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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

DOCKET NUMBER
PROPOSED RULE PR-50

Rel Comes
Numerical Guidance

June 14, 1971

PROTOTYPE LETTER

Identical letters sent to those on the attached list

Dr. C. G. Stewart, Director
Medical Division
Chalk River Nuclear Laboratories
Atomic Energy of Canada, Limited
Chalk River
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Dear Dr. Stewart:

Enclosed for your information is a copy of a notice of proposed rule making that would add a supplement to the Commission's regulation, "Licensing of Production and Utilization Facilities," 10 CFR Part 50. The supplement would provide numerical guides on design objectives and limiting conditions for operation for light-water-cooled nuclear power plants to keep levels of radioactivity in effluents from those plants as low as practicable.

On December 3, 1970, the Atomic Energy Commission published in the Federal Register amendments to 10 CFR Part 50 that specified in qualitative terms design and operating requirements for nuclear power reactors to keep levels of radioactivity in effluents to the environment as low as practicable. The Commission announced at that time that it was initiating discussions with the nuclear power industry and other groups to examine the feasibility of developing more definitive guidance on the implementation of the amendments.

The proposed numerical guidance on design objectives and limiting conditions of operation will assist applicants for, and holders of, licenses for light-water-cooled nuclear power reactors in meeting the requirements published in Part 50 on December 3, 1970, that radioactive material in effluents be kept "as low as practicable." The guidance is appropriate only for light-water-cooled nuclear power reactors and not for other types of nuclear facilities.

The enclosed notice of proposed rule making appears in the June 9, 1971 issue of the Federal Register. The notice allows sixty (60) days for public comment after publication in the Federal Register.

Enclosed also is a copy of the public announcement issued by the Commission on this matter on June 7, 1971. As noted in the public announcement, the Commission plans to hold an informal public hearing on the proposed numerical guides, and an appropriate notice regarding the hearing will be published in the near future.

Sincerely,

ORIGINAL SIGNED BY
LESTER R. ROGERS

Lester Rogers, Director
Division of Radiological and
Environmental Protection

Enclosures:
1. Notice of Proposed Rule Making
2. Public Announcement

SECRETARY

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DOCKET NUMBER Rel Comm
PROPOSED RULE PR-50
Numerical Guidance

June 10, 1971

PROTOTYPE LETTER

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Dear Dr. Everden:

Enclosed for your information is a copy of a notice of proposed rule making that would add a supplement to the Commission's regulation, "Licensing of Production and Utilization Facilities," 10 CFR Part 50. The supplement would provide numerical guides on design objectives and limiting conditions for operation for light-water-cooled nuclear power plants to keep levels of radioactivity in effluents from those plants as low as practicable.

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Office of the Secretary
Public Proceedings
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Enclosed also is a copy of the public announcement issued by the Commission on this matter on June 7, 1971. As noted in the public announcement, the Commission plans to hold an informal public hearing on the proposed numerical guides, and an appropriate notice regarding the hearing will be published in the near future.

Sincerely,

Lester Rogers, Director
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Enclosures:
1. Notice of Proposed Rule Making
2. Public Announcement

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DOCKET NUMBER
PROPOSED RULE PR-50
Numerical Guidance

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February 2, 1972

Mr. W. B. McCool
Secretary
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. McCool:

Andrew P. Hull has sent me a copy of his "Comments on Proposed Numerical Guidance to Keep Radioactivity in Light-Water-Cooled Nuclear Power Reactor Effluents As Low As Possible" and has invited me to make whatever use I care to make of this document. He has indicated that he submitted these comments to the USAEC in November. However, since you may not have a copy of this proposal close at hand, I am enclosing one. I have answered Andy and given him a list of my own comments on his comments, and I thought you might be interested in this response. Lest I be misunderstood, I would like to make it clear that these are my own views, and they do not necessarily represent those of the Laboratory or of the important organizations to which I belong. Although I was the organizer of the Health Physics Society and the International Radiation Protection Association and the first president of each of these organizations and am a member of their boards and although I am one of the 13 members of the Main Commission of the International Commission on Radiological Protection and a member of the National Council on Radiation Protection, the views I express here are strictly my own. I do believe, however, that many other health physicists share some, if not all, of the views I have expressed here although I am sure some health physicists share completely the views expressed by Andy.

Sincerely,

Karl Z. Morgan

Karl Z. Morgan, Director
Health Physics Division

KZM:jc

Enclosure

Acknowledged by card 2/8/72, cra

cc: Lester R. Rogers w/enclosure

Comments of K. Z. Morgan on Comments of Andrew P. Hull Regarding Proposed New Numerical Guidance of AEC to "Keep Radioactivity in Light-Water-Cooled Nuclear Power Reactor Effluents as Low as Possible"

1. Page 1, Andy states the AEC regulations do not prescribe an aggregate population dose; yet in the next paragraph he discusses the 400 man rem/1,000 MW(e) which when multiplied by the number of 1,000 MW(e) nuclear power plants at any time (e.g., 1,200 by year 2000) gives the average aggregate population dose (i.e., in the year 2000 it might be,

$$400 \times 10^3 \times 1200 \times \frac{1}{4 \times 10^8} = 1.2 \text{ mrem/yr average per person).}$$

2. Page 2, ICRP Publication 6 was used by Andy as reference to 2 rem/30 yr for exposure to population-at-large. However, ICRP no longer espouses this number and, in fact, recants it in ICRP Publication 9 in favor of the "as low as practicable" principle. The 2 rem/30 yr was never assigned by ICRP "for all nuclear energy programs" as stated by Hull. Instead, it was intended to include population genetically significant dose from <u>all</u> sources of population exposure except occupational exposure.

3. Page 2, what support does Andy give for his suggested 17 mrem/yr? Obviously, the AEC value of "1 mrem/yr to a sizeable population" would limit the average population dose to about 1 mrem/yr by the year 2000 even taking into account other routine nuclear power operations (e.g., fuel processing and reprocessing, waste disposal, etc.). It may not have included past exposures of uranium miners if this limit were applied to somatic as well as genetic dose. In this I am assuming that eventually the new AEC recommendations will be extended and applied also to fuel processing and reprocessing plants and AEC national laboratories (I may be wrong in this assumption, but it seems unthinkable these would be excluded or that we could condone double standards).

4. Page 2, Andy does not make clear his proposal. First (in paragraph 3, page 2) he sets population exposure at 17 mrem/yr for routine operations and presumably 17 mrem/yr for uncontrolled sources (accidents?). Then later (in paragraph 4, page 2) he sets half of the 17 mrem/yr or 8 1/2 mrem/yr for routine nuclear power and 8 1/2 mrem/yr for "incidental activities" (does he mean "ancillary"). Then he gives for illustration transportation, reprocessing and waste disposal as incidental activities. Andy's values of 0.006 rem/yr . person or 2 man rem/yr . MW are five times the value of 400 man rem/yr . person . (1,000 MW(e)) suggested by the AEC, but it is not clear why this value is better than the AEC recommendation.

5. Page 2, paragraph 5, Andy is satisfied with the present AEC use of 0.5 rem/yr to an individual. However, this is the limit set by ICRP for all man-made sources of radiation except medical. ICRP never intended that the nuclear energy industry could use up all the 0.5 rem/yr exposure to an individual.

6. Page 2, paragraph 5, Andy states, "At the maximum assumed dose effect relationships, the calculated health or environmental effects at the doses and dose rates embodied in the current standard would be too small to be demonstrable." I do not understand what Andy has in mind here. He must be referring to the effects of 0.5 rem/yr if applied to 2×10^8 persons. In such case when applying the linear hypothesis and using coefficients of ICRP, we would have:

   (1) $0.5 \times 2 \times 10^{-5} \times 2 \times 10^8 = 2{,}000$ first generation genetic deaths/yr

   (2) $0.5 \times 7 \times 10^{-4} \times 2 \times 10^8 = 70{,}000$ total genetic deaths introduced into the population/yr

   (3) $0.5 \times 10^{-4} \times 2 \times 10^8 = 10{,}000$ cancers/yr

   (4) $0.5 \times 5 \times 10^{-5} \times 2 \times 10^8 = 5{,}000$ life shortening deaths/yr

   87,000

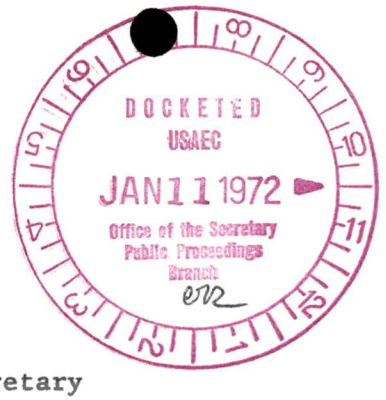
   I agree this 87,000 deaths/yr in 2×10^8 would be difficult to demonstrate experimentally (even with an extensive epidemiological study). Is this what he has in mind? However, the important question is not whether 87,000 deaths/yr per 2×10^8 persons is demonstrable but that the possibility of 87,000 deaths/yr should and can be avoided by keeping population exposures as low as practicable and as far below 0.5 rem/yr as seems reasonable in balancing the benefits against the risks.

7. Page 3, paragraph 1, here Andy admits the present nuclear power operations have in most cases met the newly suggested AEC standards. I would add that this is because industry has in fact given in most cases due consideration to maintaining "population exposures as low as practicable." It is difficult, therefore, for me to see why Andy objects to the AEC using this operating experience in obtaining a quantitative guide to serve as a definition of "as low as practicable."

8. Page 3, paragraph 2, I agree with Andy that it is difficult and sometimes unreliable to use MPC values as a standard. At best, such secondary standards can serve only as a useful guide, but on the other hand engineers and utility people claim they want MPC values as a primary control.

9. I agree completely with Andy that unnecessary medical diagnostic exposure of the population should be the principal concern of health physicists in reducing population exposure in the United States. In fact, I have indicated in Congressional hearings and other publications over 100 ways by which medical diagnostic exposure in the United States can be reduced to less than 10% of its present value while at the same time enhancing medical radiology.

I do not agree, however, that one evil justifies another or that unnecessary medical exposure justifies unnecessary nuclear power plant exposure. I do not detect any good explanation in Andy's paper why his recommended limits that are five times those suggested by the AEC have any substantial preference. Neither do I understand why he objects to a dose limit to an individual from light-water-cooled nuclear power operations that seem to offer promise of maintaining the suggested limit of average population dose from these operations.



DOCKET NUMBER
PROPOSED RULE PR-50
Numerical Guidance

3442 South River Road
West Lafayette, Indiana 47906

January 6, 1972

Secretary
U.S. Atomic Energy Commission
Washington, D.C. 20545

Attention: Chief, Public Proceedings Branch

Gentlemen:

As a member of the Board of Directors of the Health Physics Society, I have had an opportunity to review the comments by Andrew P. Hull on "Proposed Numberical Guidance to Keep Radioactivity in Light-Water-Cooled Nuclear Power Reactor Effluents as Low as Possible." It is my understanding that a copy of Mr. Hull's views have been submitted to you relative to the proposed revisions in 10CFR50.

I would like to go on record as being in substantial agreement with the views set forth by Mr. Hull. The points that he makes are important and should be seriously considered by the Commission relative to the proposed changes. As you know, health physicists have always been in favor of minimizing radiation exposures both to individuals as well as to the population. However, it is also important to consider carefully the costs involved in obtaining the benefits. Mr. Hull's analysis of this aspect is very much to the point.

I recommend that the proposed revisions to 10CFR50 not be adopted in their present form and that the ideas and recommendations as set forth in Mr. Hull's comment be incorporated in a new revision.

Sincerely,

Paul L. Ziemer

Paul L. Ziemer, Certified Health Physicist
University Radiological Control Officer
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PLZ:eew

cc: Andrew P. Hull

Acknowledged by card 1/11/72, ers

EBERLINE INSTRUMENT CORPORATION

December 13, 1971

EI-903,626

Secretary of the Commission
U. S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Subject: Proposed Appendix I to 10CFR50
Federal Register, June 9, 1971

Gentlemen:

During the past year I have participated in the preparation of eight environmental reports as required by the AEC implementation of NEPA. This has helped me to develop a much clearer perspective on the proposed Appendix I for 10CFR50. I now seriously question the need for Appendix I.

At the Fourth United Nations International Conference on the Peaceful Uses of Atomic Energy in Geneva, Switzerland (September 6-16, 1971) Kahn, Shleien and Weaver summarized the environmental experience for operating nuclear plants in the United States. To date, the only radioactivity found during routine environmental surveillance has been associated with the aquatic environment at the point of discharge of liquid wastes. Some exposure from noble gases released to the atmosphere has also occurred. It is now "practicable" to treat liquid waste by filtration, evaporation and ion exchange and to delay release of the noble gases until all but Kr-85 has decayed. Most of the plants now being built include liquid waste treatment and gaseous waste hold-up so that exposures from new plants will be even lower than from existing plants. Therefore, I feel Appendix I has served a useful purpose without being adopted and is already obsolete.

At the time Appendix I was proposed, the need to define in quantitative terms what is meant by "as low as practicable" seemed important. However, I now feel Appendix I as proposed does more harm than good. The recognized need for isotopic analysis of effluent samples with subsequent identification of pathways to man seems to argue against the arbitrary assignment of 5 curies/year or 20 pCi/liter for liquid effluents and the 10^{-5} reduction factor (from 10CFR20 levels) for radioactive particulate released to the atmosphere. In an effort to reconcile these arbitrary values with the pathway approach, I have concluded in my own mind that the proposed Appendix I of 10CFR50 should <u>not</u> be included in the Code of Federal Regulations.

Very truly yours,

EBERLINE INSTRUMENT CORPORATION

Eric L. Geiger

Eric L. Geiger
Certified Health Physicist

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Numerical Guides

PR -50

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November 19, 1971.

11/26/71
SCY

The Secretary,
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Washington, D.C. 20545.

Attention: Chief, Public Proceedings Branch

Dear Sir:

Comments were invited on the proposed 10CFR Part 50 Appendix I "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion as 'Low as Practicable' for Radioactive Materials in Light Water Cooled Nuclear Power Reactor Effluents". We feel that administratively it is essential to quantify the as low as practicable limits. We participated in the January 21, 1971 meeting with the Regulatory Staff where we stated this position. However, the specific numerical limits in the proposed Appendix I were not discussed at that meeting and we do not concur that they are reasonable nor attainable, particularly using design bases currently being utilized by the AEC Regulatory Staff.

In order to attain these lower effluent limits, additional systems will be required to concentrate radioactive waste and accomplish recycling of a greater quantity of plant effluents. With additional radioactive systems to maintain, operator exposure may significantly increase. We feel that the Commission should quantify and balance the total population dose due to exposure of plant operators as well as to persons off-site.

The proposed reduction by a factor of 100,000 of the 10CFR Part 20 limits for iodine-131 and particulates with a half-life greater than 8 days is a major concern. Utilizing the 10CFR Part 20 iodine-131 limit of 10^{-10} µci/cc and an atmospheric dilution multiplier of 10^{-6} sec/m^3 (representative of a site with excellent dilution), we calculate an allowable release of 0.03 ci/year. For many reactors this annual release is equivalent to the iodine-131 that would be contained in less than two gallons of reactor coolant with 1% failed fuel conditions. Current plants exceed

Contd./...

this annual coolant leakage by several orders of magnitude. Even with an extensive leak reduction program and much more efficient filtration of ventilation exhausts, we feel that many plants will exceed this limit when fuel leaks are present. Therefore we strongly recommend that the usual factor of 700 be applied to the 10CFR Part 20 limits for those sites which are immediately adjacent to dairy farms producing fresh milk. We are unaware of any justification whatever for the factor of 100,000 which was proposed for all sites. The guide should allow the exclusion of particulates from these restrictive limits if it can be demonstrated that the particulates do not include iodine.

The limit of 10 millirem per year to a hypothetical individual continuously present at the site boundary may possibly be an achievable objective for radioactive waste treatment systems on process streams if the site boundary is defined as any land point which is not legally under the control of the owner. However, discussions with the Regulatory Staff indicate they prefer that the limits on off-site doses be met at points on the site which are not fenced, at water boundaries if the water is not legally under the control of the applicant or on public roads which cross the site. We see no reasonable justification for these new definitions for dose points which are based on hypothetical considerations, especially when considering the genetic significance of doses which can only result from protracted exposures.

The Regulatory Staff recently has required the beta dose from noble gases (which mostly affects the exposed skin) to be added to the whole body gamma dose and that the total be less than the 10 millirem set forth in 10CFR Part 50 Appendix I. We feel that this requirement should not be continued, since without taking into consideration the shielding effect of clothing, the estimated dose has no significance nor justification especially when considering genetically signifcant doses.

It is recommended that further consideration be given to providing guidelines for permissible curie content of liquid effluents by half-life. The present format gives undue weight to short-lived radionuclides.

Contd./...

With the proposed limit on tritium, difficulty may be experienced at some cooling tower sites with discharge of tritium during periods of low cooling tower blowdown or high primary system bleed and feed. It appears that the reduction from the identified isotope bases of 10CFR Part 20 is about a factor of 50 for isotopes other than tritium and a factor of 600 for tritium. It is suggested that a consistent basis be used for all isotopes in liquid discharges and that this be a factor of 50.

Application of lower limits on releases is much more feasible on plants now being designed than in plants in operation or on which construction is nearing completion. The regulation should exempt or give relief to current plants.

In Section II it is not clear whether the total exposure from gaseous and liquid effluents to the public at the site boundary is to be less than 5% of exposure due to natural background radiation or whether 5% is acceptable from each source.

Section II-A refers to a "natural body of water". Considering the varied types and configurations of water bodies used to receive effluents, clarification of this term is required. We assume that a cooling pond or lake which is formed behind a dam built to provide cooling water for a plant would not be considered a natural body of water for the purpose of receipt of effluent but rather that the point of discharge from that body to the natural body would be the controlling point.

We appreciate this opportunity to comment, and trust that our views will be carefully considered.

Very truly yours,

R. D. Allen

RPS:mb

R.D. Allen
Vice President

 Numerical Guidance 10

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

SEP 13 1971

Dear Dr. Schlesinger:

This is in response to your letter of June 9, 1971, transmitting a proposed rule making to add a supplement to 10 CFR Part 50. We have reviewed the proposed changes and offer the following comments for your consideration:

1. The proposed supplement states that the numerical guides are provided to assist applicants in meeting the requirement, given in 10 CFR 20.1(c), to make every reasonable effort to keep radioactive releases to unrestricted areas as low as practicable. The proposed numerical guides are somewhat larger than the quantities of radioactive effluents estimated for normal operations of most current nuclear power reactors, and thus would not lead to an improvement in design objectives. Indeed, these numerical guides could be interpreted as removing incentives for improvement in the future, and therefore they may be seen in effect as setting lower limits below which it is not necessary to control radioactive effluents. This would contradict the recommendations of the Federal Radiation Council.

Further, Section II, C would permit light-water-cooled reactors to be designed for radioactive effluent levels greater than the numerical guides, presumably in areas of low population density. This disregards the possibility that population density near reactor sites may increase and also that biological populations other than human must be protected. Therefore, to eliminate the possibility that the proposed supplement might in effect forestall improvements in the management of low-level radioactive wastes from nuclear power reactors, it is recommended that:

(a) The supplement reaffirm that it shall be the responsibility of the licensee to keep radioactive releases as far below the required limits as practicable.

(b) Section II, C be deleted from the supplement.

2. The proposed supplement appears to overstress flexibility in the event that the numerical guides are exceeded. It specifically permits continued operation of the reactor when radioactive effluents exceed the numerical guides but it does not set an upper limit beyond which operations would have to stop. Section III of the proposed Appendix I states that the licensee would be permitted to exceed the numerical guides in the interest

of operating flexibility. Section IV states that the licensee should "define and initiate" action to reduce release rates, if effluents are likely to exceed twice the numerical guides, and that the "Commission will take appropriate action to assure that such release rates are reduced" if effluents are likely to exceed a range of 4 to 8 times the numerical guides. However, no limit is defined beyond which the operation resulting in the releases would have to be halted. In this absence, the need for flexibility of operation could be interpreted to permit releases up to the limits currently specified in 10 CFR 20.

To strengthen the supplement it is recommended that Section III shall include an upper limit of radioactive effluents which, if there is indication that it will be exceeded, would require immediate cessation of operation of the reactor until proper effluent control is reestablished.

Also, in this connection, the wording in Section IV, A (p. 25), "the licensee should," should be changed to "the licensee must," and in Section IV, A-3 (p. 25), "timely" should be explicitly defined.

3. The numerical guides are given in terms of radioactive effluents per reactor; however, many sites are being planned for more than one reactor. The exposure to the environment must be evaluated in terms of all effluents from a single site and indeed from other artificial sources as well. Presumably Section II, D, which would give the Commission option to lower the guides in specific circumstances, is intended to cover this situation. However, the case of multiple reactors per site is so common that it should be dealt with specifically in the Supplement.

It is recommended therefore that in Section II, A, " . . . each light-water-cooled nuclear power reactor at a site . . ." be changed to ". . . all light-water-cooled nuclear power reactors at a site . . ."

4. The use of average annual concentration limits appears to be inadequate for limiting radionuclides in the large volumes of cooling water discharged by many large power reactors. It is therefore welcome that the proposed supplement sets a numerical guide for some liquid radioactive effluents in terms of annual total quantity. However, in addition, it also appears desirable to limit short-term peak concentrations in effluents to natural water bodies.

It is recommended that all guides for liquid radioactive effluents in the supplement be given in terms of annual total quantity and maximum-peak concentration.

To summarize, the proposed rule making is a distinct improvement over the regulations now in effect, but could still be strengthened to advantage.

Sincerely yours,

John O. Carson

Assistant Secretary of the Interior

Dr. James R. Schlesinger
Chairman
U.S. Atomic Energy Commission
Washington, D. C. 20545

P.O. Box 413
Upton, New York 11973

November 8, 1971

The Secretary
United States Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public, Proceedings Branch

Dear Sir:

Enclosed are comments on the proposed amendments to 10 CFR 50, in which the Commission set forth numerical guidance to keep radioactivity in light-water-cooled nuclear power reactor effluents as low as practicable. They have been drafted after considerable discussion and informal review by a number of my professional associates.

Although I am aware that the designated time for comment has elapsed, I understand from an informal inquiry that it may still be feasible for the Division of Radiological and Environmental Protection to accept late submissions. I trust that this is the case in this instance, and that you will notify me when the date for a public hearing is established.

Yours truly,

Andrew P. Hull

Andrew P. Hull

APH/dt
Enc

COMMENT BY ANDREW P. HULL, CERTIFIED HEALTH PHYSICIST,

ON PROPOSED NUMERCIAL GUIDANCE TO KEEP RADIOACTIVITY IN LIGHT-WATER-COOLED

NUCLEAR POWER REACTOR EFFLUENTS AS LOW AS POSSIBLE

- -

Introduction

During the past several months, I have discussed the proposed amendments to 10 CFR 50 as published in the Federal Register on June 9, 1971 with many health physicists. These amendments set forth numerical guidance to keep radioactivity in light-water-cooled nuclear power reactors as low as practicable, and are intended to keep radiation exposures of persons living near such facilities to 1% or less of the currently applicable federal radiation protection guides for members of the public. I have found sufficient agreement among my associates with my position to make it appear worth submitting for the Commission's consideration.

The announced intent of the proposed amendments is to offer numerical guidance to keep radioactivity in light-water-cooled nuclear reactors as low as practicable. As indicated above, their effect would be to restrict radiation exposures to 1% or less of the currently applicable radiation protection guides. Although not stated, the apparent implication is that then the risk to the public attendant with the operation of light-water-cooled water reactors would be correspondingly reduced. However, it appears(1) that the upper limit of the calculated risk to nearby individuals or to the general public from the routine radioactive effluents from reactors designed to meet currently applicable radiation exposure guides is already insignificant, especially when compared to that from other regularly accepted public risks, including those from air pollution from conventional fossil plants. In my judgment, the efforts required to achieve the degree of additional protection which might be attained by the adoption of the proposed amendments is a misdirection of national priorities.

In my view, release guides having to do with radiation protection should be clearly relatable to dose. I therefore question the rationale for the proposed application of "across the board" concentration limits. I am also concerned that the adoption of these amendments in their present form may create an unwarranted diminution in the public confidence in any other higher radiation protection guides. For these reasons I recommend that the proposed amendments be substantially altered. Their effect should be to establish reasonable design objectives clearly related to dose, within the currently applicable protection guides, rather than to create the impression that a new set of guides has been developed to be applied ad hoc to light-water-cooled reactors.

Establishment of Standards

The International Commission on Radiological Protection (ICRP) has observed(2) that when whole populations or large numbers of persons are exposed, it becomes necessary to consider not only the risk to the individual but also the aggregate risk to the numbers of persons exposed. The current AEC radiation protection guides explicitly consider only the dose to the individual in the general population, which for whole-body irradiation is 0.5 rem/yr. The recommendation(3) of the Federal Radiation Council that a Radiation Protection Guide of 5 rem in 30 years average genetic exposure of the population is presumably also applicable in principle. By not specifically prescribing an aggregate population dose, the

AEC has in my view permitted the development of a misunderstanding that the exposure of the population as a whole has not been considered, even though average dose to the public[4,5] has in fact been effectively limited to much less than 1 mrem/yr.

Although it has not set forth any explicit population dose limit in the amendments, the Commission notes that conformance with the proposed guides would provide reasonable assurance that the resultant whole body dose to the total population would be less than 400 man-rems per year per 1,000 megawatts electrical installed nuclear generating capacity at a site, and that average exposures to large population groups would be less than 1 mrem/yr.

In my judgment, public confidence in and acceptance of nuclear power would be enhanced by the specific allocation by the appropriate agency, or agencies, of an overall population dose limit related to this purpose. While this choice must be somewhat arbitrary, 1 rem/30 years is suggested. This would be half of the ICRP's illustrative apportionment[6] for all nuclear energy programs. I further suggest that half of this be reserved for the possibility of exposure from uncontrolled sources related to these programs. Thus, the operational upper limit for the average exposure of the general public from routine nuclear power activities would be 0.5 rem/30 years, or 0.017 rem/year.

It may be that the proposed allocation would require the agreement and joint action of several governmental agencies in addition to the AEC. Even before this allocation was so formally adopted, it could be anticipated by the Commission by incorporating into the AEC rules a consistent upper limit set forth in total man-rems per year per megawatt of electrical power capacity. Within the above indicated overall population average exposure limit of 0.017 rem/year, I find it reasonable that not more than half be designated for routine nuclear power plant effluents, with the other portion reserved for such incidental activities as fuel transportation, reprocessing and waste disposal. It has been projected[7] that in the year 2000, the installed nuclear capacity in the United States will be about 0.003 MW per person. With this in mind, a population dose design guide of 2 man-rem per year per megawatt of installed capacity (at the time a reactor is constructed) is suggested. For an installed capacity of 0.003 MW per person, this upper limit would correspond to an average general population exposure of 0.006 rem/year. This would leave a leeway of 0.0025 mrem/yr for population growth in the immediate area of a reactor, for possible underestimation of the projected 0.003 MW per person, and for possible increased electrical production per capita after the year 2000.

With regard to the exposure of persons living in the immediate vicinity of nuclear power plants, I am satisfied with the adequacy of the radiation protection standard of 0.5 rem/year, as currently embodied in the Rules of the Atomic Energy Commission (10 CFR 20). In my judgment it provides for a greater degree of protection from adverse effects to individuals in the general population than do the counterpart standards for any other potentially deleterious agents in the environment. At the maximum assumed dose effect relationships, the calculated health or environmental effects at the doses and dose-rates embodied in the current standard would be too small to be demonstrable. I find that radioactive effluent releases from power reactors designed for effluent control within current standards have averaged less than 1% of the permissible limits. The calculated effects at

these release rates seem indeed insignificant. I therefore question that there is either a demonstrated need or a scientific basis for the proposed amendments. The performance data indicate that reactor designers currently aim at release limits equal to 1/100 or less than those now formally specified by the AEC. I am therefore concerned that the formal designation of the proposed "1%" release limits will constitute a strong pressure for still more conservative design practices, the benefits of which are difficult to substantiate. I recognize that, given the present climate of widespread misunderstanding about the likely exposures from nuclear power plant effluents, it is desirable that some design specifications for control of these effluents well within current protection guide limits be formally incorporated into the AEC Rules. However, it appears to me that a maximum design objective for effluent releases related to 10% of the current radiation protection standards would be sufficient to assure compliance with these standards. From current experience it can be anticipated that under present practices most reactors would in fact achieve a degree of effluent control so that the "fence post" dose at their boundaries would be within the 5 mrem/year goal of the proposed amendments. As has been indicated[4,5] this limitation of the exposure of individuals adjacent to nuclear power reactors should be more than sufficient to restrict the average man-rem population exposure to far below our previously suggested limit of 6 mrem/yr.

In addition to the foregoing general reservations about the proposal of guidelines pegged to 1% of radiation protection standards, I believe that some aspects of the specific approach taken by the Commission are radiologically questionable. In my view, reasonable discharge limitations in amount or concentration can only be arrived at in terms of a projected maximum dose to an individual (actual or hypothetical) with reference to specific nuclides. Additionally, the across the board application of reduction factors in the permissible concentration of airborne effluents below those set forth in Appendix B, Table II, Column I of 10 CFR 20, is to be questioned except for those nuclides for which a related magnitude of effective reconcentration via the deposition and/or food pathway can be demonstrated or reasonably postulated. I would also suggest that the concentrations resulting from the application of a factor of 100,000, as specified in Section II B.2 of the proposed amendment, would for many nuclides be less than those which can be detected by environmental sampling. Others could only be measured at a cost which seems incommensurate with their apparent hazard at these concentrations.

Benefits vs. Cost

In its press release accompanying the proposed amendments, the Commission observed that they are "based upon the fact that existing technology makes it possible to design and to operate light-water-cooled nuclear power plants within them". I question that this practicability by itself establishes a sound basis for their adoption. It appears to me that the cost of the extra design features required to give assurance of meeting the proposed 1% guides would be excessive relative to the reduction in radiation exposure which could be achieved under them. Specifically, I anticipate that the capital cost increment per plant could be as much as from one to three million dollars. Present experience[8] indicates that the largest total population exposure for any power reactor now on line was about 300 man-rem and that the most probable total exposure was about 3 man-rem. Assuming that the proposed design requirements would reduce these exposures to

near zero, the cost per man-rem saved would be between $30,000. and $1,000,000. Some recent assessments[9,10] indicate that the reasonable upper limit per man-rem saved is between $100. and $1,000., which makes the above cost per man-rem seem quite excessive relative to the possible benefits.

Conclusion

In summary, I conclude that the incorporation into the Rules of the Commission of effluent control design criteria which would set forth "effective" limits for environmental exposures of 1% of the current radiation standards is unnecessary and unwise. In my judgment, to formally incorporate them into the AEC Rules would tend to create a psychology of disbelief in the adequacy of any other higher stated exposure criteria, and would tend to generate a pressure to apply these more restrictive criteria to any and all situations. It does appear to me that the ratio of the current average population to individual dose limits (1:3) is too high, but that the former should be adjusted to a more defensible limit through the use of the man-rem concept.

Many toxic agents which are inadequately understood, including those from fossil-fueled electrical power plant effluents, are now abroad in the environment. It can be suggested[11] that the public is far more at risk from many, if not most, of them than it is from radiation at current public protection standard levels. Proposals to limit exposures to 1% of the latter therefore appear to me to be conducive to an unfortunate distortion in both radiation and environmental protection priorities.

The current total exposure-rate of the public from the medical use of x-rays in the United States is in the order of 2×10^7 man-rem/year, which is in addition to a comparable natural background rate. From a recent report[8] it appears that in 1969 the average exposure per power reactor (designed to meet current standards) was less than 100 man-rems/year. It has recently been suggested[12] that if the equivalent funds to the extra design cost per reactor to meet the more restrictive limits were applied to x-ray exposure reductions, the annual population dose could be reduced by 35 millirem per capital (a total of 7×10^6 man-rem).

A Committee on Pollution of the National Research Council has calculated[13] that the total annual cost attributable to air pollutants from fossil plants is $\$1.3 \times 10^7$. It has also been calculated[14] that they cause about 20,000 deaths per year. No demonstrable environmental effect from nuclear power plant effluents has yet been found.

It therefore appears to me that the proposed amendments should not be adopted in their present form. The expenditures by the utilities (and ultimately by the general public) which they are expected to occasion seem to me to be regrettably misdirected toward making what is already comparatively quite safe even safer, to the neglect of other more significant aspects of radiation and environmental protection.

Recommendations

I agree on the desirability of providing some numerical guidance for reactor design and operation of the meaning of the term "as low as practicable". In

balancing the cost and benefits, I conclude that the adoption of a design specification containing an exposure limit of 10% of the current radiation protection guidelines would in practice be quite adequate to restrict the radiation exposures of individuals to 1% or less of these guidelines. To remove misunderstanding of the possible total population exposure from routine power reactor effluents, I also recommend the adoption of a population exposure limit from reactor effluents of 2 man-rem per year per megawatt of installed capacity, within an overall allocation of an average exposure of not more than 0.017 rem/year (per capita) from routine nuclear power activities. I also recommend that no discharge limits in amount or concentration be included in the proposed amendments, unless they can be clearly related to an intended exposure limit. Finally, in the interest of public confidence in current radiation protection standards, I urge the Commission to make it clear that any amendments of the nature of those currently proposed, have solely to do with design objectives, and that they do not in and of themselves constitute a revision in the currently applicable standards.

Prepared by Andrew P. Hull
Certified Health Physicist

November 4, 1971

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Numerical Guidance -50

ATOMIC INDUSTRIAL FORUM INC.

475 PARK AVENUE SOUTH · NEW YORK, N. Y. 10016 · (212) 725-8300

October 29, 1971

Acknowledged 11/1/71 EM

Secretary
U.S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

Pursuant to our letter of August 30 commenting on AEC's Federal Register notice of June 9 proposing to amend 10 CFR Part 50 with a new Appendix I, we convened an ad hoc group "to devote further study to the effluent release limits set forth in Appendix I with the intent of suggesting alternative limits where deemed appropriate...." Those comprising the ad hoc group and subscribing to the consensus recorded below, as well as in the enclosed document, include:

Robert D. Allen (Chairman)	Bechtel Corporation
Edwin A. Wiggin (Secretary)	Atomic Industrial Forum
Walter D. Gilbert	General Electric Company
Morton I. Goldman	NUS Corporation
James Howard	Babcock & Wilcox Company
R. S. Hunter	American Electric Power Service Corporation
Richard H. Jason	Sargent & Lundy
Paul M. Krishna	Public Service Electric & Gas Company
Lionel Lewis	Duke Power Company
William W. Lowe	Pickard, Lowe and Associates
John M. Madara, Jr.	Philadelphia Electric Company
G. B. Matheney	Consumers Power Company
David Miller	Combustion Engineering, Inc.
Claude Pursel	Boston Edison Company
R. P. Schmitz	Bechtel Corporation
John Thorpe	General Public Utilities Corp.
Robert Van Wyck	Consolidated Edison Company of New York, Inc.
H. J. von Hollen	Westinghouse Electric Corp.
Woodrow Williams	General Electric Company
Edward Wrenn	New York University Medical Center

Our follow-up comments have for the most part been incorporated in a rewrite of the proposed amendments to Sections 50.34a and 50.36a and a rewrite of Appendix I, all of which are incorporated in the enclosed document.

The objectives sought in the rewrite can perhaps be clarified in the following enumeration of assumptions and observations:

1. We re-affirm our earlier endorsement of the Commission's intent to quantify its "as low as practicable" guides on the release of radioactive effluents to unrestricted areas;

2. We re-assert our understanding that the Commission has taken the action reflected in the proposed rule amendments in order to define the current state of the art in the design and operation of light water power reactors and that the action is not based on any supporting biomedical evidence or rationale which would warrant or support the very conservative radiation exposure guides that have been proposed;

3. We believe it important that the Commission explicitly state in the proposed amendments that the basic 5 millirem exposure guide is proposed as a design objective and is <u>not</u> to be construed as a radiation protection standard; and

4. We believe that the amendments should make clear that compliance with their requirements shall be accomplished through adherence to specified exposure guides and that compliance through adherence to specified effluent releases is an alternative option to be exercised by license applicants.

We would be pleased to meet with the AEC's regulatory staff to discuss further the above points and the manner in which they are reflected in the enclosed rewrite.

Very truly yours,

Robert D. Allen

Robert D. Allen, Chairman
Ad Hoc Review Group

RDA:an

Numerical Guidance
-5d

LICENSING OF PRODUCTION AND UTILIZATION FACILITIES

Light-Water-Cooled Nuclear Power Reactors

(Statement of Consideration as it appears in Federal Register notice Vol. 36, No. 111 - June 9, 1971)

1. Section 50.34 a of 10 CFR Part 50 is amended by adding the following two sentences at the end of paragraph (a):

§ 50.34a Design objectives for equipment to control releases of radioactive material in effluents - nuclear power reactors.

(a) * * * The guides set out in Appendix I provide numerical guidance on design objectives for light-water-cooled nuclear power reactors to meet the requirement that radiation exposure from radioactive material in effluents released to unrestricted areas be kept "as low as practicable." These numerical guides for design objectives and limiting conditions for operation are not to be construed as radiation protection standards.

* * * * *

2. Section 50.36a of 10 CFR Part 50 is amended by adding the following sentence at the end of paragraph (b):

§ 50.36a Technical specifications on effluents from nuclear power reactors.

* * * * *

(b) * * * The guides set out in Appendix I provide numerical guidance on limiting conditions for operation for light-water-cooled nuclear power reactors to meet the requirement that radiation exposure from radioactive materials in effluents released to unrestricted areas be kept "as low as practicable."

3. A new Appendix I is added to read as follows:

APPENDIX I - NUMERICAL GUIDES FOR DESIGN OBJECTIVES AND LIMITING CONDITIONS FOR OPERATION TO MEET THE CRITERION "AS LOW AS PRACTICABLE" FOR RADIATION EXPOSURE FROM RELEASES OF RADIOACTIVE MATERIAL IN LIGHT-WATER-COOLED NUCLEAR POWER REACTOR EFFLUENTS

SECTION I. Introduction. Section 50.34a(a) provides that an application for a permit to construct a nuclear power reactor shall include a description of the preliminary design of equipment to be installed to maintain control over radioactive materials in gaseous and liquid effluents produced during normal reactor operations, including expected operational occurrences. In the case of an application filed on or after January 2, 1971, the application must also identify the design objectives, and the means to be employed, for keeping radiation exposure from releases of radioactive material in effluents to unrestricted areas "as low as practicable."

Note: Underlining and marginal notes have been used to indicate changes in the proposed amendments as published in the F.R. notice of 6/9/71. The order of requirements contained in the proposed amendments has been changed to make clear that compliance shall be accomplished through adherence to specified exposure guides and that compliance through adherence to specified effluent releases is an alternative option.

Section 50.36a contains provisions designed to assure that radiation exposure from releases of radioactivity from nuclear power reactors to unrestricted areas during normal reactor operations, including expected operational occurrences, are kept "as low as practicable."

This appendix provides numerical guidance on design objectives and limiting conditions for operation to assist applicants for, and holders of, licenses for light-water-cooled nuclear power reactors in meeting the requirement that radiation exposure from radioactive material in effluents released from those facilities to unrestricted areas be kept "as low as practicable." This guidance is appropriate only for light-water-cooled nuclear power reactors and not for other types of nuclear facilities.

Moved from SEC.11, p.1116 of F.R.notice & slightly reworded

The guides for design objectives for release of radioactive materials in effluents from light-water-cooled nuclear power reactors specified in paragraph A of Section III are sufficiently conservative to provide reasonable assurance that, for locations having environmental characteristics likely to be considered acceptable by the Commission for a nuclear power reactor site, resultant increases in radiation exposures to individual members of the public living at the site boundary, will generally result in annual exposures of less than 5 percent of the 100-125 millirems which is considered to be the average natural background in the U.S. for whole body radiation and less than 5 percent of the applicable ICRP and FRC standards for doses to specific organs. Application of the 5 percent guide for individuals at the site boundary will provide reasonable assurance

Moved from No.2,center column, p.1114 of F.R.notice

that annual exposures to sizable population groups from radioactivity released in either liquid or gaseous effluents from all light-water-cooled nuclear power reactors on all sites in the United States for the foreseeable future will generally be less than about 1 percent of exposures from natural backaground radiation. This level of exposure is also less than 1 percent of Federal radiation protection guides for the average population dose.

SEC. II. Definitions. For the purpose of this Appendix I, the following definitions shall apply:

New Section

A. Design Conditions - That set of conditions, such as fuel leakage, system leakage, waste treatment and effluent dispersion in the environment that could reasonably be expected to occur during normal operation of the plant when averaged over an extended period of operation. In using these guides the highly conservative assumptions and calculations heretofore used for demonstrating compliance with 10 CFR Part 20 are not suitable for evaluating compliance with the design objectives set forth in paragraphs A and B of Section III since the design margins that are sought in using these highly conservative assumptions and calculations are implicit in the stated design objectives.

B. Natural Body of Water - Means any body of water not under the control of the applicant.

C. Radiation Exposure Due to Noble Gases - The exposure attributed to noble gases is the whole body gamma exposure and does not include the skin exposure due to beta radiation.

D. Site Boundary - The site boundary shall be the boundary of the exclusion area defined in 10 CFR Part 100.

New Section

E. Radioactive Material in Effluents - Means only those radioactive materials generated in or attributable to the reactor plant systems.

SEC. III. Design objectives for light-water-cooled nuclear power reactors licensed under 10 CFR Part 50.

New

A. The design objectives to demonstrate compliance with keeping radiation exposure from releases of radioactive material in effluents to unrestricted areas as low as practicable, under design conditions, shall be based on the radiation exposure to an individual resulting from quantities or concentrations of radioactive material in effluents released to unrestricted areas. These design objectives are:

1. For radioactive material in liquid effluents to be released to unrestricted areas by all light-water-cooled nuclear power reactors at a site, the quantities or concentrations will not result in annual exposures to the whole body, gonads or bone marrow in excess of 5 millirems or to all other organs in excess of 15 millirems;[3] and

2. For radioactive noble gases and iodines and radioactive material in particulate form in gaseous effluents to be released to unrestricted areas by all light-water-cooled nuclear power reactors at a site, the quantities and concentrations will not result in annual exposures to the whole body, gonads or bone marrow in excess of 5 millirems or to all other organs in excess of 15 millirems.

New

B. For those applicants who may wish to simplify demonstration of compliance with the requirement of A above adherence to the following release limits shall be construed to meet those design objectives:

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[3] For purposes of the guides in Appendix I, exposure of members of the public should be estimated from distributions in the environment of radioactive material released in effluents. For estimates of external exposure the rem may be considered equivalent to the rad; and account should be taken of the appropriate physical parameters (energy of radiation, absorption coefficients, etc.). Estimates of internal dose, in terms of the common unit of dose equivalence (rem), should be generally consistent with the conventions or assumptions for calculational purposes most recently published by the International Commission for Radiological Protection which apply directly to intakes of radioactive material from air and water, and those applicable to water may be applied to intakes from food. These conventions or assumptions should be used for calculations of dose equivalence except for exposures due to strontium-89, strontium-90, or radionuclides of iodine. For those radionuclides the biological and physical assumptions of FRC Report No. 2 should be used. It is assumed that annual average concentrations of radioactive iodine intake by breathing air or by drinking water, as listed in Part 20, Appendix B, Table II, would result in annual doses of 1.5 rems to the thyroid and the concentration of strontium-89 or strontium-90 would result in annual doses of 1.5 rems to the bone. Exposure to the whole body should be assessed as exposure to the gonads or bone marrow.

1. Liquid Effluents

a. If the estimated annual total quantity of radioactive material, except tritium and dissolved noble gases, does not exceed 5 curies for each light-water-cooled nuclear power reactor at a site; and

Tritium included here; SEC.II.A.3., p.1116, deleted

b. If the estimated annual average concentration of specified radioactive materials prior to dilution in a natural body of water does not exceed for each light-water-cooled nuclear power reactor at a site 1 percent of the limits set forth in Appendix B, Table II, Column 2 of 10 CFR Part 20.

2. Gaseous Effluents

a. If an annual radiation exposure due to noble gases and all other sources of penetrating radiation from gaseous effluents at any location on the boundary of the site or in the offsite environment is not in excess of 10 millirems;[4] and

b. If annual average concentrations at any location on the boundary of the site or in the offsite environment of radioactive iodines or radioactive material in particulate form with a half life greater than 8 days are not in excess of the concentrations in air specified in Appendix B, Table II, Column 1, of 10 CFR Part 20 divided by 100. Where there are grazing animals providing fresh milk for human consumption, the 10 CFR Part 20 concentration of iodine 131 at the location of grazing must be divided by 70,000. However, this number may be reduced by considerations such as: (1) the fraction of the year during which grazing is impossible, and (2) the fraction of dilution provided by pooling at a central dairy.

C. Notwithstanding the guidance in paragraphs A and B, above, for a particular site, the Commission may specify, as guidance on design objectives, lower quantities and concentrations of radioactive material above background in effluents to be released to unrestricted areas if it appears that the use of the design objectives described in those paragraphs is likely to result in releases of total quantities of radioactive material from all light-water-cooled nuclear power reactors at the site that are estimated to cause an annual exposure in excess of 5 millirems to the whole body, gonads or bone marrow or in excess of 15 millirems to the bone or thyroid of an individual in the offsite environment from radioactive material generated in and attributable to effluent from the plant in either liquid or gaseous materials.

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[4] An exposure rate such that a hypothetical individual continuously present in the open at any location on the boundary of the site or in the offsite environment would not incur an annual exposure in excess of 10 millirems. This dose neglects the reduction in the exposures to a real individual that would be afforded by the distance from the site boundary at which the individual is located, shielding provided by living indoors and periods of time the individual is not present in the area.

SEC. IV. Guides on technical specifications for limiting conditions for operation for light-water-cooled nuclear power reactors licensed under 10 CFR Part 50. The guides on limiting conditions for operation for light-water-cooled nuclear power reactors set forth below may be used by an applicant for a license to operate a light-water-cooled nuclear power reactor as guidance in developing technical specifications under § 50.36a(a) to keep radiation exposures from releases of radioactive materials in effluents to unrestricted areas as low as practicable.

Section 50.36a(b) provides that licensees shall be guided by certain considerations in establishing and implementing operating procedures that take into account the need for operating flexibility while at the same time assure that the licensee will exert his best effort to keep radiation exposure from releases of radioactive material in effluents as low as practicable. The guidance set forth below provides more specific guidance to licensees in this respect.

In using the guides set forth in Section V it is expected that it should generally be feasible to keep average annual releases of radioactive material in effluents from light-water-cooled nuclear power reactors within the levels set forth as numerical guides for design objectives in Section III above. At the same time, the licensee is permitted the flexibility of operation, compatible with considerations of health and safety, to assure that the public is provided a dependable source of power even under unusual operating conditions which may temporarily result in releases higher than such numerical guides for design objectives, but still within levels that assure that actual exposures to the public are small fractions of natural background radiation. It is expected that in using this operational flexibility under unusual operating conditions, the licensee will exert his best effort to keep levels of radioactive material in effluents within the numerical guides for design objectives.

SEC. V. Guides for limiting conditions for operation for light-water-cooled nuclear power reactors.

A. If rates of release of radioactive materials in effluents from light-water-cooled nuclear power reactors actually experienced, averaged over any calendar quarter, are such that the estimated annual quantities or concentrations of radioactive material in effluents are likely to exceed 5 times the design objectives set forth in SEC. III above, the licensee should:

1. make an investigation to identify the causes for such release rates; and

2. define and initiate a program of action to reduce such release rates; and

3. report these actions to the Commission on a timely basis.

B. If rates of release of radioactive material in liquid or gaseous effluents actually experienced, averaged over any calendar quarter, are such that estimated annual quantities or concentrations of radioactive material in effluents are likely to exceed 10 times the design objectives set forth in SEC. III above, the Commission will take appropriate action to assure that such release rates are reduced. (Section 50.36a(a) (2) requires the licensee to submit certain reports to the Commission with regard to the quantities of the principal radio-

nuclides released to unrestricted areas. It also provides that, on the basis of such reports and any additional information the Commission may obtain from the licensee and others, the Commission may from time to time require the licensee to take such action as the Commission deems appropriate.)

C. The guides for limiting conditions for operation described in paragraph A and B of this section are applicable to technical specifications included in any license authorizing operation of a light-water-cooled nuclear power reactor constructed pursuant to a construction permit for which application was filed more than 60 days after the effective date of this amendment. For light-water-cooled nuclear power reactors constructed pursuant to a construction permit for which application was filed prior to the effective date of this amendment, appropriate technical specifications should be developed to carry out the objectives of keeping radiation exposure from releases of radioactive material in effluents to unrestricted areas as low as practicable. These levels will be set considering each situation individually and may not be the same as would apply under Section III; such levels to become effective 36 months from the effective date of this amendment.

DOCKET NUMBER PR-50
PROPOSED RULE
Numerical Guidance

Babcock & Wilcox

Power Generation Division

P.O. Box 1260, Lynchburg, Va. 24505
Telephone: (703) 384-5111

October 20, 1971

Secretary
U. S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

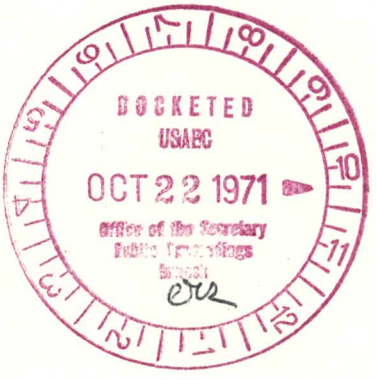
Gentlemen:

This letter is in response to the Commission's invitation to comment on the proposed amendment to 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low As Practicable' for Radioactive Material in Light-Water Cooled Nuclear Power Plant Effluents".

We support the suggested revisions to 10 CFR 50, Appendix I, and related subsections of 10 CFR 50 contained in the recommendations of the Atomic Industrial Forum Ad Hoc Review Group, Robert D. Allen, Chairman. In addition to supporting the recommendations of the AIF Ad Hoc Group, we have the following comments:

1. Consideration should be given to the limit for the estimated annual average concentration of tritium prior to release in that it is so conservative that plants which do not employ once-through heat rejection must employ tritium recycle.

2. Since release limits are within normal variation of background radiation versus time at a given site, release must be calculated rather than measured. The lack of empirical basis for radioactive releases could result in further unnecessary conservatisms applied against an applicant if the AEC does not accept the validity of the calculational technique.



Very truly yours,
BABCOCK & WILCOX COMPANY
Nuclear Power Generation

D W Montgomery

D. W. Montgomery, Manager
Systems Engineering

DWM/jny

Acknowledged by card 10/22/71, ers

UNIVERSITY OF CALIFORNIA, SANTA BARBARA

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ENVIRONMENTAL HEALTH AND SAFETY

SANTA BARBARA, CALIFORNIA 93106

October 11, 1971

U. S. Atomic Energy Commission
Washington, D. C. 20545

Gentlemen:

I would like to comment on the proposed revisions to 10 CFR 50 which appeared in the Federal Register on June 3, 1971. The amendments attempt to define the phrase "as low as practicable" in regard to radioactivity in the effluent from power reactors. As a member of the Standards Committee, Health Physics Society, I support the viewpoint expressed in the paper, "Comment by the Standards Committee, Health Physics Society, on Proposed Numerical Guidance to Keep Radioactivity in Light-Water-Cooled Nuclear Power Reactor Effluents as Low as Practicable." My latest information is that this paper will be submitted to the A.E.C. by Dr. Dade Moeller, President of the Health Physics Society.

I support the ideas expressed in this paper, particularly the point that any money spent to reduce population exposures in the next couple of decades ought to be spent for the reduction of unnecessary exposure from medical and dental X-ray examinations. I would, however, like to suggest a simplified apportionment of the per capita dose limit of one rem in 30 years proposed in the paper. My suggested apportionment is as follows:

(a) 10 mrem/y -- for routine operation of nuclear power reactors.

(b) 10 mrem/y -- for routine operation of associated activities, such as fuel reprocessing.

(c) 13 mrem/y -- held in reserve for future needs, such as accidental releases or critical power shortages.

I support the basic limit of 500 mrem/y for each facility at the boundary of the controlled area, particularly with an additional design specification of 50 mrem/y for each facility at the boundary of the controlled area. In addition, a limit of 3 man-rems per MW(e) of installed

capacity, seems to be about right. It corresponds closely with 10 mrem/y per capita in the year 2,000.

I do not really like limits like 6, 8.5, or 17 mrem/y, because they seem to indicate a degree of precision which cannot be supported by current scientific evidence.

The opinions expressed in this letter are entirely my own as a professional health physicist and should not be construed as representing the official position of the University of California.

Very truly yours,

Frank E. Gallagher III

Frank E. Gallagher, III
Campus Health Physicist

FEG/mj

YANKEE ATOMIC ELECTRIC COMPANY

20 TURNPIKE ROAD, WESTBOROUGH, MASSACHUSETTS 01581
TELEPHONE 617 366-9011

October 6, 1971

Secretary of the Commission
U.S. Atomic Energy Commission
Washington, DC 20545

ATTENTION: Chief, Public Proceedings Branch

Dear Sir:

Yankee Atomic Electric Company would like to take this opportunity to present to the Commission its' comments on the proposed amendment published in the Federal Register on June 9, 1971, which would add a new Appendix I to 10 CFR 50.

Since Yankee's operating and design philosophy has always been and will continue to be such that radioactive discharges are kept to levels "as low as practicable," we do not object to the intent of maintaining average off-site doses to small percentages of natural background radiation exposure and even smaller fractions of 10 CFR 20 limits. However, since radiation exposure at both of those levels has not been shown to produce deleterious biological effects, we feel that the philosophical description of the basis for numerical effluent limits should clearly state that the guides are not being set on any biological damage basis, but rather on the basis that the nuclear power industry has, as evidenced by its many collective years of operating experience, voluntarily agreed to limit its' share of population exposure to very small fractions of that from other sources. In other words, it should be emphasized that the nuclear power industry has been operating "as low as practicable" long before it became a regulatory requirement to do so.

With regard to the specific numerical limits on radioactive discharge levels delineated in the subject amendment, we have a number of comments and questions. They are as follows:

1. Limits are expressed for annual average amounts and concentrations of all radionuclides (excluding tritium) in plant liquid effluents. Specifically, the annual releases are limited to five curies total and an annual discharge concentration of 2×10^{-8} uCi/ml. These two limits are inconsistent with one another. With a typical circulating water flow rate of 400,000 gpm, a plant could discharge up to 16 curies per year and meet the discharge concentration limit, but would be more than a factor of three above the five curie limit.

This inconsistency becomes especially acute when a plant designed to operate with a closed (cooling tower) condenser cooling water system is considered. Here, with liquid radwaste dilution flow on the order of 20,000 gpm instead of 400,000 gpm, the annual discharge amount would have to be 0.8 curies in order to meet the 2×10^{-6} uCi/ml discharge concentration.

This inconsistency could be resolved either by realistically setting the annual curie limit as a function of plant electrical output, or by increasing the discharge concentration limit.

2. The proposed limit for liquid tritium releases (annual discharge concentration of 5×10^{-6} uCi/ml) has been set without considering the operating experience of boron-shim, stainless steel clad pressurized water reactors.

3. With regard to the gaseous release limits, we are unclear as to the dose points referenced in the amendment. In some places, it states that the dose and concentration limits for noble gas, halogen, and particulate releases are applicable at the site boundary or off-site environment (presumably whichever is more limiting), but elsewhere it is stated that the limits are applicable in unrestricted areas. Site boundaries and plant restricted areas are not one in the same, so that the discrepency is confusing.

4. The proposed MPC adjustment factor of 100,000 to account for the pasture-cow-milk-man exposure route is applied in Appendix I to all halogen isotopes, when only I-131 is the important isotope for this exposure route. Presently, the MPC adjustment factor of 700 is applied to only I-131 instead of all halogens and Appendix I should do the same.

5. To demonstrate compliance with the limits as proposed in Appendix I, it will be necessary for a plant to utilize both monitoring techniques and dose calculational methods that are far from being either sensitive enough or standardized sufficiently within the nuclear power industry, the various state agencies, EPA, and the AEC. Before Appendix I becomes a regulatory definition of "low as practicable" a major effort must be made to standardize and improve upon monitoring techniques and to standardize dose calculation models. The results of this effort should be issued in conjunction with Appendix I.

6. The application of the 400 man-rem per 1000 Mwe is unclear when two or more separate nuclear power plants are located in the same general geographical area. Appendix I should take into account the fact that two or more separate plants may have a portion of the environment in common.

We are hopeful that due consideration will be given to our comments and those of others and we believe that a better numerical definition of "low as practicable" will result.

Very truly yours,

D E Vandenburgh

D. E. Vandenburgh
Vice President

JAM/kas

Numerical Guidance

DOCKET NUMBER
PROD. & UTIL. FAC. -50

GENERAL ELECTRIC

NUCLEAR ENERGY
DIVISION

GENERAL ELECTRIC COMPANY, 175 CURTNER AVE., SAN JOSE, CALIF. 95125
Phone (408) 297-3000, TWX NO. 910-338-0116

ATOMIC POWER EQUIPMENT
DEPARTMENT

October 7, 1971

Acknowledged by card 10/12/71
SM

Secretary
United States Atomic Energy Commission
Washington, D.C. 20545

ATTENTION: Chief, Public Proceedings Branch

SUBJECT: Comments on Proposed Amendments to 10 CFR Part 50

This letter is in response to a notice published in the Federal Register, Vol. 36, No. 111, June 9, 1971 inviting public comment on proposed amendments to Part 50 of AEC Regulations regarding numerical guidance for "as low as practicable" releases of radioactive materials from nuclear power reactors.

The comments which follow are addressed to two principal areas - (a) the need for early delineation of a uniform national policy relating to environmental limits on radiation exposures and releases of radioactive materials, and (b) the need for technical consistency in deriving the relationships between doses and amounts or concentrations of radioactive materials released and in developing procedures to demonstrate compliance with the numerical guidance.

National Policies for Environmental Protection

In the notice of proposed rule making the commission has noted that the EPA is responsible for establishing generally applicable environmental radiation standards for the protection of the general environment from radioactive materials. This responsibility resulted from the President's Reorganization Plan No. 3 of 1970 in which the functions of the AEC relating to the establishment of environmental limits on radiation exposures or levels, or concentrations of radioactive materials in the general environment outside the boundaries of nuclear facilities were transferred to the EPA. Also the functions of the Federal Radiation Council were transferred to the EPA. The Commission also noted that the EPA has under consideration generally applicable environmental standards for light water cooled nuclear power reactors, and that the AEC has

consulted with the EPA in the development of the proposed AEC guides. Further it is noted that the AEC will modify its guides at some future time if the design objectives and operating limits prove to be incompatible with any generally applicable standards later established by the EPA.

We endorse these actions by the Commission and the EPA in that those efforts are in the direction of developing standards uniformly applicable to the industry.

Although we believe that guides similar to those proposed by the AEC will be of substantial benefit at this time in developing specific design and operational requirements for nuclear reactors, we also believe it unfortunate that the AEC has found it necessary to issue the proposed guides prior to formulation of national policy and generally applicable standards by the EPA.

On this point we are concerned with the magnitude and cost of the actions which would be required within the industry if it should become necessary to modify the proposed guides because of incompatibility with the standards ultimately established by the EPA. If the proposed AEC rule is adopted, design and procurement commitments have to be made in reliance upon guidance which may subsequently prove to be inconsistent with the standards ultimately established by the government agency charged with responsibility for establishing such standards. The possible need for subsequent equipment changes to comply with modified regulatory requirements could have severe cost and schedule impact.

Our concern in this area would be greatly minimized if reasonable assurance were given to the industry at the time of adoption of the proposed rule that the AEC guides will be mutually consistent with the national policies and standards which are ultimately established by the EPA.

Consistency of Numerical Guidance

As presently written, the Commission's proposed regulation provides guidance in a number of areas including concentrations of radioactive material in liquid and gaseous effluents, total amounts of radioactive materials discharged annually in liquids, dose to a location offsite and doses to persons offsite. From a design objective standpoint, it is necessary to specify only one of these - dose to persons offsite--in order to establish a consistent primary definition for "as low as practicable." For example, the guides pertaining to quantities and concentrations proposed in Section II A. 1, 2, and 3 of Appendix I are not directly related to an annual offsite dose design objective of 5 millirem to the whole body since those guides neither reflect the particular site and reactor characteristics nor are they derived in a manner consistent with basic dose objectives. Thus,

it is our view that specific numerical guides relating to quantities and concentrations should not be adopted as primary design objectives. Rather such secondary guidance in terms of amounts and concentrations of radioactive material released should be derived on a case-by-case basis, taking into account specific site and reactor characteristics, and should be technically consistent with the primary dose objective established by the proposed rule.

If the Commission nevertheless finds it necessary to retain the specific numerical guidance as proposed in Section II A, 1, 2 and 3 of Appendix I, then (a) the specific quantity and concentration guides should be reconsidered in terms of technical consistency with the primary dose objective, and (b) the rule should explicitly recognize that the effluent quantity and concentration guides represent only a simplified and conservative expedient for the determination of compliance with the primary offsite dose design objective.

The Atomic Industrial Forum has conducted an in-depth study of the proposed rule making and has developed specific alternate rewording of Appendix I which reflects the concept of dose to persons offsite as the primary guide. The General Electric Company participated in that study and we endorse the changes proposed by the AIF. Specifically, we believe that the primary design objectives should be as follows:

a. For radioactive material in liquid effluents to be released to unrestricted areas by all light water cooled nuclear power reactors at a site, the quantities or concentrations so released will not result in annual doses to the whole body, gonads or bone marrow in excess of 5 millirems or to the bone or thyroid in excess of 15 millirems; and

b. For radioactive noble gases and iodines and radioactive material in particulate form in gaseous effluents to be released to unrestricted areas by all light water cooled nuclear power reactors at a site, the quantities and concentrations so released will not result in annual doses to the whole body, gonads or bone marrow in excess of 5 millirems or to the bone or the thyroid in excess of 15 millirems.

The AIF is forwarding to the Commission the proposed revisions to Appendix I. We urge the Commission to give serious consideration to adoption of the AIF proposal.

We believe that another aspect of the proposed rule which deserves attention is in the area of demonstration of compliance. A regulation such as this should be developed in a manner such that demonstration of compliance or non-compliance is not difficult.

GENERAL ELECTRIC

Secretary, USAEC 10/7/71

Under the proposed rule, as an example, the Commission would be required to take corrective action when the iodine - 131 concentration in the air at the site boundary or offsite reaches 4-8 times 10^{-15} microcuries/ml. The ability to measure such low concentrations with precision on a routine basis is open to question, and mathematical evaluation techniques would be required to demonstrate compliance.

At present no standard calculational method is utilized by the Commission and industry, and one is needed to implement the requirements of the regulation efficiently. Neither the primary design objective nor the operational limits can be evaluated without employing suitable calculational techniques. A philosophy of applying ultraconservatism and additional margin of safety in each parameter of the calculation as is currently practiced by the Commission in its evaluation of accidents, is considered to be unrealistic when a factor of at least 100 has already been incorporated into the basic numerical guides as now proposed.

We believe it necessary that the numerical guidance of the proposed rule be accompanied by realistic, rational calculational methods applicable to both the design analysis and to plant operation evaluation. Such methods must be developed and adopted at an early date and should reflect mutual agreement of applicability between the Regulatory Staff, the designer, and the plant operator. Since "safety factors" have already been applied to the definition of "as low as practicable," it is strongly recommended that the methods reflect realism so that it will not be necessary to over-design waste process equipment, and so that an accurate knowledge of radiological doses to persons offsite will be obtained.

We appreciate this opportunity to comment on these proposed regulations, and will be happy to work with the Commission to clarify our comments or to develop the much needed analytical tools as noted above. We shall also be happy to present our views at the informal public hearing being planned by the Commission on this matter.

Sincerely,

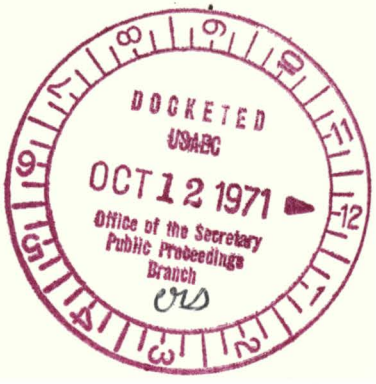
A. P. Bray

A. P. Bray, Manager
Applications Engineering

WDG/zja

ENVIRONMENTAL PROTECTION AGENCY
RADIATION OFFICE
ROCKVILLE, MARYLAND 20852

OCT 7 1971



Secretary of the Commission
U. S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

In your publication in the Federal Register, June 9, 1971, "Control of Releases of Radioactivity to the Environment from Nuclear Power Reactors," you invite comments and suggestions on the amendments proposed therein.

Your related publication in the Federal Register, December 3, 1970, formally implemented for the first time as a regulatory requirement the Federal Radiation Council's guidance that actual radiation exposures should be maintained as far below the established limits as is practicable. We note that the Atomic Energy Commission has been substantially successful over the years in maintaining occupational and public exposures generally far below the FRC guides without formal implementation of the FRC "as low as practicable" concept. Nevertheless, we believe that formal implementation of this concept was highly desirable.

We commend the Commission on its development of numerical criteria for application of the "as low as practicable" concept to nuclear power reactors. The criteria you have derived appear to be generally sound.

We have the following comments on your publication of May 1, 1971, which we hope you will take into account in revising your proposed rule change prior to publication as an effective rule:

1. Information Required

Since the proposed regulations relate design objectives and operating criteria to public exposure levels, it is essential that the means used to estimate public exposure levels be stated. We suggest 10 CFR § 50. 34a(b)(2) be amended to require such an estimate and a statement of how the estimate was made.

2. Reporting Time

We note in Section IV of Appendix I that reports on unusual operating conditions are required on a timely basis. We believe it would be wise to place a specific outer bound on this time interval, and suggest that reports, including a program of action, be required within 60 days.

3. Limiting Conditions for Operation

In Section IV. B you state that if "... estimated annual quantities or concentrations of radioactive material in effluents are likely to exceed a range of 4-8 times the design objective quantities and concentrations set forth in section II above,[5] the Commission will take appropriate action to assure that such release rates are reduced...." We believe that you should state what action you would consider "appropriate" under what conditions.

4. Effect of Regulation

The AEC's proposed regulation uses the term "Guides" throughout. It should be made clear whether AEC construes the values as limits for regulatory purposes; if so, it should be made clear how they would be applied; if not, why not?

5. Clarifications

In Section II. B. 1, an exposure rate at the boundary of 10 millirems per year appears to be equated with an annual exposure of 5 millirems per year. This is confusing; we suggest that the AEC clarify this.

Also, in Section II. A, the proposed limitations refer to each reactor at a site rather than to each site as is the case in Section II. B. and C. Again, we think an explanation of the reasons for this difference would be desirable.

Further clarification and ease of understanding could be provided by including in the regulation a summary table of the various exposure guides and their applicability.

We would be happy to discuss these or any other aspects of the proposed rule with you.

Sincerely yours,

Joseph A. Lieberman

Joseph A Lieberman
Deputy Assistant Administrator
for Radiation Programs

PR-50
Numerical Guidance

DUKE POWER COMPANY

POWER BUILDING, BOX 2178, CHARLOTTE, N. C. 28201

W. H. OWEN
VICE PRESIDENT,
DESIGN ENGINEERING

October 6, 1971

Secretary of the Commission
U S Atomic Energy Commission
Washington, D C 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

After review of the proposed rule making for 10 CFR Part 50 having to do with numerical guides for radioactive effluents from power plants, we have the following general comments:

(1) The numerical guides provided should never be construed as radiation protection standards. This should be made extremely clear throughout the regulation, but even the word "regulation" implies that these guides will be interpreted as standards.

(2) Under "Expected consequence of guides for design objectives," it is stated that these levels of exposure would be indistinguishable from exposures due to variations in natural background radiation. Furthermore, it is stated that calculational techniques will be used to estimate these low level exposures. At the present time the nuclear industry and the regulatory staff are not in full agreement on the calculational techniques (that is, partition factors, etc). This approach therefore could lead to unnecessary difficulties and problems unless standard calculational techniques are established.

(3) Under Section II of Appendix I, the annual average rate due to noble gases is not clear. The annual average concentrations for radioactive iodines and other particulates with a half-life greater than eight days have been arbitrarily reduced by a factor of 10^5. The preface to the proposed 10CFR50 discusses the appropriateness of the factor with regard to the milk pathway to man. However, the proposed rule making does not limit the dose to man as its design objective but rather an arbitrary isotope concentration. This limit has not been adequately qualified in the proposed rule making. It might be qualified as applying to the air concentration that actually exists above any nearby pasture containing milk cows averaged over a year.

(4) Under Section IV of Appendix I, arbritrary factors are applied to estimated concentrations at or above which the Commission would take "appropriate action." These factors are expressed as a range and are subject to interpretation. The "backfit" requirement in paragraph C is not qualified with reference to the preface discussion on "the economics of improvements in relationship to benefits to the public health and safety."

10/8/71, crz

Representatives of our company have participated in the Atomic Industrial Forum review of this document, and we subscribe to their comments.

In general we find the regulations unnecessarily and severely restrictive and believe you should take a firm position that these are design objectives and not required fixed limits. It is not good use of our country's economic resources to establish unyielding release limits at these extremely low levels.

Very truly yours,

W H Owen

WHO/w

cc Mr Lester Rogers, Director
Division of Radiological and
Environmental Protection
Atomic Energy Commission
Washington, D C 20545

Nebraska Public Power District

NEBRASKA PUBLIC POWER DISTRICT
P. O. BOX 499
COLUMBUS, NEBRASKA 68601

October 1, 1971

Mr. Harold L. Price
Director of Regulation
Atomic Energy Commission
Bethesda, Maryland

Dear Mr. Price:

Subject: Comments on Proposed Revision to AEC Regulations
10 CFR Part 50, Federal Register, Volume 136, No. 111,
June 9, 1971

We were pleased to see the Commission has taken positive action with regard to the widespread concern expressed by the scientific and industrial communities, in establishing specific numerical limits on the radiological constituents of power reactor effluents, in order to avoid the ambiguity inherent in "as low as is practicable".

We are, however, seriously concerned by the magnitude of the proposed reduction of the permissible exposure allowed by this regulation for the following reasons, which are presented in decreasing order of concern:

1. Effects on the General Population

We do not believe that the proposed limits are based on, nor are in agreement with, the findings of the majority of comprehensive and well-executed scientific studies and observations relating to this subject which have been performed during the past 10 to 15 years. We would propose that the limits be relaxed to a value which will still keep exposures to the general public well within the range of naturally occurring background fluctuations. In effect, such a limit would allow exposures to the public which are well within the minimum limits established by nature.

2. Proof of Compliance

The proposed limits are of such low level and, in addition, are so small as compared with normal fluctuations of naturally occurring background radiation as to be nearly impossible to detect within acceptable statistical limits with commercially available instrumentation and state-of-the-act technology. Therefore, from a compliance standpoint, the limits imposed by this regulation may tend to create situation in which many utilities would be forced into the untentable situation of not being able to conclusively prove to everyone's satisfaction that they were in fact not exceeding the imposed limits.

3. Economics

Lastly, the consideration of economics must be considered, although admittedly the use of economic arguments cannot, in good conscience, be used as a vehicle to circumvent or jeopardize the safety of the general public; it does in fact when serious enough, result in an in-depth study to determine whether any detrimental effect on the public would exist.

Our review of the existing literature and studies which have been performed to date by those individuals most knowledgeable on the subject of radiation exposure, do not, in our opinion, support the imposition of such restrictive limits. Therefore, the expenditure of the several millions of dollars required to implement the necessary plant modifications to insure compliance, in addition to the increased analytical instrumentation and a potentially increased technical support staff, does not provide an acceptable balance of economics in relation to benefits to the general public and in relation to the utilization of atomic energy in the public interest.

We appreciate this opportunity to comment on the proposed regulation and trust that you will consider our response prior to finalizing and publishing this regulation.

Yours very truly,

R E Reder

R. E. Reder
Director of Generation Engineering

JP:ajc

cc: D. W. Hill
R. D. Wilson

William J. Cahill, Jr.
Vice President

Consolidated Edison Company of New York, Inc.
4 Irving Place, New York, N Y 10003
Telephone (212) 460-3819

October 5, 1971

Secretary of the Commission
U.S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

Consolidated Edison Company of New York, Inc. respectfully submits the following comments on the proposed amendment to the Commission's regulations which would add Appendix I to Part 50, as published in the Federal Register on June 9, 1971.

The intent of the proposed amendment is to provide numerical guides for design objectives and technical specification requirements for limiting conditions for operation of light-water-cooled nuclear power reactors to keep radioactivity in effluents as low as practicable. In my previous letter to Mr. Harold L. Price, Director of Regulation, dated June 1, 1970, this Company strongly supported the Commission's initial amendment to its Part 50 regulations which established the concept of "maintaining releases of radioactivity to the environment to as low a level as practicable," and this Company has operated accordingly.

We would like to offer the following comments on the proposed Appendix I:

1. Section II.C.2 of proposed Appendix I provides for releases of radioactive noble gases and iodines and radioactive material in particulate form which will not result in annual exposures to the whole body or any organ of an individual in excess of 5 millirems. In accordance with precedents set by ICRP and FRC, the 3:1 relationship between thyroid dose and a whole body dose has been well recognized. Accordingly, the regulation should permit a dose to the thyroid of

15 millirems per year. In addition, we recommend that a 5 mrem whole body dose apply to annual exposures to radioactive noble gases. This is consistent with a level which is one one-hundreth of the 500 mrem per year whole body exposure now permitted under 10 CFR §20.105(a). Therefore, in accordance with these comments, Section II.C.2 should be modifed to read:

> "The proposed higher quantities and concentrations of radioactive materials in gaseous effluents from all light-water-cooled nuclear power reactors at a site will not result in an annual exposure from radioactive iodines which exceeds 15 mrem to the thyroid, will not result in an annual exposure to radioactive noble gases which exceeds 5 mrem to the whole body and will not result in an annual exposure to other radioactive materials including those in particulate form which exceeds 5 mrem to the whole body or any organ of the whole body."

2. There appears to be an inconsistency in Section II of Appendix I concerning the status of the limits of paragraph C. This section begins with the phrase "Notwithstanding the guidelines in paragraphs A and B above, * * *." This would indicate that paragraph C offers an alternative to paragraphs A and B. However, the introductory language to Section II states that the guides for design objectives specified in paragraphs A and B are sufficiently conservative, etc. The omission of paragraph C from the introductory language is inconsistent with the concept that paragraph C is an acceptable alternative to paragraphs A and B. We suggest that this be clarified by a revision of the introductory language to indicate that paragraph C provides protection equivalent to that provided by paragraphs A and B. We note in support of this that a plant utilizing cooling towers probably cannot comply with

Section II.A.3. Such a plant would use the approach offered by Section II.C, and there should be no question that such a plant is as safe as one complying with Sections II.A and II.B.

3. Section II.B.2 limits annual average concentrations at any location on the boundary of the site or in the offsite environment of radioactive iodines to an indicated level. Since this level is based upon the cow-milk-infant reconcentration route, it is unreasonable to apply this limit at any location except where a dairy herd actually exists.

We hope that these comments may be of assistance to you and thank you for your consideration of them.

Very truly yours,

William J. Cahill, Jr.

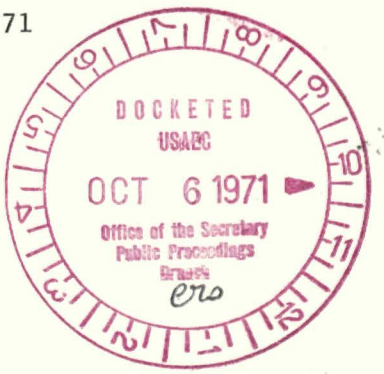
William J. Cahill, Jr.

DOCKET NUMBER
PROPOSED RULE PR-50
Numerical Guidance

STATE OF COLORADO DEPARTMENT OF HEALTH

4210 EAST 11TH AVENUE · DENVER, COLORADO 80220 · PHONE 388-6111
R. L. CLEERE, M.D., M.P.H., DIRECTOR

July 28, 1971



Mr. Harold L. Price
Director of Regulation
Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Price:

We offer the following comments relative to the supplement "Licensing of Production and Utilization Facilities" which you enclosed with your letter of June 12 to Governor John A. Love:

It has been apparent that objections exist to the requirements published in Part 50, on December 3, 1970, that radioactive material in effluents be kept "as low as practicable."

The new Proposed Rule Making supplementing the Commission's regulations provides numerical guidelines, which is a step in the proper direction.

The following are issued as questions that might arise when these new guidelines are established. It is not clear as to how the guidelines might be applied if the exposures are caused by several reactors affecting the same group of people.

We feel that the limits in Part 20 have been set as health standards and should be maintained as such. In other words, it is hoped that Part 20 limits will not be adjusted to conform to the new reactor safety technology.

The supplement to 10 CFR 50 applies only to light water reactors; however, the philosophy of 1% of the Federal Radiation Protection Guide for Individuals may be accepted as criteria for other reactors. It is not clear whether a different set of guides will be proposed for different types of reactors.

Sincerely,

Roy L. Cleere

Roy L. Cleere, M. D., M. P. H.
Executive Director

RLC:dgr

cc: Governor Love
Mr. Bronstein
Mr. Jacoe
Mr. Rozich


RECEIVED
AUG 2 1971
U.S. ATOMIC ENERGY COMMISSION
Regulatory
Mail Section

Numerical Guidance

PR -50

Westinghouse Electric Corporation Power Systems

PWR Systems Division

Box 355
Pittsburgh Pennsylvania 15230

10/4/71
SDM

September 30, 1971

Secretary of the Commission
U.S. Atomic Energy Commission
Washington, D.C. 20545

ATTENTION: Chief, Public Proceedings Branch

SUBJECT: Proposed Numerical Guidance to Keep Radioactivity "As Low As Practicable"

Dear Sir:

Responding to the invitation issued in the Federal Register of June 9, 1971, we offer our comments on the numerical guidance contained in proposed Appendix I to 10 CFR Part 50 to keep the radioactivity of effluents from light water reactors to levels "as low as practicable."

The Commission's introductory statement pointed out that "nuclear power reactors now in operation have been within a range that may be considered 'as low as practicable' and that, as a result of advances in the reactor technology, further reductions of these releases can be achieved." We believe this overall record is indicative of the responsible attitude of the nuclear industry which has strived, by both design and operation of its plants, to achieve levels which have been small percentages of the Federal Radiation Protection Guides. The nuclear industry has expended a major effort in developing accessory environmental systems that would further minimize releases of radioactivity to the environment. In the case of indirect cycle light water reactors, where our experience is most applicable, our opinion is that it is indeed practicable in a technical sense to reduce the effluent radioactivity to extremely low values through equipment and system additions.

Nevertheless, we have doubts that an appropriate yardstick is being applied to "practicability." The rulemaking as proposed will require either unnecessary loss of plant availability or additions to plant equipment to assure plant availability and thus, we believe, would create greater costs than an informed prudent man would be likely to pay for the protection he gains.

We suggest the Commission look at the concept of assigning to power plant operation an allowable dose limit comparable to what individual members of the average public would receive due to the normal fluctuations that they could obtain from natural radiation exposure in traveling from place to place, suggesting that this is a measure of what is small compared to natural background. If this individual is the "prudent man" and also a power consumer, thus paying for benefits gained, we believe he would appreciate guidelines yielding adequate protection without unnecessary cost to him. New Appendix D of 10 CFR Part 50 has required cost-benefit analyses; similarly, the AEC should seriously consider numerical criteria that are not needlessly expensive relative to the benefits gained.

We cite the example of allowable estimated tritium concentration prior to dilution in a natural body of water in illustrating that one (of several) design objective concentration in Section II may be inappropriate in the sense of being small compared to natural levels. In a typical PWR plant of 3600 MWt capacity, our current projection of tritium release would be within the proposed guidelines if once-through cooling is used; i.e., the full condenser flow is available for dilution. However, if cooling towers are used (as frequently required to meet current thermal discharge concerns), tritium would exceed the guideline concentration limit in the discharge by a factor of 3 to 8 (assuming Zircaloy cladding) depending on tower blowdown rate. The alternatives available (augmented pumping for dilution, shipping to an off-site dispersal point, etc.) produce no significant benefit to the environment, considering that the biospheric tritium level is already more than 1000 times greater than the yearly increment which will be provided by nuclear plants now planned and operating. Based on the same assumption, it has been estimated that by the year 2000, the planetary exposure to the world population from all sources of tritium would result in 0.002 mrem dose to the average individual, which we suggest is not a serious problem. This is much less than one would receive in a transcontinental flight. Since ecological damage is not an issue for establishing tritium concentration limits in the on-site conduit that transports the radioactivity, we see no need to establish a limit prior to dilution in a natural body of water so much lower than the limit permitted for drinking water.

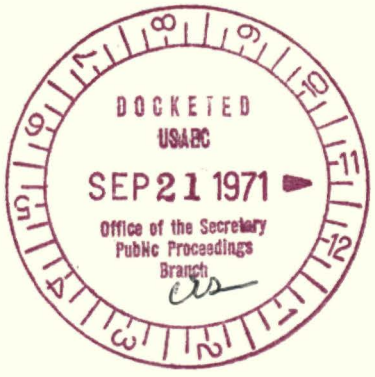
If the Commission were to adopt a yardstick for practicability based on dose limits comparable to those caused by fluctuations of natural exposure, we believe that our concerns with the proposed rules would disappear. At your convenience, we would be most happy to explore with you the consequences of our suggestion.

Very truly yours,

J. T. Stiefel
General Manager

DOCKET NUMBER
PROPOSED RULE PR-50
Numerical Guidance

SEP 20 1971



Mr. Edward C. Berkowitz
Frosh, Lane and Edson
Suite 707 - Blake Building
1025 Connecticut Avenue
Washington, D. C. 20036

Dear Mr. Berkowitz:

This is in reply to your letter of August 20, 1971, regarding the proposed amendments to 10 CFR Part 50, to provide numerical guides for design objectives and technical specification requirements for limiting conditions for operation for light-water-cooled nuclear power reactors to keep radioactivity in effluents as low as practicable.

The comments submitted by Dr. Lewis Battist in this matter will receive careful consideration.

The Commission plans to hold an informal, public rule making hearing on the proposed numerical guides. An appropriate notice pertaining to the hearing, including procedural requirements for participation by interested persons, will be published in the Federal Register in the near future. We shall send you a copy of the notice when it is published.

Sincerely,

LESTER ROGERS

Lester Rogers, Director
Division of Radiological and
Environmental Protection

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Form AEC-318 (Rev. 9-53) AECM 0240 ☆ U. S. GOVERNMENT PRINTING OFFICE: 1970—407-758

DAIRYLAND POWER COOPERATIVE

La Crosse, Wisconsin

54601

September 7, 1971

Mr. W. B. McCool, Secretary
U. S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

I would like to comment on your proposed new regulations for 10CFR part 50 regarding the application of numerical guidance on as low as practicable for radioactive releases to the environment from the operation of light water reactors.

In the proposed rule making, consideration was not given as far as we can determine to the examination of all factors in the risk benefit relationship as it applies to the numerical guidance proposed. More consideration needs to be given to the economics and benefits derived from the application of technology available to control a risk which is in this instance, not clearly apparent.

The risk or increased exposure incurred by operators of the facility in handling concentrated radioactive wastes, required by the new regulations needs to be considered. The containers of waste must be stored and shipped off site which will cause some additional radiation exposure. The maintenance of equipment installed to concentrate low levels of radioactive waste into intermediate levels of waste will also cause increased radiation exposure. Additionaly, there will be some exposure involved in the transportation and burial of these wastes. Some investigations should be made as to the amount of exposure in man-rem on this phase of the operation. Guidance could then take the form of design basis for the installation and maintenance of concentrating equipment.

In examining the man-rem of radiation exposure which the population is exposed to, one can see this relationship in clearer terms. Natural radiation background causes approximately 27,000,000 man-rem annually. The medical uses of radiation cause approximately 18,000,000 man-rem annually. Fallout from previous nuclear testing causes 1,000,000 man-rem annually. During 1970 it has been estimated that 500 man-rem was caused by the operation of power reactors. This does not include the radiation dose incurred by the operators of the facilities which is in the order of 1000-2000 man-rem. From these numbers is it justifiable to cause additional exposure to the reactor operator? If the concern is for as low as practicable there appears to be other areas where control mechanisms should be placed.

Increasing the cost of electricity from additional equipment requirements has to be equated to a benefit. This appears to be an area of diminishing returns and a total examination of the risk benefit equation should give some additional guidance.

From a practical viewpoint, it is not possible with ordinary monitoring devices to monitor doses less than 30-50 millirad per year in the environment. The proposed rule does not specifically concern itself with this area and the question arises will some future requirements be imposed in this area?

Concerning specific limits proposed for liquid releases, it should be realized that the natural background in rivers is many times above 20 picocuries/liter during periods of heavy rain and runoff. Attempting to monitor for this small increase above background will cause analysis problems.

Since the proposed rule requires the development for technical specifications in accordance with 50.36 (a) for currently licensed facilities, I would recommend that consideration be given to the applicability of these new criteria to facilities which were sited under previous rules. Retrofitting facilities where these stringent release considerations were not made, may cause undue hardship on the facility operator as well as unnecessary exposure to facility personnel. Again the risk-benefit relationship must be examined.

I make these comments with the desire that they be considered in your proposed adoption of these rules.

Your very truly,

DAIRYLAND POWER COOPERATIVE

Thomas A. Steele

Thomas A. Steele, Manager
Environmental Department
Certified Health Physicist

TAS/cl

cc: J. P. Madgett
N. W. Moser
M. J. Wise

BALTIMORE GAS AND ELECTRIC COMPANY

GAS AND ELECTRIC BUILDING

BALTIMORE, MARYLAND 21203

JOHN W. GORE, JR.
VICE PRESIDENT
ENGINEERING AND CONSTRUCTION

September 9, 1971

Secretary of the Commission
U. S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

The following comments are offered in response to the proposed amendment to 10 CFR 50 published in the Federal Register on June 9, 1971, which would provide numerical guidelines for radioactive emissions from light water reactors.

We are in complete agreement with the stated purpose of the proposed amendment but have very serious reservations about the possible interpretation of the wording during implementation of this amendment. In order to truly provide numerical guidelines for design objectives and operating technical specifications, we believe that the model which will be used to determine if a particular plant design is in conformance with the guidelines should be clearly and completely defined.

Specifically, the discussion which accompanies the proposed amendment in the Federal Register notice makes it abundantly clear that the guides are based on present operating experience and the guides are intended to apply to normal operations, including expected operational occurrences. The discussion also acknowledges the importance of operating flexibility to take into account unusual conditions of operation. We believe the model should provide for the mutual satisfaction of these two goals.

The present state of technology should and indeed can maintain normal releases at these minute levels, if the new, high-power density fuels behave as expected. However, if all of the ultra-conservative assumptions that are so typical of the licensing review process are included in the evaluation model, we believe the present state of technology is incapable of achieving these levels. The additional equipment and severe operating restraints necessary to maintain these extremely low effluent levels under all possible postulated operating conditions appears to be beyond the "state of the art" and their enforced usage could significantly affect the reliability of the plants.

In summary, we would urge that the model which will be used to determine compliance with this amendment be clearly defined. We also urge that the normal operating conditions which have been the basis for developing the numerical guides continue to be the basis for determining compliance, and the releases postulated by the ultra-conservative assumptions coupled with the abnormal operating conditions be compared with some higher percentage of the 10 CFR 20 limits.

In addition to the above general concern with the proposed amendment, we offer the following more detailed comments on the proposed amendment:

1. The new Appendix I does not include definitive instructions as to when the iodine reduction factor is applicable. The discussion in the Federal Register indicates the reduction factor is not applicable where milk is not a pathway of exposure. Appendix I should include a statement which clearly defines when this factor must be considered, and considering its extremely restrictive nature, local grazing practices should be taken into account.

2. The activity concentration limits appear to be improperly emphasized in view of their limited applicability to once-through condenser cooling water systems on fresh water supplies. They appear to be overly restrictive when applied to plants which are not amenable to once-through condenser cooling water systems. It appears the minority of new sites under consideration are suitable for once-through condenser cooling systems and, in fact, one branch of the Federal Government is promoting the wholesale use of cooling towers for all sites. A preliminary investigation indicates the guides for activity concentrations may be inappropriate for cooling towers because of the limited flow available for dilution and the concentrating effect they have on naturally occurring activity. The objectives of the various branches of government must be compatible and also achievable by industry. We believe that the appendix should emphasize the dose limit rather than the activity concentration values as presently proposed.

3. Guidance should be provided for accounting for the presence of noble gases in the liquid effluent streams.

4. Finally, we would caution that certain applications of the proposed guides might well result in an increased dose to man. If the proposed guides are to be interpreted to require unwarranted retention of radioactivity within the plant, instead of controlled releases, they would necessitate additional facilities and equipment to be operated and maintained. The increased dose to plant operators might well overshadow any reduced dose to the general population, with the net result of an increased dose to man.

We would be pleased to discuss our concerns in greater detail at the public hearing to be held on this proposed rule making.

Very truly yours,

John W. Gore, Jr.

Numerical Guides

DOCKET NUMBER
PROPOSED RULE PR-50

ATOMIC INDUSTRIAL FORUM INC.

475 PARK AVENUE SOUTH · NEW YORK, N.Y. 10016 · (212) 725-8300

August 30, 1971

9/3/71
504

Secretary
U.S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

This letter is prompted by the AEC's Federal Register notice of June 9 proposing amendments to 10 CFR Part 50 "which would supplement the regulation with a new Appendix I to that part to provide numerical guides for design objectives and technical specification requirements for limiting conditions for operation for light-water-cooled nuclear power reactors to keep radioactivity in effluents as low as practicable."

The Forum convened an ad hoc group on July 16, largely from the membership of its Environmental Law & Technology and Reactor Safety committees, to review the proposed amendments. Those comprising the ad hoc group and subscribing to the consensus recorded below include:

Merril Eisenbud (Chairman)	New York University Medical Center
Edwin A. Wiggin (Secretary)	Atomic Industrial Forum
Robert D. Allen	Bechtel Corporation
Shepard Bartnoff	General Public Utilities Corp.
John Conway	Consolidated Edison Company of New York, Inc.
Richard Eckert	Public Service Electric & Gas Company
Walter Gilbert	General Electric Company
Abraham S. Goldin	Harvard University
Morton I. Goldman	NUS Corporation

Douglas Groves	Philadelphia Electric Company
William W. Lowe	Pickard, Lowe and Associates
G. B. Matheney	Consumers Power Company
John D. McAdoo	Westinghouse Electric Corp.
James Smith, M.D.	Society of Nuclear Medicine
John E. Ward	Sargent & Lundy

At the outset, the ad hoc group wishes to record its endorsement of the Commission's intent to quantify its "as low as practicable" limits on the release of radioactive effluents to unrestricted areas. It further endorses the concept of setting such limits in terms of annual radiation exposures to which individuals offsite would be subjected from the released gaseous and liquid effluents. The establishment of such numerical guides, reasonably set, would provide meaningful design objectives while assuring that the dual responsibilities of the nuclear industry and the AEC in protecting public health and safety would be met.

Notwithstanding this endorsement, the ad hoc group is concerned about AEC's implementation of, as well as industry's ability to comply with, regulatory limits of exposure which "would be indistinguishable from exposures due to variations in natural background radiation [and] not be measurable with existing techniques." Moreover, the ad hoc group considers it unfortunate, that the Commission has chosen to propose the rule amendments in the absence of any supporting biomedical evidence or rationale as to the need for the very conservative objectives and prior to the National Academy of Sciences' completion of its comprehensive two-year study on radiation effects and prior to the Environmental Protection Agency's formulation of its criteria on radiation exposure. It is also unfortunate that the AEC press release of June 7 implied concurrence with the proposed amendments on the part of those with whom the AEC met prior to their issuance. It was indicated by a number of the industry representatives who attended the AEC meetings held prior to the development of the numerical guides that the scope of the discussion with the AEC did not include all of the specific numerical limits cited in the proposed amendments.

Time did not permit the ad hoc group during its July 16 discussion to analyze comprehensively the many complex technical implications and interrelationships embodied in the proposed amendments, particularly in the proposed Appendix I. However, the discussion elicited a number of reactions and identified a number of problems which the ad hoc group believes the Commission will wish to consider before adopting the proposed amendments. Among them were the following:

1. Most power reactors now operating and under construction should, in the opinion of the ad hoc group, be able over a reasonable time span to control their effluent discharges so as to meet the basic 5 millirem per year exposure limit from effluents to an individual in the offsite environment. This is not to say that these plants can be

considered to embody this exposure rate as a design objective. This would imply that the operator is assured not only that effluents will in fact be maintained below this level, but that effective surveillance and long-term availability can be continuously guaranteed. In our opinion, this would require procedural, if not hardware, changes in some of these plants.

2. Further to the above point, the ad hoc group seriously questions industry's ability to meet the short-term limits, set forth in that section of the proposed amendments dealing with "operating flexibility" and "graded scale of action by the licensee," on the release of specified quantities and concentrations of specific radionuclides in effluents. On the premise that the AEC is concerned with the long-term dose accumulations, it would seem reasonable to permit operators to discharge over the short-term appreciably higher quantities and concentrations of radionuclides than proposed in Appendix I, provided an average limit of 5 mrem per year is not exceeded. Further, the ad hoc group believes it would be possible, without any compromise of the health and safety protection objectives sought, to permit the 5 mrem/year limit to be averaged over an extended period of time, i.e. a number of years. This, in turn, would permit annual and quarterly rates of release for any given year to be graded upwards on a case-by-case basis to permit the flexibility of operations needed. If both these annual and quarterly rates were set below the 100-125 mrems/year cited by the AEC as the average exposure due to natural background in the U.S. and if the average long-term exposure limit were maintained at 5 mrem/year, AEC's implementation of the proposed rule amendment and industry's compliance with it would both be facilitated.

3. The specific quantities and concentrations of radionuclides that may be discharged in effluents within the dose limits proposed will depend on the site and reactor design characteristics of individual nuclear power plant installations and may or may not conform to the discharge limits called for in Appendix I. The difficulties to which this leads may well be compounded by two other factors of concern to the ad hoc group.

> a. Since the proposed "levels of exposure ... would not be measurable with existing techniques [they] would be estimated from effluent data from nuclear power plants by calculational techniques" - but the proposed rule provides no guidance on what "calculational techniques" would be acceptable to the AEC and no indication that the use of uniform and realistic calculational techniques would be required of all applicants.

b. The second concern relates to a philosophy, long practiced by the AEC regulatory staff, of considering numerical regulatory limits as values which each applicant must in practice improve upon by some order of magnitude. This is simply not going to be possible in this case if the power reactors to be regulated are to continue uninterrupted operations. Furthermore, the AEC licensing review staff should give specific consideration to this point in evaluating models of potential exposure due to measured or postulated releases. The practicality of 5 mrem/year as a long-term average exposure guideline depends on the realism of the transport and uptake assumptions used.

4. The ad hoc group is concerned that an extremely conservative evaluation of the ability of a plant to meet the new limits proposed for offsite radiation exposure will cause an increase in potential onsite exposures due to the necessity to increase the holdup, recovery or recycle of radionuclides in plant fluid streams.

5. The proposed amendments are silent on the extent to which calculated offsite exposures are to be influenced by direct and scattered radiation emanating from the plant.

It is to be hoped that some of these issues and questions can be clarified and resolved during the hearing the AEC has indicated it will hold before the proposed amendments are adopted. However, it is the view of the ad hoc group that a number of the detailed technical questions raised by the proposed amendments are so complex as to require more extensive consideration than could be afforded them through the forum of a public hearing. Accordingly, the ad hoc group suggests that the Commission give consideration to meeting with similar, if not the same, groups it met with prior to issuance of the proposed amendments. The suggestion is premised on the belief that these groups would now be able, on the basis of the information provided by publication of the proposed amendments, to comment more effectively on the AEC's efforts to achieve its objectives. In the meantime, the ad hoc group plans to devote further study to the effluent release limits set forth in Appendix I with the intent of suggesting alternative values where deemed appropriate, together with supporting technical data.

Very truly yours,

Merril Eisenbud, Chairman
Ad Hoc Review Group

ME:jri

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JOHN H. DORSEY
WILLIAM H. COBURN
OF COUNSEL

August 20, 1971

Mr. W. B. McCool
Secretary
Atomic Energy Commission
Washington, D. C. 20545

Re: Proposed Amendment of 10 CFR, Part 50

Dear Sir:

This firm recently submitted comments by Dr. Lewis Battist with respect to the proposed amendment of 10 CFR, Part 50, "Licensing of Production and Utilization of Facilities". We understand that hearings have now been set on this matter. I would appreciate your advising us of the time and place of such hearings and whether it would be possible to arrange for Dr. Battist to give testimony on this subject.

Very truly yours,

Edward C. Berkowitz

ECB:plm

FORM HQ-298 (1-68)

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

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U.S. ATOMIC ENERGY COMMISSION

Edward C. Berkowitz, Esq.
Frosh, Lane & Edson
Suite 707 - Blake Building
1025 Connecticut Avenue
Washington, D. C. 20036

UNITED STATES
ATOMIC ENERGY COMMISSION

Dear Sir: Date..8/23/71.....

Receipt is acknowledged of your communication dated:8/20/71
and postmarked: 8/21/71
concerning: 10 CFR Part 50 - Numerical Guidance

Your request has been referred to the Director of Regulation.

Chief
Public Proceedings Branch
Office of the Secretary
U. S. Atomic Energy Commission

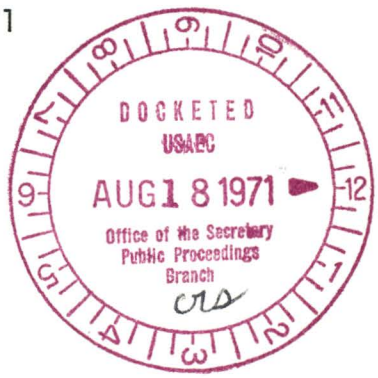
DOCKET NUMBER
PROPOSED RULE PR-50
Numerical Guidance

CONNECTICUT YANKEE ATOMIC POWER COMPANY

WETHERSFIELD, CONNECTICUT
P. O. BOX 270 HARTFORD, CONNECTICUT 06101

TELEPHONE
203-529-7471

August 9, 1971



Mr. W. B. McCool
U. S. Atomic Energy Commission
Washington, D. C. 20545

ATTN: Chief, Public Proceedings Branch

Dear Sir:

The AEC proposed change to 10CFR50, as published in the Federal Register on June 9, 1971, pertained to the establishment of numerical guides for design objectives and technical specification requirements for keeping effluent radioactivity as low as practicable. We have just finished our review of this proposed change in light of its impact on our Connecticut Yankee plant.

Connecticut Yankee has a stainless steel clad core and the requirements associated with conversion to a zircaloy clad core have been studied. Three or four years would be required to convert to a tritium retaining zircaloy core and significant changes to the plant's cooling systems would be necessary. Sustained plant operation within the proposed guides, until a conversion is implemented, will be a difficult problem at best. The tritium contained in the liquid effluent will constitute a significant percentage of the total radioactivity released. As we interpret the proposed change, the average yearly tritium discharges will exceed the guideline concentrations by a factor of two or more. Site boundary exposures, due to the tritium constituent in the liquid effluent, will approach 40% of the guideline limits.

Without relief for operating stainless steel clad cores, continued full power operation with acceptable coolant tritium concentrations will require off-site shipment of approximately 270,000 gallons of tritiated water per year. On-site storage through the use of extensive tankage will only postpone the eventual shipping problem.

Of equal significance is the proposed iodine release criteria. The proposed criteria will require substantial plant modifications and equipment additions. These changes, however, will not assure compliance with the proposed criteria. The apparent 10^5 reduction proposed for iodine, can potentially require modifications to the plant's procedures which would be reflected in the plant's availability. It is suggested that the proposed iodine criteria be reviewed

Acknowledged by card 8/18/71 ors

to establish whether or not it exceeds the intent of as low as "possible to practice".

Sincerely yours,

D. C. Switzer

D. C. Switzer
President

CJR:slj

DOCKET NUMBER
PROPOSED RULE PR-50
Numerical Guidance

Atomics International
North American Rockwell

P.O. Box 309
Canoga Park, California 91304

August 11, 1971

In reply refer to 71AT3188

Secretary
U. S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

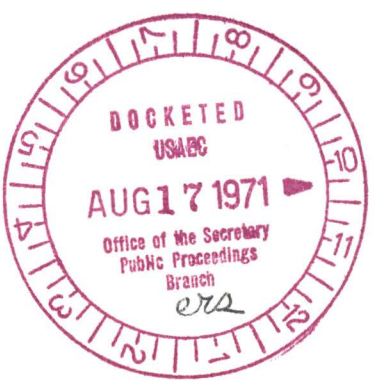
Gentlemen:

We have reviewed the proposed supplement to the Commission's regulation "Licensing of Production and Utilization Facilities" 10 CFR Part 50 published in the Federal Register June 9, 1971. We agree with the numerical criteria approach for design objectives and submit the following comments for your consideration.

1. The radiation dose - exposure rate terminology used in Appendix I for gaseous effluents - should be more carefully worded to assist in the correct interpretation by the designers. Is there an intent to place an instantaneous or short time period dose rate limit when the term "rate" is used in Section II. B. 1 and Section IV, or are the dose rate limits on calculated annual and quarterly averages?

   We prefer the use of "dose equivalence" as used in footnote 4, when referring to the numerical values in millirems of annual exposure used throughout the text.

   With reference to the allowable dose equivalent from noble gas exposure, is the skin to be considered as a candidate organ with the same limit (i.e., 5 millirem/year)?



Acknowledged by card 8/17/71 ors

2. It is recommended that a separately stated limit substantially less than 5 curies/year be added as a design objective for effluent release from the laundry, laboratory and other building drain systems so this area will be designed for the same degree of monitoring control as similar laboratories separate from nuclear power reactors and independent of the dilution available with different cooling cycles (cooling towers or direct).

Sincerely yours,

H. Dieckamp
President
Atomics International Division

Numerical Guidance

DOCKETED
PROPOSED RULE PR 50

CHAIRMAN
~~DAVID BRANDON, DIRECTOR~~
~~OFFICE OF EXAMINING COORDINATION~~

State of New York
ATOMIC ENERGY COUNCIL
Department of Commerce
112 State Street
Albany, N.Y. 12207

EXECUTIVE SECRETARY
NEAL L. MOYLAN
COMMISSIONER OF COMMERCE

August 10, 1971

Mr. Woodford B. McCool
Secretary
U. S. Atomic Energy Commission
Washington, D. C. 20545

Acknowledged by card 8/16/71

Dear Mr. McCool:

Members of the New York State Atomic Energy Council have reviewed the amendments to 10 CFR 50 concerning the numerical guidance for implementing the "as low as practicable" concept for light water cooled nuclear power reactors as published in the June 9, 1971 issue of the Federal Register (36 FR 11113-11117).

In general, we support the intent of the amendments - to minimize the individual and public exposure to radiation from light water cooled nuclear power reactors by using currently available technology. However, there are still a number of questions concerning these amendments which are of importance to New York State. These may or may not have been considered earlier in the rule making procedure.

Our main points of concern are outlined below:

1. In order to maintain environmental emissions at or below the levels in Appendix I, some modifications in operation and equipment may be necessary. We are interested in any estimates you may have made of increased waste shipments offsite as a result of these modifications and any additional regulations concerning transportation and waste management that may be under consideration. In addition, we are also interested in an estimate of any effects such modifications may have on occupational exposure levels.

2. We agree with the approach taken that these amendments are guides and objectives rather than standards. At the present time it is not technically possible to detect significant variations from natural background at the levels discussed, and consequently, it would be impossible to enforce these levels -

with the exception of the quantity and concentration limits. For this reason we support the position that the Technical Specifications for a specific reactor should include quantity and concentration limits that reflect the guides in Appendix I. We feel that members of the Commission staff should work closely with the individual facility operators and appropriate state agencies to determine the most meaningful effluent monitoring program for the facility. Since there are at least two nuclear power plant complexes developing within New York State, we would like to know what steps the Commission staff plan to follow to implement these guidelines and what specific effects such implementation may have on the nuclear power industry in the State.

3. We strongly suggest that a cost-benefit study be undertaken (perhaps jointly with EPA) of the complete fuel cycle in the near future. This study should address itself to the question of what point in the fuel cycle could be modified to yield the greatest reduction in exposure per unit cost. Some areas that might be considered are tighter fuel fabrication specifications, upgraded quality assurance programs or modification of fuel reprocessing operations. The results of such a study would offer a firm basis for decisions in developing similar guides for facilities and users other than nuclear power reactors. These would include: fast breeder reactors, research and training reactors, licensed radioactive materials users, fuel fabrication facilities, and reprocessing facilities.

We appreciate the opportunity to comment on these amendments.

Sincerely yours,

Neal L. Moylan
Executive Secretary

cc: New York State Atomic Energy Council Members
Agreement States
William Ruckelshaus
Russell Train

ENVIRONMENTAL D[redacted]SE FUND

162 OLD TOWN ROAD
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DOCKET NUMBER
PROPOSED RULE PR -50 (Numerical Guidance)

August 11, 1971

The Honorable W. B. McCool
Secretary
U.S. Atomic Energy Commission
Washington, D. C. 20545

Acknowledged by card 8/16/71

Dear Mr. McCool:

In our comments submitted by letter dated August 7, 1971, the first sentence of the last beginning paragraph on the first page contains a proof-reading error. That sentence should read as follows:

> It would appear abundantly clear that inasmuch as a most important factor in establishing the numerical guides set out in the proposed regulations is, or at least should be, consideration of the public health and safety, whatever final numerical guides are determined for light-water-cooled power reactors, similar appropriate guidelines should then be made applicable to other nuclear facilities.

It would be greatly appreciated if you would incorporate this letter as part of our comments.

Many thanks for your attention to this matter.

Sincerely yours,

Edward Lee Rogers

Edward Lee Rogers

ELR/mlr

DOCKET NUMBER PROPOSED RULE PR-50
Numerical Guidance

PACIFIC GAS AND ELECTRIC COMPANY

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August 11, 1971

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ATTORNEYS

Secretary
U. S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings
Branch

Gentlemen:

We have the following comments on proposed Appendix I to 10 CFR 50 and the related notice published in 36 F. R. 11113:

Page 11113, Column 3, Paragraph 2

> "Under the President's Reorganization Plan No. 3 of 1970, the Environmental Protection Agency (EPA) is responsible for establishing generally applicable environmental radiation standards for the protection of the general environment from radioactive materials. The AEC is responsible for the implementation and enforcement of EPA's generally applicable environmental standards."

We have already begun design studies for a new nuclear plant and are committed to studies at an existing plant based on the criteria proposed by the AEC in Appendix I. Since the above paragraph clearly states that the EPA is the responsible agency for establishing generally applicable radiation standards, we are faced with the dilemma of a commitment of resources and designs based on an AEC implementation program before the EPA has published its guidelines. To state simply that "the AEC will modify those objectives and limits as necessary" to fit any new EPA guidance does not appear to give full regard to engineering and administrative details of design changes. Under these circumstances, the proposed Appendix I appears to be premature, and consideration should be given to withholding the guideline until there are published and accepted criteria from the EPA.

Acknowledged by card 8/13/71 ers

Page 11115, Column 1, Paragraph 3

> "Conformance with the proposed guides for design objective quantities and concentrations in effluents would provide reasonable assurance that the resultant whole body dose to the total population exposed would be less than about 400 man-rems per year per 1,000 megawatts electrical installed nuclear generating capacity at a site from radioactive material in liquid and gaseous effluents. Average exposures to large population groups would be less than 1 millirem per year."

In this paragraph, which appears as general information before the proposed changes to 10 CFR 50 are presented, reference is made to the less than 400 man-rem allowable exposure to the general population as a design objective associated with a 1000 MWe power plant. However, in Appendix I proper no reference is made to 400 man-rem or to a 1000 MWe power plant as a reference plant size. To avoid questions on how to prorate exposures, annual releases, etc. for plants with outputs greater than or less than 1000 MWe, and on how to apply the 400 man-rems, it is suggested that all references to 1000 MWe and 400 man-rems be deleted in future documents.

Page 11116, Column 1, Paragraph 1

> ". . . will generally be less than 5 percent of exposures due to natural background radiation and average exposures to sizeable population groups will generally be less than 1 percent of exposures due to natural background radiation." (emphasis added)

The use of the words "sizeable population" without further guidance is unclear. There is an intuitive feeling that "sizeable population" refers to population groups some distance from the reactor site and cities of sizes larger than perhaps 100,000 people. It is suggested that use of the "low population zone" as defined in 10 CFR 100 may add some clarity. The suggested sentence would read in part:

> ". . . will generally be less than 5 percent of exposures due to natural background radiation and average exposures to populations in excess of 100,000 outside of the low population zone as defined in 10 CFR 100 will generally be less than 1 percent of exposures due to natural background radiation."

Page 11116, Column 1, Paragraph 2, Items A-2 and A-3

> "The estimated annual average concentration of radioactive material prior to dilution in a natural body of water. . . ." (emphasis added)

The proposed concentrations of 20 pCi/l for gross beta-gamma and 5000 pCi/l for tritium cannot always be met without some form of dilution. Reactors that have once-through condensers use this water for dilution of the radiation wastes prior to discharge into the nearby water system and therefore can possibly meet the criteria. As written, the distinct possibility exists that an interpretation could be made that would require a facility that uses cooling towers to pump additional flow for dilution on to the site to meet the radiation discharge concentration criteria. The question of the meaning of "prior to dilution in a natural body of water" becomes one of semantics as to whether the water is pumped to the plant for dilution or whether dilution can occur with the same volume of water in the main water course. If the discharge limits must be specified, total curie quantities and/or the limits specified in 10 CFR 20 would be more appropriate.

We also believe that consideration should be given to the complete deletion of the total curie limits and concentration limits in parts A and B of Section II. As stated in part C, the intent of Appendix I is to define "as low as practicable" and keep the dose limits to 5 millirems per year. With this intent, the total curie quantities and concentrations of radioactive effluents should be developed for each plant and given in the Technical Specifications for that plant after considering the local environmental dispersion factors that could lead to 5 millirems per year. The setting of both effluent limits and exposure limits is not consistent.

Page 11116, Column 2, Paragraphs 2 and D

> ". . . will not result in annual exposures to the whole body or any organ of an individual in excess of 5 millirems." (emphasis added)

The imposition of a 5 millirem annual exposure limit to all body organs as well as to the total body is imposing an additional and unnecessary safety factor. The limiting exposure of 5 millirems for the total body represents a factor of safety of 100 over the ICRP, NCRP and FRC guidelines for an individual in the general population. The use of a 5 millirems per year limit to the gastrointestinal tract, for example, represents a safety factor of 300 over the 1500 millirems allowed and determined as being safe by the ICRP and NCRP. To then require a dose analysis for individual body organs as well as for the total body is an unnecessary and time-consuming detail.

As a general comment, the proposed changes to 10 CFR 50 are closely coupled with the proposed Safety Guide for Monitoring and Reporting of Effluents and Environmental Levels dated June 23, 1971. Accurate measurements of low levels of radiation in the environment such as 5 millirems per year above the variable natural background and gross radioactivity measurements in the picocurie per liter range for control purposes in nuclear power plants are unattainable with present day field type instruments. It therefore follows that the implementation of the proposed guidelines in 10 CFR 50 will require the development of uniform models for transport of radioisotopes in the air and water and for the assessment of radiation exposure to the general population. Until an evaluation has been made of the levels of accuracy that can be attained in such analyses, the selection of definite values of exposure, emissions and effluent concentrations for legal limits appears to be premature.

Very truly yours,

John C. Morrissey

JOHN E. WARD
ASSOCIATE

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August 9, 1971

Via Airmail

Mr. W. B. McCool
Secretary of the Commission
U.S. Atomic Energy Commission
1717 H Street
Washington, D.C. 20545

Dear Sir:

The comments herein are offered in response to the notice of proposed rule making concerning effluent standards for light water reactors published in the Federal Register on June 9, 1971.

Generally, the formulation of numerical guidelines to define the principle of "as low as practicable" is supported. However, it must be emphasized that no new biomedical evidence has prompted this reduction in the standard for effluent activity as outlined in 10CFR20. The recently completed ten year review by the National Council on Radiation Protection and Measurements (NCRP) found no reason to change the dose limits for individuals or for population groups (i.e., 0.5 and 0.17 rems per year respectively). Although the introductory information discusses this fact, the actual language of the amendment merely states the new levels. I believe it imperative to emphasize in the language of the amendment itself that these new levels are 1,000 times less than those at which any recognizable radiation injury to man has been observed.

The limitation of these new effluent guidelines to light water reactors seems unwarranted. Air and water quality standards are applied to all sources impartially. Why should an effluent radiation standard be drafted for light water reactors that cannot be met by other radioactive materials users?

The guidelines as proposed appear to require prompt Commission action, presumably to protect the public, if the effluent activity reaches a point where the "fence post" dose would reach 20 mrem per year. I do not believe that it is the Commission's opinion that 20 mrem per year at the site boundary is an unsafe condition, but the language of the amendment would lead one to that conclusion.

The introductory statement lists the organizations consulted in drafting this proposed change. Although representatives of the organizations listed (and I was one) did attend meetings with the AEC Staff on the subject of defining "as low as practicable," no concensus was reached nor were any specific limits on selected isotopes discussed. The implication that the listed organizations support the guidelines is not warranted.

It is recommended that:

a) The proposed amendment be held in abeyance until EPA, ICRP, NCRP, and the National Academy of Science can determine their validity and necessity.

b) Any standards proposed be applicable to all radioactive effluents, not just those from light water reactors.

c) Effluent limits be expressed in terms of dose to man and not place any specific limits of unique isotopes that are inconsistent with the overall dose limit goal (as in the case for I^{131} and tritium).

d) That the language of the amendment be clarified to show that these lower levels are guidelines for design and not standards for operation.

e) That the upper limit for continued operation of the reactor plant or radioisotope user facility be as presently stated in 10CFR20.

In conclusion, the goal of reducing the level of radioactivity being released from all sources is a concept that must be supported. Radioactive material users should be required to design for minimum practicable release levels. However, the minimum practicable design level should not be established as the upper limit for operation. If the limits of 10CFR20 are valid, as the NCRP confirms, then there is no scientific or biological reason I am aware of for lowering the operational limits for reactor operation, however desirable it may be to tighten up the design.

Yours very truly,

J. E. Ward
Head, Nuclear Licensing Division

JEW/fp
cc: WRS
RWP
WAC

BUSTION DIVISION, COMBUSTION ENGINEERING, INC.
WINDSOR, CONN. 06095
203-688-1911 CABLE: COMBENG

DOCKET NUMBER
PROPOSED RULE PR-50
Numerical Guidance

COMBUSTION DIVISION

August 6, 1971

The Secretary of the Commission
U. S. Atomic Energy Commission
Washington, D.C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

This is in response to the Commission's invitation for comments on proposed amendments to 10 CFR 50 which would add Appendix I, Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "as Low as Practicable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents, as published in the Federal Register June 9, 1971.

The following comments are keyed to the section number and paragraph of the proposed Appendix I.

Section I - Introduction, paragraph 1

The term "expected operational occurrences" should be clearly defined prior to issuance of the proposed regulations in order that the applicability of these regulations to various plant operational modes is crystal clear to the utility owner and NSSS supplier, as well as the regulatory authorities. The meaning intended for this category of events should be consistent with the 10 CFR 50 Appendix A, General Design Criteria, and the ANS N-18.2, Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants. We suggest that the meaning of this term "expected operational occurrences", cover the same plant conditions as the N-18.2 Condition 1; Normal Operation. It should not encompass the conditions listed under anticipated operational occurrences in 10 CFR 50, Appendix A, nor the conditions listed under N-18.2 Condition 2; Faults of Moderate Frequency.

It is suggested that the proposed regulation be limited to normal plant operation until such time as experience with the current generation of plants provide some assurance that faulted or transient conditions can be accommodated within these highly conservative regulations.

Acknowledged by card 8/11/71, ers

Section II - Guides on design objectives for light-water-cooled nuclear power reactors licensed under 10 CFR 50

Paragraph 1

The statement concerning 5 percent and 1 percent of natural background radiation does not appear to consider the possible effects of cooling towers. Since the use of cooling towers is increasing, we recommend that their effect on liquid and gaseous discharges be carefully evaluated, prior to the adoption of overly conservative limits on the basis that these limits can be met with the current state of technology (including recent improvements). The effects of cooling towers on meeting the proposed regulations should include the following considerations:

a. The dilution flow rate for radioactive discharges of plant origin will be reduced; and

b. The natural background activity in the vicinity of the plant will tend to increase due to the evaporative process. Both blowdown and carryover from these cooling towers will be above natural background levels. As a qualitative measure of the carryover effect, it has been estimated that, for a typical 800 Mwe plant, 210 tons of salt per day would be sprayed over the surrounding terrain should evaporative salt water cooling towers be used.

In order to permit evaluation of the proposed quantitative limits for a given site, it is vital that a detailed description be provided of the model used by the AEC in relating the radioactive liquid and gaseous allowable releases to the radiation exposures of individuals at the site boundary and of sizeable population groups. In addition to the above cited problems associated with the use of cooling towers, the following additional questions arise because the AEC model is not known:

1. Why are the liquid discharge limits specified for each unit at a site, and the gaseous limits specified for all units at a site?

2. What is the assumption with regard to the relative location of all reactor sites which could affect "sizeable population groups". This is particularly important for plants located on the same body of water as it affects the background concentration of the dilution water. This and related assumptions should be identified in the AEC model mentioned above.

We acknowledge the desirability of a flexible approach on the part of the applicant and the regulatory authority in determining conformation to the stated goal of the proposed regulations. However, we wish to point out a number of important problems associated with paragraphs A, B, C, and D from the view point of a NSSS vendor as well as a utility applicant.

Paragraph A

Paragraph A applies to liquid effluents released from each LWR at a site. Hence, it is important to specify what rigorously constitutes a site and to present the bases for the specified radioactivity quantity and concentration limits in terms of the considerations in the AEC model with regard to site size, assumed distances between sites, and relationship between sites on the same and separate bodies of water. These considerations are required in relating activity releases to the radioactive material burden to the environment and the subsequent negligible dose to "sizeable population groups".

It is not apparent whether allowances have been made, in the specification of the 5 Ci/yr. liquid effluent limit, for the presence of dissolved gases in the liquid effluents or whether the assumption has been made that all radioactive gases are separately discharged as gaseous effluents. Calculations indicate that a liquid-gas separation efficiency of 99.999 percent would be required to meet the 5 Ci/yr. limit if the radioactivity contribution of dissolved gases present during liquid discharge are included. Equipment of this capability is unproven for the intended service. Furthermore, extremely high availability of gas stripping equipment would be required to limit noble gas discharged with liquid effluents to below 5 Ci/yr. To eliminate this problem, we recommend that paragraph A 1. be reworded as follows:

1. The estimated annual total quantity of radioactive material except for tritium and noble gases, should not exceed 5 curies. The noble gases dissolved in the plant liquid effluents after dilution should not exceed 10^{-2} μCi/cc in concentration.

Paragraph B.2

It is not clear whether the specified annual average concentration limits apply to all radioactive iodines, or to only those iodines with a half-life greater than 8 days. This paragraph should be reworded to remove this ambiguity.

The rationale for reducing the 10 CFR 20 specified limits by a factor of 10^5 should be presented in the statement of consideration for the proposed regulations. We see no justification in a uniform reduction of this large magnitude for all radioactive material in particulate form with a half life greater than 8 days, unless a concentrating mechanism of about 10^3 magnitude indeed does exist for each applicable isotope. The justification or basis for the 10^5 factor for all iodines (if this is what is meant) and all other particulate activities with $T_{1/2} \geq 8$ days should be presented.

Paragraph C.2

The 5 mrem criterion is applied to the whole body or to any organ uniformly, whereas it has been recognized in 10 CFR 20 and in the recommendations of the Federal Radiation Council that all portions of the body are not equally sensitive to damage from radiation. Application of the 5 mrem criterion to any organ is tantamount, for example, to an additional arbitrary reduction by a factor of 3 in the allowable thyroid dose.

Paragraphs C and D - General

In essense, paragraphs C or D specify the basic limits for annual exposure of an individual in the offsite environment from either liquid or gaseous releases. Hence, the quantity and concentration release limits given in paragraphs A and B do not represent firm limits and are thereby subject to change, with justification, so as to meet the basic requirements of paragraphs C or D in consideration of the particular site characteristics. The missing ingredient in the proposed amendment is the AEC model used in relating the quantity and concentration release limits of paragraphs A and B to the annual exposure limits of paragraphs C or D. In order to provide clean cut guidance to the applicant for use in site selection and choice of processing equipment, it is necessary that: (1) the AEC model used be presented (either within the proposed amendment or by references); (2) the site-related factors assumed in the model formulation and/or model parameters be identified; and (3) representative sites for which the AEC model is deemed applicable be identified. Through this approach, a more rational basis would be possible, with inherently less uncertainty, in the specific application of the proposed amendment.

Section IV, Paragraph C

We recommend that the cutoff date for this regulation be set as 60 days after the proposed regulation becomes effective rather than January 2, 1971. The January 2, 1971 date would require that rapid commitments be made for plants already in the licensing process, and in any case, all plants must meet these requirements within three years. The 60-day period would allow proposals for NSSS(s) outstanding at the time of enactment of the proposed regulation to be updated using the new regulations.

Summary

The adoption of highly conservative radioactivity release limits on the basis of present equipment capability (including recent improvements) can result in unwarranted serious limitations on plant operation if the bases and associated assumptions used turn out to be invalid from the standpoint of actual radioactivity sources and/or equipment performance. The likelihood of any prior quantitative assessment of "as low as practicable" being invalid increases substantially with reduction in dose limits to small fractions of natural background radiation.

Identifications of the AEC model, along with its bases and assumptions, for relating radioactivity releases to resultant exposure values is required to provide clear cut guidance in site selection and equipment specification. A summary of site information required to check conformance to the proposed regulations should be provided in order that the utility can prepare adequate plant specifications for the design of waste treatment systems.

Very truly yours,

J. M. West/MTV

J. M. West
Vice President
Nuclear Power Department

JMW/cdd

NORTHEAST UTILITIES

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August 3, 1971

Mr. W. B. McCool
U. S. Atomic Energy Commission
Washington, D. C. 20545

ATTN: Chief, Public Proceedings Branch

Dear Sir:

With reference to the AEC announcement published in the Federal Register, June 9, 1971, we have reviewed the proposed change to 10CFR50 pertaining to the establishment of numerical guides for design objectives and technical specification requirements for limiting conditions for light water power reactors to keep effluent radioactivity as low as practicable.

It is felt that the AEC should consider interim relief for operating plants with stainless steel clad cores. During the required plant modification lead time necessary to convert from the present stainless steel clad core to tritium-retaining zircaloy clad cores, three to four years, the tritium contained in the liquid effluent will constitute a significant percentage of the total radioactivity released. This tritium constituent will undoubtedly cause operational difficulty in keeping the annual site dose due to liquid effluent below 5 millirem.

It appears that without any interim relief for operating stainless steel clad cores, continued full power operation may be predicated on the off site shipment of approximately 8500-55 gallon drums of tritiated water per year. On-site storage by the installation of extensive tankage only postpones this shipping problem.

A second aspect of the proposed change to 10CFR50 is the allowable concentration of radionuclides in liquid effluent prior to discharge into any natural body of water. There appears to be no operational problem meeting these limits with a once-through cooling system since the flows are typically 450,000-650,000 gallons per minute. However, cooling towers on power plants are becoming increasingly desirable to minimize the plant's impact on the

THE CONNECTICUT LIGHT & POWER COMPANY
THE HARTFORD ELECTRIC LIGHT COMPANY
WESTERN MASS. ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY

environment. A consequence of cooling towers is a significantly reduced coolant discharge of about 7,000 gallons per minute. Obviously, the consequence of this difference is either a greater concentration of released tritium or tremendous quantities of tritiated water being drummed for off site burial.

While the above concentrations of tritium in the liquid effluent may be permitted by compliance with the site boundary dose requirement, not complying with the tighter of the two requirements (site boundary dose and release concentrations) poses serious problems with respect to public acceptance of the plant. A singular requirement which already accounts conservatively for site characteristics, the site boundary dose, should only be retained and not encumbered by a fixed concentration of radioactivity release effluent.

Preliminary studies have been made to assess the impact of the proposed criteria for iodine. It appears that the proposed iodine criteria, considering the milk chain, is reduced by about 10^5 and will require additional plant modifications and equipment as well as significant changes to the plant operating procedures. Even these changes do not assure compliance with the proposed iodine criteria. It is therefore suggested that this proposed criteria be reviewed to establish that it can actually be achieved.

Finally, it is felt that in some cases such as with operating plants, compliance with the proposed change may require additional equipment and systems. There is little doubt that upgrading of treatment systems should be made when technology is available. However, modifications should be made only once. To avoid a possible second modification, the proposed change to 10CFR50 should be approved as final by the Environmental Protection Agency before the proposed change becomes effective.

Very truly yours,

Donald C. Switzer
Executive Vice President

CJR:slj

ENVIRONMENTAL DEFENSE FUND

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516 751-5191

Numerical Guidance
DOCKET NUMBER PR -50
PROPOSED RULE

Acknowledged by card 8/10/71
SM

August 7, 1971

The Honorable W. B. McCool
Secretary
U.S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Re: Comments of the Environmental Defense Fund on Proposed Amendment to 10 CFR Part 50, "Licensing of Production and Utilization Facilities," 36 Fed. Reg. 11113

Dear Mr. McCool:

The Environmental Defense Fund has the following comments on the proposed amendment referred to above.

It is stated that the "proposed numerical guide * * * . * * * would be specifically applicable only to light-water-cooled nuclear power reactors and would not necessarily be appropriate for other types of nuclear power reactors and other kinds of nuclear facilities." Previously, however, in considering the same subject, the Commission ruled that the "as low as practicable" principle would by amendment to the regulations be made applicable "to include all nuclear power reactors rather than light-water-cooled power reactors only." At the same time, the Commission announced that it was giving "further consideration * * * to specified design and operating requirements to minimize radiation exposures from radioactivity released in effluents from other types of production and utilization facilities such as fuel reprocessing plants."

It would appear abundantly clear that inasmuch as a most important factor in establishing the numerical guides set out in the proposed regulations is, or at least should be, consideration of the public health and safety, whatever final numerical guides are determined for light-water-cooled power reactors should then be made applicable to other nuclear facilities. It is anticipated that the Commission will, then, be promulgating proposed amendments to the regulations to establish numerical guides

for other reactors and all other nuclear facilities that will be consonant with these overriding considerations of public health.

Stated in different words, the premise on which we view this situation is that the presently "established radiation protection guides" are, in the light of both technical advances and the greater sophisticated knowledge today regarding radiation hazards, for all practical purposes obsolete. While they remain the official standards, the actual ground rules "for design objectives and technical specification requirements for limiting conditions for operations" are,as the proposed amendments make clear, to be established in accordance with the "as low as practicable" principle. It follows that the focus of the proposed amendments should be on clarifying and implementing that principle -- and not simply on assuring that radioactivity in effluents do not exceed a certain percentage of the established radiation protection guides.

The proposed amendments under discussion are certainly a step in the right direction in these respects for they do establish numerical guides for implementing that principle. This is a major improvement over prior rulings on this subject. Nevertheless, because of the influence of the continued existence of the established radiation protection guides and apparently because of undue concern "that the public is provided a dependable source of power even under unusual operating conditions which may temporarily result in releases higher than such numerical guides," the proposed amendments fail in various respects to give adequate significance to and implement as fully as is desirable the "as low as practicable" principle.

For example, it is stated that "The proposed guides for design objectives* * * have been selected primarily on the basis that existing technology makes it feasible to design and operate light-water-cooled nuclear power reactors within the guides." It would appear to be beyond serious argument, however, that even if it is particularly difficult to measure biological hazards of extremely low doses of radiation, it is likewise practically impossible to establish truly safe levels of radiation exposure. It

necessarily follows that (in the absence of updated radiation protection guides) the proposed numerical guides should be considered primarily as requirements for protecting the public health from undue hazards. Obviously, the development and operation of an atomic energy industry has involved the balancing of public health hazards and safety risks against the needs for growing electrical power. Whether or not that balance has been properly struck in the past, it is morally imperative that when a technological advance permits a lowering of the risks to the public health it be fully implemented and enforced. Therefore, it is suggested that the proposed amendments be modified to reflect that the proposed guides are being adopted primarily because they are feasible and because their implementation and full enforcement will reduce the risk of public health hazards from radiation.

In connection with this point, this Commission has previously recognized "that there will be a marked increase in the number and size of nuclear power reactors in operation in the future and that other activities that contribute radiation exposure to the public can be expected to increase." 35 Fed. Reg. 18387 (1970).

The proposed guides for reduction of radioactive iodine or radioactive material in particulate form are excellent and should be implemented fully. Again, however, there appears to be some confusion as to the reasons for adopting these new standards. For example, it is stated that the "factor is highly conservative for radionuclides other than iodine and is applied only because it appears feasible to meet these very low levels." It should be pointed out that public policy requires reducing such risks or hazards to public health wherever possible and therefore the reductions are called for.

Turning to proposed Sec. 50 . 36a(b), Sec. IIC, it is stated that the "lowest practicable" principle may be deemed to have been satisfied "if the applicant provides reasonable assurance" that the releases from the reactor will not result in annual exposures to the whole body or any organ" in excess of 5 millirems. "

This removes the applicability of the numerical guidelines set out in the preceding paragraph A and B of the proposed regulations in favor of a "reasonable assurance" standard. Such a standard is entirely too vague, particularly since we are here concerned with design objectives, where more specific criteria could be imposed upon the applicant. It is therefore recommended that instead of the "reasonable

assurance" standard, the applicant be required to explain precisely why it is not feasible for it to meet the numerical guide standards as well as give precise assurances as to how the five millirem exposure rule will be satisfied.

Turning to Section III regarding limiting conditions for operations, here again the precise numerical guides are dispensed with under "unusual operating conditions" in favor of a general requirement that "annual exposures to the public are small fractions of natural background radiation." The only sanction imposed by the regulations on the licensees under these circumstances is the general admonition that "It is expected that * * * the licensee will exert its best efforts to keep levels * * * within the numerical guides for design objectives."

Leaving aside, for the moment, the situation when the release levels exceed twice the design objective numerical guides, covered in Section IV, there should be a specific requirement in Section III that at any time levels exceed the numerical guides the licensee must report such conditions, including their extent and duration to the Commission.

The Commission should require that the applicant make such excess figures a matter of public record or publish them itself. Full disclosure of all such problems will help to reassure the public that it is being fully informed of the operating conditions of these reactors and the radiation exposures resulting therefrom.

Turning to Section IV, paragraph A should be modified to provide that the first requirement upon the licensee under those circumstances should be to notify the Commission as suggested in Section III above.

In paragraph B of Section IV, the requirement that the Commission will take appropriate action is a sound provision, but it should be specified that among other alternatives, the Commission, in the exercising of its discretion, may order the termination of operations until the condition is corrected. This requirement is in keeping with the premise previously outlined herein that however the balance

has been struck between the risks and benefits of nuclear power reactors as discussed before, reducing the risks to public health as is now feasible because of technological improvements requires that the numerical guides not be exceeded for any substantial period of time because the protection to the public health is of paramount importance.

The following comments are not to suggest that the "as low as practicable" principle is the final answer to the need for more specific guidelines and standards. However, until the radiation protection guides are revised, as an interim measure, the low as practicable principle should be fully implemented by enforcing the numerical guides set out in the proposed regulations.

Respectfully submitted,

Edward Lee Rogers

Edward Lee Rogers
General Counsel

ELR/mlr

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LEWIS RESEARCH CENTER
CLEVELAND, OHIO 44135

REPLY TO
ATTN OF: 1005

August 6, 1971

Secretary, U.S. Atomic Energy Commission
Attn: Chief, Public Proceedings Branch
Washington, DC 20545

Subject: Comments on Proposed Amendments to 10 CFR Part 50 on Guides for Radioactivity Levels of Effluents

This letter is in response to the proposed amendment to Title 10 CFR Part 50 as published in the Federal Register, June 9, 1971. The views expressed below are those of the NASA-Lewis Research Center and do not necessarily represent the views of the entire NASA.

While the proposed regulations do not, of course, apply to our Plum Brook Reactor Facility, we believe our experience will be helpful in your consideration of the subject. We are further interested since numerical guides and limiting conditions promulgated for light-water-cooled nuclear power reactor effluents may serve as precedents and in future proceedings bear on revisions to effluent limits applicable to research facilities such as ours.

We are well aware of the sensitivity of the question of levels of radioactive effluents and agree with the desirability of maintenance of these levels as low as practicable. We believe our plant and experiment designs and operating practices have been consistent with this concept. This is why we are concerned that the proposed numerical guidelines will have the opposite effect to that desired.

The essence of our concern, which we will illustrate in some detail below, is twofold:

(1) For gaseous effluents, by setting limits several orders of magnitude below the level of immediate detectability, and hence corrective control, gross violation can occur and not be known until after the fact. The concurrent requirement for reporting minimal and non-dangerous violation (2-8 times) of the reduced limits when occurring will magnify a minor situation to what appears a problem to the public.

(2) For liquid effluents, no benefit is allowed for identification of the constituents of the effluent, although there is a wide

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range in the potential hazard from different isotopes. This appears contrary to most practices of pollutant control and inconsistent with the treatment of gaseous effluents.

The following comments discuss the proposals and illustrate what the effect of the amendment would be if applied to our facilities. We believe similar problems would exist for light-water-cooled power reactors.

1. Proposal for the reduction in maximum permissible concentration values for airborne radioactive iodines and particulates with a half-life greater than eight days by a factor of 100,000:

a. The state-of-the-art for detection equipment used in stack effluent monitoring has not advanced to the point where the proposed concentration guide limits can be detected. The stack monitors in operation at our facility would have to be 400 times more sensitive to radioiodine and 50 times more sensitive to particulate beta-gamma emitters to detect the proposed guide limits even after taking advantage of our average atmospheric dilution factors. Thus, under average weather conditions we could release, without immediate detection, in one brief period less than 24 hours, iodine 131 in quantities that averaged over an entire year would exceed the guide limits. We would know that the limits had been grossly exceeded when the stack monitor air filter and charcoal cartridge were counted in the laboratory several days later. Under our worst weather conditions we could exceed, without immediate detection, the proposed permissible limits by factors of 10,000 for iodine (or a 25-year release in less than 24 hours) and by a factor of 1200 for particulates (equivalent to more than a three year release).

b. Our laboratory counting equipment for particulate alpha emitters is only sensitive enough to detect 10 times the activity of the proposed guide, taking into account the average atmospheric dilution factor from the stack to the site boundary. Under the worst weather conditions it cannot detect less than 250 times the proposed guide limits.

c. In view of a. and b. above, the probability of exceeding the numerical guides and thus having to submit frequent reports to the AEC appears to be quite high. This is not indicative of a lack of controlled operation but rather is due to the highly conservative nature of the guides. The large number of such reports going in to the AEC will appear to the uninformed to be an indication of poor operating control of effluents and of basically unsafe conditions existing in the nuclear power industry. We feel that such stringent

guides may produce a public back-lash protesting the apparent insult to the environment. This could place the nuclear industry in a less defensive position than at present without providing a proportionately safer environment.

2. Proposal for limiting liquid effluent annual average concentrations (except tritium) to 2×10^{-8} μCi/ml:

   The proposed liquid effluent guide (2×10^{-8} μCi/ml) does not permit the use of the less restrictive MPC values listed in Appendix B of 10 CFR 20 where identification of effluent constituents is possible. The proposed amendment effectively negates the Appendix B Notes. Since the MPC of individual isotopes depends upon the physical and chemical properties of the isotopes and how they metabolize in the body, the MPC's vary by as much as a factor of 100,000 for different isotopes. The use of a single guide limit derived from the MPC's of the more hazardous isotopes and applied to all liquid effluents regardless of their constituents therefore appears unnecessarily restrictive and imposes needless penalties on facilities that can readily identify their effluent contents. The average MPC value of the mixture of isotopes normally present in our effluent is approximately 2×10^{-6} μCi/ml. The proposed guide limit is therefore 100 times less than the MPC values we presently use and would require deionization of large quantities of water with no real gain.

3. Proposal for reduction in permissible annual average concentration of tritium in liquid effluents by a factor of 1000:

   The proposed tritium guide limit is just within the lower limit of detectability of the laboratory which performs these analyses for us. Even for our low power plant, the liquid effluent tritium concentration averages approximately 40 times this proposed value. Since there is presently no practical, economically feasible technique available for removing tritium oxide from liquid effluents, licensees will either forever accumulate tritium and store their primary effluent or apply to the AEC for relief from this limit. The proposed limit is 1000 times more restrictive than the present MPC of 3×10^{-3} μCi/ml. Since tritium does not concentrate in the environment through the human food chain, this reduction appears unnecessarily conservative. If limits are unrealistic and frequently require relief by petition, the ultimate result is reduced respect for all the regulations.

We have the following recommendations on the proposed amendment to 10 CFR 50.

1. Since stack effluent monitoring equipment, and in some instances laboratory counting equipment, are not sensitive enough to detect concentrations that are many times greater than the proposed guide limits, and since the proposed limits are extremely conservative, we recommend the guide limits for radioactive iodine and for particulates with half-lives greater than eight days include a reduction factor of 1000 rather than 100,000.

2. The reporting requirements upon exceeding the proposed guide limits should be relaxed, considering the importance of keeping in perspective the relative insignificance of the releases and resultant potential exposure to the public. An annual report summarizing the incidents of such releases during the year would seem a reasonable requirement. The present reporting requirements of 10 CFR 20 should suffice for more prompt reporting criteria for releases of more significance as defined in Section 20.403 of 10 CFR 20.

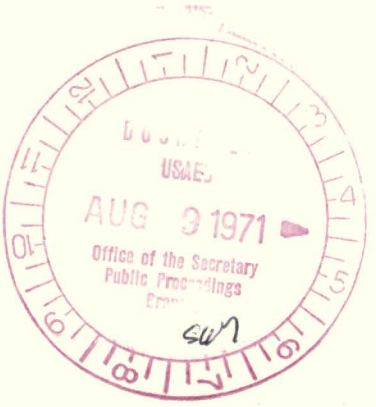
3. The guides should contain provisions for identifying radioisotopes in the liquid effluents to allow credit for wide variation in the potential hazards from different isotopes in lines with the provisions of 10 CFR 20, Appendix B. If this is done, a reduction factor of 10 from the present Appendix B values would be feasible.

4. Recognizing that nature does not concentrate tritium in man's food chain and that significant dilution of reactor effluents normally occurs before they become potable water supplies, the reduction factor for tritium limits should be 10 rather than 1000. This would also avoid the need for endless concentration and accumulation of tritium in the primary cooling water and storage of effluent.

Bruce T. Lundin
Director

Numerical Guidance

DOCKETED
PROPOSED RULE -50



25 Miriam Road
Waltham, Massachusetts
August 6, 1971

Secretary of the Commission
U.S. Atomic Energy Commission
Washington, D.C. 20545

Subject: Comments on Proposed Appendix I to 10 CFR 50, Published on June 9, 1971

Gentlemen:

The purpose of this letter is to recommend a modification of the language in the proposed Appendix I to Title 10, Code of Federal Regulations, Part 50, in order to minimize the possibility that the numerical guides contained in the new Appendix I will be interpreted as superseding the limits of 10 CFR 20 for all licensees.

The possibility of this occurring arises from the publishing of numerical guides for effluents which are lower than those of 10 CFR 20.106 even though the statement is made in the proposed Appendix I that "This guidance is appropriate only for light-water cooled nuclear power reactors and not for other types of nuclear facilities". The fact that such a set of numerical guides is in existence will bring pressure to apply them to all licensees notwithstanding the basic radiation protection standards and guides recommended by the International Commission on Radiological Protection (ICRP), the National Council on Radiation Protection and Measurements (NCRP), and the Federal Radiation Council (FRC).

Unfortunately, the ICRP-NCRP-FRC criteria are mentioned only in the Statement of Consideration preceding the proposed amendment to 10 CFR 50 and nowhere in the amendment itself. The corresponding limits of 10 CFR 20.106

are mentioned in proposed Appendix I only in Section II B,2, where it states that the Part 20 air concentration limits should be divided by 100,000 for radioactive iodines and radioactive material in particular form with a half-life greater than 8 days. Although there is the statement in Appendix I that "This guidance is appropriate only for light-water-cooled nuclear power reactors...", it is only in the Statement of Considerations that one finds the explanation that "The factor (of 100,000) is highly conservative for radionuclides other than iodine and is applied only because it appears feasible to meet these very low levels" for light-water-cooled nuclear power reactors.

Because participants at meetings with the Commission on the general subject of definitive guidance for nuclear power reactors are reported to favor numerical criteria, which presumably means that some form of numerical guides will ultimately be adopted, it is recommended that the language of Appendix I be modified to include the basis which is now given in the Statement of Considerations, but which will be separated from Part 50 if the proposed amendment is adopted in its present form. Specifically, it is recommended that the last sentence of this present final paragraph of Section I, Appendix I, be deleted from that paragraph and incorporated in a new final paragraph as follows:

"The basis for the numerical guides contained in this Appendix I is the technical feasibility of achieving them for light-water-cooled nuclear power reactors. It is in no way related to the standards and guides recommended by the International Commission on Radiological Protection, the National Council or Radiation Protection and Measurements, and the Federal Radiation Council or to the limits established for licensees in 10 CFR 20.106. The guides contained in this Appendix I are appropriate only for light-water-cooled nuclear power reactors and not for other types of nuclear facilities".

It is believed very important that a forthright statement to this effect always be included in any document which sets forth numerical guides, if such guides are to be published at all.

Finally, since the proposed guides are not based on biological evidence of radiation effects but are rather, reflections of current technological abilities and practice for particular reactor designs, it would seem appropriate

to consider publication of the guides in a document separate from the Federal Register. Such a document could be clearly labelled as the AEC's present interpretation of the "low as practicable" effluent releases for light-water-cooled nuclear power reactors, and would fulfill the industry's desire for numerical guides while at the same time, minimize the possibility of misinterpretation.

Sincerely yours,

JWGosnell.

James W. Gosnell
Assistant Professor
of Nuclear Engineering, MIT

Numerical Guidance
PR -50

WISCONSIN PUBLIC SERVICE CORPORATION

P.O. Box 1200, Green Bay, Wisconsin 54305

August 5, 1971

8/6/71
SAY

Secretary of the Commission
U. S. Atomic Energy Commission
Washington, D.C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

Subject: Comments and Questions on the "Proposed Numerical Guidance to Keep Radioactivity in Light-Water-Cooled Nuclear Power Reactor Effluents 'as Low as Practicable' (Proposed Appendix I to 10 CFR 50)"

This letter is in response to the Federal Register Notice of June 9, 1971, inviting comment on the proposed Appendix I amendment to 10 CFR 50. Comments and questions are set out separately below.

A. Comments

1. It appears that the proposed guideline values for released activity definitely assures that any radiation doses to people off site will be very low. However, it does appear that the reduced guideline concentrations for tritium, iodines, and particulates seem excessively stringent.

2. The concept of allowing operational flexibility in applying the guideline values seems to be a realistic approach. However, refer to our Question 7 below.

3. It is suggested that some clarifying statement be included in Section II-C where the guidelines allow a 5 mrem dose from liquid releases plus 5 mrem from gaseous releases. This can lead to some confusion since it is our understanding that the intent of the guidelines is to limit the total dose from liquid and gaseous releases to 5 mrem. A somewhat similar situation exists in Section II-B where the guideline dose at or near the site boundary from noble gases is 10 mrem. However, the footnote in that section provides the necessary clarification (time of occupancy, distance considerations, and shielding provided by living indoors).

4. It is suggested that some addition to the proposed Appendix I be made to explain that an applicant can justify liquid activity releases higher than the guideline values if an isotopic analysis of effluents is performed. One can come to this conclusion by a careful reading of the Appendix, but perhaps it can be more clearly stated.

5. It is suggested that Appendix I be more specific in stating that if an applicant meets the guideline activity release values given in Sections II-A and II-B, it is not incumbent on him to make independent calculations of the resulting doses. It is our understanding of the phraseology that an applicant must make dose calculations only if he wants to discharge at higher activity rates than the Sections II-A and II-B values.

6. It seems that measuring the extremely small incremental released levels of radioactivity might be masked by measurement errors inherent in the very best instrumentation available.

B. Questions

1. Is it expected that the Environmental Protection Agency (EPA) will support AEC's numerical release values, including the flexibility built into the application of these values, or is it anticipated that EPA will propose a different set of "standards"?

2. When is EPA expected to announce their standards on radiological releases?

3. A standard for or definition of an annual average liquid concentration of discharge activity is desirable. Can an applicant take credit for dilution during periods of time when no radioactivity is being released but condenser water is flowing; or must the concentrations meet the guideline values during the periods of actual discharges?

4. On what basis was it formulated that the range of 4-8 times the guideline values be the point at which the AEC would take action?

5. What was the basis for the annual total release guideline value, excluding tritium, of 5 curies?

6. In recent issues of Nucleonics Week, the man-rem concept received much attention. Has this concept been discarded?

7. The proposed AEC guidelines allow plant operation with up to twice the release values, as measured over a calendar quarter, before the applicant must take corrective action. While this concept of operational flexibility is needed, can this be interpreted to mean that the guideline values are really twice those given in Appendix I?

8. Can an applicant take credit for the effects of offshore gaseous releases if his facility is located on an ocean or huge lake? Our interpretation of the guidelines is that the applicant can take credit if he can demonstrate that the annual dose to individuals is less than 5 mrem.

Very truly yours,

E. W. James, Senior Vice President
Power Generation & Engineering

EWJ:mkk

Numerical Guidance
PR [illegible] -50

Burns and Roe, Inc.

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TWX 710-990-6637 ■ Cable BUROE ORADELLNJ

August 6, 1971

Secretary of the Commission
U.S. Atomic Energy Commission
Washington, D.C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

This is in response to the proposed amendment published in the Federal Register on June 9, 1971 which would add a new Appendix I to 10CFR50.

We have reviewed the amendment and have the following comments:

1. It is stated in the introduction of the amendment on page 11113 of the current Federal Register that the present technology can be designed to keep public exposure within a few percent of exposures from natural background. It is our opinion that, with current technology, we cannot achieve meaningful measurements below a value of approximately 50 mrem/year.

2. The annual average concentration of tritium prior to dilution outside the plant boundary is stated to be 5×10^{-3} μCi/l, a reduction of 600 from the value specified in 10CFR20 Appendix B. While this revised value may be applicable to power plants using once-through condenser cooling water, it is not within the present technology to achieve this for power plants which employ cooling towers to minimize thermal releases and thereby have reduced dilution capabilities. We would recommend that the reduction in the tritium releases be no greater than 10-fold.

3. The reduction of the annual average concentrations in air, as specified in paragraph B.2 of Section II of the proposed Appendix I, by a factor of 10^5 is also believed to be excessive. We would recommend that this reduction not exceed a factor of 10^3.

We view the issuance of guidelines as a proper form to advise the industry and assure the public of adequate protection. We trust that the Commission will consider our recommendations in the process of issuing the final rulings.

Very truly yours,

Samuel Zwickler

Samuel Zwickler
Supv. Nuclear Engineer

SZ/jlh

Numerical Guidance

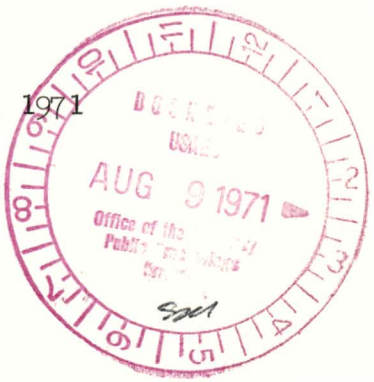
PROPOSED RULE PR -50

NCRP

National Council on Radiation Protection and Measurements

7910 WOODMONT AVENUE, SUITE 1016, WASHINGTON, D. C. 20014 AREA CODE (301) 657-2652

LAURISTON S. TAYLOR, *President*
R. H. MORGAN, M.D., *Vice President*
W. ROGER NEY, *Executive Director*



August 6, 1971

Mr. W.B. McCool
Secretary of the Commission
U.S. Atomic Energy Commission
Washington, D.C. 20545

Subject: Proposed Rule Making -- 10 CFR Part 50

Dear Mr. McCool:

Reference is made to the proposed rule making, published in the Federal Register, Vol. 36, No. 111, issue of June 9, 1971. The explanatory material and the specific recommendations for amending Section 50.36a of 10 CFR Part 50 have been examined with care and the position stated here results from the consideration of this matter by the Board of Directors at its regular meeting in June.

If, indeed, experience in the operation of light-water-cooled nuclear power plants has shown that it is feasible to maintain conditions which will assure levels of annual exposure as low as five percent of that attributable to the natural background, it is in the public interest to insist that light-water-cooled nuclear power plants be operated in a manner that such low levels be generally maintained. Such a program coincides with the completely defensible recommendation that nuclear programs should be conducted in a way which keeps exposure to radiation as low as practicable.

We may point out, however, that the proposed limit of 5 mrem per year has not been proven practicable under all circumstances and occasional small over runs, while of no biomedical significance, may cause unnecessary controversy. Since, at best, the concept of "low as practicable" is subjective in its interpretation, we feel that some reasonable and controlable latitude in the use of a special dose limitation is desirable.

The prefatory material in the statement in the Federal Register of June 9, 1971 makes it clear that the reason for the proposed change in 10 CFR Part 50 is that experience has shown it to be practical to maintain the low levels proposed in Appendix I, but the language in Appendix I, itself, fails to make a clear statement on this point.

The discussion in the prefatory material includes also the observation that such groups as the NCRP and the ICRP have found no new evidence to indicate that, from a protection standpoint, there is a need for such a

pronounced reduction in the standards for exposure of the general population as is stipulated in Appendix I. This point should be emphasized even more strongly. As a matter of fact, the proposed limit of 5 mrem per year is about one thousand times less than the lowest dose level at which injury to man has been observed.

We are concerned that those members of the public, who are unreasonably worried about radiation dose levels caused by proper utilization of radiation sources, will interpret the new rule as an acknowledgement that dose rates any higher than the very low dose rates which are considered practicable in connection with the operation of light-water-cooled nuclear power plants are cause for alarm. The current, excessive apprehension about the validity of presently recommended protection standards will more than likely be intensified unless the announcement makes abundantly clear that the reason for the proposed reduction is not a change in the basic radiation protection standards, but only because experience has shown that it is feasible to expect the operation of light-water-cooled nuclear power plants at the very low level of 5 percent of background.

In view of the above, we believe that the language of the amendment itself should state clearly and emphatically that:

1. The proposed lowering of design factors is not the result of any recently discovered new evidence which would indicate that the current basic protection standards are improper.

2. The new rule applies only to light-water-cooled nuclear power plants and not to nuclear facilities of other types.

We are not of the opinion that the proposal is incorrect, or improper, but the real difficulty is that unless statements of the kind suggested above are made prominently and unequivocably, the Atomic Energy Commission will continue to be subject to unwarranted attack. The time and effort required to parry such attack will impair our capacity to make creditable progress in the task of putting radiation to work for the benefit of all.

Sincerely yours,

Lauriston S Taylor

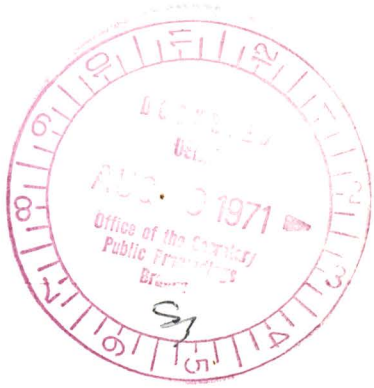
L.S. Taylor
President

LST/clk

Numerical Guidance

-50

18 Baldrock Road
Wayland, Massachusetts
August 6, 1971



8/8/71

Secretary of the Commission
U. S. Atomic Energy Commission
Washington, D.C. 20545
Attention: Chief Public Proceedings Branch

Subject: Comments on Proposed Rule Making 10CFR Part 50, Section 50.36a (b) and Appendix I

Dear Sir:

The general statement that radioactive effluents released to unrestricted areas be kept "as low as practicable", is obviously not a quantitative enough rule to be uniformly applied to the review and approval of reactor licensing. It is reasonable to establish some numerical guide lines that can be applied in an equitable manner. As in all limit settings, such as the reactor technical specifications, there must be some basis for the establishment of the limits.

It appears that the basis for the proposed limits in Appendix I are as follows:

1) Radioactive effluent levels must be kept well below the 10CFR-Part 20 limits.

2) It would be nice to have the radioactive effluent levels kept to a small fraction of the natural background.

3) Experience with light water power reactor operation indicates that with "reasonable" expenditures and present day technology the design, maximum radioactive effluent levels can be set at the proposed Appendix I values.

Although the present intent is to apply these limits only in the design review for light water reactors, it seems difficult to imagine that other types of reactors could be licensed without some consideration of these same rules. Therefore, the basis for establishing the Appendix I limits is not satisfactory.

Granted, the establishment of any limits below the 10CFR-Part 20 values must be somewhat arbitrary since even the basis for the Part 20 limits has been questioned by some people. However, before any limits are established, it would be wiser to at least consider a wider range of reactor types, even perhaps an international review of reactor operating experiences regarding radioactive effluents.

A more logical basis for reduction of the licensed limits below the 10CFR-Part 20 limits might be developed from the point of view of the potential radioactive effluent releases from several reactors and other radioisotope users. As more and more reactors are operated, it is possible that effluent releases from several plants might impinge upon the same area. From this consideration, it would be worthwhile to establish uniform design limits on radioactive effluents below the 10CFR-Part 20 by a factor of at least 3 or 4, or to be conservative, a reduction of a factor of 10 would be adequate.

It is my contention that the proposed Appendix I limits represent a good design goal but the limit is lower than can be justified for uniform application to all licensed radio-isotope users. A more reasonable design limit would be a factor of 10 reduction of the present 10CFR-Part 20 limits.

Sincerely yours,

David D. Lanning

David D. Lanning
Professor of Nuclear Engineering
M.I.T.

Not in Document Rm,
Numerical Guidance -50

UNITED STATES
ATOMIC ENERGY COMMISSION
CHICAGO OPERATIONS OFFICE
9800 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

TELEPHONE
(312) 739-7711

August 6, 1971

Secretary of the Commission
U. S. Atomic Energy Commission
Washington, D. C., 20545

8/5/71

Dear Sir:

We have reviewed the proposed amendment to 10 CFR Part 50 which was published in the Federal Register, Vol. 36, No. 111, pages 11113 - 11117, dated Wednesday, June 9, 1971. Our comments on the proposed amendment, which are included in the Attachment to this letter, are offered for your consideration.

Sincerely yours,

Gerald M. Steen

Gerald M. Steen
Reactor Safeguards Engineer
Safety and Technical Services Division

Jesse A. Pagliaro

Jesse A. Pagliaro
Health Physicist
Safety and Technical Services Division

Enclosure:
As Stated Above

Comments on Proposed Amendment to 10CFR50 Concerning New Radiation Standards for "Light-Water-Cooled Nuclear Power Reactors"

1. Page 11116, Section II.A.2

In comparison to natural radioactivity concentrations that human beings are routinely exposed to at the present time (see table below) the proposed annual average concentration of 20 picocuries per liter above background for radioactive material (other than tritium) discharges prior to natural dilution is unnecessarily low.

TABLE

Material	Concentration
Saw Mill Creek (Argonne, Illinois)	10-30
Mississippi River Top Water (LACBWR)	30-40
Beer	130
Whiskey	1200
Milk	1400
Urine	1000-3000
Salad Oil	4900

Therefore, it is suggested that the 20 picocuries per liter limit be appropriately increased so as to cause the radiation exposure hazards associated with liquid discharges from light water reactor operations to be more comparable to the corresponding hazards from unregulated liquids to which man is routinely exposed.

2. Page 11116, Section II.B.1 and II.C.2

The proposed limits of 10 mrem/year and 5 mrem/year which are given in Sections II.B.1 and II.C.2, respectively, correspond to reductions in current radiation standards for light water power reactors that are considerably greater than a factor of ten. In the past, the AEC has vigorously and publicly defended a position that a reduction in the current radiation standards (as they apply to reactors and as proposed in arguments made by Gofman and Tamplin) were not necessary. The NCRP Report No. 39 also takes the position that essentially no changes are necessary in the current radiation standards. Therefore, with the public credibility of the AEC already at a seriously low level, in our judgment, it is certain that the proposed limits referenced above will serve to further low the AEC's credibility in the eyes of the public. It is suggested that these proposed limits should be increased by at least a factor of 10.

3. General Comment

Although we do believe that it is entirely possible for the nuclear power industry to design new reactors and, as necessary, to modify existing reactors so as to meet the new limits given in the proposed amendment, it is our opinion that this will require the unnecessary expenditure of significant amounts of money. The proposed limits, in our opinion, have no technical basis and appear to be made in response to political pressures. With the many real problems which exist in the United States today (such as poverty, air pollution, water pollution, etc.), we believe that there are much better ways to utilize our financial resources than to reduce radiation exposures from light water reactors (which are already considerably lower than exposures received from diagnostic x-rays, routine jet air travel, etc.) to an even lower level. Furthermore, no comparable radiation standards exist for fossil fuel power plants which also release radioactivity.

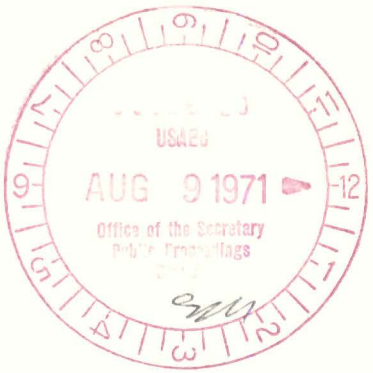
Numerical Guidance

-50

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23209

August 6, 1971

8/8/71
SM



Secretary of the Commission
United States Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

We have reviewed the proposed Appendix I to 10 CFR 50, setting forth guides for the release of radioactive effluents from nuclear power reactors, as published in the Federal Register on June 9, 1971. We are in agreement with the formal adoption of an enumeration of the previous "as low as practicable" release objectives and believe that the proposed amendment is a partial step in this direction.

It is only partial in that, while definite quantification of releases has been included, there is insufficient accompanying guidance accounting for the conditions that the low levels of radioactivity set out will, as a practical matter, be within the range of the normal variations in population exposures and will be undetectable from the general background exposure. With this the case, general individual and population exposures will be a calculated number, seldom if ever subject to proof. We can agree that this is an excellent point to be made for nuclear power stations but at the same time meeting the proposed conditions must be proved, first, by the absence of specific measured data, and second, by periodic release calculations that are further based on calculated radioactive sources. Calculations are sensitive to the assumption used, therefore, acceptable real conditions must be factored into the mathematical models and acceptable real conditions must be considered in determining whether design or operating limits truly have been exceeded. If this is not the case unnecessary shutdowns of nuclear power stations, because of arbitrary assumptions taken to satisfy an academic concern for conservatism, are going to be frequent and may lead to a very misleading impression as to the radioactive releases actually being experienced.

We believe that the proposed amendment requires further discussion, regarding the methods and assumptions to be used in the design and operating analyses, prior to becoming a rule of 10 CFR 50.

Very truly yours,

Stanley Ragone

Stanley Ragone
Vice President

Numerical Guidance
-50

Southern California Edison Company

P. O. BOX 351

LOS ANGELES, CALIFORNIA 90053

LAW DEPARTMENT

624-7111

ROLLIN E. WOODBURY
VICE PRESIDENT AND
GENERAL COUNSEL

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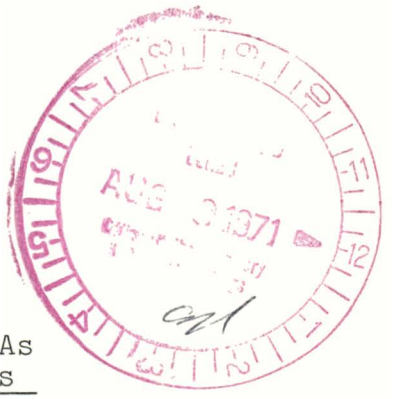
DAVID E. HOLMES
DENNIS G. MONGE
THOMAS E. TABER
JAMES A. TRECARTIN
ASSISTANT COUNSEL

August 6, 1971



Secretary
Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief
Public Proceedings Branch

Re: Proposed Rulemaking: As Low As Practicable: Numerical Guides

Dear Sir:

In accordance with the notice of proposed rulemaking published at 36 F.R. 11113 (June 9, 1971), Southern California Edison Company respectfully submits its comments, as follows:

1. The standards for protection against radiation promulgated by the Commission in 10 CFR Part 20 are based upon and are consistent with the standards and guides recommended by the International Commission on Radiological Protection, the National Council on Radiation Protection and Measurements, and the Federal Radiation Council. Moreover, those standards and guides give appropriate consideration to the overall requirements of health protection and beneficial uses of radiation and atomic energy. While it is entirely appropriate, as suggested by the standards setting groups, that all radiation exposures be held to the lowest practicable level, it is essential that implementation of that admonition be sufficiently flexible to accommodate varying factual situations. One can easily conceive situations where steps taken to reduce concentrations of radioactive materials in effluents to unrestricted areas to the lowest practicable levels could result in increased exposures to nuclear plant personnel by reason of increased maintenance of radioactive process equipment and handling of radioactive materials. In addition, increased retention of radioactive waste materials necessitated by implementation of the as low as practicable criterion will present many problems associated with storage, handling, shipping and disposal of radioactive waste materials. It is

respectfully suggested that the many considerations relevant to the public welfare can be balanced most appropriately where numerical guides are expressed in ranges of values sufficiently broad to permit meaningful exercise of regulatory discretion. While it is true that proposed sections II(C) and II(D) contemplate permissible concentrations above or below the numerical guides set forth in proposed sections II(A) and II(B) in appropriate cases, it is almost axiomatic that the numerical guides will eventually come to be treated as standards. Specifying ranges of values rather than specific limits will ensure flexibility and the exercise of regulatory discretion, and the health and safety of the public will in any event be assured because the basic standards for protection against radiation already provide a conservative limit on permissible releases.

2. The estimated annual concentration guide for tritium set forth in proposed section II(A)(3) could appropriately be expressed as a range of permissible values as suggested above, and the range of permissible values should be increased above 0.005 microcurie per liter by at least a factor of 5. The proposed value of 0.005 microcurie per liter is not believed to be practicable for many operating nuclear plants. A value of 0.025 microcurie per liter, which approximates one percent of 10 CFR Part 20, would be consistent with the as low as practicable criterion, and would not necessitate extensive plant modifications or gross shipments of tritiated wastes offsite for disposal in most cases.

3. The guides for gaseous releases set forth in proposed section II(B) specify exposure rates and concentrations so low that they must be arrived at by calculation rather than measurement. Since a variety of models for such calculations exist, it would be appropriate that the guides be accompanied by a defined method of evaluation in order that such calculations may be uniform throughout the industry. While it may not be desirable that such analytical methods be

incorporated in the regulations themselves, a safety guide could be issued at the time the numerical guides become effective.

Very truly yours,

Charles R Kocher

CHARLES R. KOCHER
Assistant Counsel

CRK:md

Numerical Guidelines
-50

8/8/71
SM

R. C. Youngdahl
Senior Vice President

Consumers Power Company

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • Area Code 517 788-1880

August 5, 1971

Secretary
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Sir: Attn: Chief, Public Proceedings Branch

Attached are the comments of Consumers Power Company on the AEC proposed amendments to Appendix 1 to 10 CFR Part 50, "Licensing of Production and Utilization Facilities," as published in the Federal Register dated June 9, 1971.

Yours very truly,

R. C. Youngdahl

RCY:fs
Enc (6)

CC: EAWiggin, Atomic
Industrial Forum (Enc)

Numerical Guidlines -50

CONSUMERS POWER COMPANY COMMENTS ON THE AEC PROPOSED GUIDELINES ON "AS LOW AS PRACTICAL" EXPOSURE OF RADIONUCLIDE RELEASES

Appendix I to 10 CFR Part 50

1. In the January 1971 meetings with the AEC, Consumers Power Company proposed that numerical guides be established to describe "as low as practicable." We are now concerned, however, that some of the numerical values given in the proposed guide were hastily derived and that possibly too little consideration has been given to the potential impact they may have on future reactor concepts; such as, the LMFBR, or long-range waste management.

For example, it is believed that the proposed maximum tritium concentration of 5×10^{-6} μCi/cc in the effluent prior to dilution in a natural body of water will force all PWR's employing cooling towers or cooling ponds to recycle the reactor coolant and dispose of the tritiated water off site. It is not clear that the AEC has given sufficient thought to the transport and disposal of the recycled coolant water containing relatively high concentrations of tritium.

In addition, it is believed that if the proposed 10 mRem/hr at site boundary from gaseous effluent is considered to be the skin plus whole-body dose, most multiple unit sites will be required to extract and store krypton-85. Again, we are not aware of any AEC accepted techniques or guides for bottling and storing krypton-85 for long periods of time. We do not consider it necessary or prudent to store krypton-85.

2. The reduction of the iodine MPC by a factor of 100,000 appears to be unduly restrictive. This new maximum permissible concentration would then be about 1×10^{-15} μCi/cc at the site boundary.

It is believed that this concentration is well below the limit of detection. In addition, the concentration in the containment building must be limited to somewhere in the range of 10^{-12} μCi/cc which is also bordering the minimum practical detection limit. Since there is a very real possibility that the operator must prove that the 1×10^{-15} μCi/cc is not exceeded at the site boundary, he is faced with the essentially impossible task of measuring concentrations of 1×10^{-12} μCi/cc or less.

3. The 10 mRem at the site boundary from gaseous effluent should be clearly identified as either skin plus whole-body dose or whole-body dose. We feel that this limit should be based on a whole-body dose. In addition, the appropriate average energy to be used and the appropriate analytical model to be employed should be identified in order to provide uniformity in the analysis.

4. A five curie liquid effluent limit not based upon isotopic composition except tritium is arbitrary. As such, it recognizes no biological hazard differences among various radionuclides. A similar argument can be made of the arbitrary concentration limit of 20 pico curies per liter.

5. It is strongly suggested that dose in the environment be considered of prime importance and that, as a result, Commission action be based solely on doses resulting from releases and not the releases themselves. Therefore, required dose measurements should be, insofar as practical, measured values based upon sample analyses or direct measurements of environmental media and not required to be calculated from plant effluent data.

6. The 400 man-Rem figure per 1000 MWe given in Footnote #2 is not identified as a guide and we consider it to be a comment only. Hence, it is assumed that such a number is not a required design objective but only, as the words describe, "Conformance with the proposed guides...would provide reasonable assurance that the...whole-body dose to the total population exposed would be less than 400 man-Rems per year per 1000 megawatts electrical...."

The 400 man-Rem figure per 1000 MWe given in Footnote #2 may be interpreted as a guide; therefore, the term "total population exposed" needs clarification as to maximum distances to be considered.

August 2, 1971

Numerical Guidance
Water cooled
Reactors

8/9/71 SD

PROPOSED RULE PR -50

COMMISSION
DES
COMMUNAUTES EUROPEENNES

Direction Générale
des Affaires Sociales

VE - 2 71 23375

Luxembourg, le 3. 8. 1971
FL/deu

To the Secretary of the Commission
Attn. : Chief, Public Proceedings Branch
U.S. Atomic Energy Commission
WASHINGTON, D.C. 20545

U.S.A.

Subject : Comments on proposed amendments to 10 CFR Part 50, published in Federal Register, Vol. 36, Nr. 111, Wednesday, June 9, 1971.

We received for information a copy of a proposed rule making that would add a supplement to the Commission's regulation, 10 C F R part 50.

As all interested persons are invited to submit comments or suggestions in connection with this proposed amendmend, I would like to express a personal viewpoint on one of the proposed numerical guides.

The proposed appendix I, section II, A, reads as follows :

" For radioactive material above background in liquid effluents to be
" released to unrestricted areas by each light-water-cooled nuclear power
" reactor at a site :

" 1. : The estimated annual total quantity of radioactive material, except
" tritium, should not exceed 5 curies...."

According to this text, the annual discharge limit of radioactivity in liquid effluents is the same for any water-cooled nuclear power plant, whatever its power.

But the activity production in a reactor and, in part, the activity release from the primary circuit are power-dependent. Hence, the proposed limit will impose a higher decontamination factor on the larger nuclear power plants than on the smaller ones.

In order not to overburden the decontamination plants of these larger nuclear power plants, it would therefore be more justifiable to take a value proportional to the plant power as a numerical guide for the annual total quantity of radioactive material (except tritium) to be released in liquid effluents to unrestricted areas.

In Europe, for instance, a proposal was recently made to limit to 1 curie per 100 MWe installed the activity discharge into the Rhine from all nuclear power plants located along its banks.

Yours sincerely

F. LUYKX

29 RUE ALDRINGEN – LUXEMBOURG – TEL.: 29241 – TELEX - 423 - 446 COMEUR L.

8/9(71)
SAEC

~~Light Water Cooled~~
~~Reactor Emissions~~
-50
Min. guidance

LAW OFFICES
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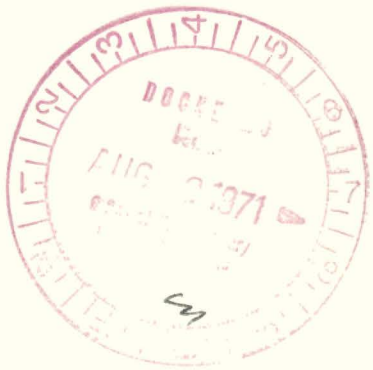
EDWARD C. BERKOWITZ

JOHN H. DORSEY
WILLIAM H. COBURN
OF COUNSEL

August 6, 1971



Mr. W. B. McCool
Secretary
Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

These comments are submitted on behalf of Dr. Lewis Battist with respect to the proposed amendment of 10 CFR, Part 50, "Licensing of Production and Utilization of Facilities," which sets forth technical specifications and design objectives for light-water-cooled nuclear power reactors to keep safe levels of radioactivity in effluents. The comments pertain to specific portions of the proposed amendment as well as to some of the basic considerations underlying the proposed rules. Briefly, we submit that the proposed rules fail to take advantage of presently available levels of technology. They proceed to establish criteria which are either inappropriate or unenforceable. For this reason, the protection which the proposed rules are intended to provide the public is, at best, inadequate or, at worst, illusory. In light of these considerations, we suggest by way of conclusion that the Agency consider the adoption of rules which would increase its capacity to meet the problems at which the proposed rules are aimed.

1. The proposed rulemaking as published in the Federal Register, Vol. 36, No. 111, June 9, 1971, at p. 11114 discusses "Expected Consequences of Guides for Design Objectives." It is stated that conformance with the design objectives would achieve "reasonable assurance that annual exposures to sizable population groups from radioactivity released in ... gaseous effluents from all light-water-cooled nuclear power reactors ... will generally be less than about one per cent of exposures from natural background radiation." It is further stated that "(t)hese levels of exposure would be indistinguishable from exposures due to variation

in natural background radiation, would not be measurable with existing techniques, and would be estimated from effluent data from nuclear power plants by calculational techniques." If, as it appears, the proposed rules are based upon these assumptions, we submit that the levels of exposure provided for by the proposed standards are ineffective.

The levels of exposure calculated on the basis of the above assumptions are set at about one per cent of exposure from natural background radiation. It is noted in the proposed rules that average annual exposures due to background radiation in the United States are in the range of 100 to 125 millirems per year. This is misleading because, while this may be the "average", background radiation varies from one location to another from between 50 to 250 millirems per year. Thus, in effect, the AEC is saying that one-half of one millirem is the safe level for a citizen in Connecticut and five times that amount or 2.5 millirems, is the safe level for a citizen in Colorado. We suggest that this artificial one per cent level be replaced with a realistic, objective, measurable standard.

2. We also take exception to the statement that "these levels of exposure are indistinguishable from exposures due to variations in natural background radiation" and are not " ... measurable with existing techniques." The AEC has recognized the existence of a monitoring system which can measure, continuously and in real time, gaseous effluents from nuclear power plants and concentrations of radioactive noble gasses at less than one per cent of the unrestricted area guidelines now specified in 10 CFR 20. This instrument, which is known as the Environmental Radiation Monitoring System, has been selected for inclusion in the AEC exhibit at the Fourth International United Nations Conference on the Peaceful Uses of Atomic Energy. The instrument, which has been developed by Dr. Battist, is exactly capable of performing the monitoring function which the proposed rulemaking states is beyond the capability of existing techniques. A resume of Dr. Battist's background and experience is attached.

3. The proposed rules place great weight on levels of average annual radiation exposure. We submit that reliance on this as a standard is not entirely adequate in view of the fact that it does not take into consideration the effect of periodic peaks. We suggest that in view of the availability of technology to conduct real time monitoring of such levels of radiation, an additional standard be established for maximum levels

of exposure at any given time. Continuous real time monitoring could, therefore, allow a utility to take appropriate measures in the event of even isolated episodes of discharges resulting in higher than normal radiation exposures.

4. In addition to the above considerations, we submit that the basic structure and enforcement procedures of the proposed rules appear to be founded on the initial erroneous assumption that the present state of the art does not allow for precise measurement of the effluent output of the nuclear power plants which are subject to the new rules. Thus, no provision is made for AEC monitoring of the exposure to the public to radioactive effluent other than the imposition of a requirement that the utility itself provide the AEC with "reasonable assurance" that the annual exposure of individuals be less than five per cent of the average natural background radiation. We submit that in view of the availability of sufficiently precise monitoring and measuring technology, the AEC should assume a more active role in assuring itself and the public that appropriate objective safety standards are being satisfied, rather than abdicating this function to the utility which is directly concerned.

5. For the above reasons, we suggest that the proposed rules be revised to reflect the level of existing technology. In addition, we suggest that the Commission consider the promulgation of new rules calling for the provision of appropriate measuring devices at nuclear power plants in order to generate a comprehensive flow of data which would allow for the establishment of realistic standards, as well as providing for a real time monitoring and warning system.

Respectfully submitted,

FROSH, LANE and EDSON
For Dr. Lewis Battist

By: Edward C. Berkowitz

Frank H. Pearl

Light Water Cooled Reactor Exhibits
PM -50

LEWIS BATTIST

Educational Background

Bachelor of Arts	New York University
Doctor of Philosophy (Physical Chemistry)	University of Texas

Employment Record

1958-1961	Senior Scientist	Bettis Atomic Power Laboratory Westinghouse Electric Corp. West Miflin, Pennsylvania
1961-1962	Director, Analytical Div., Physical Sciences Dept.	Nuclear Science & Engineering Corporation Pittsburgh, Pennsylvania
1962-1965	Senior Technical Assoc.	Nuclear Utilities Services, Incorporated Washington, D. C.
1965-1970	Associate Professor, Nuclear Science & Engineering	Catholic University of America Washington, D. C.
1965-1970	Consultant	
1969-Present	Vice President, Technical Director	Ambionics, Incorporated Washington, D. C.

Pertinent Qualifications

Dr. Battist has over ten years of experience in nuclear science and engineering. Since 1959 he has been directly involved in control and monitoring of radioactive contamination of the environment. As a consultant to the U.S. Navy, he was concerned with the operation and safety considerations of the PM-3A nuclear power desalting plant. At the Bettis Atomic Power Laboratory of Westinghouse he directed "technical problem" aspects and contractual and contractor logistics during shipboard nuclear power reactor startups and for analytical "follow-up" procedures. At Nuclear Science and Engineering he supervised the program for low level radioactivity, biological and environmental assay measurement. During this period he planned, and directed the radiochemical start-up studies of the N. S. Savannah.

At Nuclear Utility Services he was responsible for nuclear reactor plant chemical and radiochemical behavior and performance and the planning and establishment of management programs for the limitation and control of radioactive materials release to the environment. At Catholic University he directed research efforts in radiation effects, radiation detection and dosimetry, environmental monitoring, handling and transportation of radioactive materials, radioisotope utilization and activation analysis. At Ambionics he directs all aspects of research work in the radiation and nuclear fields and in management programs in radiation safety.

STATE OF MINNESOTA
POLLUTION CONTROL AGENCY
717 DELAWARE STREET S.E.
(OAK AND DELAWARE STREETS S.E.)
MINNEAPOLIS 55440
612-378-1320

GRANT J. MERRITT
EXECUTIVE DIRECTOR

August 4, 1971

Secretary of the Commission
U.S. Atomic Energy Commission
Washington D.C. 20545

Attention: Chief Public Proceedings Branch

Re: Commentary on AEC Proposals for Numerical Guides for Light-Water-Cooled Reactors Effluents

Gentlemen:

The Minnesota Pollution Control Agency has consistently supported the minimization of all radioactive releases to the environment. Although the AEC proposed rules are a small positive step (in so far as they reduce emissions), the regulations are deficient in several aspects as discussed below.

Much of the limitation of emissions in light water cooled reactors will be the result of using presently available waste treatment systems. Many present day systems including filtration and hold up systems can be used at nuclear facilities other than light water reactors and usage of such systems at all facilities should be required. The proposed regulations should be amended to apply to all nuclear facilities.

As in the past the proposed regulations show that the AEC intends to continue its policy of having the licensee act as his own policeman. If it is not possible to have all monitoring independent of the licensee, then at least some independent effluent monitoring should be done to remove present total reliance on the licensee's monitoring and records.

Several changes in the proposed regulations should be made if the AEC intends that "radiation exposures to the public should be kept as low as practicable." If only levels of dose at the boundary are used it could limit the utilization of available waste treatment at some sites because of either site size or meteorological conditions. In this instance meeting the guidelines would not keep exposures as low as practical. To correct this deficiency the proposed dose at the boundary should be specified as an upper limit and in addition further application of available technology should be specifically required for all facilities.

Section III of appendix I may be used in such a way as to meet only the guidelines and not make use of existing technology. It could also be used to ignore future technological developments. The proposed guides should be amended to remove such possibilities and to truly reflect the concept of keeping exposure as low as practicable.

Finally action should be taken when the guidelines are exceeded and not only at such time as guidelines are exceeded by a factor of 4 -- 8.

Only if the above actions are taken can the AEC show any real commitment to minimizing radiation exposure to the public. The guidelines as proposed move only slightly in this direction.

Respectfully submitted,

Lyle H. Smith
Assistant Executive Director

LHS:sjn

PR-50
Numerical Guidance

SUFFOLK SCIENTISTS FOR
CLEANER POWER & SAFER ENVIRONMENT
100 DURKEE LANE
EAST PATCHOGUE, N. Y. 11772

August 3, 1971

The Secretary
United States Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Dear Sir:

Our organization, composed of approximately 150 scientists and engineers (most of whom have worked professionally in fields relating to radiation), intends to make comment on the "proposed rule making" published in the Federal Register, Vol. 36, No. 111, Wednesday, June 9, 1971 at pages 11113 to 11117. Unfortunately, our comments cannot be submitted before the 60-day period for comment expires.

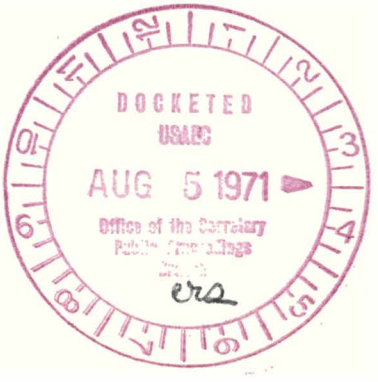
It is our consensus that the proposed rule changes will have a major impact on the future development of nuclear energy in this country. At this particular moment in history the proposed changes touch on an extremely sensitive subject of public emotion, and must be expected to receive widespread public attention. Because of these two factors our members urge that the effects of the proposed changes receive careful judicious consideration before their adoption. We hope, therefore, that the period for comment might be extended beyond the present August 6, 1971 deadline.

If hearings are held on this subject, we would probably petition to present two or three expert witnesses. Your instructions for obtaining a place on the agenda will be appreciated.

Very truly yours,

Vance L. Sailor

Vance L. Sailor
Chairman



8/5/71, ers

STATE OF NEW JERSEY
OFFICE OF THE GOVERNOR
TRENTON

WILLIAM T. CAHILL
GOVERNOR

August 2, 1971

Dear Mr. McCool:

On June 12, Mr. Harold L. Price wrote to me and transmitted material pertaining to proposed additions for inclusion in 10CFR50 which would provide numerical guides for operation for light water cooled nuclear power plants to keep levels of radioactivity in effluents from those plants as low as practical. This supplement has been reviewed, and I wish to express the following comments for the consideration of the United States Atomic Energy Commission.

We fully support the philosophy of maintaining releases of radioactive material to the environment at the lowest practical value at all times. In general, these suggested guidelines merit support. There are, however, two exceptions:

1. This philosophy and these guidelines should be based on a degree of biological protection afforded to the public. No non-uniform basis, therefore, is indicated in limiting these guidelines to only light water reactors.

2. While a reduction in tritium discharge levels has been proposed, the proposed level for tritium is deemed inadequate, and the Commission is urged to give due consideration to further reduction of this effluent level for this radioisotope.

Sincerely,

William T. Cahill
GOVERNOR

W. B. McCool, Secretary
United States Atomic Energy Commission
Washington, D. C. 20545

cc: Harold L. Price, Director of Regulation
United States Atomic Energy Commission
Washington, D. C. 20545

8/4/71, ers

Gibbs & Hill, Inc.
ENGINEERS DESIGNERS CONSTRUCTORS

July 26, 1971

Mr. Lester Rogers, Director
Division of Radiological and
Environmental Protection
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rogers:

We have studied the proposed rule, as published in the June 9 issue of the Federal Register, relating to the numerical guides on radioactivity in effluents to the environment. The ruling is quite clear and we believe complete and, therefore, I can advise that we have no comments to offer.

Very truly yours,

GIBBS & HILL, Inc.

PHS-RSP:bap

P. H. Smith
President

(16)

393 SEVENTH AVENUE NEW YORK, N.Y. 10001 PHONE: 212-565-4300 CABLE: GIBBSHILL, NEW YORK

FEDERAL POWER COMMISSION
WASHINGTON, D.C. 20426

IN REPLY REFER TO:

JUL 26 1971

Mr. Harold L. Price
Director of Regulation
Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Price:

Thank you for your letter of June 10, 1971 and the copy of the notice of proposed rule making which would provide numerical guides for light-water-reactor radioactivity release design objectives and limiting operating conditions.

The following comments are offered relative to the proposed rule making, in accord with the Federal Power Commission's statutory responsibility for the adequacy and reliability of electric power under the Federal Power Act.

1. Our current projections of the sources of energy for future electric power requirements indicate a rapidly rising dependence on nuclear energy. In the decade from 1970 to 1980, nuclear energy is projected to provide approximately 40 percent of the total electric capacity additions. Similarly between 1980 and 1990, nuclear is projected to represent about 55 percent of the total additions. Attainment of these projected levels of nuclear utilization is rapidly becoming not just a projection but a national requirement, because of the increasing difficulty of meeting air pollution standards with fossil fuels and the uncertain availability of low pollution fuel supplies. Consequently it is important to take all possible steps to clarify the criteria for construction and approval of nuclear plants, to shorten their environmental reviews, and to minimize their lead times to commercial operation.

   The proposed rule making is consistent with these objectives and is therefore endorsed as a contribution toward assurance of an adequate electric power supply.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COMMISSION
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2. We are especially cognizant of the serious problems of the electric power industry in finding environmentally acceptable methods for disposing of waste heat. A major consequence has been a trend toward closed cycle cooling systems, in some cases retroactively specified. For nuclear plants with closed cooling systems, there may be an acceptable discharge pathway to unrestricted areas for liquid radioactive effluents to which the proposed guidance would apply. However, in other cases, the absence of such pathways requires the concentration of such effluents for periodic removal.

   In view of the critical need to shorten nuclear plant lead times, the present inability to guarantee that the design approach to plant cooling will not be subject to required change, and the feasibility suggested by some of designing for no radioactive liquid effluent discharge, it appears that pursuit of a design objective of no radioactive liquid effluent discharge as soon as possible may be warranted.

3. The reliability of electric power supply is a continuing major concern of the Federal Power Commission. A key element in this reliability is the capability of generation units to maintain operation during periods of peak load, despite deficiencies of various components. Until such time that more perfect performance can be assured, therefore, we commend the flexibility provisions in the proposed guide on operation limits, which would permit continued power production, for limited periods under positive control, with radioactivity releases moderately in excess of the design objectives.

We appreciate the opportunity to offer these comments.

Sincerely,

John N. Nassikas

John N. Nassikas
Chairman


RECEIVED
JUL 28 1971
U.S. ATOMIC ENERGY
COMMISSION
Regulatory
Mail Section

Jerry J. Cohen
1009 Via Madrid
Livermore, California 94550

July 22, 1971

Secretary of the Commission
U.S. Atomic Energy Commission
Washington, D.C. 20545

Attn: Chief, Public Proceedings Branch

Re: Proposed amendments to 10CFR Part 50 as published in Federal Register 36:111 June 9, 1971.

Dear Sirs:

Please accept the enclosed paper entitled "A Suggested Guideline for Low Dose Radiation Exposure to Populations Based on Benefit-Risk Analysis" as part of my comment on the proposed amendments.

As may be gathered from the remarks in this report, I believe that the adoption of these amendments would be unfortunate. These changes might temporarily appease those environmental alarmists whose intemperate attacks delay the orderly development of nuclear energy. However, such a move would also lend credence to their arguments, and provide them with a firmer base for future attacks.

It is my firm conviction that the only way out of the morass of emotionalism and recrimination associated with development of nuclear energy would be to place all the risks and benefits involved into some commonly understood perspective which, in turn, could be objectively judged.

For example, an exposure limit given in terms of Man-Rem/MWe-Yr. is a good start in this direction. Using the figure of 400 Man-Rem per year per 10^3 MWe (Fed. Register 36:111), and our Mer concept (UCRL-72848),

and assuming a benefit of 5 mills per KWhre, we calculate a Mer equivalent of ∿ $100,000. One might infer from the above that each Man-Rem of exposure would result in damage equivalent to $100,000. This seems excessive (for example: on the same basis, a chest X-ray would cause ∿ $10,000 worth of damage to the recipient). The $100,000 Mer equivalent is a factor of 400 greater than our estimate of $250. Whatever the best value might be, however, the approach is sound and should be persued with the goal of determining an objective and generally acceptable benefit-risk criteria.

Thank you for your consideration.

Respectfully yours,

Jerry J. Cohen

JJCstd

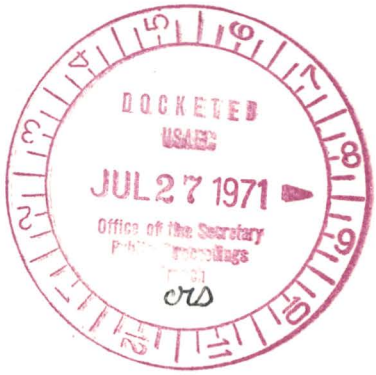
Encs. (5 UCRL-72848)

UCRL - 72848
PREPRINT

Lawrence Radiation Laboratory

UNIVERSITY OF CALIFORNIA

LIVERMORE



A SUGGESTED GUIDELINE FOR LOW-DOSE RADIATION EXPOSURE TO POPULATIONS BASED ON BENEFIT-RISK ANALYSIS *

Jerry J. Cohen

June 1971

This paper was prepared for presentation at:

Sixteenth Annual Meeting of the Health Physics Society
New York City, N. Y., July 14, 1971

* Work performed under the auspices of the U.S. Atomic Energy Commission

A SUGGESTED GUIDELINE FOR LOW-DOSE RADIATION EXPOSURE TO POPULATIONS BASED ON BENEFIT-RISK ANALYSIS*

Jerry J. Cohen

Current standards for allowable exposure of general populations to ionizing radiation prescribe for a maximum exposure of 500 mrem/yr to individuals and an average exposure of 170 mrem/yr to suitably sized groups. These standards, as set by the International Commission on Radiological Protection (ICRP), the National Council on Radiation Protection (NCRP), and the Federal Radiation Council (FRC) have been generally accompanied by such admonisions as; and I quote from NCRP,[1] "It is recommended that all doses be kept as low as practicable, and that any unnecessary exposure be avoided," or from FRC,[2] "It is critical that this guide be applied with reason and judgment."

The 170 mrem/yr standard is the most widely used as a basis for comparison in reactor siting studies or Plowshare effects evaluations, and is the one with which we will deal primarily in this report.

The various bases given for the establishment of this figure are:

1) The radiation protection guide for population exposure of 5 rad over the first 30 years of life, based on genetic damage. This figures out to 170 mrem/yr.

   $5 \text{ rem}/30 \text{ yr} \simeq 0.17 \text{ rem/yr}$

2) The arbitrary assumption of a factor of 3 between average and maximum exposure of populations.

   $\frac{0.5 \text{ rem/yr}}{3} \simeq 0.17 \text{ rem/yr}.$

3) Use of natural background assumed to be between 100 and 125 mrem/yr as a guide for acceptable exposure.

   $100 \rightarrow 125 \text{ mrem/yr} \simeq 0.17 \text{ rem/yr}$

A fourth possible origin which has been rumored to be the basis of this standard is depicted in (Slide #1). This is an artist's conception of an early meeting of the NCRP.

* Work performed under the auspices of the U.S. Atomic Energy Commission.

I should point out, however, that I have found no evidence indicating that the radiation standards have been divinely inspired. It is therefore my opinion that questioning the propriety of the standards does not constitute sacrilege. Indeed, the practice seems to have become in vogue recently in some sectors of the scientific community.

Two alleged infidels from out our way who have done so are Drs. Gofman and Tamplin.[3] They base their objections to current standards on their "doubling dose" concept. A doubling dose may be defined as the amount of radiation exposure which would double the spontaneous incidence of malignant disease. Their analysis of current radiation exposure data led them to the conclusion that about 50 rad of exposure constituted one doubling dose. This, in turn, led to their rather famous calculation shown in (Slide #2), indicating that 32,000 additional deaths would occur in this country if the population were to receive an average exposure of 170 mrem/yr.

One needn't accept Gofman and Tamplin's assumptions to perform such a calculation. (Slide #3) If you accept the figures of Anspaugh and Robison among others,[4-9] of $\sim 10^{-3}$ genetic plus somatic deaths per man-rad of exposure and go through the same type of exercise, you can get essentially the same result. The trouble with this kind of calculation is that it is based on some dubious, if not erroneous, premises. First, discussion of mortality risk, or numbers of deaths, can be rather misleading. Let me assure you that under <u>any</u> circumstances, the death rate is exactly one per person; no more, no less. Since everyone must die, the only question is when and perhaps how. I believe effect on longevity would be a far more rational and understandable basis for expressing biological risk.

Another questionable presumption is that an average exposure of 170 mrem/yr to the entire population is indeed a credible possibility. Let's explore that.

(Slide #4) shows the results of air samples taken (at some of the major cities in this country) by the National Air Sampling Network for gross β activity in air.[10] As we are aware, the atmosphere is far from an homogeneous entity. Indeed, it can be characterized as being quite "lumpy". For this reason air sample results are log variant. This variance is

described by the geometric standard deviations (σ_g) shown in the column at the right. Now, if we may use this as an indication of the nature of variance of human exposure to man-made radiation, certain inferences become possible. From this data it would seem reasonable to ascribe a value of 2.5 as the typical σ_g.

If we look at the 500 mrem/yr standard for maximum exposure to individuals in the population and attempt to interpret the intent of the standard setting bodies, it would seem unreasonable to assume that not even one person out of our entire population could be allowed to receive that level of exposure. Monitoring for compliance with such a standard could create horrendous problems. One might assume that the standard was meant to apply only to persons living at the site boundary of nuclear installations, but then it's quite possible that people living at greater downwind distances could receive even larger doses under particular circumstances. Anyway, for this analysis, let us conservatively assume that the 500 mrem/yr standard would be complied with if not more than one person in 1000 were exposed in excess of this level. This assumption is also mathematically convenient since it is roughly the +3 σ level.

In log-normal statistics the ratio between the mean and the +3 σ level is the σ_g^3 which, in our case, would be 2.5^3 or roughly 15.7. This would mean that if the radiation standards were enforced in such a manner that not more than one person in 1000 received a dose $\geq$ 500 mrem/yr, the mean exposure would be 500 ÷ 15.7, or $\sim$ 32 mrem/yr. The average exposure would be slightly higher but certainly nowhere near the 170 mrem/yr level.

Conversely, should the condition ever occur where the average population exposure were indeed 170 mrem/yr, then roughly 12% of the population would receive doses in excess of 500 mrem/yr. Clearly, this would exceed the 500 mrem/yr limit for exposure to individuals.

A similar analysis has been performed by Knox[11] (Slide #5). His study considers the distribution of nuclear reactor effluent as caused by some typical atmospheric diffusion conditions. It shows that the average annual dose to individuals residing within 100 km of a nuclear site would be a factor of less than .03 of the "fence line" dose. Therefore, assuming

a "fence line" dose of 500 mrem/yr, the average exposure would be about 15 mrem/yr. Bond[12] has stated that actual operating experience with 11 power reactors indicates doses of 5 and .01 mrem/yr, respectively, at the site boundary and as an average to all persons within a 50-mile radius. This is a ratio of 50. Wright,[13] discussing "design basis" releases from pressurized water reactors, gives data indicating a ratio of over 200.

From the foregoing it appears that the arbitrary assumption of a factor of three (3) between maximum and average dose is quite low. A factor of one or even two orders of magnitude might more closely reflect reality. This being the case, adherence to the 500 mrem/yr standard for maximum dose would, in itself, assure an average dose far lower than the prescribed 170 mrem/yr. Partially for this reason, I think it would be a good idea to abolish the 170 mrem/yr standard completely. I, for one, cannot see that it serves any useful purpose. If anything, its existence is detrimental. Being based on some rather untenable premises, it can and has given certain environmental alarmists a focal point for attacking nuclear development. From a monitoring standpoint it would be nearly impossible to judge compliance with this standard because it requires rather precise measurement of extremely small concentrations which, at best, are highly variant. In addition, it is difficult, if not impossible to determine specifically what was meant by the "suitable population group" to which the standard was meant to apply. Guidance on this point has been somewhat vague. All these problems would be eliminated if the 170 mrem/yr standard were dispensed with completely.

While we're at it, let's also rid the standards and guidelines of such nebulous phrases as "low as practicable," "no unnecessary exposure," or "avoidance of undue hazard". It is difficult to see how one can put such guidance to practical application. I have personally seen examples where literally thousands of dollars have been spent to avoid the possibility of exposing people to what, at most, would be a few mrem. I would personally question the practicability of such an expenditure, but there are many who don't, especially when their own personal money is not involved. If I had my way, I would ban such words as "practicable," "necessary," "proper," "reasonable," and "suitable" from the lexicon of the standard setters unless

they were required to explicitly define them. I assure you that for any given set of circumstances, if you polled a large enough group of people, you would get very wide spectrum of opinions on just what is "practicable" or "reasonable". If standards are not definitive they simply are not standards. I suspect that the vagueness and equivocation found in many of the radiation guidelines is due to a reluctance to come to grips with the basic issues, or stated more succinctly, a "cop-out".

Having dispensed with the 170 mrem/yr standard and the weasel words, what could we substitute as a guideline for low-dose radiation exposure to populations? First, let me submit that the mere elimination of these items would in itself constitute a distinct improvement. However, I believe a far greater improvement would be achieved by incorporating the results of benefit-risk analysis into radiation protection guidelines.

We've all heard that the risk of radiation exposure should be balanced against the benefit to be derived from such exposure. This concept, like the weather, is something that everyone seems to talk about, but nobody does anything about. In recent years, a growing number of people, including myself, have begun thinking and doing something about it. Some studies along the line of benefit-risk analysis have been already performed, albeit at a fairly primitive level.[14-17] At this year's mid-year topical symposium on standards to be held in Richland this fall, a complete session is planned to be devoted to the subject. For those of you not familiar with the nature of this work, the objective of benefit-risk analysis is to determine a rational, definitive, and generally-acceptable means of evaluating the potential benefits of any given operation, program, or technology against the possible risks. Two years ago, at the Pittsburg meeting of this society, I presented a paper in which I proposed the use of a new unit called the "Mer".[5] (Slide #6) The Mer is defined as that amount of benefit required to justify an exposure to one rem. Now I'll admit that, at the time, this idea was presented somewhat with tongue in cheek, but let me assure you that now the tongue is out of the cheek, and I'm quite serious. The tangible and, hopefully, comprehensive Mer equivalents I proposed at the time were 25 days of life, 2000 motor vehicle miles, and, most important, $250. Use of the

latter figure would conveniently enable one to calculate, in dollars, the biological damage resulting from various radiation exposures and compare this to the cost of the remedial measures necessary to reduce or avoid such exposures. One problem with this approach is that it rather explicitly infers a monetary value on human life (specifically $250,000). This appears to be morally objectionable to some.[18] However, in the subsequent two years, others,[19-22] using entirely different assumptions, have also placed monetary values on radiation risk. These values, shown in (Slide #7), appear to be remarkably consistent. Those advocating this approach feel it is neither unreasonable nor immoral to explicitly state a type of judgment that is implicitly being made by mankind continually.

As an example of how one might apply the Mer (Slide #8), we refer to a study performed by Otway[23] on the risks of siting the Omega West Reactor in the Los Alamos Canyon. In his analysis, Otway considered all the various reactor failure mechanisms and their probability of occurrence. He also considered meteorology and all the other factors he could think of which had a bearing on reactor releases. His analysis enabled him to draw these isopleths of mortality risk per year of exposure. Now, using the Mer, it becomes a simple exercise to substitute monetary values, as seen on (Slide #9). Here it can be seen that anyone residing at the site boundary would undergo a risk equivalent to $.25/yr. In this particular case nobody would live at the site boundary. The closest residents would actually be about a mile away, where the price would scale down to about 1¢ for every 400 years of exposure. Now, if we accept the concept of hazard duty pay which is quite common and well accepted in the military as well as certain other high-risk occupations, then it might be right and proper to compensate these people for the risk they would undergo. I believe that, at these rates, any reactor operator would be delighted to do so.

Application of some form of benefit-risk analysis into radiation guidelines would have the effect of placing low-dose exposure risks into a commonly comprehensible perspective. By retaining the 500 mrem/yr limit for individual exposure, we avoid the possibility of giving excessive exposures to any segment of the population.

Metzger[24] has suggested the elevation of benefit-risk analysis to the status of a science incorporating social scientists, lawyers, theologians, and even soliciting the involvement of the technically naive. Why not also involve such groups in the process of setting radiation standards.

Believing that expeditious development of nuclear energy in this country would be advantageous, if not essential, I was rather dismayed at seeing the latest AEC proposed amendments to its licensing regulations for light water reactors.[25] Regardless of their protestations, I veiw the new guidelines (5 Mr/yr) as a capitulation by the Commission to the attacks of Drs. Gofman and Tamplin, among others. It's the same old numbers game, and no matter who plays it, it's still wrong! If one accepts the often stated proposition that no safe radiation threshold exists, then any exposure could result in some harm (apparent or not). No amount of bureaucratic gobbledygook can obscure the fact that there is a finite element of risk involved with low dose radiation exposure regardless of what absolute limit is set. Lowering the dose limits to whatever happens to appear "practicable" at a given time merely evades the basic issue and can accomplish little more than temporarily to cater to the mentality of the environmental paranoids. Like the old saying goes, "If you give them an inch . . ."

Forgive me if I should sound like an "ecology freak" myself, but let me show you the sort of thing that can be done with these reduced standards. (Slide #10) According to the federal register[24], under the newly proposed regulations, average population exposures will be less than 1 mrem/yr and/or less than 400 man-rem/10^3 MWe capacity. Calculating this out Gofman-Tamplin style, (by assuming that sooner or later, everyone will reach this dose level) we see that adherence to these new regulations could result in an additional 200 deaths/year in this country.

By what calculus, one might ask, has it been concluded that this effect is justified by the benefit anticipated from light water reactors? I, for one, think that such calculation can and <u>should</u> be made. It would probably reveal that this means of power generation is easily worth the attendant risk. An analytical approach toward solving benefit-risk questions could go a long way toward eliminating much of the conjecture,emotionalism and recrimination which often accompany deliberations on nuclear applications.

Man's history is replete with examples of risks taken as the cost for real or assumed benefit. Mostly these were taken on an intuitive basis. However, it is quite possible to explicitly and quantitatively define risks as well as benefits. Such benefit-risk analysis could well serve as a meaningful basis for radiation protection guidelines.

As a starting point, I would submit, for serious consideration of those groups charged with the responsibility for establishing radiation standards, the substitution of the Mer, or some similarly definitive benefit risk concept for the 170 mrem/yr limit as a guideline for low-dose population exposures. It might not solve all the problems, but I believe it would be a substantial improvement. At least it would be worth a try.

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22 J. Lederberg, Affidavit filed on petition of Vermont Yankee Nuclear Power Corp., Washington County, State of Vermont, PSB Docket No. 3445, September 1970.

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SLIDE #1

GOFMAN AND TAMPLIN DOUBLING DOSE CONCEPT

A DOUBLING DOSE IS THE AMOUNT OF RADIATION EXPOSURE THAT WILL DOUBLE THE SPONTANEOUS INCIDENCE OF MALIGNANT DISEASE.

ONE DOUBLING DOSE $\simeq$ 50 RAD.

- 0.17 RAD/YR TO ONE GENERATION (30 YR) = 5 RAD = 0.1 DOUBLING DOSE.
- SPONTANEOUS INCIDENCE OF MALIGNANT DISEASE = $\frac{2.8 \times 10^{-3} \text{ CASES}}{\text{MAN-YEAR}}$
- $0.1\ (2.8 \times 10^{-3})\ (1 \times 10^{8})^{*}$ = 28,000 CASES/YEAR + 4,000 ESTIMATED CASES FOR AGE LESS THAN 30 YEARS = <u>32,000 CASES/YEAR.</u>

* ESTIMATED U.S. POPULATION OVER 30 YEARS OF AGE.

MORTALITY RISK DUE TO RADIATION EXPOSURE

AUTHOR	REF. NO.	ESTIMATED PROBABILITY OF DEATH/MAN-RAD
ANSPAUGH AND ROBISON	4	10^{-3}
COHEN	5	10^{-3}
GOFMAN AND TAMPLIN	3	10^{-3}
OTWAY	6	7×10^{-4}
BARRY	7	10^{-4}
HULL	8	10^{-4}
STORER	9	10^{-4}

ASSUME 10^{-3}; AT EQUILIBRIUM:

$$0.17 \text{ RAD/YR} \times 10^{-3} \frac{\text{INCREASED DEATHS}}{\text{MAN-RAD}} \times 2 \times 10^{8} \text{ PEOPLE}^{*} = 34{,}000 \frac{\text{INCREASED DEATHS}}{\text{YEAR}}$$

* ESTIMATED TOTAL U.S. POPULATION.

NATIONAL AIR SAMPLING NETWORK

1957 - 1958

STATION LOCATION	MEAN (pc /M^3)	GEOMETRIC STANDARD DEVIATION σ_g
BALTIMORE, MARYLAND	3.1	1.928
CHICAGO, ILLINOIS	6.0	2.360
CLEVELAND, OHIO	8.5	1.582
DETROIT, MICHIGAN	3.6	2.642
HOUSTON, TEXAS	6.4	4.787
LIVERMORE, CALIFORNIA	4.1	2.528
LOS ANGELES, CALIFORNIA	4.4	2.006
NEW YORK, NEW YORK	4.0	2.617
PHILADELPHIA, PENNSYLVANIA	4.2	2.764
ST. LOUIS, MISSOURI	15.5	3.637
WASHINGTON, D.C.	4.8	2.507

COMPARISON OF MAXIMUM TO AVERAGE RADIATION EXPOSURES TO POPULATIONS SURROUNDING NUCLEAR FACILITIES

AUTHOR	REF. NO.	$\frac{\text{MAXIMUM EXPOSURE}}{\text{AVERAGE EXPOSURE}}$
J. J. COHEN	--	15.7
J. B. KNOX	11	33.3
V. P. BOND	12	50.0
J. H. WRIGHT	13	209.0

MER

A UNIT OF BENEFIT: THE MER IS THE AMOUNT OF BENEFIT REQUIRED TO JUSTIFY AN EXPOSURE TO ONE REM.

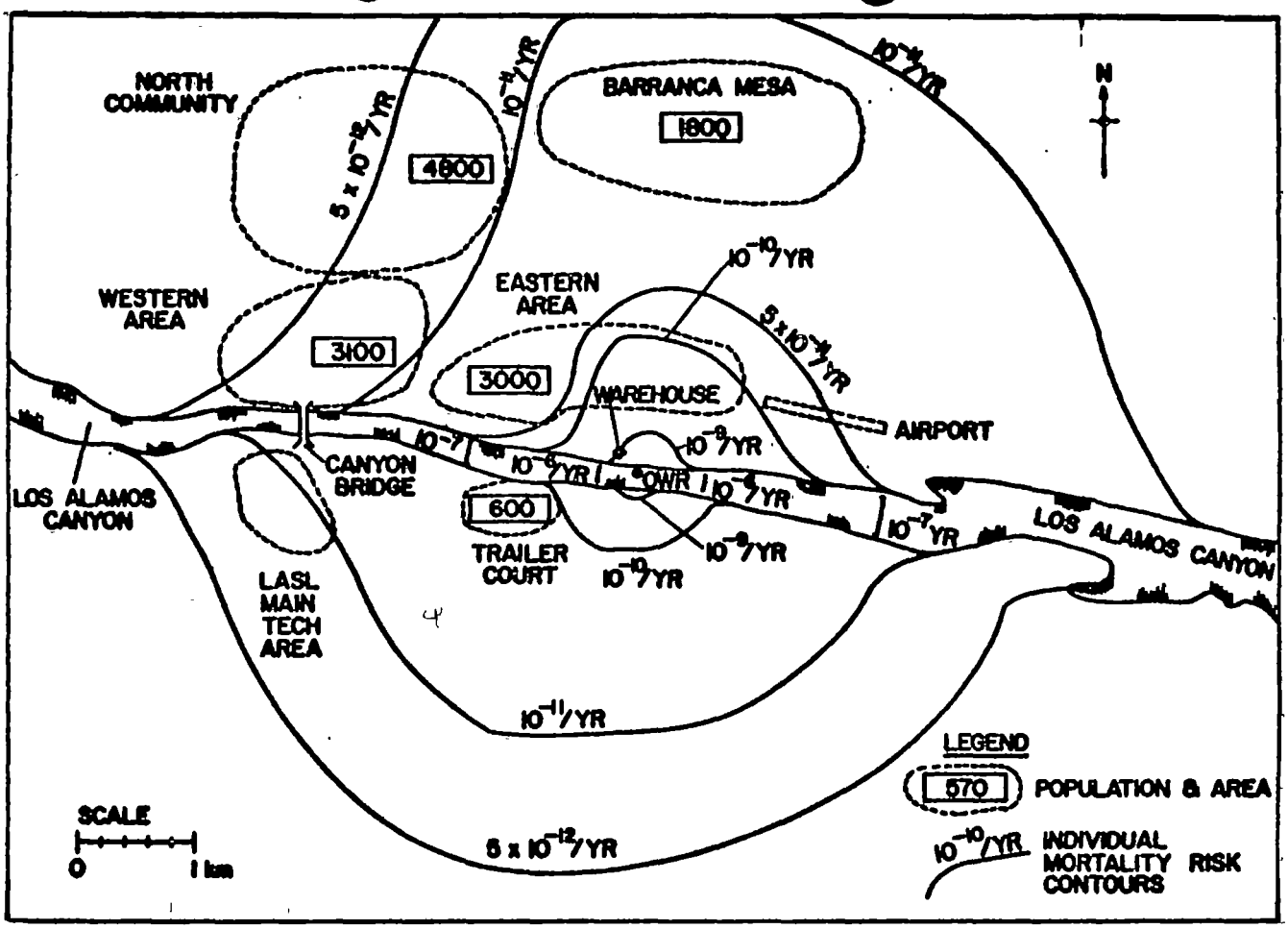
MER EQUIVALENTS

1. 25 DAYS OF LIFE.
2. 2,000 AUTOMOBILE MILES.
3. $250.

BIOLOGICAL COST OF RADIATION DAMAGE

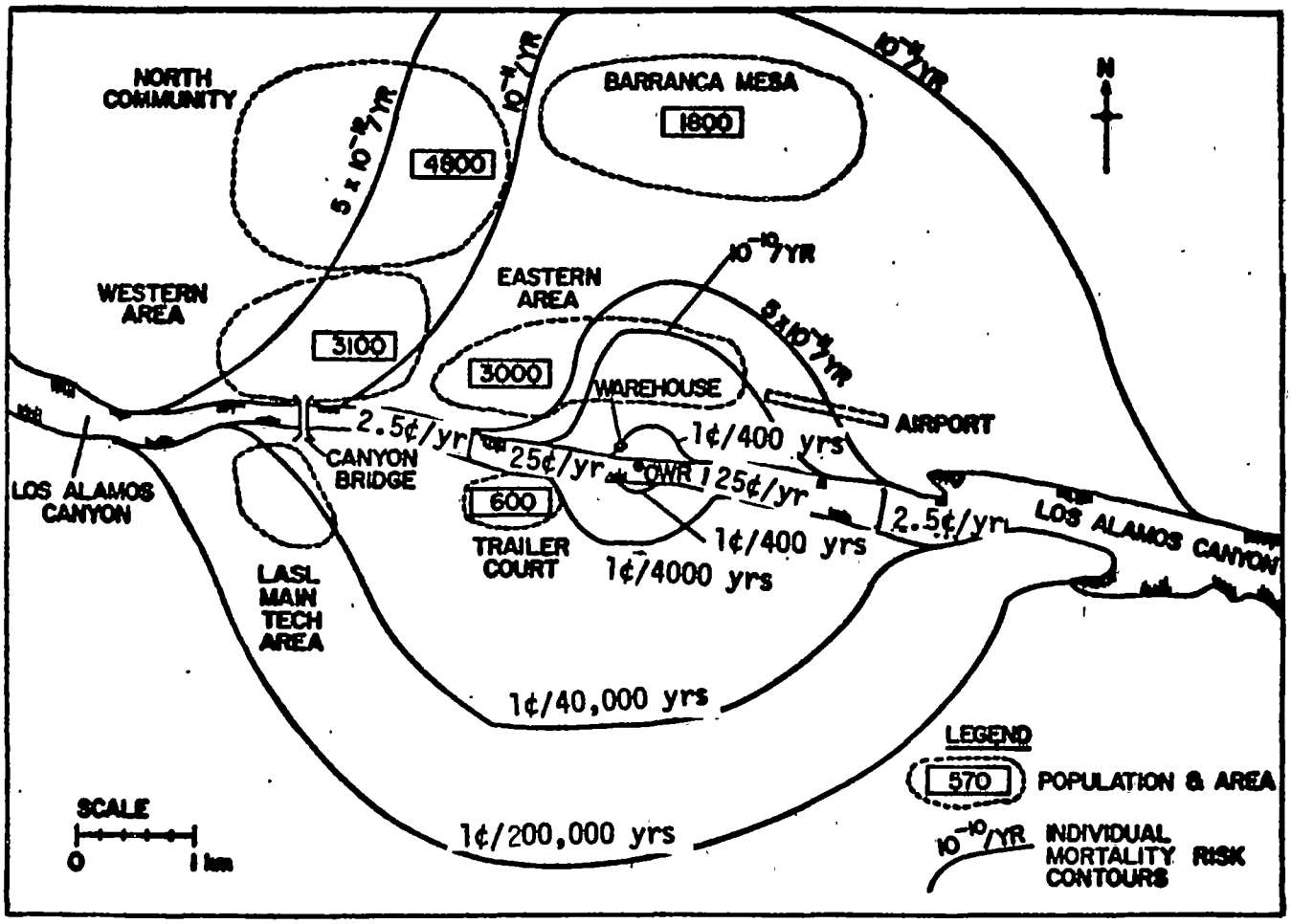
AUTHOR	REF. NO.	$/MAN-RAD
COHEN (LRL), 1969	5	$250.00
HEDGRAN, LINDELL (SWEDEN), 1970	19	$100.00
DUNSTER (UK), 1970	20	~ $ 10.00*
OTWAY (LASL), 1971	21	$200.00
LEDERBERG (STANFORD), 1971	22	$100.00

* "A FEW POUNDS STERLING"



INDIVIDUAL MORTALITY RISK CONTOURS SUPERIMPOSED ON PLAN OF LOS ALAMOS, NEW MEXICO

SLIDE #8


NORTH COMMUNITY
4800
BARRANCA MESA
1800
WESTERN AREA
3100
EASTERN AREA
3000
WAREHOUSE
AIRPORT
CANYON BRIDGE
LOS ALAMOS CANYON
600
TRAILER COURT
LASL MAIN TECH AREA
2.5¢/yr
25¢/yr
OWR
125¢/yr
1¢/400 yrs
1¢/4000 yrs
1¢/40,000 yrs
1¢/200,000 yrs
N
SCALE
0
1 km
LEGEND
570
POPULATION & AREA
INDIVIDUAL MORTALITY RISK CONTOURS

SLIDE #9

EFFECTS OF PROPOSED AEC REGULATIONS

1. 1.0 MREM/YR BASIS

$1.0\ \text{MREM/YR} \times 10^{-3}\ \text{MREM/REM} \times 2 \times 10^{8}\ \text{PEOPLE} \times 10^{-3}\ \text{DEATH/MAN-REM}$

$= 200\ \text{DEATHS/YR}$

2. 400 MREM/10^3 MWe BASIS

INSTALLED NUCLEAR REACTOR CAPACITY ANTICIPATED BY THE YEAR 1990

$= 500 \times 10^{3}\ \text{MWe}$ (REFERENCE 26)

$$500 \times 10^{3}\ \text{MWe} \times 400\ \frac{\text{MAN-REM}}{10^{3}\ \text{MWe}} \times 10^{-3}\ \text{DEATHS/MAN-REM} = 200\ \text{DEATHS/YR}$$

SLIDE #10

DISTRIBUTION

Technical Information Department - 15

Jerry J. Cohen - 125

University of Missouri
COLUMBIA - KANSAS CITY - ROLLA - ST. LOUIS

Reply to:
413 Clark Hall
Columbia, Missouri 65201

RADIATION SAFETY OFFICE

July 16, 1971

Mr. Lester Rogers, Director
Division of Radiological and Environmental Protection
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rogers:

Thank you for the opportunity to comment on the proposed changes in 10 CFR 50 as invited by your letter of June 10, 1971. Unfortunately, I have no experience directly applicable to power reactors and, hence, cannot evaluate whether the proposed changes are fair and achievable. My reaction to changes of this kind reflects a strong bias toward decreasing rather than increasing the strictures placed upon use of the byproducts of atomic energy. Contrary to the present public opinion, I find the AEC squeezing the licensee so hard that he must consider reducing rather than expanding his efforts in utilization.

The AEC has been the target of a shotgun attack against its dual development and regulatory function, which has enjoyed public support. Wherein this attack has merit and reason in certain of its elements, the AEC must attempt to respond where and when it can to correct the errors of the past. My hope is only that over reaction will be avoided lest we suffer a depression of our carefully nurtured development process. If the proposed changes can be incorporated in power reactor design and operation without a significant change in the orderly expansion of this source of power, I support them wholeheartedly.

Sincerely yours,

John H. Tolan

John H. Tolan
Radiation Safety Officer

JHT:wp

(12)

NUS CORPORATION

July 23, 1971
ESD-71-904

Secretary of the Commission
U.S. Atomic Energy Commission
Washington, D.C.

Attn: Chief, Public Procedures Branch

Dear Sir:

The comments below are made in response to the notice of proposed rule making on numerical guidance for emissions from light water cooled nuclear power reactors published in the FEDERAL REGISTER on June 9, 1971. In general, we have supported the concept of providing numerical guidance for discharges from light water power plants. In testimony before the Joint Committee on Atomic Energy on January 30, 1970, I had indicated in part that Part 20 and Part 50 required some modification along these lines and included in my statement a number of the considerations included in the presently proposed numerical guidance. Also in the January 21, 1971, meeting with the Regulatory Staff on this subject, we supported the concept of numerical guidance at a fraction of Part 20 values.

However, the proposed guidance as published represents, in our view, an application of the "as low as practicable" principle to an extreme which is not warranted by radiation safety considerations; not supportable by available technology as evaluated by the Regulatory Staff; and which may, in fact, lead to an overall detriment both to the radiation exposure budget in the U.S. and to the provision of reliable electric energy. We would also like the record to show that, in spite of our being listed as one of the organizations consulted in this matter, we did not then, nor do we now agree with the specific numerical values proposed.

Our concerns about these proposed amendments reside in several areas:

1. The basic numerical guidance of 5 mrem per year is extremely conservative; as indicated by both our own and the Regulatory Staff's calculations, it represents a probable average per capita dose within

ENVIRONMENTAL SAFEGUARDS DIVISION

Acknowledged by card 7/26/71, crs

■ 4 RESEARCH PLACE, ROCKVILLE, MARYLAND 20850, U.S.A. ■ TELEPHONE (301) 948-7010 CABLE: NUSWASH

50 miles of between 0.05 and 0.005 mrem per year.* As noted in the press release accompanying the announcement, it is also well within the normal range of variation with time of natural background radiation at a given location. Because of this fact alone, it is totally impossible to verify compliance directly, and indirect verification by calculation presents difficulties which are treated in Item 2 below.

As a design objective, the 5 mrem per year value for waste discharges from normal operation should present no major difficulties in achievement. However, the proposed deviations permitted from this design objective make it clear that this is to be applied as an operating limit, and as such it may well impose substantial restrictions on reliable electrical energy supply; indeed some overall reduction of radiation safety is also likely to be induced as described in Item 3 below.

The guides for limiting conditions would suggest that if discharges exceed twice the design objective quantities averaged over a calendar quarter, then programs to reduce discharges should be initiated, and that if discharges exceed 4 - 8 times design objective quantities over the same time interval, the Commission will act to assure reduction of such discharges. The unfortunate implication is that a maximum individual exposure from this source in the range of 10 - 15 mrem per year $\left(40 \text{ mrem per year} \times \frac{1 \text{ quarter}}{4 \text{ quarters per year}}\right)$, and a corresponding average per capita dose in the range of 0.15 - 0.010 mrem per year is sufficiently hazardous to warrant prompt Commission action for reduction. If the Commission does in fact hold this view, its previous attitudes can only be regarded as derelict, as has been suggested by some of its critics; if, on the other hand, this implication is (as we suspect) not correct, then it would seem that greater flexibility could be afforded without a significant compromise in the public health and safety. This seems particularly true since the numerical guides are much less than the incremental dose contributions from structural materials used in homes, schools and offices.

2. We are greatly concerned that, in the application of these guides by the Regulatory Staff, substantial additional conservatism will be required. This has been their practice in the past, and one which

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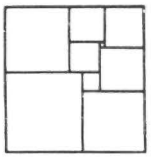
* Carl C. Gamertsfelder, "Regulatory Experience and Projections for Future Design Criteria," presented at the Southern Conference on Environmental Radiation Protection at Nuclear Power Plants, April 21-22, 1971, St. Petersburg Beach, Florida



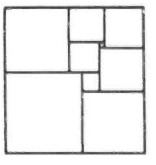
has been commendable, resulting as it has in the excellent record of waste management compiled to date in this area. However, preliminary meetings with members of the Staff have lead us to believe that much the same philosophy of cautious conservatism and desire for "margin of safety" will prevail in determining the suitability of systems and discharges under this new numerical guidance, which already incorporates a "factor of safety" of 100. This is particularly true in view of the fact that demonstration of compliance with the basic dose guide is technically impossible; support must therefore depend upon calculations using models which are always subject to additional conservatisms since they cannot be verified by field measurements at this dose level.

An example of this approach is clearly evident in the specification of discharge quantities and concentrations in Section II, A. and B.2. which demonstrate no correlation with dose whatsoever. The radioiodine reduction by a factor of 100,000, for example, increases to 1000 the already conservatively estimated reconcentration factor of 700 and applies it both to iodines and to other particulates at the site boundary, regardless of the existence, duration or location of grazing.

On this basis we would feel strongly that any numerical guidance can be meaningful only in the context of a defined method of design basis analysis and evaluation to which both the Regulatory Staff and the applicants can agree. If the past conservative practices of the Staff are continued with the new criteria (and considering that these practices under the present Part 20 limits have resulted in a few percent of those limits), a design basis objective of 50 mrem per year might be more reasonable as we suggested in our meeting on January 21, and in a letter to Mr. Rogers dated January 25, 1971.

3. We are concerned that the stringent application of these criteria as limits will lead to a significant <u>detrimental</u> impact on the overall population radiation exposure. The basis for this concern rests on our evaluation of the public population exposure and the "population exposure" to plant personnel in presently operating facilities.

Studies which have been reported both by applicants and the AEC indicate that the primary public exposure from operating nuclear power plants results from gaseous discharges. Gamertsfelder, as an example, estimated that the total 1969 general population radiation exposure from

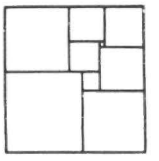


nuclear plants was approximately 500 man-rem. If one assumes that in 1969, BWR off-gas emissions had been reduced by a factor of 100 consistent with present plans at BWR facilities, the total population dose would have approximated 30 man-rem, and no site would have exceeded the 5 mrem guidance value, as calculated by Gamertsfelder.

To achieve the emission reductions implied by the proposed rule under design basis conditions, would require improved retention of radionuclides in-plant by processing of additional fluid streams not now treated, by improved, more efficient recovery or hold-up of these materials, and/or by recycling and reuse of processed reactor coolant. This will inescapably result in more direct maintenance of radioactive process equipment, more handling of coolant and waste samples, solid wastes, filters, spent resins, etc., and more potential for inhalation or other internal exposure to plant personnel. It is our conviction, based on evidence available at present, that this will <u>increase</u> rather than decrease the overall population radiation exposure in the U.S.

Film badge exposure records for plant personnel indicate that, for the plants considered in the Gamertsfelder analysis referenced above, the in-plant "population exposure" for 1969 totalled about 2400 man-rem or almost a factor of 100 greater than the estimated residual public exposure in the example year 1969 assuming additional BWR off-gas processing. Approximately 85% of this exposure was received by maintenance personnel. If, therefore, the additional in-plant processing systems required to deal with extremely conservative application of the proposed criteria result in no more than a 1.5% increase in dose to plant personnel from maintenance and handling activities, any public benefit that may be received from elimination of further emissions from plants will be completely negated.

Working familiarity with power plant fluid processing systems and their maintenance needs make it extremely doubtful to us that the extremely stringent emission standards will not result in an <u>increase</u> in the overall U.S. population dose due to increased in-plant exposure. According to the linear dose-effect hypothesis under which our standards are set, it is this total dose which is important. Two thousand man-rems to the U.S. population is, under this assumption, equally damaging whether received by 2000 plant workers or 200,000,000 people. It is our strong feeling that excessive conservatism and inflexibility in the application of these numerical criteria which are themselves conservative, may lead to a substantial increase in this overall population exposure.



4. With respect to the specific guides contained in Section II.A of proposed Appendix I, the quantities and concentrations listed there are largely without specific relevance to the numerical dose criteria, since the quantities and concentrations releasable within the limitations of these dose objectives will vary widely with site and plant characteristics. For example, the concentration limits expressed in Part A are entirely inappropriate when applied to a plant with a cooling tower and the resulting limited dilution available in the discharge from such a plant, or for a plant operating on a cooling lake.

In Section II.B.2, the use of a reconcentration factor of 1,000 for radioactive iodines and other particulate material with a half-life greater than 8 days is unreasonably conservative since the use of this value implies the existence of grazing dairy cattle at the downwind site boundary on a year-round basis. Considering the conservative implication of a 5 mrem dose guide in the first instance, the application of a further reduction factor to a situation which may not exist at all, or may exist at most for a few months out of the year, is an example of unreasonable conservatism.

We are also concerned that, if the design objectives are interpreted literally as limits on all sources of potential radiation exposure from these plants to individuals living at the site boundary, waste emissions will be even further restricted, since theoretical calculations of direct and scattered radiation from sources contained within a plant indicate expected doses in the range of 2 - 6 mrem per year, shielding against which would be unreasonable.

SUMMARY AND RECOMMENDATIONS

In summary, we feel that the use of numerical guides is highly desirable, both to plant designers and operators and to the public. We would, however, strongly suggest that the overall interests of the public might be better served by providing a greater degree of flexibility in discharges, thus assuring the ability of these plants to produce needed energy while continuing to maintain public exposures at insignificant values. We submit that the proposed design objectives and limits on operation do not even meet the Part 20 definition of "as low as practicable" --- "taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety and in relation to the utilization of atomic energy in the public interest."

It is suggested that operation of a particular facility at an annual average of 25 mrem for any single year, and a 5 mrem per year average over a 5 year period would not be inconsistent with past experience, expected plant performance and the protection of the public health. It is further noted that evidence available now suggests that unreasonable application of further conservatism in individual plant design bases and operating limits is quite likely to result in an increase rather than a decrease in the overall radiation exposure to the U.S. population deriving from substantially greater in-plant exposures than presently exists.

Since one of the basic radiological concerns rests with the long-term dose accumulation from these plants and since the basic source of emissions derives from fuel which is typically replaced, or major systems which are maintained at annual intervals, we would suggest a modification of the numerical guides which incorporate these considerations:

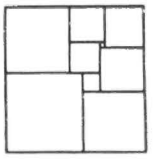
a. a design basis objective of 5 mrem per year or less to any individual is to be averaged over a 5 year period, and is to refer only to materials discharged as wastes from the plant,

b. in any one year, the release of liquid and gaseous wastes should not result in any individual receiving more than 25 mrem per year,

c. in any calendar quarter, the average rate of release should not exceed that which would result in any individual receiving more than 75 mrem per year, and

d. numerical limits for discharges corresponding to these dose guides should be proposed by applicants on the basis of their site and environmental evaluations which determine critical exposure pathways, and critical individuals and populations.

These modifications would not materially change the degree of public health protection afforded by the proposed numerical criteria, since the average dose guide would remain the same; they would provide for a considerably greater degree of flexibility by permitting operation with a less-than-satisfactory fuel batch until the next scheduled refueling or, in the case of PWRs, the greater-than-anticipated steam generator tube leakage until the next scheduled shutdown.



We are looking forward to an opportunity to expand on these points at the public hearing to be held on this proposed rule making.

Very truly yours,

Morton I. Goldman

Morton I. Goldman, Sc.D.
Vice President & General Manager

MIG:rdf

GILBERT ASSOCIATES, INC.

ENGINEERS AND CONSULTANTS

July 16, 1971

Secretary of the Commission
U. S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Chief, Public Proceedings Branch

Gentlemen:

This letter is in response to the Federal Register Notice of June 9, 1971 inviting public comment on a proposed amendment to 10 CFR 50 which would add a new Appendix I - Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low as Practicable" for Radioactive Materials in Light-Water-Cooled Nuclear Power Reactor Effluents.

We completely concur with the commission with regard to the need to establish numerical guidelines which quantify the "as low as practicable" limits. This will be a big help in establishing a definitive design basis for radioactive waste processing systems. However, Section II.A.3 of the proposed Appendix I appears to be unduly restrictive in limiting tritium concentration prior to dilution in a natural body of water, to 0.005 micro curie per liter. This is particularly true when considering the dilution flow normally available for present day water reactors with cooling tower heat rejection systems at acceptable sites. It is also a factor of 600 lower than the existing limit in 10 CFR 20.

The impact of this proposed guideline for tritium concentration on the siting of new plants would be to limit the availability of many new sites that would otherwise be acceptable from the viewpoint of other social conditions, since the availability of dilution water would now become one of the primary siting criteria. For example, a 900 MW(e) PWR releases approximately 500 curies per year to the reactor coolant (assuming 1% diffusion through the fuel clad). In order to release this amount to the environment, an average annual dilution flow in excess of 50,000 gpm is required. This flow is substantially in excess of the normal blowdown flow of a cooling tower system. Therefore, a plant with cooling towers would be required to pump a substantial quantity of additional water for dilution only, or to recycle tritiated water and allow

GILBERT ASSOCIATES, INC.

ENGINEERS AND CONSULTANTS

Secretary
U.S. Atomic Energy Commission
Washington, D. C. 20545
Attn: Chief, Public Proceedings
Branch

July 16, 1971

the tritium concentration to build up in the reactor coolant, which only delays the problem of disposal.

The use of cooling tower blowdown plus the cooling water discharge from the nuclear services coolers have been found acceptable for use as dilution flow at some sites. Other sites require the utilization of evaporative cooling for nuclear services, with standby emergency cooling facilities provided. In this latter case there is no dilution flow beyond the 1800 gpm to 3000 gpm provided from blowdown. In still other proposed sites, the diversion of water from its existing channel by pipeline would provide all plant makeup requirements.

Therefore, we recommend that a tritium concentration limit not be set unnecessarily low, in consideration of realistic values for available dilution flows and their effect on the acceptability of potential plant sites. Although existing data from operating plants indicate no problem, these plants employ once-thru heat rejection systems. The future trends are towards increased unit size and predominantly cooling tower heat rejection systems.

For these reasons we recommend that the value in Section II.A.3 be changed from .005 micro curies per liter to a higher number in the range of 10% of 10 CFR limits.

Very truly yours,

S D Goodman

S. D. Goodman
Chief Nuclear Engineer

SDG:C

cc: Edwin A. Wiggin
Atomic Industrial Forum

DOCKET NUMBER
PROPOSED RULE PR-50
Numerical Guidance

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926

RALPH A. MAC MULLAN, Director

July 12, 1971

Secretary of the Commission
U.S. Atomic Energy Commission
Washington, D.C. 20545

Attention: Chief, Public Proceedings Branch

Gentlemen:

We wish to express our support to the proposed rule making that adds a supplement to the Commission's regulation, "Licensing of Production and Utilization Facilities," 10 CFR Part 50.

We are pleased to see the low as practicable radioactivity effluent requirement further developed to definitive numerical criteria for light-water-cooled nuclear power reactors and hope that similar criteria can be developed in the near future for gas cooled and fast breeder reactors.

We hope that in developing the proposed numerical values that your first concern has been to establish effluent criteria that will provide full protection to the entire Eco system, including man, either as a result of direct exposure to the effluents or by exposure to such levels of radioactivity as may result from biological concentration factors in the food chain. We believe this to be particularly important in view of the size and number of light-water-cooled nuclear power reactors now being built or proposed in the Great Lakes area.

We believe that appropriate state agencies should have an opportunity to participate in the decision making process for determining those instances where lower qualities and concentrations of radioactive materials than that set forth in paragraphs (a) and (b) are desirable or where higher levels can be deemed to meet the requirements of keeping levels of radioactive materials in effluents as low as practicable.

Very truly yours,

WATER RESOURCES COMMISSION

Ralph W Purdy

Ralph W. Purdy
Executive Secretary

MICHIGAN
THE GREAT LAKE STATE

RWP:S
cc--Leonard J. Goodsell

Acknowledged by card 7/15/71, ers

(1) -

as from

Department of Physics
Harvard University
Cambridge 02138.

Sec. US. AEC
Chief Public Proceedings Branch

Dear Sir,

Please excuse this handwritten letter - sent because I am on vacation.

I wish to comment on your proposed amendment to 10 CFR 50 published in the Federal Register Vol 36, 111 June 9 1971.

In general, I believe your proposed amendment is excellent & timely, & far better than your pres release & both better than the statement of Mr Harold Price as reported in the NY Times. Another instance of carefully considered wisdom being superior to casual utterance.

It is not clear to me the extent to which the preamble remains in the final document. I believe some part should. There has been considerable confusion caused in the body politic by uncertainty about radiation standards. The reason for the "low as practicable" doctrine must be there. I suggest after 50.36 a (#), but before the ~~...~~ regulation itself the following be inserted.

"It is a ~~The~~ recommendation of ICRP, FRC, & NCRP that radiation be kept as low as practicable. This is not based on any biological effect that is known to occur at the low levels of radiation corresponding to these regulations. Rather it is based on the conservative (and in this case pessimistic) assumption that the genetic and carcinogenic effects of radiation are proportional to dose, independent of dose rate, and that even a low level of radiation causes a small measure of risk which must be constantly balanced against a corresponding benefit"

"There are many distinguished people who believe in the linear theory, James D Watson, Linus Pauling, and Joshua Lederberg & are ~~two~~ three. There has been confusion because Commissioner Seaborg, and the late Commissioner Theos Thompson stated their personal beliefs that a threshold exists below which radiation is harmless. Official statements ~~must~~ can overcome this confusion between ~~pu~~ prudent public policy and personal belief. The ICRP in their report No 39 (which should never have been written) ducked all important issues, & particularly the issue of what "as low as practicable" means. I am glad you are taking it up officially & legally but the background must be clear.

Yrs sincerely

Richard Wilson

Professor of Physics

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY
RONALD REAGAN, Governor

DEPARTMENT OF PUBLIC HEALTH
2151 BERKELEY WAY
BERKELEY 94704

June 30, 1971

Mr. Harold L. Price
Director of Regulation
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Harold:

Governor Reagan has asked me to respond to your June 12, 1971 letter and accompanying material concerning proposed regulations limiting radioactivity in effluents from nuclear power plants.

We consider this to be a major constructive step. Your Commission is to be commended for initiating this action, and we would urge adoption of the regulation as proposed.

Sincerely,

John M. Heslep, Ph.D.
Deputy Director for
Environmental Health and
Consumer Protection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JUL 2 1971
U.S. ATOMIC ENERGY COMMISSION
Regulatory
Mail Section

HARVARD UNIVERSITY
SCHOOL OF PUBLIC HEALTH

KRESGE CENTER FOR ENVIRONMENTAL HEALTH
DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCES

665 Huntington Avenue
Boston, Massachusetts 02115
Tel. 617 734-3300

June 29, 1971

Mr. Lester Rogers, Director
Division of Radiological and
Environmental Protection
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rogers:

In response to your letter of June 10, 1971, we have reviewed the copy of the notice of proposed rule making that would add a supplement to the Commission's regulation, "Licensing of Production and Utilization Facilities," 10 CFR Part 50. On the basis of this review, we would like to submit the following specific comments with respect to the text of this proposed rule:

1. With reference to the introductory material, we do not understand how a 10-millirem exposure from noble gases (last column on page 11114) can be expected to give assurance "that actual annual exposures to the whole body or any organ of an individual member of the public will not exceed 5 millirems," unless the skin is not considered to be an organ.

2. We disagree with two philosophies which are expressed in Appendix I:

   A. Limiting total annual discharge without respect to radionuclide composition, or

   B. Limiting effluent concentrations without respect to radionuclide composition.

Apparently the idea is that these values, given the nuclide composition to be expected from light water reactor, are sufficiently low that calculations of dispersion, population distance, site boundaries, etc., are unnecessary. If this is so, it should be specifically stated in the Statement of Considerations, which would be a part of the introductory material.

(7)

3. The authors of the proposal have taken many liberties in the use of the terminology "exposure rate" in terms of millirems (per year). We would strongly urge that the noun, "exposure," and the phrase, "exposure rate," be restricted to the ICRU definition (Roentgens). Following this approach, the present statements might be modified to read along the following lines--"exposure to radiation (or to noble gases, etc.) at these levels is not expected to result in dose equivalents greater than 5 millirems per year to any individual."

4. On the positive side, we were pleased to note that the proposed rule points out that:

   A. Reduction of effluent releases to a level which will result in less than 5 mrem/yr was being done because it is readily possible with existing technology, and

   B. The report provides for annual averaging, with specified permissible over-runs for shorter periods of time.

We appreciate the opportunity of commenting on this proposal, and we hope these suggestions will be useful.

Sincerely yours,

Dade W. Moeller

Dade W. Moeller, Ph.D.
Department Head

DWM:jmb

cc: Dr. A. S. Goldin

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY
RONALD REAGAN, Governor

DEPARTMENT OF PUBLIC HEALTH
2151 BERKELEY WAY
BERKELEY 94704

June 29, 1971

Mr. Lester Rogers, Director
Division of Radiological and
Environmental Protection
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Les:

I appreciate your thoughtfulness in sending me the material relative to the Commission's proposed rule concerning nuclear power reactor effluents.

You know my views well enough to anticipate that I would consider this to be a major constructive move, both as a matter of general prudence and to counter some of the unreasoned opposition to nuclear power. I would certainly hope that the rule can be adopted as proposed or closely similar thereto.

I realize the necessity for limiting the rule to light-water-cooled reactors but it would, in my opinion, be highly desirable for the Commission also to announce that, for other classes of reactors, the burden of proof will be on their proponents to justify not meeting the same standards. It would also be helpful for the Commission to develop and announce plans for dealing with potential long-range problems such as releases of Kr-85 and I-129 from fuel reprocessing plants.

If, then, there were only some way of eliminating the Price-Anderson indemnity provisions! I realize that this is unlikely to happen, but I have long felt - and often said - that they provide the strongest available argument against the safety of nuclear reactors.

Kind regards.

Sincerely,

John M. Heslep, Ph.D.
Deputy Director for
Environmental Health and
Consumer Protection

JMH:cl

SAM YORTY
MAYOR

DEPARTMENT
OF
WATER AND POWER
THE CITY OF LOS ANGELES

COMMISSION
JOHN W. LUHRING, PRESIDENT
HENRY G. BODKIN
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WATER AND POWER SQUARE
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EDGAR L. KANOUSE
GENERAL MANAGER
AND CHIEF ENGINEER

JOHN G. COWAN
ASSISTANT GENERAL MANAGER
AND CHIEF ENGINEER

FLOYD L. GOSS
CHIEF ELECTRICAL ENGINEER
AND ASSISTANT MANAGER

ROBERT V. PHILLIPS
CHIEF ENGINEER OF
WATER WORKS AND
ASSISTANT MANAGER

WILLIAM D. SACHAU
CHIEF FINANCIAL OFFICER

June 24, 1971

Secretary of the Commission
U. S. Atomic Energy Commission
Washington, D. C. 20545

Attention Chief, Public Proceedings Branch

Gentlemen:

We have reviewed proposed Appendix 1 - "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'as Low as Practicable' for Radioactive Material in Light-Water-Cooled Nuclear Power Effluents", which would be added to 10-CFR Part 50 "Licensing of Production and Utilization Facilities".

We agree that quantitative guides are needed; however, we believe the proposed 5 millirem per year limitations are not practical because:

1. The proposed limiting conditions are less than the variations in natural background radiation and cannot be measured with present technology. Calculated estimates are approximate and controversial.

2. There is little gas holdup operating experience with large nuclear units.

3. The proposed limitation would handicap multi-unit nuclear power installations in remote locations.

Based on the above, we recommend that the proposed annual limitation for water reactors be set at 50 millirem per

year. We believe this would be practical and conservative. It is well below the overall radiation limits (500 millirem per year) recently reaffirmed by the National Council on Radiation Protection and Measurements and is less than the English limits, where 20% (100 millirem per year) is allocated to the nuclear power industry.

Very truly yours,

Floyd L. Goss

FLOYD L. GOSS
Chief Electrical Engineer
and Assistant Manager

cc: 1 Attached

Numerical Guidance
DOCKET NUMBER PR-50
PROPOSED RULE

BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC.
UPTON, L.I., N.Y. 11973
TEL. AREA CODE 516 YAPHANK 4-6262

INSTRUMENTATION AND
HEALTH PHYSICS DEPARTMENT

REFER:

June 22, 1971

Dr. Lester Rogers, Director
Division of Radiological and
Environmental Protection
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Dr. Rogers:

Thank you for sending me the material dealing with the proposed design interia for light-water-cooled power reactors. Although they don't affect us at BNL directly, we find it useful to be fully informed on such developments.

The proposed limits still seem to me to be unnecessarily low but one can hardly quarrel with them if they represent a fair and open conclusion in regard to what is "as low as practicable" and if there is no implication that the proposed limits will apply to other situations.

I certainly hope that you and others will be able to maintain a rational balancing of benefits and risks in setting limits for other types of operations despite the presently popular overemphasis on radiation risks coupled with little consideration of benefits, costs of exposure reduction and the status of alternative technologies.

Sincerely yours,

Frederick P. Cowan

Frederick P. Cowan, Head
Health Physics Division

FPC/ad

(4)

WESTERN INTERSTATE NUCLEAR BOARD

DR. ALFRED T. WHATLEY
EXECUTIVE DIRECTOR

June 18, 1971

Mr. Lester Rogers, Director
Division of Radiological and
Environmental Protection
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rogers:

Thank you very much for the information on the supplement to 10 CFR Part 50 providing numerical guides for radioactivity in effluents from light water cooled reactors. As you may be aware, I attended, along with Hon. Jack Westland, the Federal Representative to WINB, one of the AEC information meetings last winter. At that time I supported numerical standards, and am thus pleased with this latest development. I certainly feel this clarifies the situation, and wish to express my support to the Commission in this matter.

Very truly yours,

A. T. Whatley by crs

A. T. Whatley
Executive Director

dms

(3)

THE UNIVERSITY OF CHICAGO
CHICAGO • ILLINOIS 60637
UNIVERSITY HEALTH SERVICES
950 EAST 59TH STREET

STUDENT HEALTH CLINIC
Office of the Director

EMPLOYEES HEALTH CLINIC

June 15, 1971

Lester Rogers, Director
Division of Radiological and
Environmental Protection
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Rogers:

Thank you for sending along the Notice of Proposed Rule Making with respect to effluents from light-water-cooled nuclear power reactors. I have been interested in this problem for many years and am familiar with some of the data and much of the debate about plants such as Dresden I here in Illinois. I am in complete agreement with the proposed new regulations and hope they will encourage the development of more nuclear generating stations as well as allay public concern about them.

Yours very truly,

George V. LeRoy

George V. LeRoy, M.D.,
Director
Professor
Department of Medicine

GVL:ser

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COUNSELLORS AT LAW
200 WEST MAIN STREET
BABYLON, N. Y. 11702

MOHAWK 9-3000

CABLE ADDRESS
RELIK

IRVING LIKE
BERNARD J. REILLY
WILBUR H. SCHNEIDER
GEORGE HOFFMAN
EDWARD A. BROOKS JR.
PAUL R. ADES

June 15, 1971

Mr. Stanley Robinson
Secretary
Atomic Energy Commission
Washington, D.C. 20545

Re: Proposed Numerical Guidelines to Limit Radiation Exposures of Persons Living Near Power Plants to 5 MR Annually

Dear Sir:

Based on my experience as attorney for the intervenor, The Lloyd Harbor Study Group, Inc., in the Shoreham proceeding (Docket No. 50-322), I endorse the concept of your proposed regulation reducing permissible radiation exposures from nuclear plants to 5 MR per year.

I have not yet seen the text of the proposed regulation and hence my comments are preliminary and suggest the considerations which should guide the Commission in finalizing the proposed regulation.

1. The 5 MR maximum should be firm with no right granted to the operator of the nuclear power plant to exceed such level under any circumstances. The public has been assured many times that the state of the art has progressed to the point where the utilities can, and do in fact, operate with resultant radiation exposures below 1% of the maximum permitted levels. (500 MR) There is no reason why this assurance cannot be codified into law as the new upper limit of exposure. Any relaxation of this limit in the alleged interest of flexibility would undermine the effectiveness of the new regulation and the credibility of the Commission and the industry.

2. The provisions for enforcement of the 5 MR regulation should be clearly spelled out with substantial penalties provided for any violation, including the immediate shutdown of the plant.

3. Any person or organization who would be entitled to be admitted as an intervenor in the construction permit or operating license proceedings, or any individual residing within the

June 15, 1971

Mr. Stanley Robinson
Secretary
Atomic Energy Commission

low population zone of the particular power plant, should be granted the right to institute a proceeding before the Atomic Energy Commission to complain of any violation by the utility of the proposed radiation exposure limits, and to enforce compliance with such regulations, such proceeding to be conducted with all of the rights granted under the Federal Administrative Procedure Act.

4. The utility should be required to file monthly reports, available for public inspection by any citizen in the area in which the plant is located, giving detailed data on the quantities of effluents discharged by the plant (including measurements of gross radioactivity and that of individual radioisotopes) and the calculations of radiation exposure.

5. A procedure should be established for continuous and independent field monitoring of radiation exposure by an independent agency such as the Environmental Protection Agency) as a double-check to the utility self-policing and AEC compliance inspections.

6. Nochanges should be authorized by the AEC in any conditions or requirements imposed upon the utility in its construction permit or operating license without reasonable public notice and a public hearing, at which the rights of intervenors to participate as parties is recognized subject to the safeguards of the Administrative Procedure Act.

Upon my receipt of the proposed regulation, I hope to forward to you further comments.

Respectfully

Irving Like

IL:mc

cc.
Atomic Industrial Forum
475 Park Avenue South
New York, N.Y. 10016
Att: Mr. Joslin

SECY

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

DOCKET NUMBER
PROPOSED RULE PR-50
Numerical Guidance

June 10, 1971

Dr. Joshua Lederberg
Stanford University Medical Center
Stanford, California 94305

Dear Dr. Lederberg:

Enclosed for your information is a copy of a notice of proposed rule making that would add a supplement to the Commission's regulation, "Licensing of Production and Utilization Facilities," 10 CFR Part 50. The supplement would provide numerical guides on design objectives and limiting conditions for operation for light-water-cooled nuclear power plants to keep levels of radioactivity in effluents from those plants as low as practicable.

On December 3, 1970, the Atomic Energy Commission published in the Federal Register amendments to 10 CFR Part 50 that specified in qualitative terms design and operating requirements for nuclear power reactors to keep levels of radioactivity in effluents to the environment as low as practicable. The Commission announced at that time that it was initiating discussions with the nuclear power industry and other groups to examine the feasibility of developing more definitive guidance on the implementation of the amendments.

The proposed numerical guidance on design objectives and limiting conditions of operation will assist applicants for, and holders of, licenses for light-water-cooled nuclear power reactors in meeting the requirements published in Part 50 on December 3, 1970, that radioactive material in effluents be kept "as low as practicable." The guidance is appropriate only for light-water-cooled nuclear power reactors and not for other types of nuclear facilities.

The enclosed notice of proposed rule making appears in the June 9, 1971 issue of the Federal Register. The notice allows sixty (60) days for public comment after publication in the Federal Register.

Enclosed also is a copy of the public announcement issued by the Commission on this matter on June 7, 1971. As noted in the public announcement, the Commission plans to hold an informal public hearing on the proposed numerical guides, and an appropriate notice regarding the hearing will be published in the near future.

Sincerely,

Lester Rogers, Director
Division of Radiological and
Environmental Protection

Enclosures:
1. Notice of Proposed Rule Making
2. Public Announcement

SECY

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

DOCKET NUMBER
PROPOSED RULE PR-50
Numerical Guidance

June 10, 1971

Mr. Richard Lewis, Editor
Bulletin of Atomic Scientists
935 East 60th Street
Chicago, Illinois 60637

Dear Mr. Lewis:

Enclosed for your information is a copy of a notice of proposed rule making that would add a supplement to the Commission's regulation, "Licensing of Production and Utilization Facilities," 10 CFR Part 50. The supplement would provide numerical guides on design objectives and limiting conditions for operation for light-water-cooled nuclear power plants to keep levels of radioactivity in effluents from those plants as low as practicable.

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Sincerely,

Lester Rogers, Director
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