



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

September 28, 1979

ARMY, DEPARTMENT OF THE  
US ARMY ELECTRONICS RESEARCH AND DE  
DELSO-SF  
FT. MONMOUTH NJ 07703  
29-01022-10

Dear Licensee:

Maintaining occupational radiation exposure and releases of radioactive effluents to the environment as low as is reasonably achievable (ALARA) is an important element in radiation safety practice. The principle of maintaining occupational radiation exposure ALARA is an extension of an original recommendation of the National Council on Radiation Protection. The Council's 1949 report introduced the philosophy of assuming that any radiation exposure may carry some risk and recommended that radiation exposure be kept at a level "as low as practicable" (currently referred to as "ALARA") below the recommended permissible dose equivalent.

When the maximum permissible dose (MPD) levels set forth in 10 CFR §20.101 (enclosed) were first established, the field of nuclear medicine was in its infancy. At the time, there was no sound data base for determining that lower levels were readily achievable. Our most recent data throughout the medical community (Figure 1) indicates that occupational exposures less than 10% of MPD are readily achievable with proper attention to the ALARA concept. With thousands of workers in this field, the sum of all exposures received by these workers, referred to as collective radiation dose (man rem), is an important consideration in determining the need to control individual doses.

Under the current regulations, 10 CFR §20.1(c), each licensee is expected to be committed to the ALARA concept. We believe that this commitment should be made more formal. Therefore, the Nuclear Regulatory Commission will request that each medical licensee develop and implement by December 4, 1979, a specific action program to maintain occupational radiation exposures ALARA. The reporting and record keeping part of this program are subject to clearance by the General Accounting Office (which will publish a notice in the Federal Register) and, unless advised to the contrary, will also be effective on December 4, 1979. After December 4, 1979, each licensee is requested 1) to submit its program when it submits its next

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amendment or renewal application and 2) to request that it's program be incorporated by a license condition into it's NRC license.

NRC Regulatory Guides 8.10 and 8.18 (enclosed) provide guidance for establishing an ALARA program. Two basic conditions are essential to the success of this program:

- Management must be dedicated to the ALARA goal both with respect to collective dose as well as to the individual dose.
- Personnel responsible for radiation protection must be continually vigilant for means to reduce radiation exposure.

A key feature in any ALARA program is the establishment of performance objectives for specific kinds or classes of operations. In the actual program, these performance objectives should take the form of exposure action levels which, when exceeded, will trigger investigation by the Radiation Safety Committee and/or the Radiation Safety Officer. As stated previously, current experience (Figure 1) indicates that values less than 10% of MPD are readily achievable without resulting in increased collective dose. Therefore, NRC will request written justification for exposure action levels that you specify in your ALARA program in excess of 10% of MPD. This justification should include details of the past exposure history at your institution (or private practice) for the particular kind or class of operation, a summary of efforts taken to reduce this exposure, and an explanation of why further dose reductions are not feasible. NRC will also request that in the ALARA program you submit to NRC you indicate that you will:

- Maintain on file at your institution for review by NRC an account of the considerations used in establishing action levels. (You need not submit this account to NRC.)
- Investigate the cause of personnel exposures that exceed the action levels you have established; and, if a personnel exposure exceeds the action level or 10% of MPD, whichever is higher, maintain for NRC inspection a written account of the investigation, including the cause of the exposure, the action taken to correct the problem and a description of the follow-up action taken. (You need not submit this record to NRC.)

A model ALARA program is provided as an enclosure to this letter. Your institution may adopt this program by designating exposure action levels in Section VII and providing the signature of the appropriate certifying official in Section VIII. Otherwise, you should develop an equivalent alternative program. Be certain that you submit your completed ALARA program along with your next renewal or amendment request.

Sincerely,

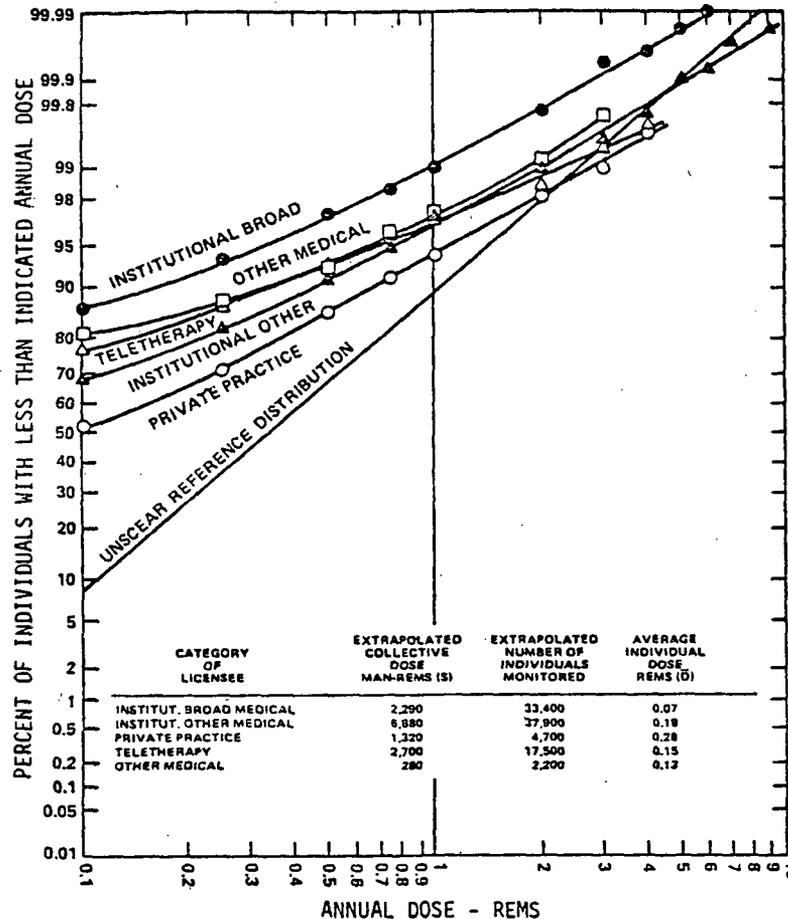


William J. Dircks, Director  
Office of Nuclear Material  
Safety and Safeguards

Enclosures:

1. 10 CFR Part 20
2. Reg. Guides 8.10 & 8.18
3. Model ALARA Program

Figure 1



1975 Voluntary Data - Medical Licensees

Reproduced from: Cool, Walter S., NUREG-0419, Occupational Radiation Exposure at NRC-Licensed Facilities 1975, Office of Standards Development, U.S. Nuclear Regulatory Commission

The graph above depicts voluntary one-time personnel monitoring data for 1975 which were found to have log-normal distributions.\* These are consistent with other distributions of personnel monitoring data reported in the literature.

A reference distribution has been developed by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) such that the distribution of annual doses is log-normal, the mean or arithmetic average of the annual dose distribution is 0.5 rem (one-tenth of the International Commission on Radiation Protection's recommended maximum permissible average annual whole body dose), and the percentage of individuals exceeding the annual dose of 5 rems is 0.1 percent. (Note that the median or 50% value is about 0.34 rem.) These properties were selected arbitrarily to define the distribution as one complying with the intent of the ICRP.

\* A variable such as the annual occupational radiation exposure of individual workers is said to be "log-normal" when the frequency distribution of the logarithm of the exposure can be reasonably approximated by the normal (Gaussian) curve, with appropriate mean and standard deviation. Plotted on log-probability paper, on which cumulative probabilities are laid off on the vertical axis at distances proportional to the corresponding number of standard deviations above or below the median with dose plotted on the horizontal axis on a logarithmic scale, the function becomes a straight line. Any given set of data from a finite-size sample can, of course, only give an approximate representation of a presumed smooth underlying function. The log-probability plot is simple to use and facilitates intercomparisons between types of activities, between individual facilities conducting similar activities, and between years of experience.