. Because these situations are not expected to be routine, the decision on whether or not to consider recalculating an internal dose should be made on a case-by-case basis. The following paragraphs address some of the considerations associated with such a decision.

Magnitude of the expected change: The estimated magnitude of the change is important in assessing the significance of the recalculation. For example, small changes (10%) to large doses and large changes to small doses (< 0.1 rem) may not have a significant effect on an individual's lifetime dose. The Internal Dosimetry Program Guide (DOE G 441.1-3) recommends revising internal dose evaluations "when information demonstrates a change in the currently evaluated committed effective dose equivalent of 0.5 rem or a factor of 1.5 of the previously assigned dose for that intake, whichever is higher."

Programmatic costs: Because case-by-case recalculations of internal dose are not expected normally to occur frequently the annual costs budgeted for the internal dosimetry program at a site are expected to be adequate to cover only occasional internal dose recalculations. If, however, a significant number of internal dose recalculations are anticipated, cost along with the significance of the change in the internal dose should be considered in the decision to perform these recalculations.

Impact on compliance with dose limits: It is possible a dose, originally within a dose limit, may exceed the dose limit when recalculated. In many such cases, the workplace events which caused the intake of sufficient magnitude to approach or exceed the dose limit have long passed and corrective actions taken. Thus, further actions would not, in most cases be needed. However, if the status of an internal dose estimate relative to the dose limit changes as a result of an incorrect dose evaluation, the Departmental Offices responsible for enforcement of 10 CFR 835 would have to determine the appropriate actions.

Documentation of the recalculated result in official records: Section 835.704 (h) specifies "data necessary to allow future verification or reassessment of recorded doses shall be recorded." Because 10 CFR 835.704(g) anticipates internal doses may be recalculated, an acceptable approach to compliance with the record-keeping provisions of 10 CFR 835 (subpart H) is to record the recalculated dose

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and data used in the recalculation in an individual's official monitoring records. In addition, the individual's records should include a notation that the internal dose estimate was recalculated and the reason for the recalculation.

Communication of the recalculated dose estimate to current and former workers:
If a dose is recalculated, current workers should be informed of changes to their dose records and the justification for the change. Informing such workers may be done by informing them of the dose recalculation at the time it is completed or by indicating in their annual report a previously completed internal dose evaluation had been recalculated. Note if the recalculation was based on monitoring performed in accordance with 10 CFR 835 402, the recalculated dose would have to be reported to the individual as part of the annual report to meet the requirements of 10 CFR 835.801(c). For former workers, several attempts should be made to contact individuals for whom an internal dose had been recalculated.

Long-term reevaluation of intakes:

Per DOE STD 1121-98, long-term reevaluations of intakes are intended to verify the accuracy of projected bioassay patterns and thereby verify the accuracy of assigned intakes and doses. Thus, long-term reevaluations of intakes are special situations which differ from the above case-by-case internal dose recalculations in that they do not result from emergent situations but may be considered an extended process of refining an individual's internal dose estimate. Despite this difference, the factors mentioned above should be considered before making a decision to either occasionally perform these dose reevaluations or make them a recurring part of the internal dosimetry program. Guidance on long-term reevaluations of intakes is contained in section 9.2 of DOE STD-1121-98.

Technical Position:

DOE does not encourage routine recalculation of internal doses in response to changes in internal dosimetry methodologies such as biokinetic models, tissue weighting factors, or improved bioassay techniques after a final dose estimate has been completed and recorded. Internal doses calculated using technically sound and defensible methods available at the time of the dose estimate are an acceptable way to meet the Department's expectations for internal dose monitoring and compliance with occupational exposure dose limits promulgated in 10 CFR 835. However, in the process of updating methodologies it is recommended that DOE sites should maintain close communication with cognizant DOE personnel.

DOE recognizes there may be unique situations in which a DOE site may consider or be directed to reevaluate an internal dose estimate. Examples of such situations are a response to litigation, determination that an internal dose has been incorrectly estimated, or availability of new bioassay data. In such cases the decision to recalculate a final internal dose estimate should be made on a case-by-case basis and consider:

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- The magnitude of the expected change,
- Programmatic costs,
- Impact on compliance with dose limits,
- Documentation of the recalculated result in official records, and
- Communication of the recalculated dose to current and former workers.

Guidance on these considerations is contained in the discussion section of this RCTP.

To ensure compliance with record-keeping provisions of 10 CFR 835 subpart H, the technical basis and results of determinations to recalculate a completed internal dose assessment should be documented in official site records.

References:

10 CFR 835, U.S. Department of Energy, Occupational Radiation Protection. 63 FR 59662, *Federal Register*, Vol. 63, No. 213, dated 11-4-98. Washington , D.C.

DOE STD-1121-98, INTERNAL DOSIMETRY, dated December 1999. Washington, D.C.

DOE G 441.1-3, INTERNAL DOSIMETRY PROGRAM GUIDE, dated 3-17-99. Washington, D.C.

ICRP Publication 60, 1990 Recommendations of the International commission on Radiological Protection.