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FEDERAL RADIATION COUNCIL
Washington, D. C. 20449

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ACTION PAPER

RADIATION PROTECTION POLICY

Effects of low-level radiation exposure

The attached proposal is submitted for the approval of the Council.
Council members are requested to advise me of action on the
proposal.

Paul C. Tompkins

Paul C. Tompkins
Executive Director

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THE PROBLEM

1. To approve initiation of a review by the FRC of its basic radiation protection guidance.

BACKGROUND AND SUMMARY

2. As shown by attachment A, Mr. Finch as Secretary of Health, Education, and Welfare, and as Chairman of the FRC, has recommended that the Council institute a careful review and evaluation of the relevant scientific information that is now available for estimating the risks associated with low levels of environmental radiation. This would serve as a basis for review of FRC guidelines in the light of present and projected radiation levels in the foreseeable future.

3. FRC report 1, which established the basic philosophy of radiation protection, was issued in 1960 and reflects the knowledge and thinking as it existed at the end of the 1950 decade. FRC report 2 dealt with radioactive contamination of the environment from iodine 131, strontium 89, strontium 90, and radium 226. This report also reflected the state of knowledge and thinking at the end of the 1950 decade.

4. From 1962 to 1965 the FRC was preoccupied with problems associated with radioactive fallout from atmospheric testing of nuclear weapons. These activities resulted in the preparation and issuance of FRC reports 3, 4, 5, 6, and 7.

5. Since 1965, in addition to the main FRC project concerned with radiation protection for uranium miners, the FRC staff and Working Group have kept developments under continuous review to identify major deficiencies in the existing guidance of the FRC or to determine if a special FRC project might be needed. A summary of these activities is shown in attachment B for information of the Council members.

6. More recently several citizens groups have attacked both Government and industrial activities associated with radiation exposure from the release of radionuclides to the environment. Some have attacked the entire foundation of the radiation protection standards recommended by the FRC on the basis that they permit unduly hazardous exposure. For example, some have concluded that continued exposure of the population at the average level "permitted" by the FRC Radiation Protection Guides (RPG) would result in up to 32,000 additional cancer deaths per year. In addition to the recommendation from the Secretary of Health, Education, and Welfare, the replies from the Departments of Labor and Commerce to Senator Muskie indicated it would be appropriate for some organization such as the FRC to carefully examine the underlying assumptions used by those making this assertion.

7. On the recommendation of the Working Group the FRC staff requested the NAS Advisory Committee to the FRC to suggest how the review of the basis for estimating risks associated with low levels of radiation exposure could best be accomplished. The committee met March 25, and will probably submit recommendations along the following lines:

a. The review could best be accomplished by an expansion of the present committee to include separate subcommittees on genetic effects, somatic effects, environmental effects with special reference to movement of radionuclides through the food chain, and how the resulting information can be used within the concept of a benefit-risk balance.

b. The review should be conducted according to the highest standards of scientific inquiry over a period of about 2 years.

c. The discussion showed the committee's concern that if public policy involving radiation is not to be made in a social vacuum there is a need to have similar estimates of the potential biological costs of other agents including chemical and chemical mutagens as these might affect man and his environment. However, the committee recognized that their expertise did not encompass such a broad examination.

STAFF JUDGMENTS

8. Following the guidelines in Secretary Finch's letter the staff initially suggested restricting the review to protection of the general public. During review by the Working Group the Department of Labor member suggested that the review must be general and include a review of occupational exposures if public credibility is to be maintained. HEW staff members have expressed a similar view. The second draft submitted for a more general agency review enlarged the statement of the problem to indicate a more comprehensive review and a recommendation that the initial emphasis be placed on exposure of the general public. Responses to the draft indicate lack of agreement on what the scope of the FRC review should be. The recommendations below give the broad outline of a realistic review program based on all opinions available to us on April 1, 1970, and represent the best judgment of the FRC staff.

RECOMMENDATIONS

9. It is recommended that the Council:
- a. Determine that the basic guidance for radiation protection will be reexamined.
 - b. Determine that the NAS will be requested to review the scientific basis for the evaluation of risks associated with exposures near the Radiation Protection Guides (RPG's).

c. Determine that radiation exposures from various sources experienced by various population groups will be evaluated. This will include occupational groups as well as exposures of the general public.

d. Determine that major potential sources of radiation that can be anticipated in the next two decades need to be identified.

e. Note that on the basis of the information developed, existing guidelines will be reviewed to determine if changes are needed.

f. Direct the staff and Working Group to develop an implementing program including specific objectives, manpower requirements, and budget for approval of the Council.

g. Advise the Executive Director of your action by the close of business April 10, 1970.

February 12, 1970

Dear Doctor Tompkins:

I am enclosing a copy of the letter which Secretary Finch sent to Senator Muskie regarding the testimony of Drs. Gofman and Tamplin.

You will note that the Secretary, as Chairman of the FRC, has recommended that the Council "institute a careful review and evaluation of the relevant scientific information that has become available in the past decade."

It will be appreciated if you will undertake the necessary steps to initiate this reevaluation along the lines recommended in the enclosed letter.

Sincerely yours,

sgd---Jesse L. Steinfeld, M. D.
Surgeon General, USPHS

Enclosure

Dear Senator Muskie:

This is in reply to your letter of December 1 pertaining to the testimony of Drs. Gofman and Tamplin for the hearings of the Subcommittee on Air and Water Pollution on November 18.

Gofman and Tamplin, in reaching their conclusion that the Federal Radiation Council guidelines should be "reduced now to 0.017 rads or even less," used an approach similar in principle to that used by expert advisory groups (e. g. , ICRP, NCRP, FRC) in developing radiation protection standards and guidelines. This approach is based on the assumption of a direct linear and non-threshold relationship between dose and biological effect. In contrast to Drs. Gofman and Tamplin, however, these expert groups generally agree that this approach probably overestimates the risks, but is the prudent one to use in the formulation of radiation protection guides.

While we concur with this basic approach, we do not agree with all the premises, conditions and extrapolations used by Gofman and Tamplin in their testimony. In general, we believe that their calculations result in overestimates rather than, as they indicate, "minimum values" of cancer risk. Nevertheless, we believe that there is a need to establish more definitive estimates of the radiation risks that are associated with assumed, or observed, exposure conditions; otherwise, there is inadequate basis to evaluate benefit versus risk. We also agree with the concept that the radiation standards should be developed on the assumption that any increase in radiation exposure will be accompanied by a commensurate increase in the risk of cancer.

Drs. Gofman and Tamplin have raised the question of whether the present FRC guidelines are still acceptable. In the past ten years, since the formulation of the FRC basic guides, sufficient additional information has developed from epidemiologic studies and animal experiments so that a reevaluation of such guidelines is believed to be warranted.

In view of our concern with the potential hazard of ionizing radiation in the environment, and as Chairman of the FRC, I am recommending that the Council institute a careful review and evaluation of the relevant scientific information that has become available in the past decade. I am recommending that this reevaluation provide, as definitely as possible, estimates of the risks associated with low levels of environmental radiation as a basis for review of the adequacy of current FRC guidelines as applicable to projected radiation levels. Based on projected exposure levels, the need for possible dose apportionment among the more important classes of radiation sources, such as nuclear power reactors, other peaceful uses of nuclear energy, and radiation from consumer products would also be considered.

I hope that these comments are useful to your subcommittee. Please call on us if we can be of any assistance.

Sincerely,

sgd---Robert H. Finch
Secretary, DHEW

FRC Staff and Working Group Reviews of Prospective Activities

The FRC staff and Working Group have kept problems related to radiation hazards and radiation protection under continuous surveillance from the point of view of the desirability of FRC involvement. From these many discussions and briefings, a list of suggested projects was drawn up. These are listed below in order of priority.

1. Updating of FRC report 1 --- Several developments have occurred in the past ten years that appear to warrant an examination of the ways to interpret the estimate of the upper limit of risks associated with exposures that could occur under the FRC guidelines. Three methods of interpretation are now extant: (a) an absolute risk estimate expressed in terms of the number of malignancies per million persons exposed per rad of radiation, (b) a percentage increase over the spontaneous risk (incidence) and (c) comparative risks based on comparative doses with the comparison dose usually taken as the average annual dose from naturally occurring sources.

Current ICRP recommendations are intended by that organization to apply to mining as well as other occupational exposures and also to potential cosmic radiation exposures associated with high altitude flight. The numerical standards in FRC report 1 have not been applied to either. The mandate to keep exposures as low as practicable has proved to be particularly troublesome in regulatory activities.

2. Updating FRC report 2 --- Current problems indicate that radio-activity concentration guides for ^3H , ^{85}Kr , and ^{137}Cs may be needed.

3. Plowshare --- The Working Group has been briefed on the proposal to excavate a new Atlantic-Pacific canal by the use of nuclear explosives. Existing standards did not envision such an activity and their applicability is dubious.

The use of nuclear detonations for gas stimulation has been discussed at some length. The staff position is that existing regulations in AEC Part 20 are applicable to the experimental phase of such programs but not to commercial use including residual radioactivity in the gas distributed to customers.

4. Transportation of radioactive materials --- The staff felt that this problem could be handled best by an interagency committee and that the FRC would not be involved unless a problem developed.
5. SST applications --- The staff recommended that the FAA establish an advisory committee to help it in the collection of the necessary information on cosmic ray intensities at SST altitudes. It did not appear appropriate for the staff to suggest FRC involvement at that time but developments are being watched.
6. Relocation of natives on Bikini Atoll --- This was handled as an inter-agency operation. However, the Working Group was kept continuously up to date by the AEC on the survey results.
7. RPG's or PAG's for plutonium --- The two accidents involving nuclear weapons, the current problem at Rocky Flats and the prospects of plutonium fueled reactors has led to several suggestions that guidance specifically to deal with plutonium should be considered. No action has been taken on this suggestion.
8. Methods of quantitating benefits --- The proposal that FRC should develop a standardized formula for estimating the "benefit" side of the benefit-risk balance has often come up. The current posture is that such a balance is made on the basis of broad parameters and that the concept becomes very difficult to apply to specific problems or projects.
9. Manned Space flight --- The FRC staff worked with the Space Radiation Study Panel of the Life Sciences Committee (Space Science Board, NAS) to develop radiation protection criteria for extended manned space missions. Under the FRC guidance, the responsibility for making the ultimate balance between potential risk and anticipated gain is an integral part of mission planning and approval for which NASA is accountable. Accordingly, NASA is now developing different criteria for different missions.
10. Use of vanadium and uranium mill tailings in Colorado --- Old mill tailings have been used as substrata under some homes, and some houses were constructed on discarded tailings areas. Significant concentrations of radon daughter products have been measured in such homes. Assistance to the State Health Department is being provided jointly by DHEW and AEC. The FRC staff and Working Group are watching developments but contemplate no involvement at this time.

COMPARISONS OF LEVELS OF ALPHA RADIOACTIVITY IN SOIL

<u>Date</u>	<u>pCi/g Soil</u>	<u>Radionuclide</u>	<u>Location</u>
1970	< 0.4	^{239}Pu	SRP (onsite)
1969	0.38-0.46	Alpha	AI (onsite)
1969	0.04-3.0 (avg.-0.4)	^{239}Pu	RF (offsite)
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1968-1969	0.01-0.08	^{239}Pu	NTS-12 (onsite)
	0.02-0.20	"	NTS-11 "
	2.9	"	NTS-20 "
	1.3-3.1	"	NTS-10 "
	0.2-854	"	NTS-5 "
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1964	11	^{239}Pu	Bikini Island*
1969	115)	"	"
"	107) duplicate	"	"
"	130)	"	"
"	130) duplicate	"	"
"	75)	"	Eneman Island
"	83) duplicate	"	"
"	410	"	"
"	27	"	"
"	48)	^{238}Pu	"
"	50) duplicate	"	"
"	220	"	"
"	11	"	"

* ^{238}Pu not detectable in these samples.

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