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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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BRIEFING ON FINAL RULE ON STANDARDS FOR PROTECTION AGAINST RADIATION - PART 20

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PUBLIC MEETING

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Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Thursday, November 10, 1988

The Commission met in open session, pursuant to notice, at 10:00 a.m., the Honorable LANDO W. ZECH, Chairman of the Commission, presiding.

COMMISSIONERS PRESENT:

LANDO W. ZECH, Chairman of the Commission
THOMAS M. ROBERTS, Member of the Commission
KENNETH M. CARR, Member of the Commission
JAMES R. CURTISS, Member of the Commission

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

S. CHILK

W. PARLER

V. STELLO

J. GUNTER

A. RICHARDSON

D. D'ARRIGO

P. STANSBURY

J. COLVIN

B. MORRIS

E. BECKJORD

R. CUNNINGHAM

H. PETERSON

F. CONGEL

P R O C E E D I N G S

[10:00 a.m.]

CHAIRMAN ZECH: Good morning, ladies and gentlemen.

Commissioner Rogers will not be with us this morning. He is on overseas travel.

The purpose of the briefing this morning is to discuss the final rule on standards for protection against radiation. This is an information briefing which supplements information contained in SECY 88-315, currently under Commission review.

The Commission will reflect on all the comments that we receive here today and also the previous comments we have received, and we will not vote today, but we will vote later in public session sometime in the future.

If I could point out that originally today's briefing was intended to be an information briefing by the staff to the Commission, to review and discuss the many details and the various aspects of the proposed final rule. However, we received a number of requests from other interested parties, so today's briefing will be a combination briefing.

During the briefing today, the Commission will hear from the interested parties who have requested to appear before the Commission. It will also hear from the staff as regards briefing the Commission as we had originally intended, for it to be an information briefing.

We recognize the issue is of great interest, certainly because of nothing more than the large number of comments we received, something over 800, I understand, that the staff has previously received and reviewed.

As many of you know, 10 CFR Part 20 establishes the NRC's standards for protection against radiation that are used by all licensees and enforced by the NRC staff to protect radiation workers and members of the public from radiation hazards.

Recognizing that radiation protection philosophy and technology have evolved since Part 20 was promulgated nearly 30 years ago, the Commission believes a revision is desirable to provide better assurance of protection of public health and safety. Some of the benefits of this rulemaking initiative include updating regulations to reflect current scientific knowledge of radiation protection philosophy, consistency with recommendation of authorities on radiation protection matters and also provisions for clearly identified dose limits for the public and an understandable health risk base for protection.

First, this morning we will hear the views from some of the representatives of the Environmental Protection Agency and other interested groups, then we will hear from the NRC staff concerning the proposed revisions to Part 20.

I understand slides are available and the SECY paper also as you entered the room this morning.

I'd like to also invite the NRC staff to comment on the remarks made by our earlier presenters when they come to the table this morning.

Do any of my fellow Commissioners have any comments they would like to make before we begin?

[No response.]

CHAIRMAN ZECH: We will begin. Mr. Gunter, you are welcome and you may proceed.

MR. GUNTER: Thank you and good morning. My name is Bill Gunter. I am the Director of the Criteria and Standards Division in the Office of Radiation Programs at the U.S. Environmental Protection Agency. I appreciate having the opportunity to come and address the Commission today concerning these proposed revisions to 10 CFR Part 20.

10 CFR Part 20 is by far the most widely used U.S. codification of radiation protection requirements. It directly affects hundreds of thousands of workers employed by NRC licensees. It has also served in the past as the model upon which states and other federal agencies, such as OSHA, base their regulations. We estimate that the total number of individuals occupationally exposed to radiation in any year now exceeds 1.5 million. The importance of 10 CFR Part 20 beyond its direct application to NRC licensees is clear.

As you know, in January of 1987, President Reagan issued new federal guidance for the protection of workers from

radiation. This guidance was developed through an interagency effort under the leadership of EPA. We were most appreciative of the essential, continuous and most help input from the Nuclear Regulatory Commission during this process.

The new federal guidance represents the first official major revision of radiation protection principles in the United States in almost 30 years. It contains a number of significant changes from previous policy. These include introduction of risk based weighting of doses to different parts of the body and the use of committed dose as the primary basis for control of internal exposure.

The numerical values of the guidance for maximum radiation doses were reduced and now explicitly apply to the sum of external and internal doses.

These changes brought U.S. policy into general conformance with international recommendations and practice. In addition, numerical guidance is now provided for protection of the unborn and greatly increased emphasis is placed on eliminating unjustified exposure and on keeping justified exposure as low as reasonably achievable.

Finally, the new guidance emphasizes the importance of instruction of workers and their supervisors on the basic risks to health from radiation and on basic radiation protection principles, of monitoring and recording of doses to workers, including cumulative lifetime doses and of the use of

administrative control and reference levels for carrying out ALARA programs.

One of the most difficult decisions EPA faced when it recommended this new guidance to the President was the choice of the limiting value for annual dose. It would, I believe, be useful to repeat here the considerations that accompanied our recommendations.

"In recommending a limiting value of five rems in any single year, EPA has had to balance a number of considerations. Public comments confirmed that for some beneficial activities, occasional doses approaching this value are not reasonably avoidable. On the other hand, continued annual exposures at or near this level over substantial portions of a working lifetime would, we believe, lead to unwarranted risks.

For this reason, such continued annual exposures should be avoided and these recommendations provide such guidance. These recommendations also continue a system of protection which combines limiting values for maximum dose with a requirement for active application of measures to minimize dose, the ALARA requirement.

This has resulted in steadily decreasing average annual doses to workers most recently to about 1/50th of the recommended limiting value and to date, only a few hundred out of millions of workers have received planned cumulative doses that are a substantial fraction of the maximum previously

permitted cumulative dose over an occupational lifetime.

EPA anticipates that the continued application of the ALARA requirement combined with new guidance on avoidance of large cumulative doses will result in maintaining risks to all workers at low levels. EPA will continue to review worker doses with a view to initiating recommendations for any further modifications of the dose limitation system that are warranted by future trends in worker exposure."

The continuing importance of the considerations I have just cited become obvious in view of current trends in risk estimates for exposure to radiation. We should soon have before us the results of the careful re-evaluation of the health effects in Hiroshima and Nagasaki atom bomb survivors, which has been carried out over much of this decade. Based on everything I have heard so far, I don't believe anyone is predicting that risk assessments associated with radiation exposure are going to go down.

It is our opinion that these draft final revisions of 10 CFR Part 20 are consistent with the recommendations of the new federal guidance. They replace the limitation of annual dose to critical organs with the risk based effective dose formalism that forms a central part of the guidance. The approach to control of internal exposure is now based on committed doses for all radionuclides and although other methods of implementation are possible, is completely

consistent with the guidance.

In its tabulation of annual limits on intake, the rule incorporates the significant improvements in physiology and dosimetry of radionuclides that have been achieved over the past few decades. It provides explicit limits for protection of the fetus and it presents these and other aspects of radiation protection regulation in a more streamlined, internally consistent fashion.

In a letter to the NRC dated October 31, 1986, EPA commented on the proposed revision of 10 CFR Part 20. We are pleased to find that NRC has responded positively to these comments. Only with regard to a relatively minor point, whether reports should be filed for the annual doses of all NRC licensed workers or only for those likely to receive the highest exposures are we are not fully in agreement. We continue to urge the Commission to reconsider this point at some time in the future.

In summary, we support prompt promulgation of this rule. Accompanying me today is Allan Richardson, who chaired the Interagency Committee that developed the federal guidance and we would be happy to answer any questions that you may have.

CHAIRMAN ZECH: Thank you very much. Any questions from my fellow Commissioners at this time? Commissioner Roberts?

COMMISSIONER ROBERTS: No.

COMMISSIONER ZECH: Commissioner Carr?

COMMISSIONER CARR: Yes, I have a question. Maybe I misunderstood you. Would you read that part again about it is in compliance, complete compliance and especially the 20.205 part?

MR. GUNTER: The approach to control of internal exposure is now based on committed dose for all radionuclides and although other methods of implementation are possible, is completely consistent with the guidance.

COMMISSIONER CARR: It seems I read in some of the stuff they gave me that the recommendation from EPA was it not be used for actual computations. Did I read it wrong?

MR. RICHARDSON: No, there was no such recommendation. The recommendation was that the control of internal dose be placed first on avoidance of exposure to radionuclides and secondly, control the workplace on the basis of the committed dose.

There are a variety of ways through which you can control the workplace on committed dose, the one the staff has chosen to propose is based on the doses that it is indicated workers may receive.

The guidance goes further and says that if a worker is over exposed on the basis of committed dose, than that particular worker should be monitored in the future years,

because of the body burdens he may have accumulated, to assure that he does not exceed the annual dose.

In the last analysis for an individual worker who has ingested a body burden in excess of the committed dose requirement, the bottom line becomes the annual dose requirement.

CHAIRMAN ZECH: Commissioner Curtiss?

COMMISSIONER CURTISS: Just one quick question following up on that point. In comments before the Agency and in a presentation that we will hear later this morning, one of the fuel cycle licensees will encourage us to adopt a system using committed dose rather than an annual dose and makes the point in the comment letter that is consistent with the President's guidance.

Is one approach versus the other inconsistent or is it just a question of both being consistent, one preferable over the other?

MR. GUNTER: I would have to see all the details of that other proposal, but without, I will just read you what Dr. Stansbury will say later this morning. Setting a strict committed dose system, GE would encourage the Commission to adopt a system using committed dose for design and daily control of the workplace and an annual dose to assess and manage the actual dose to workers. In an earlier comment, the same company makes the point that approach -- let me state it

differently, the deletion of that approach from the proposal is inconsistent with the presidential guidance.

MR. RICHARDSON: If I can comment, the point is how you exercise control over internal exposure. It would not be inconsistent -- neither approach is inconsistent with the guidance if control is actually exercised based on committed dose. What the point of dispute appears to be is when are you going to call an individual worker over exposed and when not, and when are you going to call the workplace itself under control or not under control.

COMMISSIONER CARR: If we control the workplace, what effect is that going to have on the worker at all in his lifetime? Are you satisified if we control the workplace, we are going to protect the worker?

MR. RICHARDSON: If the workplace is controlled so the committed doses won't be exceeded, then the worker will never exceed the committed dose level.

COMMISSIONER CURTISS: Their argument I guess is the air sampling approach is less reliable as a means of control and they have suggested another control approach.

MR. RICHARDSON: That is really a detailed regulatory matter that the guidance does not address.

MR. GUNTER: I don't hear any inconsistency there with the guidelines.

COMMISSIONER CURTISS: Thank you.

CHAIRMAN ZECH: Would you elaborate very briefly on the point of disagreement or non-concurrence you have with the staff?

MR. GUNTER: It is not a matter of non-concurrence. It is a comment that we made that was not adopted and it has to do with the coverage of reports on annual doses, whether it would be for all workers or for only those likely to receive the higher exposure we had suggested, that it would be preferable to cover all workers. This has not been adopted. We still believe that would be the better approach and would like for you to reconsider that at some time in the future.

CHAIRMAN ZECH: All right, thank you very much. Let me thank you very much, gentlemen, for appearing before us this morning. We call on Dr. Stansbury from the GE Nuclear Energy Organization. Dr. Stansbury, you may proceed. Welcome.

MR. STANSBURY: Thank you. Good morning, gentlemen. My name is Paul Stansbury, and I represent GE Nuclear Energy. I would like to take just a moment of your time to introduce myself for it's relevant to what GE would like to say.

I'm a graduate of Georgia Tech's Nuclear Energy and Health Physics program. As it happens, I did my dissertation research in the Health Physics Division of the Oak Ridge National Laboratory, in the group which did the modeling calculations for ICRP-30, the scientific document on which the new Part 20 is based.

I taught Health Physics for five years at the University of North Carolina at Chapel Hill. For the past six years, I have worked for GE as the senior nuclear safety engineer, sharing with another senior engineer, the day-to-day responsibility for all technical aspects of the radiation safety program at GE's fuel fabrication plant in Wilmington, North Carolina.

I've been discussing the Part 20 revisions since 1983. That's well over five years. I've had discussions with the staff drafting the regulations; with the Health Physics society; with the AIF, which of course is now NUMARC.

This morning, GE Nuclear Energy would ask you to reconsider the staff's recommendation on the role of committed dose and radiation protection from persistent radionuclides. How this issue is resolved will mold the fundamental nature of health physics programs at fuel fabrication facilities for the next several decades.

It will influence the cost of uranium fuel, and the competitiveness of U.S. industries in the world market for reactor fuel. The issue, as GE sees it, is whether to use either a strict committed dose system, or a combined system using committed dose and annual dose; using committed dose values for design and day-to-day control of the workplace; using annual dose as the dose of record for individuals occupationally exposed.

Under a strict committed dose system, compliance is demonstrated by determining and summing a small number of intakes, say, daily. Air sampling is indeed the tool to do this. Once an intake is specified, the committed dose value is calculated using the pre-determined values in Appendix B. These are based on the reference man assumptions and integrated over the next 50 years.

Annual dose to an individual can be determined more directly. What needs to be known is the amount of radioactive material residing in the organ during the year. For the uranium fuel fabrication industry, the organ of concern is the lung, and lung counting is an established practical method for assessing lung contents.

A series of a few to several lung counts for each individual will specify the average lung contents during the year. One may then convert to dose, annual dose, by using the physiologic parameters of reference man, such as organ weight. But this conversion is done without making assumptions about how much is retained in what organs and for how long.

Air sampling seems straightforward and precise. Radioactivity collected on a filter can be measured to a high degree of accuracy. One must assume that the air sampled resembles the air the worker breathed. This representativeness is of concern to the facility health physicist, to the regulatory inspector, and potentially to a court someday in the

future.

How representative is representative enough is a difficult and unending question, and an important one if air sampling is the major method of determining a worker's dose of record. Representativeness is still an issue with lapel or personal air samplers, often presumptively called breathing zone air samplers.

I did go to college for a good while, but it didn't take that to realize that all air samplers measure air the worker didn't breathe. With lapel samplers, partical collection problems cause difficulties where one's intuition would suggest that good representativeness is obvious.

Determining committed dose from air sampling has two further problems. It requires that more reliance be placed on assumptions rather than measurements to account for the distribution and retention of inhaled material. It has no way to account for material remaining in the body from prior intakes, other than by lumping the committed dose from an intake together with all the other committed doses from prior intakes.

Lung counting to determine dose on an annual basis has some significant advantages. It's a direct measurement, and representativeness is not the issue that it is with air sampling. Lung counting directly accounts for individual worker differences in clearance times, breathing rates; also

accounting for particle size and solubility to some extent.

It minimizes under or overestimation of dose. There are some lung counting limitations. It is easier to determine the radioactivity on an air sample filter than in an organ. Lung counting minimum sensitivity does not permit determinations of intakes at levels of day-to-day interest, say, 40-DAC hours.

However, lung counting sensitivity and accuracy are quite acceptable at lung contents equal to or greater than say 35 percent of an annual dose based action limit. In some cases, a series of lung counts may be necessary to determine the average organ contents, and thus the annual dose with enough precision. I would like to briefly outline other problems with the strict committed dose system -- briefly.

The NCRP specifically advises against it. Second, it is expensive. The staff estimate is $75 million. This is an okay estimate for capital costs, but GE feels the cost to operate under the new stricter limits will be higher still.

A strict committed dose system will complicate epidemiology among uranium fuel fabrication worker populations, because the legal record of committed dose is not a good estimate of the exposure variable. Committed dose is an abstract modeling quantity. It is difficult to explain to those outside the field of health physics.

Explaining it will be a liability in court, and a

difficulty in discussions with workers. Lung counting is an employee-oriented direct measurement. Adoption of the strict committed dose will tend to discourage lung counting at fuel fabrication facilities. Adopting a strict committed dose system will focus health physics attention on reducing conservatism in the dose determining models.

Such attention would otherwise be spent in reducing actual worker exposures. A strict committed dose system could perhaps mask the whole purpose of the proposed 10 CFR 20 changes to have a clearer relation between regulatory dose limits and risk. The reason is a strict committed dose system will make the new DAC functionally analogous to the old MPC.

Such an analogy is dangerous in that it hides the real fundamental differences between the quantities and falsely, it suggests that the former MPC is too large by a factor of five in the case of uranium. This is not the case. Instead of a strict committed dose system, GE would encourage the Commission to adopt a combined system, committed dose for planning and daily control of the workplace; annual dose for management of actual worker exposures and determination of the dose of record. Such a combined system is in accord with the recent presidential guidance, and parallels the Department of Energy's implementation of that guidance. It is in accord with the recommendation of the NRC's own Advisory Committee on Reactor Safeguards.

Finally, it makes the best use of both air sampling and lung counting technology to provide excellence in the management and control of workers' internal exposures, while avoiding extremely costly unnecessary conservatism. It places more emphasis on direct measurement and less reliance on general assumptions.

Use of practical, technically sound and reasonably cost effective radiation exposure management systems is essential to the future of nuclear energy in this country and in the world. How you decide the issue will have pervasive and far-reaching impacts.

Thank you, and I will answer any questions, or at least try to, now or at some other time.

CHAIRMAN ZECH: Thank you very much. Questions? Commissioner Roberts?

COMMISSIONER ROBERTS: No.

CHAIRMAN ZECH: Commissioner Carr?

COMMISSIONER CARR: Give me your opinion on what the effect will be on the worker after fifty years of the two methods.

MR. STANSBURY: Virtually the same, because the ALARA principle is going to be used to control the average worker exposure. Most workers' exposures are not going to be at the limits.

COMMISSIONER CARR: Over fifty years, the worker is

not going to see any difference, no matter which method we pick?

MR. STANSBURY: Well, one can conceive of hypothetical cases that would demonstrate that one system or another is better at the extreme. If you look at the average worker population, I'm not sure that there would be a big change in the worker's actual exposure.

COMMISSIONER CARR: Go ahead, I didn't mean to cut you off if you have something else to say.

MR. STANSBURY: Well, it all depends on how you account for those things. Those that believe in committed dose, over fifty years, would be able to show a huge dose savings in terms of committed dose, because that's the way they calculated it, compared with what might be received on an annual dose system. It's a bookkeeping problem.

The actual dose to workers is likely to be similar. Under annual dose, I see the added benefit that we would have a better established dose record firmly based in measurements on the individual. Under a committed dose system, the dose of record would be primarily based on air sampling for fuel fabrication facilities and would have some holes in it.

They would actually have higher recorded doses in rems under a committed dose system, because of the conservative nature of the assumptions.

COMMISSIONER CARR: But it might not be -- actually,

the worker might not have been exposed to it; is that what you're saying?

MR. STANSBURY: Yes.

COMMISSIONER CARR: Okay.

CHAIRMAN ZECH: All right. Commissioner Curtiss?

COMMISSIONER CURTISS: Just one quick question. Do you have an estimate of what the additional operational costs would be above the $75 million?

MR. STANSBURY: That's a real issue. Integrated over how long? Fifty years? Equal to the $75 million dollars -- that's just a guess, and that's my guess, not GE's.

CHAIRMAN ZECH: I have just one question, too. To get back to Commissioner Carr's question, or at least a similar question; it would seem to me, if I understand the difference between the annual dose approach and the committed dose approach, that it would be conceivable that under the annual dose approach, if one received the maximum dose annually each year throughout his lifetime, that that could end up being a considerably higher number than one would receive in the committed dose approach method.

Is that correct? If not, please enlighten me.

MR. STANSBURY: No, there again, when you get into extremes, one can come up with models that will show one case against another. If you looked at a worker near the limit and he collected an annual dose of, let's say, 5 rems a year.

CHAIRMAN ZECH: Each year for, say, what, fifty years or forty years?

MR. STANSBURY: Forty years, and then he lives for another thirty years, he would get the annual dose of five rems in a year. If there was a build-up in the annual dose system, the allowable intakes would go down as the lung contents went up.

CHAIRMAN ZECH: Then he would get a total dose that would be larger than the individual who, under the committed dose approach, would get?

MR. STANSBURY: Not substantially, because at the end of fifty years of the employment lifetime, with the annual dose, you'd have to go ahead and accrue the slight residual dose that would be committed. Under the committed dose, you would have already have accrued all of that.

CHAIRMAN ZECH: So you're saying they would be essentially the same.

MR. STANSBURY: Over a lifetime.

COMMISSIONER CARR: Let me ask that so that I understand it. Are you saying that maybe in his 35th year, he would not be allowed to get his 5 R?

MR. STANSBURY: The way I see an annual dose system working is, one would take 3 rems is what paragraph 20.205 suggested, to provide some flexibility, and convert that to a lung content limit. The worker would be managed so that lung

contents would never exceed that amount.

Therefore, the dose would be no more than three rems per year from internal exposure, plus a short tail after the individual retires, where the uranium is cleared from his body. Add that little dose into the 3 rems a year, and you have a total.

Under a committed dose system, you would essentially allow the worker to have a number of intakes so that three rems over the next fifty years, which includes the little tail, would be the limit, or 5 rems as the case may be. I guess it involves taking the graph of dose versus time, and under annual dose, you cut it vertically, and under committed dose, you kind of cut it horizontally.

COMMISSIONER CARR: We're trying to find out if his actual limit reduces over his lifetime in both cases. Are we actually reducing the limit he's able to be exposed to?

MR. STANSBURY: I beg your pardon?

COMMISSIONER CARR: I start out this year and I get 5. Next year, I'm not allowed but 4.9999? The next year maybe 4.9998, and finally in my fiftieth year, I'm not allowed any? Is that the way it works?

MR. STANSBURY: No, not in reality.

COMMISSIONER CARR: Is that the way it's supposed to work?

MR. STANSBURY: No, the uranium compounds are cleared

from the lungs, and if you worked and had a series of intakes, breathing the small amounts of uranium dose that are in the plant, we might have an intake that give you a lung content that was equivalent to 5 rems a year. Next year, your intake will probably have to be a little bit more tightly controlled because we wouldn't want the total lung content to go over the number that corresponds to 5 rems a year on the annual dose basis.

COMMISSIONER CARR: There would be some reduction in my limit the next year?

MR. STANSBURY: Right, under a committed dose system, your limit is up front. What you would be allowed in a year under a committed dose system is much, much, much less than what you get under an annual dose system. So, under a committed dose system, you could have been involved in perhaps a situation that is far from ideal, not be able to work for the rest of the year.

Then when January 1st comes along, under a committed dose system, you erase the fact that you had that intake, and you now start over with accumulating DAC hours.

COMMISSIONER CARR: I have no other questions.

CHAIRMAN ZECH: Any other questions?

[No response.]

CHAIRMAN ZECH: Thank you very much, Dr. Stansbury. We appreciate your being with us today.

The representative from the Nuclear Information and Resource Service, Ms. Diane D'Arrigo; is that correct?

MS. D'ARRIGO: Good job. Right, very definitely.

CHAIRMAN ZECH: Welcome, Ms. D'Arrigo. You may proceed. Yes, don't put that in front of the microphone if you would. You might move it to this side rather than at the front. Thank you very much.

MS. D'ARRIGO: I very much appreciate the opportunity to address the Commissioners this morning on what I believe is one of the most important responsibilities that the Nuclear Regulatory Commission has, protection from radiation exposure.

We have at the Nuclear Information Resource Service would have liked more than four working days' notice that we were given the opportunity to speak and an advance copy of the proposed rule would have allowed us to have more pertinent comments, but we are glad to be here in any case.

Nuclear Information Resource Service and many others including unions, county and state officials, public health associations, national and local environmental groups, citizen organizations, church groups, concerned individuals, and even nuclear utilities and health physicists commented critically on the 1986 NRC proposal regarding radiation standards.

I'm speaking today on behalf of Nuclear Information Resource Service, Environmental Policy Institute, Critical Mass Energy Project and many of the local organizations and citizens

groups across the country who couldn't be here.

The worker portion -- worker exposure portion of my comments, is also on behalf of the Oil Chemical and Atomic Workers and the International Chemical Workers Union and the Maine Labor Group on Health.

The Commission received in the range of 1,000 comments on the rule so there's clearly public interest in it and we would like the opportunity to comment again after thoroughly reviewing this proposal that was given out today before the Commission votes.

We're requesting regional, public, adjudicatory hearings on the rule. Further, we are again requesting since the radiation release to the environment and exposure to the human gene pool are involved and since this is a major federal action affecting the environment, that a full environmental impact statement be done.

NRC has not considered the impact of reducing all exposure and contamination levels. I would like to point out that we are in agreement with Commissioner Roberts' opinion in 1986 that the rule should not be approved although our reasons are different.

The NRC's cost benefit or backfit analysis concluded that the proposed rule "may not provide a substantial increase in overall protection of public health and safety or of the common defense and security."

In other words, the supposed benefits are not worth the cost to implement this rule. Although our organization does not support using the cost-benefit analysis to decide public health and safety issues, we do find it curious that the Commission is proceeding with a rulemaking which it has determined that is not economically worthwhile and which fails to provide increased safety.

My statement this morning is based largely on the proposed radiation standards as I was refused an advance copy of the final proposal which is being released today.

I apologize for any criticisms that may have already been taken into account and changed. The main concern that we have with the proposed radiation standards is that the permissible contamination and exposure levels for many of the radionuclides in air and water will be increased above the current levels.

NRC admits this fact in its 1986 proposal. 10 CFR Part 20, Appendix B, the table of radionuclides and concentration levels, permissible contamination levels for air and water, table one is for workers and table two is for the public. In the 1986 proposal, the permissible contamination levels for over two-thirds of the radionuclides increased to higher levels than are currently allowed.

My understanding is that there are some changes in that but that it's basically the same thing in this final

proposal. The standards set by the Nuclear Regulatory Commission for workers will set the precedent for other federal and state agencies and departments.

Workers at the nation's troubled weapons facilities will legally receive higher internal radiation doses if and when the Department of Energy follows the NRC's lead in adopting these standards and I understand that they're moving in that direction.

It would be preferable we feel to require cleaner operations at all sites than to increase allowable worker exposures. The Environmental Protection Agency used this 10 CFR Part 20 Appendix B to derive its safe drinking water regulations. Further, many state radiation regulatory agencies used 10 CFR Part 20 Appendix B to analyze nuclear plant effluents, other nuclear facility releases and to indicate to the public and the media what acceptable federal radiation release limits are.

The increases in permissible exposure to the public can occur at all NRC licensed facilities allegedly except the uranium fuel cycle facilities, so hospitals, research reactors, university reactors, radiopharmaceuticals, industrial and other facilities will be permitted to expose the public to higher radiation levels than are currently allowed -- internal radiation.

I contend also that nuclear power plants will also

end up using 10 CFR Part 20 Appendix B. Nuclear plant licenses have technical specifications which are the limiting conditions for reactor operation.

These technical specifications require adherence to 10 CFR Part 20 Appendix B for dealing with radioactive effluents, specifically liquid effluents.

The alarm set point on monitors for liquid waste streams are set according to 10 CFR Part 20 Appendix B, for example, the technical spec 3.11.1.1 for the Callaway Nuclear Plant in Missouri, reads "the concentrations of radioactive material released in liquid effluents to unrestricted areas shall be limited to concentrations specified in 10 CFR Part 20 Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained Noble gases."

The proposed rule also requires that uranium fuel cycle facilities which is nuclear power plants, uranium mills, conversion and enrichment facilities and reprocessing plants, must meet the U.S. Environmental Protection Agency or EPA standard for 40 CFR Part 190 which limits the maximum radiation dose to each member of the public to 25 millirems per year whole body dose.

But 25 millirems per year is not an enforceable, numerical emission standard. The Appendix B of the NRC regulations is the working tool used to limit radiation releases which can lead to public exposures.

If the intent of the NRC is that the individual public exposure should be limited to EPA's standards of 25 millirems per year, then the NRC tables should be based on an annual dose to the public of 25 millirems per year rather than based on a 100 millirem per year exposure level which the tables in the 1986 proposal were based on. I haven't looked at the one released today but I assume it's based on the same 100 millirems per year.

We advocate a change in the standards that significantly reduces the permissible contamination levels and exposure levels. Another concern that we have is with the method of calculating radiation doses. The weighting factor by which the individual's internal dose is multiplied incorporates risk estimates and we oppose incorporating risk estimates into what is supposed to be an objective dose measurement.

In addition, there are several problems with these risk estimates. First, the only risks that are considered are for fatal cancers and birth defects in the first two generations. There's no consideration or calculation for cancers that people don't die of or for other health effects related to radiation such as decreased immune system function which can then lead to increased susceptibility to diseases and accelerated onset of age-related diseases.

If radiation risks are going to be calculated and used in the dose measurement, we believe that all the known

risks should somehow be included.

Secondly, the risks of developing a fatal cancer or birth defect in the next two generations is underestimated. The Nuclear Regulatory Commission uses a risk co-efficient of 1.65 cancer deaths per 100,000 person rems. That's if 100,000 people are exposed to one rem each, 1.65 of them will die from radiation-induced cancer more than otherwise would have died.

This is a controversial number. The estimates range from 1 to 37 fatal cancers per 100,000 person rems and we believe that NRC has chosen a very low and not a conservative risk estimate for basing the data.

The re-evaluation of the Hiroshima and Nagasaki dosimetry and the debate over what the dose-response curve should be, that is, the biological effect from a given amount of radiation exposure, call into question the reliability of the risks which are used in the weighting factor and that's also used in developing Appendix B.

With all due respect, I have yet to understand how the supposedly objective measurement of internal radiation dose can incorporate a controversial risk estimate into its measurement and there should be some way to measure an internal dose and make it comparable with external doses without depending on controversial risk estimates.

The third problem with the risks is that they are based on risk to the entire population when a good number of

people in the population such as the unborn and young children whose cells are dividing much more rapidly than adults, are at much greater risk.

People who have undergone voluntary radiation treatment and diagnosis for personal health reasons are also at increased risk because they have already increased their radiation-related risk, thus will be at even higher risk from this increased, involuntary exposure.

Now, referring to occupational exposures, quite a few unions did submit a longer list of comments. A few of them that I've included here are the lack of worker rights regarding planned special exposures. By the planned special exposures provision, workers can be required, involuntarily, without their consent, to receive up to twice the annual dose limit in certain situations. If it's an emergency situation, they can get 5 rems more of radiation exposure without agreeing to it.

Pregnant workers can be exposed to .5 rems per the 9-month pregnancy period and this is within the range of exposure that has been shown to double the risk of childhood cancer and mental retardation. Concern is also for men planning to start or add to their families. The use of risk co-efficients to justify allowable dose increases to internal organs, which I went through a few minutes ago, is also a concern to the unions.

It's also of interest that the National Radiological

Protection Board in England has adopted this scheme that is proposed in the proposed rule for calculating radiation exposure, but they have reduced the total annual allowable exposure to each worker from 5 rems a year to 1.5 rems a year.

It has been claimed in many of the documents, even from the nuclear utilities that most workers don't come near to getting 5 rems a year and it was in the decisionmaking that the National Radiological Protection Board in their discussion of why they made this decision, that it really wasn't making a whole lot of difference. There were only a few cases where workers got more than 1.5 rems a year and in those cases, they could get special permission to do so.

Social reduction is quite advisable for the United States and should be seriously considered before the Commission votes on this rule.

Fourth, the de minimis concept that there is a level of exposure so low that it is not worth regulating should be abandoned. In Japan, when a de minimis exposure level was established for workers, it gave the appearance of a significant reduction in radiation exposure but the reduction was not from not recording exposures -- wait a minute -- the reduction was a result of not recording low exposures below the de minimis level, not from improved worker protection.

The 1986 proposed rule calls for de minimis levels for public exposures. I've been informed by the NRC staff that

this portion of the proposal has been deleted from -- that the de minimis concept and declaring waste below regulatory concern has been removed from the radiation standards that are being presented today and are being considered under another rulemaking here at the NRC, but in any case, I'll give a short comment that there is unequivocal opposition to this concept and this policy.

Unions, municipalities, citizens, will not accept deregulated nuclear waste which is now being referred to as BRC or below regulatory concern waste. This linguistic toxification as Barry Commoner calls it, of nuclear waste, could allow nearly half of what is currently considered low-level radioactive waste to be declared regular garbage or hazardous waste.

The NRC's most recent paper after your international conference on below regulatory concern waste says that up to 32 percent of the low level waste stream could be deregulated or declared not radioactive and go to landfills, incinerators, sewers, anywhere that regular garbage or hazardous materials go.

We in conclusion do request adjudicatory hearings and an environmental impact statement be done. We encourage the reduction in permissible contamination levels, exposure levels in 10 CFR Part 20 Appendix B and we thank you again for the rare opportunity to address the Commission.

CHAIRMAN ZECH: Thank you very much.

MS. D'ARRIGO: You're welcome.

CHAIRMAN ZECH: Any questions from my fellow Commissioenrs? Commissioner Roberts?

COMMISSIONER ROBERTS: No.

CHAIRMAN ZECH: Commissioner Carr?

COMMISSIONER CARR: No.

CHAIRMAN ZECH: Commissioner Curtiss?

COMMISSIONER CURTISS: No.

CHAIRMAN ZECH: Thank you very much for being with us today. We appreciate your testimony and thank you for your presentations. We'll now hear from Mr. Joe Colvin from NUMARC. Mr. Colvin, welcome, you may proceed.

MR. COLVIN: Mr. Chairman, gentlemen, good morning. My name is Joe Colvin. I'm the Executive Vice President and Chief Operating Officer of the Nuclear Management and Resources Council, called NUMARC. I would like to take this opportunity to thank the Commission for being able to appear before you at this meeting and present a statement on behalf of NUMARC on the proposed revision of 10 CFR Part 20.

With me today is also our Project Manager on this issue, Lynn Fairobent. NUMARC wishes to express its overall support for the proposed revision to 10 CFR Part 20. We support the Commission's efforts to incorporate revisions to 10 CFR Part 20 which reflect the developments and advancements

that have occurred since the original publication of this rule some 30 years ago, but also commend the NRC staff for seeking, during the development stage of the proposed rule, scientific and technical inputs from licensees directly affected by the rule change.

The industry has provided extensive comments on the proposed rule. In addition, NUMARC has provided recent comments in two letters dated April 26 and October 20, respectively, of this year. As expressed in these letters, there are two specific areas that we urge you to consider prior to issuance of the final rule. The first one, as we have discussed it in some depth already this morning, is with Section 20.205, and the staff has recommended deletion of that proposed section from the final regulation.

As you are aware, this section would allow licensees to control occupational exposure to certain long-lived radioactive nuclides in terms of the sum of the external deep dose equivalent and the effective dose equivalent actually received in one year from all radioactive material retained in the body. This section, as you are also aware, is of particular importance to the commercial uranium fuel fabrication workers and industry.

The retention of proposed Section 20.205 will allow licensees the option of accounting for dose on an annual basis in conjunction with tracking the 50 year committed dose, rather

than requiring dose evaluation based solely on calculating the 50 year committed dose. We recognize that the issue of how to account for radiation dose from radioactive nuclides persisting in the body is decidedly complex and not without controversy. However, both the NCRP in its Publication 84 from September of 1985, and the NRC Advisory Committee on Reactor Safeguards in its June meeting of this year recommended the use of accounting for dose from these persistent radionuclides on an annual basis in conjunction with tracking the 50 year committed dose.

We believe there is a significant cost impact in implementing the proposed rule without the inclusion of the option to account for these doses on an annual basis. As pointed out earlier, the NRC estimate for implementing this section would require recording of doses based on the 50 year committed dose as approximately $75 million to fuel fabricators alone. This is an one-time cost of complying with the regulation and does not reflect the annual operational cost.

Not stated in my paper, obviously, is the point that that cost will be certainly passed on to the utility industry and users of fuel.

We believe that retaining Section 20.205 would essentially eliminate those costs without decreasing the level of radiological protection afforded to workers. The NRC staff has sought and obtained extensive comments on the proposed rule. The decision to delete this important provision does not

appear to reflect the comments obtained.

If it's decided to delete this section, we strongly urge that the Commission publish this proposed aspect or the aspect of this proposed change for public comment due to the significant difference in approach that this change represents from the original draft regulations published for comment. Shifting to the second area I'd like to discuss, we would urge you to consider looking at the implementation of this rule.

Our letter to the NRC staff of April 26 of this year expressed concern that the complexity of this rule could result in non-uniform application of its provisions by those who must regulate the various licensees.

We understand that the NRC staff has currently not developed the corresponding guidance documents necessary to provide us licensees with sufficient information to effect consistent interpretation and implementation. In order to aid in uniform application of the regulation and facilitate a greater understanding of the new regulations and potential implementation problems by all involved, we urge the Commission to publish the necessary guidance documents and to consider regional workshops for both its inspection staff and licensees, with the accompanying detailed guidance prior to the full implementation date.

This approach was used in implementing 10 CFR Part 50, Appendix I, in the early 1970's and has proved beneficial

to both the regulator and to licensees.

In the proposed rule, the implementation period was stated to be five years from the date of publication as an effective rule. It is our understanding that the final rule under consideration before you today recommends an implementation period of two years from the effective date of the final rule.

We believe that this time is not adequate to ensure correct implementation of the rule. We believe that a phase-in of specific sections of the regulation may be beneficial for both the regulator and for the licensees. NUMARC would be pleased to work with the NRC staff to identify those sections that could be implemented with minimum impact and that would benefit most from the phased-in implementation once the guidance documents are prepared and regional workshops conducted.

For example, it would be most cost effective to have all power reactor licensees simultaneously implement the proposed regulations dealing with dose recording. The recording of worker dose is a major portion of the recordkeeping costs for the utility industry as was identified in the industry's study under the National Environmental Studies Project as the single most costly aspect of the proposed rule.

In closing, we would urge the Commission to consider

retaining the proposed Section 20.205 and restoring the five year time period for full implementation utilizing a phased-in approach to achieve your goal. Thank you very much for your consideration.

CHAIRMAN ZECH: Thank you very much. Questions from my fellow Commissioners? Commissioner Roberts?

COMMISSIONER ROBERTS: No.

CHAIRMAN ZECH: Commissioner Carr?

COMMISSIONER CARR: Yes. On your recommendation to not delete the 20.205 rule, part of the rule, my understanding is if we do delete it, we're going back to already what is in effect. Is that correct?

MR. COLVIN: No, sir. I don't believe that's the case. I believe the Section 20.205 did provide an exemption for fuel fabrication industries or for specific licensees that would allow them the option of calculating either with annual dose and the 50 year committed dose, and to delete that provision would delete that exemption and only allow the 50 year committed dose option.

CHAIRMAN ZECH: Commissioner Curtiss?

COMMISSIONER CURTISS: No.

CHAIRMAN ZECH: Thank you very much for your presentation. I'll ask the staff to come to the table, please.

CHAIRMAN ZECH: Mr. Stello, you may proceed.

MR. STELLO: Thank you, Mr. Chairman. You have

already heard a great deal about what Part 20 is all about and you have already heard from various speakers before us on what these impacts may be and where they are and possibly could have a significant effect and especially in fuel fabrication facilities, as you have already heard.

It is my view that the overall thrust of the rule, taking into account everything will be a generally more restrictive rule than the present rule we have in place today, I do believe that the NRC ought to issue its rule to conform to the President's new guidance and that in my view is sufficiently important. I have, therefore, recommended that the backfit rule be suspended for the purpose of implementing this new federal guidance.

We have listened carefully to the comments that you have heard this morning and with the Chairman's permission, what we would like to do is include as we go through our presentation this morning, some comments on what you have heard and respond to some of the issues that were raised in those comments as a part of our presentation as we go through it.

I will very quickly turn if I can to Eric Beckjord for some brief introductory comments and others here at the table will follow with presentations being made, integrating those responses to the comments you have heard this morning, with your permission.

CHAIRMAN ZECH: Thank you very much. We appreciate

the staff doing that, to integrate those responses during the briefing, if you would. Mr. Beckjord, you may begin.

MR. BECKJORD: Mr. Chairman, with this briefing, we are approaching the completion of work that began a decade ago in 1977, with the recommendations of the International Commission on Radiological Protection, the ICRP. These recommendations fundamentally altered the concepts and philosophy underlying the science of radiation protection and proposed new concepts and methods for limiting radiation exposure based upon quantitative estimates of the biological risks of radiation.

The publication of these recommendations initiated a worldwide effort to re-evaluate existing radiation protection standards and modify them to incorporate the new approaches. In the United States, this effort led to the issuance of the federal guidance on radiation protection in 1987.

Parallel with the development of the federal guidance, the NRC was examining the implications of the new radiation protection concepts. The fact that the NRC staff representatives served on the Interagency Committee which developed the new federal guidance assured consistency between the efforts.

In early 1978, the NRC staff formed two task groups to examine the implication of these new concepts for the NRC standards for radiation protection in 10 CFR Part 20. The work

of these task groups culminated in the issuance of an advanced notice of proposed rulemaking on March 20, 1980. This notice identified the issues related to the ICRP recommendations that the staff believed needed to be addressed in any revision to 10 CFR Part 20. Public comment was requested on these issues.

In addition, the senior staff met with many organizations including labor unions, trade associations, licensees, public interest groups and technical societies asking for suggestions in the revision of 10 CFR Part 20. The results from this consultation was an important input to the preparation of the proposed rule.

The proposed rule underwent several years of internal review and modification before it was approved by the Commission and published for public comment at the beginning of 1986. Because of the importance of this rule and its complexity, the comment period on the proposed Part 20 revision was extended several times, eventually to more than 250 days.

In that period, over 800 public comment letters were received. The total number of comments in these letters amounted to several thousand that the staff reviewed and analyzed.

In order to deal with this important task, the Office of Research formed two groups, tasked with the job of bringing the revised Part 20 to fruition. The first group which was the Steering Committee, consisted of top level managers and had the

function of directing the effort and providing early resolution of policy issues and recommending approaches to be used. The Steering Committee includes Dr. Bill Morris of Research; Mr. Congel of NRR; Richard Cunningham of NMSS; Donald Nussbommer from the Office of Governmental and Public Affairs; Joanna Becker from the Office of General Counsel.

Reporting to the Steering Committee was a working group made up of senior technical staff members. This working group was charged with analyzing and summarizing the public comments, preparing the regulatory text and recommending the technical approaches for consideration by the Steering Committee.

The working group was chaired by Hal Peterson of Research on my left, who was the Part 20 Project Manager. Other members of the working group were Donald Cool of NMSS; John Buchannon of NRR and Walt Cool, formerly with Research.

The contribution of these individuals greatly facilitated the analysis, modification and resolution of difficult technical and policy issues and is the primary reason why this difficult and complex task was completed essentially in about a year and a half after approval.

I want to state my appreciation for the effort of these individuals. I also want to acknowledge substantial input and review from the Regional offices and by a number of state officials that commented on the evolving rule.

I suggest now that Dr. Morris present the Part 20 revision.

CHAIRMAN ZECH: Thank you very much. Dr. Morris, you can proceed.

MR. MORRIS: Thank you.

On page one of the handout is a list of the topics that will be covered in the presentation today, in addition, we will try to respond to the remarks of the earlier presentations as best we can.

[SLIDE.]

MR. MORRIS: On page two, we indicate some of the key milestones in the development of the recommendations in radiation protection that have occurred over the years. As you have heard in the previous remarks by Mr. Beckjord, ICRP Publication 26 included recommendations for a fundamental new system for limits on doses from radiation exposure and also recommended specific dose limits for workers and members of the public.

CHAIRMAN ZECH: Let me ask the Reporter if he is getting this.

THE REPORTER: Yes, sir.

CHAIRMAN ZECH: Thank you very much. You may proceed.

VOICE: Mr. Chairman, we can't hear.

CHAIRMAN ZECH: Would you speak a little louder?

MR. MORRIS: There were other ICRP publications such as Publication No. 30 in 1979 and No. 48 in 1986 which provided new scientific models and data governing the distribution and retention of radionuclides in the body and for calculations of doses to specific organs.

I might point out NCRP Publication No. 91, issued in 1987, also had essentially the same recommendations as included in the presidential guidance issued in 1987.

We should mention that the Interagency Committee that was formed by EPA to develop the revised presidential guidance was chaired by the Environmental Protection Agency and included representatives of NRC, the Occupational Safety and Health Administration, the Mine Safety and Health Administration, the Departments of Defense, Energy, Commerce, Transportation, Health and Human Services, and the National Aeronautics and Space Administration, the Conference of Radiation Control Program Directors, the National Academy of Sciences, and the NCRP advised that committee.

I am going to page three of the handout.

[SLIDE.]

MR. MORRIS: Here are some of the key actions by the NRC staff that Mr. Beckjord summarized earlier. I would point out that in parallel with the development of the international recommendations on radiation protection, the staff was cognizant of these actions and when the EPA Committee was

formed, the staff had a representation on that Committee and because of that, these staff actions and NRC actions were essentially consistent pretty much throughout with the evolving development of the presidential guidance.

[SLIDE.]

MR. MORRIS: I am going to page four of the handout. Here we indicate the objectives that the staff has had in revising Part 20; first and foremost was the intent to conform to the new federal guidance. However, there are other goals we have had. We have had 30 years of experience in implementing the current Part 20 and we wanted to take advantage of that experience in revising the rule.

ICRP Publication No. 26 had proposed explicit dose limits for the public, and we wanted to incorporate those into the rule. Also, it was our intent to update the scientific basis for intake and concentration limits that had been put forward in ICRP Publication Nos. 26, 30 and 48.

COMMISSIONER CARR: In that slide, it looks as if the federal guidance and ICRP No. 26 are the same thing; is that right?

MR. MORRIS: Not precisely. The main thing there is that ICRP No. 26 begins with the dose limitation system. That is pretty much incorporated in the federal guidance. The federal guidance does differ in some minor ways. For instance, a different dose to the embryo fetus was proposed in the

federal guidance than what ICRP No. 26 had indicated.

[SLIDE.]

MR. MORRIS: On page five, it just summarizes some of the new requirements that are involved here now. We would now place a limit on the sum of the external and internal doses rather than separate limitations on each of these. The dose limits of three rem per quarter would be replaced by a limit of five rem per year. There would be a deletion of a cumulative dose limit according to the formula, five rems times the age of the individual minus the age 18.

CHAIRMAN ZECH: Why are you doing that?

MR. MORRIS: This was one of the recommendations in ICRP No. 26 and in the federal guidance.

CHAIRMAN ZECH: Can you tell me the reason behind it?

MR. MORRIS: If you look at that formula, essentially it comes out to reflect an average dose through the years of five rem, five times the age of the individual minus 18, the age when he could have begun working. The use of the new five rem dose limit now has that same effect on the average. It would have been a redundant concept.

The idea of the cumulative dose limit would have allowed something that you could think of as a dose bank, if someone had doses well below five rems per year over a number of years, this could have been thought of the same way as a dose bank, to allow him to achieve greater doses in later

years. I think the fundamental idea was to have an averaging effect through the provision of a specific limit per year of five rem.

CHAIRMAN ZECH: All right. Thank you.

COMMISSIONER CARR: Why didn't you take it as N minus 18?

MR. MORRIS: The current value is --

COMMISSIONER CARR: Five times N minus 18. You are taking it as age right now? What do we have now?

MR. MORRIS: We have no cumulative dose limit in the new recommendation.

COMMISSIONER CARR: Nobody is keeping track of cumulative dose?

MR. MORRIS: We will be getting reports on cumulative dose but we are not placing a limitation on that other than for the purpose of those workers who might have to receive what is called planned special exposures and in those cases, there would be a total lifetime dose from planned special exposures.

CHAIRMAN ZECH: Let's proceed.

COMMISSIONER CARR: I'm not sure why you deleted it, the dose bank concept didn't get through to me.

CHAIRMAN ZECH: Let's try again, Dr. Morris.

MR. MORRIS: Let me go back to the point I made earlier.

CHAIRMAN ZECH: Please do.

MR. MORRIS: With the five rem limit now in place, that has the same effect as the previous cumulative dose limit of five times the age minus the age 18. That would have had an effect of average, five rem per year dose limit.

COMMISSIONER CARR: Except for the first 18 years.

MR. MORRIS: Use of 18 years is just to take into account the time when most workers begin work.

COMMISSIONER CARR: It is not really a five rem average.

MR. MORRIS: It is a simplification of that.

COMMISSIONER CARR: Five rem average over the working years, perhaps. Is that correct?

MR. MORRIS: Yes.

CHAIRMAN ZECH: The answer is yes?

MR. STELLO: Yes.

CHAIRMAN ZECH: Thank you. You may proceed.

[SLIDE.]

MR. MORRIS: Continuing on to page six of the handout, there will now be a change from a series of units and specific organ doses to a limit on the sum of organ doses weighted by specific separate organ risk factors.

The three provisions on the previous page and this provision substitute the recommendations that were in ICRP No. 26 and the new federal guidance.

Further than that, ICRP No. 26 proposed an explicit

limit on the dose to members of the public. The current implicit limit in Part 20 is 500 millirem a year. We would be adopting this new limit in accordance with ICRP No. 26.

Finally, the other provision is the limit on dose to the embryo fetus for pregnant workers. This dose limit is one-half a rem and would be imposed on the sum of contributions resulting from exposures of the pregnant woman to both external radiation and from her intake of radionuclides. This was included in the federal guidance, but as I said earlier, a different dose level had been proposed in ICRP No. 26.

MR. STELLO: Before we turn the slide, if I could return to this question of the N minus 18. The limits in the present Part 20 are three rem per quarter, 12 per year. We're changing it now to five rem per year. The formula was to accommodate the fact that you could be getting up to 12 rem per year, which we won't allow anymore, you're going up to five, so you don't need it.

COMMISSIONER CARR: Except that's calendar year accounting. I can still get 9.99 in two months.

MR. MORRIS: That's correct.

MR. STELLO: Yes.

COMMISSIONER CARR: So it depends on how you look at it.

MR. STELLO: It's still five a year.

COMMISSIONER CARR: But it depends on when you start

the calendar year.

MR. STELLO: Start it any way you want, per year five rem.

COMMISSIONER CARR: All right. But I go across the end of the year.

MR. STELLO: Okay. In my --

COMMISSIONER CARR: And I go to 9.99, right?

MR. STELLO: N minus 18 was the same thing. It was calendar year.

COMMISSIONER CARR: Yes, but you had an accumulated collection there. Well, it won't make any difference --

MR. STELLO: It won't, because it's still --

COMMISSIONER CARR: But I'm not sure it made any difference to change it either.

MR. STELLO: Oh, yes, because it used to be 12.

COMMISSIONER CARR: It used to be three per quarter.

MR. STELLO: Twelve per year.

CHAIRMAN ZECH: It's five per year.

MR. STELLO: Now it's five per year.

MR. CUNNINGHAM: One and a quarter per quarter.

CHAIRMAN ZECH: It is now.

MR. STELLO: Yes.

CHAIRMAN ZECH: That's my understanding.

COMMISSIONER CARR: It's one and a quarter per quarter now.

MR. CUNNINGHAM: No.

COMMISSIONER CARR: No. It's five per year now.

MR. CUNNINGHAM: It's five.

CHAIRMAN ZECH: A total of five per year, three per quarter, but a limit of five per year. Isn't that correct?

MR. STELLO: Yes. Five per year.

CHAIRMAN ZECH: Right, five.

COMMISSIONER CURTISS: I hesitate to jump in here, but what's the effect of focusing on the exposures over lifetime, what's the effect of the reduction of 12 to 5 discounted for the fact that you're not counting the first 18 years? Does the lifetime risk go up or down when you add those two together?

MR. CUNNINGHAM: It should stay the same.

COMMISSIONER CURTISS: From the standpoint of lifetime exposure, you eliminated accounting of the first 18 years. Commissioner Roberts alluded to the reduction of 12 to five yields the same result from a health and safety standpoint.

MR. CUNNINGHAM: I think in actuality, if you received a larger dose at the beginning of your working career where certain types of cancer show up over a 20 year period, solid tumors take about 20 years, leukemia is about 10 years to show up. If you got that dose at the end of your working career and your life expectation was not 20 additional years,

there may be some difference in the overall risk.

CHAIRMAN ZECH: All right, let's proceed.

MR. MORRIS: So we would now be moving to page seven of the handout.

[SLIDE.]

MR. MORRIS: Licensees are currently required to report annual radiation doses to workers upon request of the worker. In conjunction with the revision of Part 20, Part 19 would be amended to require such reports even if the worker does not make the request. This was a recommendation in the federal guidance.

Let me remark on the EPA comments. At this time, in the current Part 20, we only expect to receive annual reports from the seven types of licensees whose workers have the highest range of doses. We would receive from those licensees an accumulative total or average dose for that type of facility and would only receive individual reports on workers, for those who terminated employment in those facilities at this time.

In our deliberations on what to do about this in the revised rule, we decided that we could be satisfied if we continued with that same general concept that now requires separate dose reports for the workers rather than the accumulative for that type of licensee.

Also, I note that on the basis of experience we've had with disposal of radioactive waste into sanitary sewers,

there would be a reduction in the limits to the concentrations of materials that could be reduced in the sewers. It would be essentially a factor of ten below the current Part 20 with regard to what can now be released. Furthermore, because of experience from release of americium flakes specifically from smoke detector manufacturing facilities, we no longer allow all readily disbursable materials to be released, only those which are biological along with soluble material.

This requirement was based on the concept, on recognition that there are potentially multiple users of the sewers who might release radioactivity into them, so we wanted to reduce those limits.

[SLIDE.]

MR. MORRIS: Moving to page eight, just note that as the staff has proceeded with preparation of the final version of the Part 20 revision, one of the goals we set was to minimize the impacts to the extent we could while still implementing the basic principles of the federal guidance and the scientific recommendations of the ICRP and NCRP.

A number of simplifications of the proposed rule were achieved and we believe we have reached the goal that we set out for ourselves to the best we can. However, when such fundamental changes in the principles of radiation protection are involved, there is some impacts that are unavoidable and the revised Part 20 is more complex in that internal and

external doses must be combined and there are new concepts and terms which will require that licensees revise their procedures and enhance the training of those who must implement the new procedures.

So this is contributed to the cost of the rule and we estimated those costs in the regulatory analysis and I think we have made conservative estimates of those costs. When all is said and done, there may be possibilities to reduce those costs below what our estimates were. Now, what you have heard about earlier today is the possibility that the requirement that long-lived radionuclides would have lower allowable concentrations to be significant for fuel fabrication facilities. Let me spend a few minutes talking about this issue and going back to the comments that were made by the industry earlier today.

[SLIDE.]

MR. MORRIS: Moving first to page nine of the handout, I will comment again that the ACRS also had the view that the annual dose concept should be allowed and we earlier had received letters from NUMARC and from the fuel fabrication companies which we have been analyzing. Industry comments here emphasize the contrast between two approaches for limiting the risk from long-lived radionuclides. The committed dose control versus annual dose control. I'll come back to these concepts in just a minute, but first I think it's important to point out

the basis for the problem that is facing the decision in the Commission.

[SLIDE.]

MR. MORRIS: Moving on to page 10, note that the issue has as its fundamental basis new scientific information indicating an increase in risks from inhalation of insoluble uranium and thorium. Because of this, one issue is that the concentration limits for uranium would have to be reduced and approximately by a factor of the order of five, because of that new scientific information. The point here is the new scientific data that has really pushed us in this direction and not the idea that we have started doing dose limitation in a new way. We've always used the committed dose concept for 30 years to set these limits.

[SLIDE.]

MR. MORRIS: On page 11 of the handout, I point out that the new models and data that we're talking about really are about the retention of radionuclides in the body and the new models for calculating organ doses. These were proposed in the publications, ICRP Publications 26, 30 and 48.

[SLIDE.]

MR. MORRIS: And on page 12, as I mentioned earlier, for 30 years we have been using the concept of committed dose to control the risks due to the inhalation of long-lived radionuclides. We believe that this is consistent with the new

federal guidance and the close reading of that guidance to us says that you should use a committed dose concept in limiting doses to the workers, but that you may use the annual dose concept in the cases where there might be an overexposure. Mr. Richardson, in his comments earlier today, pointed out this distinction in the federal guidance on how to use these two concepts and that has been the basis for our position.

[SLIDE.]

MR. MORRIS: Moving on to page 13, defining again the concept of committed dose, which essentially means that doses from future decay of long-lived radionuclides retained in the body are counted as though they occur in the year of inhalation. So if you take radionuclides into the body, those radionuclides will redistribute themselves according to the physiology of the body and the chemical characteristics of the radionuclides. They will be decaying throughout the years after you had that intake.

What the committed dose concept does is it just takes all those doses that would occur in future years and assigns them to the year of the intake.

COMMISSIONER CARR: How do you decide what was put into the body?

MR. MORRIS: Well, the rule requires that there be monitoring of air and allow -- well, let me make it clearer. The rule requires that a combination of methods be used,

including air sampling, body counting such as lung counting, bioassay measurement of excreta from the body be performed when someone is going to be exposed to concentrations above a certain level. So you'll be monitoring these doses through the time that the worker would be exposed to radiation.

MR. STELLO: Well, Billy, I think you said that the rule requires all of those.

MR. MORRIS: No. It requires a combination of those -- some combination of those practices be followed. The general requirement is one of monitoring and specific ways to do the monitoring are allowed. This is --

MR. STELLO: Including lung counting.

COMMISSIONER CARR: Only if the guy is exposed to atmosphere above some limit.

MR. MORRIS: I think you have to exceed a certain threshold before you have to institute these measures.

MR. PETERSON: The monitoring requirements for internal dose is set if you expect the individual to be exposed to conditions that will result in a dose in excess of ten percent of the limit or half a rem essentially effective dose.

COMMISSIONER CARR: It seems reasonable to control the atmosphere, then you wouldn't have to do any measuring on the guy.

MR. MORRIS: That's correct.

MR. PETERSON: That's one option.

MR. STELLO: That's one of the options, but you can also use lung counting, you can actually measure it.

COMMISSIONER CARR: But you're saying if the atmosphere control is satisfactory, then you don't have to worry about measuring anything or computing anything.

MR. MORRIS: That's correct.

MR. STELLO: That's correct, but it's an option. You can still use -- I think the impression was left at perhaps you could not use lung counting. You can. That's permitted. There's a way to demonstrate compliance to the rule. The issue becomes what you include when you do the lung count.

CHAIRMAN ZECH: All right, let's proceed.

[SLIDE.]

MR. MORRIS: Moving on to page 14, the annual dose control approach would assess internal doses actually occurring during the year, each year, both from intakes in that year and intakes in previous years. The industry proposal, as you have heard, is to use that concept in lieu of the current proposal that the staff proposes.

COMMISSIONER CARR: And that's no matter how they're measured.

MR. MORRIS: As I interpret the industry proposal, yes. They would allow lung counting and they would allow air sampling and --

COMMISSIONER CARR: Well, that's what this says,

right? Any way you measure it, you just --

MR. MORRIS: The whole issue is whether you take into account the doses year by year or whether you take them into account in the year of the intake. That's the real debate. The technology for making the measurements and the assessments of what the doses are, in our rule, we would allow all of those technologies that I believe the industry would like to have available to them.

As mentioned, this concept was considered in the proposed rule, but it was discarded. We felt that if we were going to be consistent with the federal guidance and for reasons that I'm going to explain now that we should not continue to -- we should not retain this particular concept in the final rule. And the reasons that we believe this is the case are the following.

[SLIDE.]

MR. MORRIS: Looking at page 15, we believe that if worker dose levels are controlled solely on the basis of annual dose, the risk from radioactive decay of radionuclides remaining in the body after the worker leaves employment will have been ignored in establishing control.

COMMISSIONER CARR: Do you have a copy of that presidential guidance there? Everywhere I read in there, these quotes that I read from the various statements, the quotes always stop before the guidance statement.

MR. MORRIS: Yes.

COMMISSIONER CARR: For General Electric, for instance, it says "Presidential guidance says the limiting values for control of the workplace should be based on committed dose. The limiting values for assessed dose to individual workers' should be based on the annual dose." Is that an accurate quote of the presidential guidance?

MR. STELLO: No.

MR. MORRIS: We have --

MR. STELLO: Did you give it to him? Is that it?

MR. MORRIS: Yes.

COMMISSIONER CARR: Go ahead. I'll read while you talk.

MR. MORRIS: I can specify the places for the quotes that I think are of interest here. Does anybody have a copy of --

MR. CONGEL: Yes.

MR. MORRIS: Could I have a copy of that, please?

MR. CONGEL: Yes.

MR. PETERSON: It's the same as you have.

MR. MORRIS: Yeah, I know, but I just can't find it.

COMMISSIONER CARR: 2831 is what you gave me.

MR. CONGEL: Yes, 2831.

MR. PETERSON: 2831, No. 4.

MR. STELLO: 2831, No. 4.

MR. MORRIS: Yes. What it says there is the primary means for controlling internal exposure to radionuclides, agencies should require that radioactive materials be contained to the extent reasonably achievable so as to minimize intake. In controlling internal exposure, consideration should also be given to concomitance external exposures. The control of necessary exposure of adult workers to radioactive materials in the workplace should be designed, operated, and monitored with sufficient frequency to assure that, as a result of intake of radionuclides, the following limiting values for control of the workplace are satisfied.

The anticipated magnitude of the committed effective dose equivalent from such intake, plus any annual effective dose equivalent from external exposure, will not exceed five rem. I think that last phrase is essentially the key phrase, that says that it is committed dose that you should be using. They go on in this section to discuss that they believe it should be the 50 year committed dose.

If you go on to the next page, on 2832, at the beginning of the first full paragraph, you'll see that it says in circumstances where assessment of actual intake for an individual worker shows the above conditions for control of intake have not been met, agencies should require that appropriate corrective action be taken to assure control has been re-established and that future exposure of the worker is

appropriately managed.

Provisions should be made to assist annual dose equivalence due to radionuclides retained in the body from such intake for as long as they are significant for ensuring conformance with the limiting values specified in recommendation three. So we interpret that the previous quote that I made says that in order to limit doses, you use committed dose, but if in circumstances these dose levels, these limits should be exceeded, we may do further monitoring using the annual dose concept in order to regain control of the worker's dose condition.

That's the reason that we have chosen to believe that we should not use the annual dose concept.

COMMISSIONER CURTISS: Did I misunderstand in hearing you say that either of the two approaches would be consistent with the guidance?

MR. MORRIS: I can't speak for EPA, but I believe they meant to say that in these two cases. These are the two ways that they interpret.

COMMISSIONER CURTISS: Let me ask it differently.

CHAIRMAN ZECH: Why don't we ask the EPA, will you step to the microphone and clarify this situation for us, please? Identify yourself again for the Reporter.

MR. RICHARDSON: I am Allan Richardson. I chair the group that developed the guidance. This is not something which

is crystal clear. There is intentionally some flexibility in the recommendation. What the recommendation says is that internal exposure should be controlled on the basis of committed dose and if that control fails, then the annual dose limitation must still be met.

All of the implications that Mr. Morris has raised in his slides about the use of annual dose solely as the basis for controlling committed dose are correct. The guidance, because there was great controversy on this matter, did not exclude the use of annual dose recording for workers, but it's quite unequivocal in the need to control the workplace on the basis of the committed dose. Now, you can control a workplace by monitoring the air or by looking at the worker's body, and that's where the controversy really lies.

CHAIRMAN ZECH: Thank you very much. All right, you may proceed. Proceed, please, Mr. Morris.

MR. MORRIS: Thank you.

[SLIDE.]

MR. MORRIS: A further point, on page 16, that we would make is that if the annual dose system is used, if workers change jobs within the nuclear industry, their future employees would have to take over the task and absorb the cost of accounting for doses from previous intakes. Taking for an example, a worker in a fuel fabrication facility who had intakes over a number of years and, therefore, had

radionuclides within his body decaying giving him doses for a good part of the rest of his life perhaps, suppose he transferred and went to work for a radiographer who has no need for a system of monitoring and accounting for internal doses. In that situation, the burden of this previous intake from the fuel fabrication facility would now have been transferred to essentially not only the worker, but to the new employer.

That is a concern of ours and we believe that that would be a very difficult system to implement. It would require a fundamental change to the way we regulate the industry.

COMMISSIONER CARR: Do you mean because the radiographer wouldn't be able to compute what his internal dose was when he was getting ready to add his external dose?

MR. MORRIS: Well, the annual dose concept, you recall, speaks to the idea that there would be annual monitoring for internal -- for the doses from these internal doses, and the radiographer would normally not have much occasion to even deal with internal doses at all. Most of the dose exposures there, I believe, are external. So that is sort of an example --

COMMISSIONER CARR: I guess I don't see why that's a problem.

COMMISSIONER ROBERTS: I don't understand that, either.

MR. CUNNINGHAM: Let me try to expand on this. If you go to an annual accounting for a dose, this would permit an employer to allow an employee to take into his body a sufficient amount of radioactive materials that he will get five rem in the first year. Say that's the annual limit. The following year, he may get 4.5 rem from that same intake in the following year, on-out years he will be receiving some dose. Now, what the industry is proposing to do is to say that if an employee gets five rem in the first year from an intake, they will measure him the second year, and if that annual dose from that same radioactive material is calculated to be 4.5 rem, they will control him in the workplace so that he doesn't get more than half a rem so that he is within the five rem limit.

Now, what this means is that an employer would be able to mortgage the future employability of an employee. It implies that they are going to control him throughout a large part of his working career.

COMMISSIONER CARR: Control him always though at five rem a year.

MR. CUNNINGHAM: Yeah. And assume that he will be employed there and the employee wants to stay there, not work in some other field. Now, let's take what Bill Morris did and say, okay, this worker has this five rem initial intake from a large quantity, larger than -- much larger than would be involved under the committed dose concept. He will be

receiving four rem, three rem, what have you as time goes on. He leaves that employer. He goes to a radiography company which only deals with external exposure.

The implication there is that the radiography company will have to have whole body counters or what have you to assess what his dose is from that internal dose that year and then control the employee so that when he conducts radiography he doesn't get more than half a rem or what have you to exceed that five a year limit.

Now, this is a substantial policy issue, whether or not you allow a worker to have his future dose mortgaged so that it affects his employability in future years. It also presents some very significant regulatory control problems. You go into a plant, look at occupational exposures, you have a variety -- any single employee may have a variety of doses -- or any population of employees may have a variety of different doses to which they can be received if you go to this annual dose commitment.

If you look at design of equipment, you look at design of equipment so that you say, okay, the exposure to airborne concentrations aren't going to exceed a certain level and from that we know employees are not likely to receive more than five rem committed dose. But if we tried to evaluate air concentrations for each employee, depending on the given year and previous history, is subject to a different concentration.

That becomes an extremely difficult type of thing to regulate.

So we have regulatory problems, we have policy problems with respect to what we are allowing employees to receive under this annual dose, and how we are mortgaging their future and future employability in the radiation industry. That's the substance of the argument. Now, what the industry is faced with because of new science, you have about a factor of five reduction in the amount that can be taken in for a given dose. That's with new science.

So the industry is faced with two kinds of problems, controlling concentrations down to this lower level, and secondly, dealing with the problem of assessing committed dose, because you're dealing with a much smaller quantity and the technology for assessing, either through lung counting, bioassay, does become more difficult. That is correct. But there are ways to do it, we believe.

COMMISSIONER CARR: When he leaves his employer after whatever years it is, why doesn't the employer give him a count and say, okay, you're going to decay off at this rate and so the next three or four years, this is all you're allowed to have, and give him -- that seems a reasonable -- I believe that you could give him a piece of paper that says, okay, next year you can only have four, the next year three or, I mean, you can have five or you can only have one next year, two the next year, three the next year, and he finally works his way out of

this, I assume, if he doesn't inhale any more.

MR. CUNNINGHAM: Well, that's one way to look at it. Yes, that's true, that's correct if the employee is willing to accept that. But the question is --

COMMISSIONER CARR: Well, he's got to tell him annually what his exposure is anyway, so --

MR. CUNNINGHAM: But the issue is should one employer commit a person to restricting dose in the future which can affect his future employability.

COMMISSIONER CARR: That's an employee's voluntary decision when he hires out, I would assume.

MR. CUNNINGHAM: Right. I think that's the kind of policy decision the Commission has --

COMMISSIONER CARR: That's why we're here, I guess. Okay, that answers my question anyway.

CHAIRMAN ZECH: Thank you. All right, let's proceed.

[SLIDE.]

MR. MORRIS: Going on to page 17, it's just the same problem we've been discussing, but the issue is -- we've keyed on it here, is one of worker employability after he leaves a particular job. In summary, the staff has proposed that the committed dose approach should be continued to assure the control of dose as based on the total risk from long-lived radionuclides. Those future doses and risks are not discounted, that the licensee responsible for exposures deals

with them rather than passing responsibility on to future employers, that the employee's future employability is not jeopardized.

I have prepared to go into some more detail on the remarks made earlier by the industry representatives. We've covered a lot of that and I think selectively I would just go over a few of the points.

CHAIRMAN ZECH: Go right ahead.

MR. MORRIS: First off, Mr. Stansbury apparently believes that licensees would be limited to air sampling in determining committed dose. This is not the case, as we said earlier. Section 20.204 of Part 20 allows bioassay, including lung counting and measurements of radionuclides excreted from the body in addition to air sampling. Combinations of these are also allowed.

There was the proposal that the NCRP advises against use of committed dose. Remembering that our objective was conformance with the President's federal guidance and we've discussed what that says about this issue, we did prepare --

COMMISSIONER CARR: We may not have agreed on it, but we've discussed it.

MR. MORRIS: Yes. That's what I said. NUMARC also made a similar comment in its letter earlier, a few weeks ago on this issue and we did respond to the specific NUMARC concerns in Enclosure 9 of SECY 88-315. And there, we quoted

the NCRP 91, which points out twice that committed dose may be used to eliminate -- to estimate lifetime risks from a given intake, and that's our way of looking at this.

COMMISSIONER CARR: Well, on that one, I guess the General Electric letter says, and this is in full quotes all the way, "A committed effective dose equivalent system should specifically not," underlined not, "be used as a measure of an individual worker's exposure status." It says emphasis from original and that quotes NCRP Page 38. Is that an accurate quote?

MR. STELLO: I believe it is fairly accurate.

COMMISSIONER CARR: Well, how can you say it agrees with the NCRP then if that quote says you shouldn't use it?

MR. PETERSON: Because there is another quote.

COMMISSIONER CARR: You pick your quotes, he picks his quotes.

MR. PETERSON: If you will note, the industry comments do not generally refer to 91, they referred to an earlier report, 84. 91 does say that for the best control of the dose to the individual for monitoring purposes after exposure, you should use the annual dose approach. But it also says, earlier, that the committed effective dose equivalent is assumed to be a measure of the risk that will result from that intake, that is of radionuclides, and it's assumed to be the best measure of that.

COMMISSIONER CARR: But that doesn't counter what they recommend.

MR. PETERSON: No, it does not.

COMMISSIONER CARR: Okay.

CHAIRMAN ZECH: Let's proceed.

MR. MORRIS: Mr. Stansbury mentioned the committed dose is abstract and could give false impressions because of abstract modeling, but as I just mentioned, bioassay measurements and radionuclide behavior in the individual can be used in lieu of the generic models and I think this will avoid this process of abstract modeling that Mr. Stansbury is concerned about.

He also said that lung counting is employee oriented and it's preferred by GE, but lung counting is allowed by the revised rule, so there would be no prohibition on doing that. He mentioned that the committed dose will mask the relation between dose limits and risk. On the contrary, I believe that the committed dose concept establishes limits on intake based on the total risk an individual incurs and does not involve some truncation in that risk.

Furthermore -- but on the other hand, the annual dose concept would ignore future doses when workers leave their current employment. He mentioned that it is misleading that the NPC's for uranium were a factor of five too large. The new scientific information in ICRP 26, 30, and 48 do indicate --

does indicate that the concentration limits for uranium should be reduced by a factor of approximately five. That seems to be the outcome of the new science, I don't know how to avoid that.

And he mentioned that the annual dose concept is in accord with the presidential federal guidance. We've discussed that issue and I see no problem going back to that one. NRC cost estimates are too low. This was also a subject of the NUMARC comments earlier today. These cost estimates are discussed in the regulatory analysis, Enclosure 7 to SECY 88-315. There is a figure of $75 million total cost that has been estimated which would be the initial cost of developing procedures and training and the annual cost.

We believe this is an upward bound. The rule allows flexibility to use bioassay, including lung counting and air sampling, so there is flexibility to allow the licensees to do things using this flexibility that would reduce the burden. It also allows adjustments to airborne concentrations and intake limits based on site-specific physical or chemical characteristics of airborne materials. That is the aerosol, size distribution, or density. So there is more flexibility that they would have there.

So we believe that there are ways the licensees may be able to comply with this provision that would not cause the large cost that were the upward bound levels that we put into the regulatory analysis. Those high costs would be the result

of having to install glow boxes or something like that. We are thinking that there will be other ways to deal with this issue.

Mr. Stansbury mentioned that the committed dose is not useful for epidemiology. I would like to point out that the primary purpose of the NRC regulations is to set limits on risks, not to provide basis for research. But you will recall that the National Cancer Institute has requested NRC's cooperation in establishing a worker dose registry, as discussed in SECY 88-177 earlier this year. The cost for this would be no greater than the current reporting cost if the Commission decides to require licensees to report doses to workers in conformance with the new federal guidance.

If the information on these reports is required, Part 19 would include, we believe, sufficient information to support epidemiology studies. We think of it, though, as a fallout of the new requirements rather than a principal basis for promulgating it. I think that covers most of the issues that Mr. Stansbury brought up and I think that in those comments and other discussion, we have pretty much covered the remarks that Mr. Colvin made on this issue.

What I'd like to do now is to move on and go into some of the ACRS comments and then we may come back to other parts, other presentations.

[SLIDE.]

MR. MORRIS: Turning to Page 19 of the handout,

please, where we indicate some of the specific ACRS comments that were transmitted to the Commission in a letter dated June 7, 1988. The staff'S written response to ACRS comments was included in the Commission paper, so I will only briefly summarize these at this time.

We've discussed the issue of annual dose control versus committed dose, so let's go on to the second issue. The ACRS recommended that an evaluation be conducted on the health effects from discharge of excreta from patients undergoing therapy or diagnosed as using radioactive materials. Such discharges are exempt in the revised Part 20. It turns out that a project to assist the potential health effects from discharge to sewers has been underway for the past year, so we will be able to report to the ACRS on this issue in the near future.

Preliminary results indicate doses from these discharges are small and we believe this exemption should be retained because of the special benefits it allows to medical patients which justified as small risks. The ACRS also recommended that the revised rule provide exemptions from security requirements to prevent access to radioactive materials when the quantities are small enough to represent only minimal risks. The staff reply pointed out that there are certain quantities and forms of materials for which exemptions are granted in Part 20, but noted that further exemptions would

be inconsistent with the longstanding policy that control be maintained over radioactive materials to prevent possible contamination of the workplace or environment.

That is we believe there should be no relaxation of controls over such materials and possible exposure to the public would have no compensating benefit. This is not a case where we're releasing consumer products or has a particular benefit, it would just be a relaxation of security controls. Turning to slide 20, please.

[SLIDE.]

MR. MORRIS: The ACRS recommended that those who receive transportation packages containing radioactive materials should only have to monitor for external radiation if the packages have an external radiation warning label. The staff reply points out that incidents which occurred in the past demonstrate that there is potential for leakage of packages or failure of shielding which could result in serious radiological consequences.

To guard against such events, the final rule includes requirements to monitor packages as soon as practical. The ACRS proposed changing the definition of natural background to emphasize that exempted sources do not include sources of natural origin which have been technologically enhanced. That would be cases such as uranium or radium in phosphates and fertilizers. However, the regulation of these is not within

the NRC's statutory authority and the staff would conclude that the exemptions should remain.

The ACRS also proposed that the definition of whole body dose, in that definition, consideration be given to development of weighting factors for converting partial external exposure to equivalent whole body doses. The definition remains the same in the final rule, but use of such weighting factors has now been allowed through redefinition of the concept of weighting factors.

[SLIDE.]

MR. MORRIS: I think at this time, we have already mentioned that we believe that the benefit of conforming with the revised federal guidance on occupational protection and the consistency with the national and international radiation protection standards, this is on Page 21 of the handout.

[SLIDE.]

MR. MORRIS: And further on Page 22, the need to update the technical basis for intake and concentration limits and to incorporate the many years of experience in implementing radiation protection under the current Part 20, to provide explicit dose limits for the members of the public, are a basis for our recommendation that you approve this proposed final rule.

As we mentioned, we are trying to look at the various comments made in the earlier presentations to see if we can

somehow come back and address some of those and it might be appropriate at this time to see if there are any questions and then come back to these issues.

CHAIRMAN ZECH: Thank you very much. Questions from my fellow Commissioners? Commissioner Roberts?

COMMISSIONER ROBERTS: I have a request, not a comment. I would like to see in writing the ACRS position on the deletion of Section 20.205. Secondly, in the SECY paper, Page 7, I find this "logic" on why this is exempt from 50.109 is totally illogical. That's all I have.

CHAIRMAN ZECH: Thank you. Commissioner Carr?

COMMISSIONER CARR: Yes, I've got a couple of questions, as one of my former Commissioners used to say, but annual reporting of the individual doses to the worker, I guess that's to the radiation worker. Who is supposed to do that?

MR. MORRIS: The licensee.

COMMISSIONER CARR: Okay. Am I a radiation worker?

MR. MORRIS: I think if you visited a plant, that --

COMMISSIONER CARR: Who is supposed to report it to me? Annually?

MR. STELLO: I don't believe the old rule required it annually. I think you get a report after your visit.

MR. MORRIS: It's a termination report in the current provisions.

COMMISSIONER CARR: I'm still uneasy because when you

get down to employee's employability after he leaves his past job, when I was employed here, nobody asked me how much radiation I had before I got here. I don't guess anybody cares. How are we getting away from the individual employee's responsibility to monitor his own radiation? You're going to let him go a year before the employer tells him?

MR. MORRIS: We believe this information being supplied to the worker each year gives him a --

COMMISSIONER CARR: Well, don't they do that now?

MR. MORRIS: Some do and some don't. It's not a requirement. I don't know the exact numbers that do or do not, since we don't have any way of monitoring that. But I think -- I agree that it's an important part of the principal to have the employees cognizant of the doses that they might be encountering and this annual report is essentially a report card for how well that was done during the year and the employee is a participant in that, I believe. He has opportunities to avoid exposures that go beyond the kinds of things you can do with procedures.

COMMISSIONER CARR: I guess my point is I think we can take care of that employee's employability after he leaves in a lot of ways, how much he can take the next year after he terminates. The other one I think I'm worried about is I don't know that our residents aren't getting more radiation than they're allowed. The only guy that knows is them.

MR. CONGEL: The resident is under the control and turns his badge in to the licensee at the plant where he works and gets his reports back.

COMMISSIONER CARR: So who knows how much he gets, except him. A licensee is only required if he is overexposed, but he doesn't know where else he might be going. Each licensee reports to him, but he could go to five or six different places and they still -- he'd be under unless he kept track, right?

MR. CONGEL: Yes. If you're talking about our individual inspectors who do --

COMMISSIONER CARR: That's what I'm talking about.

MR. CONGEL: The residents are usually, at one place, they're easier to keep track of.

COMMISSIONER CARR: Well, whoever travels around. All I'm saying is I don't see us taking care of our own people.

MR. CONGEL: No. The inspectors do have the records of the ones who travel plant to plant kept at the regional headquarters where they are based.

COMMISSIONER CARR: Who monitors them?

MR. CONGEL: There are two things. First of all, the inspectors are provided with an exposure record.

COMMISSIONER CARR: Sure. I am, too.

MR. CONGEL: In addition to that, I know that in each of the regions there is a group that is responsible for

collating the exposure records of the inspectors and their responsibility for informing --

COMMISSIONER CARR: Who does it for the headquarters?

MR. CONGEL: The records are kept in our Office of Research.

COMMISSIONER CARR: I keep mine. Nobody gets mine but me, I don't think. Anyway, let's look at that a little bit. On those fuel cycle facilities --

MR. STELLO: I think you raised a good point.

COMMISSIONER CARR: Yeah, it worries me.

MR. STELLO: This particular regulation, in terms of the extent to which we've taken into account people that are in the regulatory business, they have to get to a lot of plants. They have to keep track of their own records.

COMMISSIONER CARR: Contractors, you know.

MR. STELLO: Well, the contractors, they're covered by the regulation.

COMMISSIONER CARR: I mean our contractors that do --

MR. STELLO: Oh, yeah, people that work for us. We ought to look at it. I think that it is an area that we ought to take a look at and make sure that people understand what their responsibilities are.

COMMISSIONER CARR: On the fuel cycle facilities, are you going to grandfather those people that have been working there 38 years? I mean, if I figure it like I've been figuring

it for them, are they going to be overexposed? It's such a serious problem and we haven't been keeping track of it, right?

MR. MORRIS: Using the committed dose concept, their doses will have been described each year as the intakes occurred. I don't think that there would be a need to do any grandfathering of those cases.

COMMISSIONER CARR: Well, what you're saying to me is this current system is okay.

MR. MORRIS: Yes, that's what we -- yes. The current system is the one we proposed to continue, it's just that the new scientific data has caused some of those limits to go down. But otherwise, the system would remain as it has always been.

COMMISSIONER CARR: The only thing we're going to change then is the air control in the workplace.

MR. MORRIS: Well, there may be other ways to do the same thing. You could do that, but there are other options.

COMMISSIONER CARR: It looks like we're going to have to. I mean, that's one of the effects of the rule, isn't it?

MR. MORRIS: No, no, no. It's just to control the doses to the workers.

COMMISSIONER CARR: I thought we were going to lower the limits on uranium by a factor of five.

MR. CUNNINGHAM: Well, that's the way it comes out.

COMMISSIONER CARR: Well, that's a fact, I guess.

MR. CUNNINGHAM: Yes, that's a fact. In practice,

the exposures, and this is a general statement but it's fairly accurate, the exposures to workers, the committed dose has been running about ten to 15 percent of the limits. What the factor of five is going to do in actuality is move that so worker exposures under the present way they operate very close to the limits. That means that you're going to have to do more close monitoring because you don't have that cushion. That's the first thing. You do closer monitoring.

You might have to adjust certain parts of the plan to take care of air concentrations, but really it's a problem first of closer monitoring of people because you're closer to the limits, and make sure you don't go over.

COMMISSIONER CARR: Okay. And then on consistency with national standards and all that, everybody has kind of left the Health Physics Society recommendation out of this. Do you want to address that? A Physics Society position paper presumably approved the committed dose for control of workplace and annual dose for worker dose. In 1985, a full membership referendum supported that.

MR. PETERSON: I think the quote is correct. The Health Physics Society took the same position as the NCRP. Again, from a scientific point of view, as Dr. Stansbury pointed out, when you look at the long term control of the worker, there is little difference far out in what the worker is going to get under either system. It's a question of

whether you account for that tail after employment.

Now, he indicated if you do account for that tail after employment, then the two systems would give you the same total lifetime dose. The problem is their system doesn't account for that tail and the committed dose does.

COMMISSIONER CARR: I understand that.

MR. PETERSON: From a scientific point of view, the annual dose is probably preferable. We're arguing against it on a regulatory point.

COMMISSIONER CARR: I have one other question, I guess for the general counsel. Your argument for no backfit analysis kind of hung on we're complying with Presidential guidance and, therefore, we shouldn't have to do a backfit analysis. But from what I hear, the Presidential guidance kind of allows it to go either way. Do you think we require backfit analysis, particulary on this 20.205 portion of it or do you have to study that some more?

MR. PARLER: Well, I can tell you what I think now. I'd be pleased to study it some more if necessary. The starting point is that the backfit rule does apply to Commission actions. It does apply to rulemaking. As some of you may recall, there was a big debate about that some years ago as to whether the backfit rule should apply to rulemaking. The backfit rule requires a basic finding that a Commission action will require substantial additional protection to the

public health and safety. And even if it does, the benefits would outweigh the costs.

If you can't pass that obstacle over the backfit rule, you have to fall within one of the exceptions, one of which is to provide adequate protection to the public health and safety. The language on Page 7 of this paper to which reference has already been made as perhaps being illogical speaks about suspending the backfit rule. That suggests to me that the basic requirements of the backfit rule, that is that the proposed change would require -- would result in substantial additional protection cannot be met.

Furthermore, it seems to me that the staff has chosen not to rely on the provision of adequate protection to the public health and safety exception. With that background, then the Commission is left with this question. If it has a regulatory policy decision that it believes should be made and it will be compatible with its mission, whether it be because of a statute or a Presidential document or the movement in the worldwide community over the last decade that has been alluded to, whether the backfit rule precludes the Commission from making that regulatory policy decision.

The backfit rule, the way that it was written, did not provide for that contingency. What we have been trying to do over the last couple of years is to apply a common sense approach to questions such as this and at least indicate to the

Commission that it is up to the Commission to make that decision if it thinks that a particular proposal is a right way to move in.

Otherwise, the Commission would be stymied in making important regulatory policy decisions by the backfit rule. It would either have to amend the backfit rule or, in this case, suspend it. Now, my own personal view is that the thing -- the backfit rule isn't literally being suspended, that this is an interpretation of the backfit rule. As a matter of fact, the paper covers many of the pros, the cons, the benefits, the costs, why the Commission is moving in the direction. What the paper has done, accomplished is the basic objective of the backfit rule, that is having a disciplined managed approach.

True, there is no exception. True, the basic findings of the backfit rule apparently can't be satisfied here. It's up to the Commission to decide what they want to do. In my judgment, they would not be precluded from acting because of the lack of explicit provisions in the backfit rule for situations such as this and they wouldn't be precluded either if there were a specific statute that required a Commission action. That contingency is not covered in the backfit rule.

COMMISSIONER CARR: Thanks.

COMMISSIONER ROBERTS: I have a question.

CHAIRMAN ZECH: Yes, go ahead.

COMMISSIONER ROBERTS: Reading Page 7, the staff recommends that the backfit rule 50.109 not be applied to the Part 20 revision. The basis for this is that conformance to the Federal guidance on occupational radiation exposure issued by the President should take precedence over compliance with the backfit rule. Can't you imagine a scenario where there is Federal guidance that makes no sense and is contrary to law?

MR. PARLER: Well, of course, I would hope the Commission, in its informed judgment, including the advice from myself or whoever may be in my position, would recommend to you under such circumstances that you not exercise your discretion and forget about the backfit rule.

What I was trying to advise the Commission on earlier in my responses to Commissioner Carr is if you do have a situation where it is sound regulatory policy to move in a particular direction because of advice from the President or from some other place which is authentic and is part of the national policy, that perhaps the Commission would not want to be precluded from acting by the literal language of the backfit rule.

COMMISSIONER CARR: I understand.

CHAIRMAN ZECH: That's my understanding of the backfit rule exactly and what it really means to me in the way I look at it is that the backfit rule does not preclude this Commission from doing what we think is right. Simple as that.

I think that's a proper interpretation of it.

MR. PARLER: I would like to add --

COMMISSIONER ROBERTS: I don't disagree with that general statement.

CHAIRMAN ZECH: You don't or you do?

COMMISSIONER ROBERTS: I do not disagree with that general statement.

CHAIRMAN ZECH: Well, that's all it means. It does mean that if we believe that we should make some decision and we do think it's in the public interest, then this Commission is not precluded from doing so and we should indeed make that decision, in my judgment, recognizing that we may be overriding the backfit rule. I think we have the authority to do that and I think we should keep that in mind and exercise it when necessary.

MR. PARLER: May I make one other comment? Every paper would come to the Commission which the staff would say, Commission, please just suspend the backfit rule or exempt it, and there wasn't a good underlying foundation for it, I would think that would be an abuse of the backfit rule and I would object to it.

CHAIRMAN ZECH: Well, I would agree with that.

MR. PARLER: But minds to differ as to whether or not these are good reasons here or are we moving in the direction that the paper recommends.

COMMISSIONER ROBERTS: Yes, we can differ on that.

MR. PARLER: Right.

CHAIRMAN ZECH: The essence of my point is that if the Commission, in its judgment, believes it's the right thing to do and it is in the public interest, then we should do so. Not precluded by the backfit rule or anything else.

MR. STELLO: That's why we brought it to the Commission, because it isn't a clear policy issue.

CHAIRMAN ZECH: Commissioner Carr?

COMMISSIONER CARR: I'd like to join our representative from the Nuclear Information and Resource Service. I didn't get the paper in time to really look at it. With that, I quit.

CHAIRMAN ZECH: Commissioner Curtiss?

COMMISSIONER CURTISS: I just have two quick questions and one following up on the backfit discussion. Is the staff taking the position that what is being proposed here is not required to bring the facilities into compliance with the statutory levels of health and safety that we're required to abide by? Is this an additional level of protection that goes beyond that statutory level?

MR. STELLO: We struggled with that very question. Let me see if I synopsize it, I might need some help. Do the current regulations in totality that exist today give us confidence that the public is being adequately protected?

Answer, yes. Another way to look at it, if you took this rule and put it on a scale and tried to do a cost benefit analysis, would it pass? Answer, no.

COMMISSIONER CURTISS: Followup then on what Mr. Parler has said, in the SECY paper itself but in more detail in one of the enclosures, it seems to me that the staff is articulating an exception or clarification of the backfit rule that we should consider in the context of waiving that rule or not applying it construing the backfit rule that goes to situations where this agency, either in the case of a statutory requirement that was referred to or in this case, the matter of the Federal guidance. But in those instances, the backfit rule really didn't envision the conforming steps that this agency would take should be covered by the cost benefit analysis. Is that sort of a fair summary of what the premises of the recommendation to waive the backfit rule or to proceed with that interpretation of the backfit rule?

MR. PARLER: The gentlemen are looking at the general counsel and the general counsel is personally involved in the decision to shift from a line on something that's needed for adequate protection, and incidentally as I see it, we could be thinking about adequate protection, not right now, but say something that is needed for adequate protection over the long term, ten, 20, or 30 years in the future.

Just because we rely on the adequate protection

exemption as an exception to the backfit rule does not mean that people should inquire or that the action implies that there is some immediate problem now. There was uncertainty at the proposed rulemaking stage as to how the backfit rule would be handled. For that reason, the question was put to the public in the enclosed rulemaking. Their response of the public is summarized on Page 105 of Enclosure 3 to the paper.

All of the commentors, practically all of them were opposed to a suspension or an exemption from the backfit rule. Their reason for doing that, as I understand it from the summary, is that otherwise you will not have a uniform interpretation of application of the backfit rule. From my earlier remarks in responding to the two Commissioners, I don't believe that that argument would necessarily hold up because I think that we have well identified circumstances, which you, Commissioner, have just alluded to as to when it would be appropriate to consider an exemption, a limited exemption from the backfit rule.

As I said earlier, everything that the backfit rule contemplates has been done except making the finding that there would be a substantial additional protection to the public and that if that were the case, that the benefits would outweigh the costs.

COMMISSIONER CURTISS: I guess at some point, and I agree with a lot of what has been said here. In trying to

review the file last night, it's clear that a lot of analysis has gone into this and the discipline, I take it, the backfitting rule was designed to accomplish has essentially been a discipline analysis, but undertaken by the staff. I think at least the spirit of the backfit rule has been met in the paper that we have before us and the years of consideration.

In addition, I agree with what the Chairman has said that this agency can do and is not constrained by the backfitting rule from doing what it thinks is right from the standpoint of public health and safety. My questions go more to the generic significance of a decision to waive the backfit rule in this context. Let me ask just one other question and then I have a final question.

If the Commission waives the backfit rule in the manner described in the enclosure because this is a situation where Federal guidance is being conformed to, is that then considered an interpretation of the backfit rule that would apply to any subsequent case that comes up or is the precedent nature of that limited to just this one case involved in Part 20?

MR. PARLER: In my judgment, we take them one at a time, look at the facts of the particular situation, look at the applicable law and come up with the best common sense judgment. So to handle case by case, as far as I'm concerned,

that it wouldn't have precedent for anything.

MR. STELLO: If I might add one --

MR. PARLER: That's the general counsel speaking. He is speaking for himself.

MR. STELLO: I would try to help to answer the question. The Commission, in responding to the presentations we've given on information related to severe accidents, has reminded the staff that what the Commission wishes to have is when the staff believes that even though something may not pass a cost benefit test and there is a belief that we, as a matter of policy, should still go ahead with the backfit. The Commission has reminded the staff to be assured that we inform the Commission of those kinds of issues so that the Commission, at least once before, has recognized this potential problem could exist as you get into severe accident issues, and specifically asked us to bring it to them.

MR. PARLER: I certainly agree with that point, Mr. Chairman. That's a different point that something shouldn't be kept from the Commission because of potential concerns about the ability to comply explicitly with the backfit rule.

CHAIRMAN ZECH: I agree and that, I think, is well understood. I hope the staff well understands that.

MR. STELLO: We do.

CHAIRMAN ZECH: Bring to the Commission those such --

MR. STELLO: We intend to.

CHAIRMAN ZECH: -- cases that end up in that circumstance.

COMMISSIONER CURTISS: I wonder if I might ask, and I don't think we need to go into it here, if the counsel could take a look at whether there is any benefit given the limited nature of the waiver here in just granting an exemption under 5012 to the agency's backfitting regulations versus the approach that the staff has suggested, which is to waive the backfit rule but not using the 5012 exemption.

MR. PARLER: We would be pleased to look at that, Mr. Chairman. I don't think that it makes too much difference one way or the other, but we'd be pleased to look at it and provide the advice. While we are doing that, and we hope to do it expeditiously, I'm suggesting to the Commission that the Commission should not feel, under circumstances such as this, that its hands are tied because of the failure of the backfit rule when it was adopted to anticipate contingencies such as this.

COMMISSIONER CURTISS: One quick final question. When the IAEA did its OSORT review of the Calvert Cliffs plant, did they review the radiation protection programs of the plant, and if so, was it done against the international guidance?

MR. PARLER: We'll have to check and give you that answer, because I don't think any of us here really know the answer to that question.

COMMISSIONER CURTISS: What I'd like to get a sense of at some point is when the plant was reviewed first, were the radiation programs covered, were they reviewed against the international guidance which we're presumably incorporating here and what was the upshot of it?

MR. PARLER: Let us get you that answer.

COMMISSIONER CURTISS: Thank you. That's all I have.

CHAIRMAN ZECH: Commissioner Carr has another question.

COMMISSIONER CARR: I have one more I forgot to ask. According to my staff's look at this thing, it says that we're going to require nine new reg guides, three major revisions to reg guides, and 55 minor revisions and you estimate something like six man years. Based on that, what I'm concerned about is what the NUMARC representative said whether we shouldn't make the effective date five years after the proposed rule or whether we should give some consideration to, since we've got a lot of work to do, taking a look at making the effective date after these things get on the street.

COMMISSIONER ROBERTS: If I may interject, you're drawing a good analogy to what is going to happen about the maintenance rule, but that's a private comment.

CHAIRMAN ZECH: To which we all don't agree.

COMMISSIONER ROBERTS: I understand that.

MR. MORRIS: You know, in the Commission paper we had

an analysis done to analyze what the workload would be. We have budgeted this work. It's in the five year plan, it's in the budget planning. Admittedly, there is a challenge to get all of that done on time. When you're proposing to take on that challenge, in order to get these --

COMMISSIONER CARR: By on time, do you mean you're going to have that done before '91?

MR. MORRIS: In time to support the final implementation date of the rule, yes. That's our plan.

COMMISSIONER CARR: All those are expected.

MR. MORRIS: It's a lot of work, yes.

COMMISSIONER CARR: Okay.

CHAIRMAN ZECH: Well, let me -- do you have another comment to make?

MR. MORRIS: Well, if you wish, we could go into some of the comments made by the representative of the Nuclear Information and Resource Service.

CHAIRMAN ZECH: I was going to ask you to do that.

MR. MORRIS: It was difficult to fold those into the remarks during the --

CHAIRMAN ZECH: Go right ahead.

MR. MORRIS: Because I had to jot down those remarks as she was speaking. The point was made that we should not bring risk estimates into those limits, but that is exactly what I see ICRP 26 did and what has been endorsed by the

scientific community as a way to make sure that the dose limits are associated with an understanding and a limitation on risk.

There was a proposal that the risk coefficient that we're using is too low and it may change and further that the British NRPB has recommended a different number than the five rem limit based on the possibility of those numbers changing. We recognize that those data from the Hiroshima and Nagasaki bombing survivors are being reevaluated. The BEIR-5 report will come out early next year. But the ICRP was aware of this information also and they revisited this issue and they reaffirmed that they believed that the five rem limits were appropriate because the total package of radiation protection is more than just a dose limit. It's the dose limits plus the ALARA programs.

The comment was made that there should be hearings on this, but I would point out that the EPA in its development of the Federal guidance, did hold hearings in several cities and got public comment on that at that time. I think that plus the public comment process has aired all the issues that are involved in this rulemaking and we believe that that has been appropriately dealt with.

We have done an environmental assessment. It is not a full environmental impact assessment because we believe that the environmental impact of this rulemaking are minimal. That is not necessary. The statement was made that the .5 rem dose

limit during pregnancy was too high. I pointed out to you earlier that the ICRP had a value of 1.5 rem for the pregnancy. The Federal guidance came out with a lower number and we have adopted that lower number and believe it is supported by the best technical evidence we have today and we will be developing regulatory guidance that will further explain how this limit should be adhered to in practice. We believe that this will be an acceptable dose limit for the pregnant worker.

We have, in the rulemaking on Part 20, eliminated the concept of defining de minimis levels because we are doing that, as you know, in a policy development project that we have underway. There was a concern about the impacts of the new concentration limits as they might be promulgated through the technical specifications and a discussion of the other limits, such as the EPA 25 millirem limit in Appendix I, turns out that the adoption of the 100 millirem limit dose to the members of the public is probably not going to have an impact because these other limits are in place, the limits, the design objectives that is in Appendix I and the limits in the EPA. And those will be the predominant impact. Mr. Congel mentioned that he might want to speak to the issue of how those technical specifications are derived and I'd like to give him an opportunity to do that.

MR. CONGEL: The point I wanted to make when I listened to the presentation was the fact that in our present

technical specifications, effluents are limited on the short term basis by the concentrations that are specified in the present Part 20, Appendix B. With the reduction of the allowable off-site limit to the general public, going from 500 to 100, the only effect I would see on the technical specifications is the guidance for short term limiting would be effected, mainly the set points that were referred to in the testimony.

But as was pointed out by Dr. Morris, the design objective limits of Appendix I would not change at all, so we would be only faced with changing those parts of the technical specifications that refer to controls for short term limits.

MR. STELLO: You might want to give what the number is, the average that we're seeing around nuclear plants at the moment?

MR. CONGEL: Well, it's a very small fraction of the Appendix I design objectives, which are essentially millirem to the total body from airborne effluents and 3 millirem to the total body from liquid effluents. I'd like to add, for the liquid effluents, there are factors of conservatism of at least one and about two orders of magnitude. So the number of changes that we're talking about here really will have no effect on the impact -- the environment by power plants.

MR. STELLO: We're through.

MS. D'ARRIGO: May I respond to that?

CHAIRMAN ZECH: Yes. You may respond briefly.

MS. D'ARRIGO: The first point was you said that the ICRP has revisited, the ICRP, the International Commission on Radiological Protection, revisited the data only up until March 1980. The Hiroshima and Nagasaki dead are coming out now. There have been quite a few studies since March of 1980 that really haven't been taken into consideration for calculation of risk coefficients. Also, the EPA hearings were held in the late '70's and this issue is something that is going to, as the man from the EPA earlier stated, there are thousands of workers and facilities that are going to be effected by this rule change and we can debate whether or not nuclear power plants actually, the 110 that there are, are going to meet these -- need to meet these criteria.

But the point is there is still a significant amount of potential increase in radiation exposures and releases that will result from this rule change and the later data since 1980 hasn't really been taken into consideration. Regarding birth defects, the exposures to pregnant workers at .5 rem, Dr. Alice Stewart's studies have shown that there is, in that range, a possibility of doubling the risk of cancers in children that are exposed in utero to that level of radiation.

So even though it's three-fold lower than ICRP suggested, it is still not something that the general public would consider an acceptable risk. Further, there is a paper

in the British Journal of Radiology, Volume 57, 1984, regarding in utero exposure to radon radiation, Otake and Schull, and it points out -- it looks -- it concludes that one to two rads of exposure in utero doubles the risk of retardation. We've heard also in the past that five rads doubles the risk of retardation.

So this is a risk that the NRC, if you pass this rule, is saying is acceptable risk and workers might not know that they're pregnant and get out of the exposure in time to avoid the risk. Since the proposal has been around since 1977, the ICRP recommendation, maybe we should wait until early next year and see what their five concludes before voting on it, and further, the -- you were talking back and forth about the backfit rule and I don't really see what the benefit is. I mean the industry said that it's costing them money. Health physicists are saying that it's difficult to do these calculations. You talked for half an hour about how difficult it is going to be to measure, the different kinds of measurements that are going to need to happen, you're not going to know for a year.

And what we're saying is that there are no benefits and why should we put the money in, the NRC put the money in, the industry unless we're really going to have a significant increase in protection. I think those are the comments that -- let's see -- technical specifications.

I think those were all the comments that I got. Thank you.

CHAIRMAN ZECH: Thank you very much.

MS. D'ARRIGO: Thank you for the opportunity to respond.

CHAIRMAN ZECH: Thank you.

MR. STELLO: Mr. Chairman, we are through. Our considered technical judgment is that the Commission ought to go forward with the rule.

CHAIRMAN ZECH: Thank you very much. Let me thank all of the guest speakers and the staff for a very informative presentation. It's a complex matter and a very important matter, as we all recognize. As I indicated in my opening remarks, it was clear to me before we started the meeting that we'll need to do a fair amount of reflection. That was only reemphasized a number of times during the meeting today. I would ask my fellow Commissioners to reflect carefully on what we have heard and we will make a decision when we feel that we are confident that we can make the best possible decision.

So unless there are any other comments from my fellow Commissioners, thank you very much. We stand adjourned.

[Whereupon, at 12:38 p.m., the Commission was adjourned, to reconvene at the call of the Chair.]

CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting of the U.S. Nuclear Regulatory Commission entitled:

TITLE OF MEETING: Briefing on Final Rule on Standards for Protection Against Radiation - Part 20
PLACE OF MEETING: Rockville, Maryland
DATE OF MEETING: Thursday, November 10, 1988

were transcribed by me. I further certify that said transcription is accurate and complete, to the best of my ability, and that the transcript is a true and accurate record of the foregoing events.

John Trowbridge

John Trowbridge

Ann Riley & Associates, Ltd.

NUMARC Briefing to the Commission on 10 CFR 20
Thursday, November 10, 1988

Good morning. I am Joe Colvin, Executive Vice-President and Chief Operating Officer of the Nuclear Management and Resources Council (NUMARC). I'd like to thank the Commission for the opportunity to appear before you at this meeting to present a statement on behalf of NUMARC on the proposed revisions to 10 CFR Part 20. With me today is Lynne Fairobent, NUMARC Project Manager on this issue.

NUMARC wishes to express its overall support for the proposed revision to 10 CFR Part 20. We support the Commission's efforts to incorporate revisions to 10 CFR Part 20 which reflect developments and advancements that have occurred since the original publication of this rule some thirty years ago. We also commend the NRC staff for seeking, during the development stage of the proposed rule, scientific and technical input from licensees directly affected by this rule change. The industry provided extensive comments on the proposed rule. In addition, NUMARC provided recent comments in our letters dated April 26, 1988 and October 20, 1988. However as expressed in these letters, there are two specific areas that we urge you to consider prior to issuing the final rule.

First, we understand that the Staff has recommended the deletion of the proposed Section 20.205 from the final regulation. This section would allow licensees to control occupational exposure to certain long-lived radionuclides in terms of the sum of the external deep dose equivalent and the effective dose equivalent actually received in one year from all radioactive material retained in the body. This section is of particular importance to the commercial uranium fuel fabrication workers and industry. The retention of the Proposed Section 20.205 would allow its licensees the option of accounting for dose on an annual basis in conjunction with tracking the 50-year committed dose rather than requiring dose evaluation based solely on calculating the 50-year committed dose.

We recognize that the issue of how to account for the radiation dose from radionuclides persisting in the body is decidedly complex and not without controversy. However, both the National Council on Radiation Protection and Measurements in Publication 84, issued in September 1985 and the NRC Advisory Committee on Reactor Safeguards at its June 1988 meeting, recommend the use of accounting for dose from these persistent radionuclides on an annual basis in conjunction with tracking the 50 year committed dose.

We believe there is a significant cost impact in implementing the proposed rule without the inclusion of the option to account for these doses on an annual basis. The NRC estimate for implementing this one section of the final rule that would require the recording of dose from long-lived radionculides based on the 50-year committed dose is 75 million dollars to

the fuel fabricators alone. This is the one time cost of complying with the regulation and does not reflect the annual operational costs. We believe that retaining Section 20.205 would essentially eliminate this cost without decreasing the level of radiological protection afforded to workers.

The NRC staff sought and obtained extensive comments on the proposed rule. The decision to delete this important provision does not appear to reflect the comments obtained. If it is decided to delete this section, we strongly urge that the Commission publish this proposed change for public comment due to the significant difference in approach that this change represents from the original draft regulations published for comment.

The second area that we urge you to consider relates to the implementation of the rule. Our letter to the NRC staff of April 26, 1988, expressed concern that the complexity of this rule could result in a non-uniform application of its provisions by those who must regulate the various licensees. We understand that the NRC Staff has not yet developed the corresponding guidance documents necessary to provide its licensees with sufficient information to effect consistent interpretation and implementation.

In order to aid in uniform application of the regulation and facilitate a greater understanding of the new regulations and potential implementation problems by all involved, we urge the Commission to publish the necessary guidance documents and to consider regional workshops for both its inspection staff and licensees with the accompanying detailed guidance prior to the full implementation date. This approach was used in implementing 10 CFR Part 50 Appendix I in the early 1970s and proved beneficial to both the regulator and to licensees.

In the proposed rule, the implementation period was stated to be five years from date of publication as an effective rule. It is our understanding that the final rule under consideration before you today recommends an implementation period of two years from the effective date of the final rule. We believe that this time is not adequate to ensure correct implementation of this rule.

We believe that a phase-in of specific sections of the regulation may be beneficial from both the regulatory and licensee viewpoints. NUMARC would be pleased to work with the NRC staff to identify those sections of the regulations that could be implemented with minimum impact and those that would benefit most from a phased-in implementation once the guidance documents were prepared and regional workshops were conducted. For example, it would be more cost-effective to have all power reactor licensees simultaneously implement the proposed regulations dealing with dose recording. Recording of worker dose is a major portion of the recordkeeping cost for the utility industry and was identified by an industry study (AIF/NESP-30) as the single most costly aspect of the proposed rule.

In closing, we urge the Commission to consider retaining the proposed Section 20.205 and restoring the five year time period for full implementation, utilizing a phased-in approach to achieve your goal. Thank you for your consideration.

GE Nuclear Energy

General Electric Company
Castle Hayne Road Wilmington NC 28402

November 7, 1988

Mr. Samuel J. Chilk
Secretary of the Commission
US Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20850

Dear Mr. Chilk:

GE Nuclear Energy looks forward to addressing the Commission on the subject of the proposed changes to 10CFR20, at 10 a.m. on November 10, 1988. As you requested in your letter of November 3, we have provided you with 12 copies of our prepared statement (see enclosed). In addition we have transmitted a telecopy to you.

Please be advised that we intend to have Dr. Paul S. Stansbury give the actual presentation. He will require no viewgraphs. Please contact me if we should provide any further information at this time.

Sincerely,

GE NUCLEAR ENERGY

T. Preston Winslow, Manager
Licensing & Nuclear Materials Management

/sbm

STATEMENT FOR
NOVEMBER 10TH COMMISSION BRIEFING ON 10CFR20
BY GE NUCLEAR ENERGY

GE Nuclear Energy would like to present an alternative to the costly, unnecessarily conservative strict application of committed dose being considered in the proposed changes to 10CFR20. The alternative is this: for the persistent chemical forms of radionuclides used in the uranium fuel fabrication industry, allow licensees the option to (1) control the work place using air sampling and associated action guides and limits based on committed dose models and (2) determine the internal dose of record for occupationally exposed individuals on the basis of annual dose as determined with appropriate measurements, primarily lung counting.

To help in your consideration of this matter, GE would like to review the salient features, of both committed and annual dose from the practical viewpoint of day-to-day health physics in a commercial fuel fabrication plant. How the new 10CFR20 incorporates either or both of these concepts will mold the fundamental nature of health physics programs at fuel fabrication facilities and will prioritize the importance of assumptions versus the importance of measurements in the protection of worker health.

Under a strict committed dose system, compliance with internal dose limits must be demonstrated by determining and summing a number of small intakes (i.e., daily). The tool to do this is air sampling. Once the intakes are assessed, radiation dose is deterministically calculated using the Appendix B values which are based on Reference Man assumptions integrated over the next fifty years.

It is the assumptions about how a material which enters the body is deposited, how it moves from organ to organ, and how fast it is eliminated from the body that specify the committed dose that would be entered in an individual's record. Such assumptions are almost universally established to be conservative, i.e., to overestimate internal doses. While deviating from the standard assumptions is theoretically possible, doing so in practical, everyday situations will not be feasible and doesn't really do much for the worker.

Annual dose to an internal organ can be determined much more directly. What needs to be known is the amount of radioactive material residing in the organ during the year. For individuals occupationally exposed in the commercial fuel fabrication industry, this can be accomplished most practicably with a series of lung counts. One may then convert to dose using the physiologic parameters of Reference Man (such as organ weight) without having to make assumptions about how much is retained in the organ and for how long.

Granted, air sampling seems straightforward and precise. The radioactivity collected on a filter can be measured to a high degree of accuracy. But there is inherent in air sampling a serious question of representativeness, i.e., the relation of the radioactivity on the filter to that which may have been inhaled, even for the highly touted lapel air samplers, often presumptively named breathing zone air samplers. This question of representativeness is of concern to the facility health physicist, the regulatory inspector, and potentially to a court considering a claim for radiation injury. Determining internal dose from air sampling has two further handicaps: it requires the use of assumptions rather than measurements to account for retention of inhaled material, and it tends to "write off" the effect of all previously determined and duly recorded intakes.

Lung counting to determine doses on an annual basis has some significant benefits. Since it is a direct measurement, representativeness is not the issue it is with air sampling. Second, lung counting measurements directly account for differences in individual clearance times, particle size and solubility, minimizing over or under estimations of dose. Third, lung counting measures and accounts for previous intakes; it does not "write off" prior dose.

It is easier to determine radioactivity on an air sample filter than it is to determine radioactivity in an internal organ. Because of minimum sensitivity limitations, lung counting of uranium cannot be used to determine intakes at a level of day-to-day operational interest, say 40 DAC-hours. However, detection sensitivity and accuracy become quite acceptable at an organ contents equal to 35% of a practical action guide or regulatory limit. Further, when needed, a series of lung counts can be made to determine average lung contents with more precision and it is the average over time which is the dosimetrically important quantity for determination of annual internal dose.

There are several further problems with a strict committed dose system.

1. The NCRP in its Report 84 (1985) specifically advises against the use of committed dose for determining an individual's exposure status. The more recent NCRP 91 Report, published in 1987, reaffirms the Report 84 comments on committed dose.

2. It is expensive. The NRC staff has estimated a $75M cost associated with the internal dose provisions of the proposed 10CFR20. Industry believes and GE concurs this cost is low. It may reflect the necessary capital costs but it does not

reflect the ongoing operational costs. Most of this cost is attributable to the over-conservatism in the committed dose models.

3. Since a sizable part of the committed dose is delivered in the future, the quantity is useless for epidemiological purposes. Good, straightforward applied epidemiology is important to the nuclear industries and the NRC -- it has the potential to provide clear demonstration of the overall efficacy of the licensees' radiation safety programs and the Commission's regulations. Using committed dose as the dose of record will seriously limit the usefulness of epidemiology among uranium fuel fabrication workers by complicating the exposure variable. Use of annual dose limits will encourage lung counting of workers thus maximizing the usefulness of routinely collected radiation protection data in the further development radiation protection models and limits.

4. Committed dose is an abstract concept including dose delivered in the current year, doses to be delivered in the next 50 years, and doses which may never be delivered due to overestimating assumptions. Just explaining the concept to a listener outside the field of health physics will be a daunting task and a real liability to the defendant in a lawsuit alleging radiation injury. Adopting a strict committed dose limit system is likely to give false impressions about permanence and concreteness of what was developed as an abstract modeling quantity.

5. Lung counting is employee oriented. It provides the individual, his employer, and a regulatory agency the best, most direct demonstration that the overall radiation safety program is working in all cases. A strict committed dose

system will severely focus uranium facility health physics attention on air sampling, sums of DAC-hrs, and associated issues of representativeness and over-conservatism, thus diminishing the attention to actual worker exposure management.

6. Implementation of a strict committed dose is likely to mask the whole purpose of the internal dose portions of the proposed 10CFR20 changes, i.e. to adopt a regulatory system which more clearly demonstrates the relation between dose limits and risk. A strict committed dose system will make DAC the prime measure of compliance demonstration, resulting in DAC being treated functionally as analogous to the current MPC. Such perceived functional equivalence will tend to hide the fundamental difference of the new quantity, and further, will tend to suggest, completely misleadingly, that the previous MPC's for uranium were a factor of five too large.

Instead of a strict committed dose system, GE would encourage the Commission to adopt a system using committed dose for design and daily control of the work place and annual dose to assess and manage the actual dose to workers. Such a system is in direct accord with the Presidential Guidance developed by Federal agencies under EPA's chairmanship published in January 1987 and parallels the Department of Energy's implementation of that guidance. It is in accord with the recent recommendation of the Commission's own Advisory Committee on Reactor Safeguards. Finally, it makes best use of both air sampling and lung counting to provide excellence in control of internal exposures in the work place while avoiding extremely costly, unnecessary conservatism. Use of a technically sound, effective and reasonably cost-effective radiation control and management program is essential to the future of nuclear energy in this country and in the world.

Presented by
Paul S. Stansbury, Ph.D.

NIRS
Nuclear Information and Resource Service
1424 16th Street, N.W., Suite 601, Washington, D.C. 20036 (202) 328-0002

Comments of Diane D'Arrigo
Nuclear Information and Resource Service
to the
United States Nuclear Regulatory Commission
on the Part 20 Radiation Protection Standards Proposed Rule
Commissioners Meeting
November 10, 1988

I very much appreciate the opportunity to address the Commissioners this morning on what I believe is one of the most important responsibilities of the Nuclear Regulatory Commission, protection from ionizing radiation exposure.

We would have liked more than 4 working days notice that we were being allowed to speak. An advance copy of the proposed rule, which we were denied, would have afforded us the opportunity to make even more pertinent comments.

Our organization, Nuclear Information and Resource Service, and many others including unions, county and state officials, public health associations, national and local environmental groups, citizen organizations, church groups, and concerned individuals, even nuclear utilities and health physicists commented critically on the 1986 NRC proposal regarding radiation standards.

I speak, today, on behalf of Nuclear Information and Resource Service, Environmental Policy Institute, Critical Mass Energy Project, and many of the organizations and citiizns across the country who couldn't be here. The worker exposure portion of my comments is also on behalf of the Oil Chemical and Atomic Workers, the International Chemical Workers Union and the Maine Labor Group on Health.

The Commission received in the range of 1000 comments on the rule, so there is clearly public interest in it. There are many interested parties that would like the opportunity to address the Commission regarding this final proposal and, as requested in a large percentage of the comments on the proposed rule, the unions representing radiation workers, citizens and environmental groups would like the opportunity to comment again after thoroughly reviewing the final proposal, before the Commission votes. We request regional public adjudicatory hearings on the rule.

Further, we are requesting again, since increases in radiation release to the environment and exposure the human gene pool are involved, and since this a major federal action affecting the environment, that a full Environmental Impact Statement (EIS) be done. NRC has not considered the impact of reducing all exposure and contamination levels.

I would like to point out that we are in agreement with Commissioner Roberts' opinion in 1986 that the rule should not be approved, although our reasons are different. The NRC's cost-benefit (backfit) analysis concluded that the proposed rule "may not provide a substantial increase in the overall protection of public health and safety or the common defense and security." In other words, the supposed benefits are not worth the costs to implement this rule. Although Nuclear Information and Resource Service does not support using cost-benefit analysis to decide public health and safety issues, we do find it curious that the Commission is proceeding with a rulemaking which it has determined is not economically worthwhile and which fails to provide increased safety.

My statement this morning is based largely on the proposed radiation standards as I was refused an advance copy of the final proposal which is being released today.

I. The main concern with the proposed radiation standards is that the permissible contamination levels of many radionuclides in air and water will be increased above current levels. NRC admits this fact in its 1986 proposal.

The NRC argues that there will be a potential reduction in external exposure to workers as a result of the new proposed method of calculating dose. We agree that external dose should be reduced and commend the removal of the rule [5(N-18)] which currently allows up to 12 rems of external exposure annually to workers, depending on their ages.

Regardless, it is our position that the permissible contamination levels in air and water should be reduced for all radionuclides. There is no justification for increasing allowable internal radiation exposures to workers and the public.

10 CFR Part 20 Appendix B gives the permissible contamination levels for air and water. Table I is for workers and Table II is for the public.

In the 1986 proposal, the permissible contamination levels for over two thirds of the radionuclides increase to higher levels than currently allowed. My understanding is that the proposal being released today has some changes in those levels, but that for the most part, there is no significant change. There are still increases in permissible contamination of workers and the public.

The standards set by NRC for workers will set the precedent for the other federal and state agencies and departments. Workers at the nation's troubled weapons facilities will legally receive even higher radiation doses if and when the Department of Energy follows the NRC's lead in adopting these standards. It would be preferable to require cleaner operations at all sites than to increase the allowable exposures to workers.

The Environmental Protection Agency used 10 CFR 20 Appendix B to derive its Safe Drinking Water regulations (National Interim Primary Drinking Water Regulations, June 1977).

Further, many state radiation regulatory agencies use 10 CFR Part 20 to analyze nuclear plant effluents and to indicate to the public and the media "acceptable" federal radiation release limits.

The increases in permissible exposure to the public can occur at all NRC licensed facilities except (allegedly) uranium fuel cycle facilities. So, hospitals, research reactors, university reactors, radiopharmaceutical plants, industrial and other facilities will be permitted to expose the public to higher radiation levels than currently allowed.

But I contend that nuclear power plants will also end up using 10 CFR 20 Appendix B. Nuclear plant licenses have technical specifications, which are the limiting conditions for reactor operation. These technical specifications require adherence to 10 CFR Part 20 Appendix B for dealing with radioactive effluents, specifically liquid effluents. The alarm-set point on monitors for liquid waste streams are set according to 10 CFR Part 20 Appendix B. For example, technical specification 3.11.1.1 for the Callaway nuclear plant in Missouri reads,

> The concentrations of radioactive material released in liquid effluents to UNRESTRICTED AREAS shall be limited to concentrations specified in 10 CFR Part 20, Appendix B, Table II, column 2, for radionuclides other than dissolved or entrained noble gases.

The proposed rule also requires that uranium fuel cycle facilities (nuclear power plants, uranium mills, conversion and enrichment facilities, reprocessing plants) must meet the U.S. Environmental Protection Agency (EPA) standard (40 CFR 190) which limits the maximum radiation dose to each member of the public to 25 millirems per year. But 25 millirems per year is not an enforceable numerical emission standard. Appendix B is the working tool used limit radiation releases which lead to public exposures.

If the intent of the NRC is that the individual public exposure be limited to 25 millirems per year, as required by EPA, then

NRC's 10 CFR Part 20 Appendix B should be based on an annual dose to members of the public of 25 millirems/year rather than 100 millirems/year (51FR 1119 column 3).

We advocate a change in the standards that significantly reduces the permissible contamination levels.

The requirement that facilities meet the EPA dose limit is not a guarantee. If a nuclear facility which is supposed to meet the EPA regulation of 25 millirems per year has a problem meeting that limit, a variance can be requested which will allow exposures to the public of up to 100 millirems per year continuously and up to 500 millirems per year "noncontinuously." We oppose the variances allowed by both NRC and EPA.

The point is that changes in 10 CFR 20 Appendix B, which increase worker and public internal radiation exposures will have major direct and indirect impacts on many facilities, agencies, workers and the public. Appendix B is used as working tool in the field and as a basis for other state and federal agencies' permissible contamination limits.

II. Another concern we have is with the method of calculating radiation doses. The weighting factor, by which an individual's internal dose is multiplied, incorporates risk estimates. We oppose incorporating risk estimates into what is supposed to be an objective dose measurement. In addition, there are several problems with these risk estimates:

A. The only risks considered are for fatal cancers and birth defects in the next two generations. Not all risks from radiation exposure are considered. Nonfatal cancers, birth defects beyond the next two generations, decreased immune system function thus increased susceptibility to diseases and accelerated onset of age-related diseases are ignored. If radiation risks are going to be calculated into the dose measurement, all known risks should be included.

B. The risks of developing a fatal cancer or birth defects in the next two generations is underestimated. The NRC is assuming that the risk of fatal cancers (1.65 per 100,000 person rems) and birth defects in the next two generations are numbers upon which everyone agrees but there is serious scientific debate. National and international radiation bodies and independent scientists disagree--estimates range tremendously (from 1 to 10 to 37 fatal cancers per 100,000 person rems). The reevaluation of the Hiroshima and Nagasaki dosimetry and debate over the true dose-response curve (the biological effect of a given amount of radiation exposure) call into question the reliability of the risks included in the weighting factor.

With all due respect, I have yet to understand how the supposedly objective measurement of internal radiation dose can incorporate

a controversial risk estimate into its measurement. There must be a way to measure internal dose and make it compatable with external dose without depending on controversial risk estimates.

C. NRC bases its risk estimates on the entire population but some members of the population such as young and unborn children whose cells are dividing much more rapidly than adults, are at much greater risk. People who have undergone voluntary radiation treatment or diagnosis for personal health reasons have already increased their radiation-related risks thus will be at even higher risk from this increased involuntary exposure.

III. Occupational Exposure

The unions have requested public hearings to further discuss their concerns which include:

A. The lack of worker rights regarding Planned Special Exposures. Workers can be required, involuntarily, to receive up to twice the annual dose limit in certain situations.

B. Pregnant workers can be exposed to .5 rems per pregnancy, which is within the range of exposure that has been shown to double the risk of childhood cancer and mental retardation. Concern is also for men planning to start or add to their families.

C. The use of risk coefficients to justify allowable dose increases to internal organs.

The National Radiological Protection Board in England has adopted the scheme for calculating radiation exposure that is put forth in the proposed rule, but they have reduced the allowable annual exposure to workers from 5 rems per year to 1.5 rems per year, with a consideration to lower that amount further to .5 rems in the near future. Such a reduction is quite advisable for the United States and should be seriously considered before the Commission votes on this rule.

IV. The de minimis concept, that there is a level of exposure so low that it is not worth regulating, should be abandoned. In Japan, when a de minimis level was established for workers, it gave the appearance of a significant reduction in radiation exposure. The reduction was a result of not recording low exposures below the de minimis level, not improved worker protection. The 1986 proposed rule called for de minimis levels for public exposures. We have been informed that the proposal being released today deleted the de minimis concept but that it has been moved to a separate rulemaking process within the NRC.

There is unequivocal opposition to this concept and policy. Unions, municipalities, citizens will not accept deregulated nuclear waste, now being referred to as BRC or Below Regulatory Concern waste. This "liguistic detoxification" (as Barry Commoner calls it) of nuclear waste could allow nearly half of

what is currently considered "low-level" radioactive waste being redfined as regular garbage and going to landfills, incinerators, sewers anywhere in the country.

V. To conclude, I will ask you to step back and consider how much we are hearing recently about acid rain and gases from fossil fuel plants. The gases and liquid effluents that are routinely released from nuclear facilities will be increased by this rulechange. These are effluents that are much more difficult to monitor than those from fossil fuel based industrial facilities and about which, we know less. This rule is changing some basic permissible levels. Citizens have the right to analyze and actively participate in these changes. Nuclear workers, their unions and citizens have the right to be actively involved in rules affecting their health and safety.

We request adjudicatory hearings and an environmental impact statement be done. We encourage the reduction in permissible contamination levels in 10 CFR Part 20 Appendix B. And we thank you again for the rare opportunity to address the Commission.

Comments on Part II Title 10 Part 20 Dated January 9, 1986. Standards for Protection Against Radiation; Proposed Rule; Extension of Comment Period and Publication.

By Karl Z. Morgan

March 27, 1986

I have taken a hurried look at the Federal Register, Part II NRC 10 CFR 19 et al of Tuesday, January 9, 1986 and considered this a terrible retreat of the NRC from its obligation to protect the public from the harmful effects of nuclear power. The NRC and EPA have finally weakened to political pressure and given second place to the health of radiation workers and the public by adopting the Handbook 26 recommendations of the International Commission on Radiological Protection (ICRP).

I was a member of ICRP for a quarter of a century but now am an emeritus member. During the years I was active with ICRP I was chairman of the Internal Dose Committee that prepared ICRP-2. Tables I and II of present Title 10 Part 20 are, for the most part, a complete adoption of the tables of (MPC)a and (MPC)w [maximum permissible concentrations in air and water] from ICRP-2. During the quarter of a century I was an active member of ICRP we recognized an inconsistency in the rules by which we had set values for (MPC)a and (MPC)w, namely we set the dose rate limit at 5 rem/y for both the total body and the gonads. It

seemed obvious that if the whole body, including the gonads, got 5 rem/y the dose allowed to the gonads alone would be greater. I suggested the solution was very simple,viz. reduce the limit to whole body to 2.5 rem/y. Unfortunately, after I retired from active membership in ICRP, they moved in the other direction and kept the 5 rem/y for whole body and raised the dose limits to all other organs. In this reckless move, ICRP jumped from the frying pan into the fire because with other modifications the dose rates to the thyroid and bone became 167 rem/y instead of the previous 30 rem/y and ICRP realized that this could cause radiation sickness in employees. Thus, to save face, ICRP picked the number 50 rem/y out of thin air as ;the limiting dose rate for these two organs. I took a look at some of the radionuclides of major interest in the nuclear industry (28 altogether) and found that in about half the cases the proposed values of (MPC)a and (MPC)w were increased in the January 9, 1986 NRC Title 10 Part 20 tables for occupational exposure using using ICRP-26 recommendations. All the values are not increased because of other changes brought on by ICRP-26, e.g. here the dose to a critical organ is determined not only by the amount of radionuclide in this organ but also by the additional dose from the radionuclide deposited in adjacent body organs.

During the past few years I have met with members of NRC twice trying to convince them that this was not an appropriate

time to increase values of MPC because the present ICRP-2 was published in 1959 and today we know that the risk of radiation-induced cancer is more than ten times what we believed it to be in 1959. I, along with R.E. Alexander, of the NRC, urged we adopt the ICRP-26 values when they were lower than the ICRP-2 or Title 10 Part 20 values but otherwise we keep the present values.

The newly proposed values of January 9, 1986 are not only higher than present values in at least 50% of the cases but the values are not given directly; instead they are given in an obsure and surreptitious manner. Values of Annual Limit on Intake (ALI) and Derived Air Concentration (DAC) are given instead of (MPC)w and (MPC)a. I can't help but believe this choice was made only as a coverup or to make it more difficult for the radiation worker and members of the public to realize that at a time when the Maximum Permissible Concentrations of radionuclides in air, water and food should be reduced by at least a factor of 10 they are being increased. In practice the health physicist or radiation worker will never use ALI or DAC but must convert them to (MPC)w and (MPC)a respectively.

In the attached table we have for radiation workers, (MPC)w=3.64 x 10 E-6 (ALI)oral microcuries/cc and

(MPC)a=4.17 x 10 E-10 (ALI)inhal microcuries/cc.

The values of (MPC)a and (MPC)w for members of the public should be 1/30 of the above occupational values except when the whole body is the critical organ. In this case the values for public are 1/100 the occupational values in order to reduce the genetic risk.

There are many other ways in which the January 9, 1986 proposed changes of Title 10 Part 20 are a serious regression and a political concession to the nuclear industry at the expense of the workers and public in terms of a greater somatic, teratogenic and genetic risk.

It is unfortunate that the Government Agencies we have set up to protect the public so consistently come to believe their mission is to protect big business. We have numerous examples of this. For example, the Veterans Administration is not offering help and compensation to the servicemen who, in the line of duty, have suffered radiation damage. Even in the early period we have a good example. When, in about 1960, it was shown that uranium miners in the Colorado Plateau were dying of lung cancer from radon levels higher than those in Bohemia and Schnuberg, Saxony 500 years earlier, the AEC, PHS and FRC fought against reducing

the Radon-222 level in uranium mines to the value given in ICRP-2. Finally, an honest man showed up in Washington, Secretary of Labor (1962-69), Mr. W.W. Wirtz, and he unilateraly adopted the ICRP-2 value of 0.3 WL (working level) or 4 WLM/y.

I hope it is not too late for NRC and EPA to recant its crayfish posture and consider the need to reduce the values of MPC rather than increase them.

MAXIMUM PERMISSIBLE CONCENTRATIONS OF RADIONUCLIDES
In Microcuries Per Cubic Centimeter (uCi/cc)

Isotope	OCCUPATIONAL EXPOSURES AIR ICRP-2	OCCUPATIONAL EXPOSURES AIR 10CFR20	OCCUPATIONAL EXPOSURES WATER ICRP-2	OCCUPATIONAL EXPOSURES WATER 10CFR20	EXPOSURES TO GENERAL PUBLIC AIR ICRP-2	EXPOSURES TO GENERAL PUBLIC AIR 10CFR20	EXPOSURES TO GENERAL PUBLIC WATER ICRP-2	EXPOSURES TO GENERAL PUBLIC WATER 10CFR20
Am-241	6E-12	2E-12	1E-4	3.6E-6	7E-14	2E-14	1E-6	3E-8
Au-198	3E-7	(2E-6 °(7E-7	2E-3	3.6E-3	3E-9	(3E-9 °(2E-9	2E-5	--
Ba-140	1E-7	6E-7	8E-4	1.8E-3	1E-9	2E-9	1E-5	7E-6
Be-7	6E-6	8E-6	5E-2	1.5E-1	2E-8	3E-8	7E-4	6E-4
Co-58	8E-7	(4E-7 °(3E-7	4E-3	3.6E-3	3E-9	(2E-9 °(1E-9	3E-5	2E-5
Co-60	3E-7	(8E-8 °(1E-8	1E-3	7.3E-4	1E-9	(2E-10 °(5E-11	1E-5	3E-6
Cs-134	4E-8	4E-8	3E-4	2.5E-4	1E-10	1E-10	9E-7	9E-7
Cs-137	6E-8	6E-8	4E-4	3.6E-4	2E-10	2E-10	2E-6	1E-6
Fe-59	1E-7	(1E-7 °(2E-7	2E-3	2.9E-3	7E-10	(5E-9 °(7E-10	2E-5	1E-5
H-3	5E-6	3E-5	1E-1	2.9E-1	2E-8	7E-8	3E-4	1E-3
I-129	2E-9	4E-9	1E-5	1.8E-5	2E-11	4E-11	1E-7	3E-7
I-131	9E-9	2E-8	6E-5	1.1E-4	1E-10	2E-10	7E-7	1E-6
Kr-85	1E-5	1E-4	--	--	1E-7	7E-7	--	--
Np-237	4E-12	2E-12	9E-5	2.5E-7	3E-14	2E-14	1E-6	2E-9
Pb-210	1E-10	1E-10	4E-6	2.2E-6	1E-12	4E-13	1E-8	1E-8
Po-210	5E-10	3E-10	2E-5	1.1E-5	7E-12	9E-13	2E-7	4E-8
[redacted]38	2E-12	(3E-12 °(7E-12	1E-4	2.5E-5	2E-14	(2E-14	2E-6	2E-7
Pu-239	2E-12	(2E-12 °(6E-12	1E-4	2.2E-5	2E-14	(2E-14	2E-6	1E-7
Pu-240	2E-12	(2E-12 °(6E-12	1E-4	2.2E-5	2E-14	(2E-14	2E-6	1E-7
Ra-226	3E-11	3E-10	4E-7	7.3E-6	2E-13	9E-13	2E-9	7E-8
Ru-106	8E-8	(4E-8 °(5E-9	4E-4	7.3E-4	1E-9	(1E-10 °(2E-11	3E-6	3E-6
Sr-89	3E-8	(4E-7 °(6E-8	3E-4	1.8E-3	3E-10	(1E-9 °(2E-10	3E-6	6E-6
Sr-90	1E-9	(8E-9 °(2E-9	1E-5	1.1E-4	7E-12	(3E-11 °(5E-12	7E-8	4E-7
Tc-99	2E-6	(2E-6 °(3E-7	1E-2	1.5E-2	2E-8	(8E-9 °(9E-10	1E-4	6E-5
Th-232	2E-12	(5E-13 °(1E-12	5E-5	2.5E-6	2E-14	(4E-15	7E-7	3E-8
U-235	5E-10	(6E-10 °(2E-11	8E-4	3.6E-5	6E-12	(3E-12 °(6E-14	1E-5	3E-7
U-238	7E-11	(6E-10 °(2E-11	1E-3	3.6E-5	1E-12	(3E-12 °(6E-14	1E-5	3E-7
Zr-95	1E-7	(5E-8 °(1E-7	2E-3	3.6E-3	4E-10	(4E-10	2E-5	2E-5

[redacted] 20: (MPC)w = 3.64E-6(ALI)w (MPC)a = 4.17E-10(ALI)a

[redacted]2: (MPC)a and (MPC)w values for members of the public are 1/30 of values for occupational workers except when radionuclide is a gonad exposure problem, in which case reduction factor is 1/100.

Source: K.Z. Morgan, April 7, 1986.

COMMENTS ON 10 CFR 20

NIRS NEWS RELEASE

Nuclear Information and Resource Service, 1424 16th Street, N.W., Suite 601, Washington DC 20036, (202) 328-0002

PRESS STATEMENT NOVEMBER 10,1988

Nuclear Information and Resource Service representative, Diane D'Arrigo, testified today at the Nuclear Regulatory Commissioners meeting, opposing the proposed radiation standards which would increase allowable worker and public exposure to ionizing radiation.

There is no safe level of exposure. Any radiation exposure increases the risk of cancer, birth defects, and genetic damage, accelerates the aging process, and causes other health problems including impaired immunity.

Some of the provisions of the proposed rule that threaten human health and environmental quality include:

*Increased Internal Exposure Levels

Exposures to 65% of the most significant radionuclides, including strontium-90 and iodine-131, will increase up to 10 times or more above present "allowable" levels. This is unacceptable because even at low levels many of these radionuclides are incorporated into internal organs and continually irradiate the body for years.

*Weighting Factor = Tool for Increasing Internal Exposures

A "weighting factor" is used to equate the internal dose to individual organs and tissues to external (total body) dose. Presently, internal and external doses are measured separately. The weighting factor is derived from observations of survivors of high level radiation exposures and animal experiments, not chronic low level exposures to humans, which is what would be permitted by the proposed rule. Multiplying the actual internal exposures by the weighting factor results in a lower value for total body exposure than the body actually received. The exposure is treated as if it were spread over the whole body when it has really been concentrated in one organ or one small area of one organ. Both the way the weighting factor is derived and its use are unacceptable.

*Inadequate Definition of Radiation Risk

Radiation risk is limited, in the rule, to fatal cancers and birth defects within two generations. No consideration is given to nonfatal cancers, health effects other than cancer, or mutations that are recessive and may not show up until later generations. Tell the NRC that any rule that increases radiation exposure MUST take into account all known health effects of radiation, not just fatal cancers and some defects.

Lois T. Ellison, M.D., *President*
Carol H. Kawanami, *President-elect*
Walter J. Hatcher, *Past-President*
John R. Seffrin, Ph.D., *Vice-President*
Thomas J. Godar, M.D., *Vice-President*
Charles P. Felton, M.D., *Secretary*
Thomas B. Jackson, Jr., *Treasurer*
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October 30, 1986

Docketing and Service Branch
Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Re: F.R. Part II, Title 10, Parts 19 et.al. "Standards for Protection Against Radiation", proposed rule published January 9, 1986

Dear Mr. Secretary:

The American Lung Association and its medical section, the American Thoracic Society submits its official comments on the proposed rule, "Standards for Protection Against Radiation." In recognition of the fact that exposure to radiation can cause lung cancer in humans, the U.S. Nuclear Regulatory Commission is strongly urged to adopt standards that result in the lowest possible exposure to radiation from nuclear power facilities. The proposed standards may permit exposure levels sufficiently high to result in human morbidity and mortality, and should be revised to ensure that worker and community radiation exposure is reduced to the maximum extent possible.

Respectfully submitted,

Conrad Mason, Ph.D.
Chairperson
National Air Conservation Commission

David W. Cugell, M.D.
Chairperson
Occupational Health Committee

/vr
bcc: Bob Weymuller
Allen Rubin
Fran DuMelle
Diana D'Arrigo, NIRS ✓

Accord Research and Educational Associates, Inc.

314 West 91st Street New York, N.Y. 10024

Phone: (212) 580-3889

31 October, 1986

Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, DC 20555
Attn: Docketing and Service Branch

Dear Sir or Madam:

As physicians and scientists concerned with the futures of our patients, ourselves, and the rest of the human race, we object to the NRC's proposed changes in radiation standards (Federal Register 10 CFR Parts 19, et al., Jan. 9, 1986) on several grounds.

- We object to the NRC's underlying assumptions of acceptable risk.

- We disagree with the NRC's calculations of estimated risks.

- We call for publication and open discussion of the revised Hiroshima/Nagasaki dosimetry.

- We object to the increase, by the NRC, of permitted exposures for over 65% of the radioisotopes regulated.

- We call for public hearings and an environmental impact statement.

The NRC proposes an "acceptable level of risk for a member of the public" as one per 1,000,000 to one per 100,000 per year, which it considers as "producing no undue concern." The NRC optimistically estimates the risk from radiation-induced cancer to be 1.65 deaths per 10,000 person-rems of exposure. With the NRC's

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recommended exposure limit for the general public of 0.5 rem per year, over an 80-year lifetime, this means:

1.65 deaths/10,000 person-rem
x 0.5 rem/year
x 80 years/lifetime
= 66 deaths/10,000 lifetimes

i.e., one person in every 150 exposed to these doses would be expected to die from cancer as a direct result of the "normal" operations of licensed nuclear facilities. For workers in nuclear facilities exposed to the permitted 5 rem per year, over a working lifetime of 40 years, the expected risk becomes 1 cancer death for each 30 workers.

The NRC has based much of the proposed regulations on publications of the International Committee on Radiological Protection (ICRP). In ICRP Publication 26, 1977, the Committee estimated that the annual level of exposure of 0.1 rem to the public would result in an "acceptable" number of cancer deaths; but the limit proposed was 0.5 rem per year. This limit was rationalized on the basis that the exposures to members of the public would average to lower levels. The NRC has accepted the 0.5 rem yearly limit, although the ICRP has further modified its recommendations. In Publication 43, 1984, the IRCP states, "... for repeated exposures over prolonged periods, that it would be prudent to further restrict this to 1 mSv [0.1 rem] from each year of lifelong exposure"(1). Those individuals exposed to the full permitted dose will incur a risk five times greater than "acceptable".

The NRC proposed regulations are based on "acceptable risks," as discussed above, and an estimated cancer death rate of 1.65 per 10,000 person-rem. If the estimation of the cancer death rate is increased, as we will show it should be, the actual death risk becomes even greater than 1 in 150 (public) or 1 in 30 (worker).

Current literature supports the linear dose-response model and the relative risk projection for radiation-induced cancer fatalities (2-5). In 1980 the BEIR Committee concluded that when these models are applied, the predicted cancer death rate becomes 3.85 per 10,000 person-rem (6). Furthermore, ongoing recalculation of the doses received by Hiroshima-Nagasaki bomb survivors who have and are still developing cancer indicate that the radiation doses received were in fact lower by a factor of two than had been previously calculated (7,8). As the number of

observed cancers remains the same, this would raise the estimated rate of cancer deaths two-fold, to approximately 8 per 10,000 person-rems (9,10).

The NRC's calculation of risk is based entirely on cancer mortality (11). This method eliminates from consideration all cases of cancer in which the patient survives, or dies of another cause (12). The method ignores the vast amounts of money, physician time, patient time off work, and anguish spent during the tedious process of diagnostic evaluation, treatment and follow-up for "curable" cancer. As health workers, we deal from day to day with all aspects of disease. We feel it is the job of the NRC, as a public health protection agency, to protect the health of the public by preventing disease, and not to assign allowable levels of exposure to radiation based on mortality statistics alone. Thus for a more complete evaluation of the cancer-related impact of radiation exposure, the death rate should be multiplied by a factor of roughly 3 (using the ICRP estimated ratio of total to fatal cancers)(13), yielding 24 cancers per 10,000 person-rem. Substituting this number in the preceding risk calculation, with the allowed exposure of 0.5 rem/year over 80 years, we now have a one in ten risk of incurring radiation-induced cancer over a lifetime for a member of the public. For a radiation worker exposed to 5 rem/year over 40 years, the lifetime radiogenic cancer risk becomes one in two.

The effect of dose fractionation is another serious consideration when estimating cancer incidence as a result of exposure to low level radiation. The radiation exposures in Hiroshima and Nagasaki were received in one very short period. Currently available evidence shows that fractionation of a radiation dose into multiple smaller doses produces higher rates of mutagenesis and cell transformation compared to the total dose given at once (14-17). This strongly suggests that in the low-dose range, fractionation of doses over time increases the cancer production per rem of exposure.

There are other effects of radiation exposure which the NRC ignores. These include synergistic enhancement of chemical carcinogenesis (18-22), and genetic effects manifested in recessive mutations which will be expressed after the two-generation limit used by the NRC.

We feel, in summary, that the accumulation of scientific data since the publication of ICRP #26 overwhelmingly argues in favor of a decrease in the permissible radiation exposure, rather than the increases proposed by the NRC. These increases apply to internal exposures resulting from ingested or inhaled radioisotopes, and are accomplished through the misuse of organ weighting factors and of the "annual limit of intake" concept.

For bone, thyroid, and skin, previous organ dose limits of 30 rems/year for each are being increased to 50 rems/year.

It should also be recognized that the 5 rem/0.5 rem exposure limits for workers and public apply only to "routine releases from normal operations" of nuclear facilities. Workers can be required without their consent to incur 10 rems/year exposure in "special" situations if their employer deems it "necessary." Larger exposures to both workers and public from nuclear accidents are not covered by these regulations. Some 3,000 such "events" were recorded in 1985 alone (23).

The "de minimis" rule establishes a dangerous precedent for allowing unregulated radiation releases and exposures. By the linear dose-response hypothess, any given radiation dose will cause a predictable number of cancers whether the radiation is concentrated in a small number of people at high risk, or spread over a large population at lower risk. Small, continuous releases unregulated and ignored under the de minimis rule will ultimately have a significant cumulative effect.

No safe level of radiation exposure exists. At a time when evidence is accumulating that the hazards of radiation are greater than was previously thought, there is no justification for increasing any permitted exposures. Rather than yielding to the convenience and expansion of the nuclear industry, the NRC should fulfill its mandate to protect the public health.

Respectfully,

Nancy Eyler, M.D.

Marjorie Baron, M.D.

Leslie Gulick, B.S.N.

Richard Piccioni, Ph.D.

Note: All of the authors are volunteer staff-scientists with Accord Research and Educational Associates.

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INTERNATIONAL INSTITUTE OF CONCERN FOR PUBLIC HEALTH
67 MOWAT AVENUE, SUITE 343, TORONTO, ONTARIO M6K 3E3 CANADA (416) 533-7351

To: U.S Nuclear Regulatory Commission
Re: 10 CFR Parts 19, 20, 30, 31, 32, 34, 40, 50, 61 and 70
'Standards for Protection Against Radiation
From: Rosalie Bertell, Ph.D, G.N.S.H.

An updating of radiation protection standards in the U.S. has been needed for some time. However, the proposed revision is already seriously outdated and the revision is in a direction contrary to that of the most recent scientific findings.

The proposed standards are given as a response to:
ICRP 26, adopted 17 January 1977
ICRP 30, adopted July 1978
ICRP 32, adopted March 1981
These documents are more than 5 years old, and they depend on scientific research which predates these ICRP screening dates. More importantly, even ICRP appears to be changing its position.

One of the most recent ICRP documents, Publication 43, adopted May 1984, reads in part:

> "For stochastic effects in members of the public the Commission recommends that the committed effective dose equivalent from exposure to radioactive materials in any year be limited to 5 mSv, (500 mrem) and, for repeated exposures over prolonged periods, that it would be prudent further to restrict this to 1 mSv (100 mrem) from each year of lifelong exposure."

This is the first indication that ICRP is admitting that its permissible doses were too high by a factor of at least 5. The U.S. National Academy of Science (BEIR III-1980) estimates of radiation induced cancers are about eight times higher than the old ICRP figures being used by the N.R.C. for its new rule making.

For comparison, the following estimates of radiation induced cancers after one million person rems of exposure are found in the literature:

This is a re-cycled paper product.

Estimated by	11-30 years after	lifetime
ICRP (prior to 1984)	----	125
ICRP (after 1984)	----	600
UNSCEAR 1977	----	100
BEIR III-1980	359-719	---
John Gofman-1981	----	3,333-4,255
Rosalie Bertell-1982	369-823	549-1,648

One can recognize here a new concensus that the predicted cancers used by governments (UNSCEAR) were low by a factor of six to sixteen. There is in addition, a new in-house review of the Hiroshima Atomic Bomb data, being funded by the U.S. Department of Energy. Dr. Edward Radford, who is in charge of this review, has told me personally that my estimates of radiation induced cancers based on published research would be doubled after the published reanalysis of the Hiroshima data. This would mean roughly 2000 cancers in contrast to the pre-1984 ICRP figure of 125 cancers (a factor of 16 higher).

It is certainly a poor time for the NRC to adopt the seriously flawed earlier ICRP recommendations. Updating again in view of easily predictable, and even already known, changes in radiation risk estimates will be costly in lives, dollars and government credibility. The present outdated document should not be approved.

In addition to these obvious reasons for not finalizing the NRC regulations at this time, I would like to call to your attention two research papers which indicate that the public is suffering harm under present regulations. Relaxing standards at this moment in time is harmful to the public health. That the proposed NRC regulations will relax standards for some important radionuclides and allow higher doses to some body parts will be shown later.

The first research deals with low birthweight infant deaths down-wind of state-of-the-art nuclear power plants which have not experienced serious accidents. Almost one hundred excess low birth-weight infant deaths have occured in the first few years of normal operation in the observed down-wind areas (see enclosure) of Wisconsin.

The second research, which I hope to present at the International Conference on Nuclear Waste in Winnipeg, September 1986, deals with a residential exposure to radium and its decay products at a chronic level of 200 to 300 mrem (2 to 3 mSv) per year. This is below the pre-1984 ICRP recommendation for the general public and above the post-1984 recommendation. The exposed people suffered a significant drop in white blood cell count (see enclosure), which of course decreases their ability to fight infection. In view of the current U.S. epidemic of AIDS, this inability to fight infection is of great public health concern.

This empiracle evidence is a second very strong reason for not relaxing radiation exposure standards at this time.

Some emissions from nuclear facilities which would actually be allowed to increase under the proposed NRC regulation include:

Radionuclide	In Air	In Water
H- 3	x	x
Be- 7	x	x
Fe- 59	x	x
Kr- 85	x	---
Sr- 89	x	x
Sr- 90	x	x
Zn- 95	---	x
Ru-106	---	x
I- 129	x	x
I- 131	x	x
Au-198	x	x
Ra-226	x	x
Pu-239	x	---
Pu-240	x	---

Note: x indicates that releases exceeding those permitted by ICRP 2 (1959) would be permitted by the proposed NRC regulations.

Clearly increasing radionuclides in the environment and food chain at this moment in time when both theoretical and empiracle evidence indicates that they are more harmful than was recognized by ICRP 26, 30 or 32, is reckless to say the least.

We strongly oppose rule-making on this shakey basis, and urge an immediate updating of the NRC information base. A more cautious lowering of the permissible dose limits for both workers and the general public would be a more appropriate response to current scientific knowledge.

When this proposed regulation is combined with NUREG 0956, one finds that the nuclear industry will be required to spend less on safety and reduction of radiation exposures. This is hardly a way to cut costs in an industry dying because of its past bad record with respect to safety and public health concerns.

Rosalie Bertell, Ph.D., GNSH

Statement of J. William Gunter, Director
Criteria and Standards Division, Office of Radiation Programs
U.S. Environmental Protection Agency

Public Hearing on Proposed Revisions to 10 CFR Part 20
November 10, 1988

My name is J. William Gunter. I am Director of the Criteria and Standards Division in the Office of Radiation Programs at the U.S. Envivonmental Protection Agency. We appreciate having the opportunity to address the Commission concerning these proposed revisions to Title 10, Part 20, of the Code of Federal Regulations.

10 CFR Part 20 is by far the most widely used U.S. codification of radiation protection requirements. It directly affects hundreds of thousands of workers employed by NRC licensees. It has also served, in the past, as the model upon which States and other Federal agencies, such as OSHA, base their own regulations. We estimate that the total number of individuals occupationally exposed to radiation in any year now exceeds 1.5 million. The importance of 10 CFR Part 20 beyond its direct application to NRC licensees is clear.

As you know, in January of 1987 President Reagan issued new Federal guidance for the protection of workers from radiation. This guidance was developed through an interagency effort under the leadership of EPA. We were most appreciative of the essential, continuous, and most helpful input from the Nuclear Regulatory Commission during this process.

The new Federal guidance represents the first official major revision of radiation protection principles in the United States in almost 30 years. It contains a number of significant changes from previous policy. These include introduction of risk-based weighting of doses to different parts of the body and the use of committed dose as the primary basis for control of internal exposure. The numerical values of the guidance for maximum radiation doses were reduced, and now explicitly apply to the sum of external and internal doses. These changes brought U.S. policy into general conformance with international recommendations and practice. In addition, numerical guidance is now provided for protection of the unborn, and greatly increased emphasis is placed on eliminating unjustified exposure and on keeping justified exposure as low as reasonably achievable (ALARA). Finally, the new guidance emphasizes the importance of instruction of workers and their supervisors on the basic risks to health from radiation and on basic radiation protection principles; of monitoring and recording of doses to

workers, including cumulative lifetime doses; and of the use of administrative control and reference levels for carrying out ALARA programs.

One of the more difficult decisions EPA faced, when it recommended this new guidance to the President, was the choice of the limiting value for annual dose. It would, I believe, be useful to repeat here the considerations that accompanied our recommendations:

"In recommending a limiting value of 5 rems in any single year, EPA has had to balance a number of considerations. Public comments confirmed that, for some beneficial activities, occasional doses approaching this value are not reasonably avoidable. On the other hand, continued annual exposures at or near this level over substantial portions of a working lifetime would, we believe, lead to unwarranted risks. For this reason such continued annual exposures should be avoided, and these recommendations provide such guidance. ...[T]hese recommendations also continue a system of protection which combines limiting values for maximum dose with a requirement for active application of measures to minimize dose - the ALARA requirement. This has resulted in steadily decreasing average annual doses to workers (most recently to about one-fiftieth of the recommended limiting value), and, to date, only a few hundred out of millions of workers have received planned cumulative doses that are a substantial fraction of the maximum previously permitted cumulative dose over an occupational lifetime. EPA anticipates that the continued application of the ALARA requirement, combined with new guidance on avoidance of large cumulative doses, will result in maintaining risks to all workers at low levels. EPA will continue to review worker doses with a view to initiating recommendations for any further modifications of the dose limitation system that are warrented by future trends in worker exposure."

The continuing importance of the considerations I have just cited become obvious in view of current trends in risk estimates for exposure to radiation. We should soon have before us the results of the careful reevaluation of the health effects in Hiroshima and Nagasaki atom bomb survivors, carried out over much of this decade. I do not believe that anyone is predicting that current assessments of risk will go down.

It is our opinion that these draft Final revisions of 10 CFR Part 20 are consistent with the recommendations of the new Federal guidance. They replace the limitation of annual dose to critical organs with the risk-based effective dose formalism that forms a central part of the guidance. The approach to control of internal exposure is now based on committed dose for all radionuclides and, although other methods of implementation are possible, is completely consistent with the guidance. In

its tabulation of Annual Limits on Intake, the Rule incorporates the significant improvements in physiology and dosimetry of radionuclides that have been achieved over the past few decades. It provides explicit limits for protection of the fetus. And it presents these and other aspects of radiation protection regulation in a more streamlined, internally consistent fashion.

In a letter to the NRC dated October 31, 1986, EPA commented on the Proposed revision of 10 CFR Part 20. We are pleased to find that NRC has responded positively to these comments. Only with regard to a relatively minor point, whether reports should be filed for the annual doses of all NRC licensed workers or only for those likely to receive the highest exposures, are we not fully in agreement. We continue to urge the Commission to reconsider this point at some time in the future.

In summary, we support prompt promulgation of this rule. Accompanying me today is Allan C.B. Richardson, who chaired the Interagency Committee that developed the Federal guidance. We would be pleased to attempt to answer any questions that you may have. Thank you.

United States
Environmental Protection
Agency

Office of
Radiation Programs
Washington, D.C. 20460

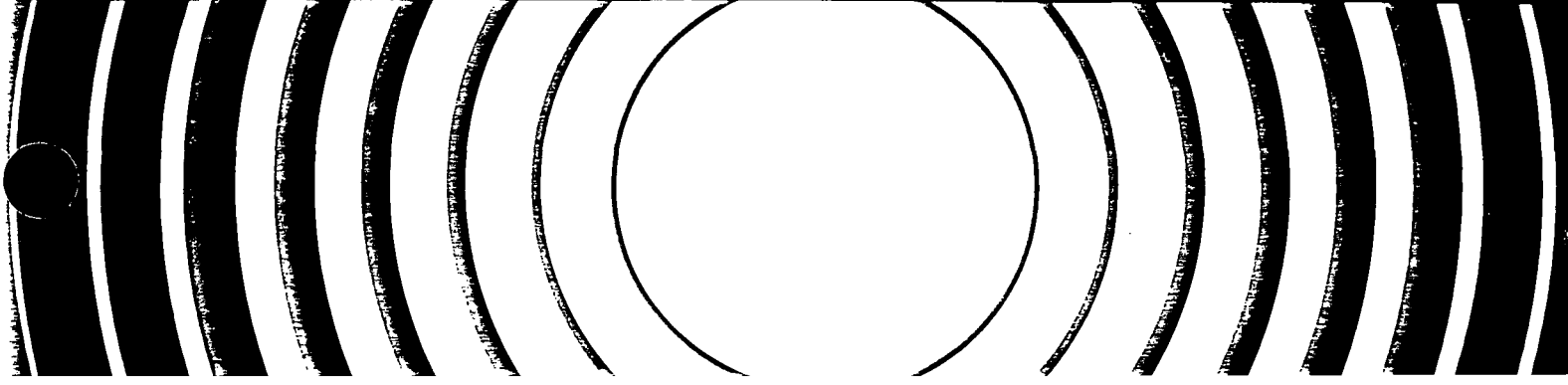
January 1987

Radiation

EPA

Radiation Protection Guidance to Federal Agencies for Occupational Exposure

Recommendations Approved by the President



federal register

Tuesday
January 27, 1987

Part II

The President

Radiation Protection Guidance to Federal Agencies for Occupational Exposure; Approval of Environmental Protection Agency Recommendations

[This reprint incorporates corrections published in the **Federal Registers** of Friday, January 30, and Wednesday, February 4, 1987.]

Federal Register
Vol. 52, No. 17
Tuesday, January 27, 1987

Presidential Documents

Title 3—

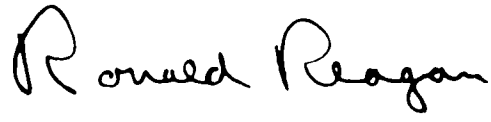
The President

Recommendations Approved by the President

Radiation Protection Guidance to Federal Agencies for Occupational Exposure

The recommendations concerning Federal radiation protection guidance for occupational exposure transmitted to me by the Administrator of the Environmental Protection Agency in the memorandum published below are approved. I direct that this memorandum be published in the **Federal Register**. To promote a coordinated and effective Federal program of worker protection, the Administrator is directed to keep informed of Federal agency actions to implement this guidance and to interpret and clarify these recommendations from time to time, as necessary, in coordination with affected Federal agencies. Consistent with existing authority, the Administrator may, when appropriate, consult with the Federal Coordinating Council for Science, Engineering and Technology. The Administrator may also, when appropriate, issue interpretations and clarifications in the **Federal Register**.

Approved: January 20, 1987



Billing code 3195-01-M

Memorandum for the President

FEDERAL RADIATION PROTECTION GUIDANCE FOR OCCUPATIONAL EXPOSURE

This memorandum transmits recommendations that would update previous guidance to Federal agencies for the protection of workers exposed to ionizing radiation. These recommendations were developed cooperatively by the Nuclear Regulatory Commission, the Occupational Safety and Health Administration, the Mine Safety and Health Administration, the Department of Defense, the Department of Energy, the National Aeronautics and Space Administration, the Department of Commerce, the Department of Transportation, the Department of Health and Human Services, and the Environmental Protection Agency. In addition, the National Council on Radiation Protection and Measurements (NCRP), the National Academy of Sciences (NAS), the Conference of Radiation Control Program Directors (CRCPD) of the States, and the Health Physics Society were consulted during the development of this guidance.

Executive Order 10831, the Atomic Energy Act, as amended, and Reorganization Plan No. 3 of 1970 charge the Administrator of the Environmental Protection Agency (EPA) to ". . . advise the President with respect to radiation matters, directly or indirectly affecting health, including guidance for all Federal agencies in the formulation of radiation standards and in the establishment and execution of programs of cooperation with States." This guidance has historically taken the form of qualitative and quantitative "Federal Radiation Protection Guidance." The recommendations transmitted here would replace those portions of previous Federal guidance (25 FR 4402), approved by President Eisenhower on May 13, 1960, that apply to the protec-

tion of workers exposed to ionizing radiation. The portions of that guidance which apply to exposure of the general public would not be changed by these recommendations.

These recommendations are based on consideration of (1) current scientific understanding of effects on health from ionizing radiation, (2) recommendations of international and national organizations involved in radiation protection, (3) proposed "Federal Radiation Protection Guidance for Occupational Exposure" published on January 23, 1981 (46 FR 7836) and public comments on that proposed guidance, and (4) the collective experience of the Federal agencies in the control of occupational exposure to ionizing radiation. A summary of the considerations that led to these recommendations is provided below. Public comments on the previously proposed guidance and a response to those comments are contained in the document "Federal Radiation Protection Guidance for Occupational Exposure—Response to Comments" (EPA 520/1-84-011). Single copies of this report are available from the Program Management Office (ANR-458), Office of Radiation Programs, U.S. Environmental Protection Agency, Washington, D.C. 20460; telephone (202) 475-8388.

Background

A review of current radiation protection guidance for workers began in 1974 with the formation of a Federal interagency committee by EPA. As a result of the deliberations of that committee, EPA published an "Advance Notice of Proposed Recommendations and Future Public Hearings" on September 17, 1979 (44 FR 53785). On January 23, 1981, EPA published "Federal Radiation Protection Guidance for Occupational Exposures; Proposed Recommendations, Request for Written Comments, and Public Hearings" (46 FR 7836). Public hearings were held in Washington, D.C. (April 20-23, 1981); Houston, Texas (May 1-2, 1981); Chicago, Illinois (May 5-6, 1981), and San Francisco, California (May 8-9, 1981) (46 FR 15205). The public comment period closed July 6, 1981 (46 FR 26557). On December 15, 1982, representatives of the ten Federal agencies noted above, the CRCPD, and the NCRP convened under the sponsorship of the EPA to review the issues raised in public comments and to complete development of these recommendations. The issues were carefully considered during a series of meetings, and the conclusions of the working group have provided the basis for these recommendations for revised Federal guidance.

EPA has also sponsored or conducted four major studies in support of this review of occupational radiation protection guidance. First, the Committee on the Biological Effects of Ionizing Radiations, National Academy of Sciences—National Research Council reviewed the scientific data on health risks of low levels of ionizing radiation in a report transmitted to EPA on July 22, 1980: "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation: 1980." National Academy Press, Washington, D.C. 1980. Second, EPA has published two studies of occupational radiation exposure: "Occupational Exposure to Ionizing Radiation in the United States: A Comprehensive Summary for the Year 1975" (EPA 520/4-80-001) and "Occupational Exposure to Ionizing Radiation in the United States: A Comprehensive Review for the Year 1980 and Summary of Trends for the Years 1960-1985" (EPA 520/1-84-005). Third, the Agency sponsored a study to examine the changes in previously derived concentration limits for intake of radionuclides from air or water that result from use of up-to-date dosimetric and biological transport models. These are presented in Federal Guidance Report No. 10, "The Radioactivity Concentration Guides: A New Calculation of Derived Limits for the 1960 Radiation Protection Guides Reflecting Updated Models for Dosimetry and Biological Transport" (EPA 520/1-84-010). Finally, the cost of implementing the changes in Federal guidance proposed on January 23, 1981 was surveyed and the findings published in the two-volume report: "Analysis of Costs for Compliance with Federal Radiation Protection Guidance for Occupational Exposure: Volume I—Cost of Compliance" (EPA 520/1-83-013-1) and "Volume II—Case Study Analysis of the Impacts" (EPA 520/1-83-013-2). These EPA

reports are available from National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161.

The interagency review of occupational radiation protection has confirmed the need for revising the previous Federal guidance, which was promulgated in 1960. Since that time knowledge of the effects of ionizing radiation on humans has increased substantially. We now have a greatly improved ability to estimate risk of harm due to irradiation of individual organs and tissues. As a result, some of the old numerical guides are now believed to be less and some more protective than formerly. Other risks, specifically those to the unborn, are now considered to be more significant and were not addressed by the old guidance. These disparities and omissions should be corrected. Drawing on this improved knowledge, the International Commission on Radiological Protection (ICRP) published, in 1977, new recommendations on radiation protection philosophy and limits for occupational exposure. These recommendations are now in use, in whole or substantial part, in most other countries. We have considered these recommendations, among others, and believe that it is appropriate to adopt the general features of the ICRP approach in radiation protection guidance to Federal agencies for occupational exposure. In two cases, protection of the unborn and the management of long-term exposure to internally deposited radioactivity, we have found it advisable to make additions.

There are four types of possible effects on health from exposure to ionizing radiation. The first of these is cancer. Cancers caused by radiation are not different from those that have been historically observed, whether from known or unknown causes. Although radiogenic cancers have been observed in humans over a range of higher doses, few useful data are available for defining the effect of doses at normal occupational levels of exposure. The second type of effect is the induction of hereditary effects in descendants of exposed persons. The severity of hereditary effects ranges from inconsequential to fatal. Although such effects have been observed in experimental animals at high doses, they have not been confirmed in studies of humans. Based on extensive but incomplete scientific evidence, it is prudent to assume that at low levels of exposure the risk of incurring either cancer or hereditary effects is linearly related to the dose received in the relevant tissue. The severity of any such effect is not related to the amount of dose received. That is, once a cancer or an hereditary effect has been induced, its severity is independent of the dose. Thus, for these two types of effects, it is assumed that there is no completely risk-free level of exposure.

The third type includes a variety of effects for which the degree of damage (i.e., severity) appears to depend on the amount of dose received and for which there is an effective threshold below which clinically observable effects do not occur. An example of such an effect is radiation sickness syndrome, which is observed at high doses and is fatal at very high doses. Examples of lesser effects include opacification of the lens of the eye, erythema of the skin, and temporary impairment of fertility. All of these effects occur at relatively high doses. At the levels of dose contemplated under both the previous Federal guidance and these recommendations, clinically observable examples of this third type of effect are not known to occur.

The fourth type includes effects on children who were exposed *in utero*. Not only may the unborn be more sensitive than adults to the induction of malformations, cancer, and hereditary effects, but recent studies have drawn renewed attention to the risk of severe mental retardation from exposure of the unborn during certain periods of pregnancy. The risk of less severe mental retardation appears to be similarly elevated. Although it is not yet clear to what extent the frequency of retardation is proportional to the amount of dose (the data available at occupational levels of exposure are limited), it is prudent to assume that proportionality exists.

The risks to health from exposure to low levels of ionizing radiation were reviewed for EPA by the NAS in reports published in 1972 and in 1980.

Regarding cancer there continues to be divided opinion on how to interpolate between the absence of radiation effects at zero dose and the observed effects of radiation (mostly at high doses) to estimate the most probable effects of low doses. Some scientists believe that available data best support use of a linear model for estimating such effects. Others, however, believe that other models, which usually predict somewhat lower risks, provide better estimates. These differences of opinion have not been resolved to date by studies of the effects of radiation in humans, the most important of which are those of the Hiroshima and Nagasaki atom bomb survivors. Studies are now underway to reassess radiation dose calculations for these survivors and in turn to provide improved estimates of risk. It will be at least several years before these reassessments and estimates are completed, and it is not likely that they will conclusively resolve uncertainties in estimating low dose effects. EPA is monitoring the progress of this work. When it is completed we will initiate reviews of the risks of low levels of radiation, in order to provide the basis for any indicated reassessment of this guidance.

In spite of the above uncertainties, estimates of the risks from exposure to low levels of ionizing radiation are reasonably well bounded, and the average worker is believed to incur a relatively small risk of harm from radiation. This situation has resulted from a system of protection which combines limits on maximum dose with active application of measures to minimize doses within these limits. These recommendations continue that approach. Approximately 1.3 million workers were employed in occupations in which they were potentially exposed to radiation in 1980, the latest year for which we have comprehensive assessments. About half of these workers received no measurable occupational dose. In that year the average worker measurably exposed to external radiation received an occupational dose equivalent of 0.2 rem to the whole body, based on the readings of individual dosimeters worn on the surface of the body. We estimate (assuming a linear non-threshold model) the increased risk of premature death due to radiation-induced cancer for such a dose is approximately 2 to 5 in 100,000 and that the increased risk of serious hereditary effects is somewhat smaller. To put these estimated risks in perspective with other occupational hazards, they are comparable to the observed risk of job-related accidental death in the safest industries, wholesale and retail trades, for which the annual accidental death rate averaged about 5 per 100,000 from 1980 to 1984. The U.S. average for all industries was 11 per 100,000 in 1984 and 1985.

These recommendations are based on the assumption that risks of injury from exposure to radiation should be considered in relation to the overall benefit derived from the activities causing the exposure. This approach is similar to that used by the Federal Radiation Council (FRC) in developing the 1960 Federal guidance. The FRC said then, "Fundamentally, setting basic radiation protection standards involves passing judgment on the extent of the possible health hazard society is willing to accept in order to realize the known benefits of radiation." This leads to three basic principles that have governed radiation protection of workers in recent decades in the United States and in most other countries. Although the precise formulation of these principles has evolved over the years, their intent has continued unchanged. The first is that any activity involving occupational exposure should be determined to be useful enough to society to warrant the exposure of workers; i.e., that a finding be made that the activity is "justified". This same principle applies to virtually any human endeavor which involves some risk of injury. The second is that, for justified activities, exposure of the work force should be as low as reasonably achievable (commonly designated by the acronym "ALARA"); this has most recently been characterized as "optimization" of radiation protection by the International Commission on Radiological Protection (ICRP). Finally, to provide an upper limit on risk to individual workers, "limitation" of the maximum allowed individual dose is required. This is required above and beyond the protection provided by the first two principles because their primary objective is to minimize the total harm from occupational exposure in

the entire work force: they do not limit the way that harm is distributed among individual workers.

The principle that activities causing occupational exposure should produce a net benefit is important in radiation protection even though the judgment of net benefit is not easily made. The 1960 guidance says: "There should not be any man-made radiation exposure without the expectation of benefit resulting from such exposure . . ." And "It is basic that exposure to radiation should result from a real determination of its necessity." Advisory bodies other than the FRC have used language which has essentially the same meaning. In its most recent revision of international guidance (1977) the ICRP said ". . . no practice shall be adopted unless its introduction produces a positive net benefit," and in slightly different form the NCRP, in its most recent statement (1975) on this matter, said ". . . all exposures should be kept to a practicable minimum; . . . this principle involves value judgments based upon perception of compensatory benefits commensurate with risks, preferably in the form of realistic numerical estimates of both benefits and risks from activities involving radiation and alternative means to the same benefits."

This principle is set forth in these recommendations in a simple form: "There should not be any occupational exposure of workers to ionizing radiation without the expectation of an overall benefit from the activity causing the exposure." An obvious difficulty in making this judgment is the difficulty of quantifying in comparable terms costs (including risks) and benefits. Given this situation, informed value judgments are necessary and are usually all that is possible. It is perhaps useful to observe, however, that throughout history individuals and societies have made risk-benefit judgments, with their success usually depending upon the amount of accurate information available. Since more is known about radiation now than in previous decades, the prospect is that these judgments can now be better made than before.

The preceding discussion has implicitly focused on major activities, i.e., those instituting or continuing a general practice involving radiation exposure of workers. This principle also applies to detailed management of facilities and direct supervision of workers. Decisions on whether or not particular tasks should be carried out (such as inspecting control systems or acquiring specific experimental data) require judgments which can, in the aggregate, be as significant for radiation protection as those justifying the basic activities these tasks support.

The principle of reduction of exposure to levels that are "as low as reasonably achievable" (ALARA) is typically implemented in two different ways. First, it is applied to the engineering design of facilities so as to reduce, prospectively, the anticipated exposure of workers. Second, it is applied to actual operations; that is, work practices are designed and carried out to reduce the exposure of workers. Both of these applications are encompassed by these recommendations.* The principle applies both to collective exposures of the work force and to annual and cumulative individual exposures. Its application may therefore require complex judgments, particularly when tradeoffs between collective and individual doses are involved. Effective implementation of the ALARA principle involves most of the many facets of an effective radiation protection program: education of workers concerning the health risks of exposure to radiation; training in regulatory requirements and procedures to control exposure; monitoring, assessment, and reporting of exposure levels and doses; and management and supervision of radiation protection activities, including the choice and implementation of radiation control measures. A comprehensive radiation protection program will also include, as appropriate,

* The recomendation that Federal agencies, through their regulations, operational procedures and other appropriate means, maintain doses ALARA is not intended to express, and therefore should not be interpreted as expressing, a view whether the ALARA concept should constitute a duty of care in tort litigation. Implementation of the ALARA concept requires a complex, subjective balancing of scientific, economic and social factors generally resulting in the attainment of average dose levels significantly below the maximum permitted by this guidance.

properly trained and qualified radiation protection personnel; adequately designed, operated, and maintained facilities and equipment; and quality assurance and audit procedures. Another important aspect of such programs is maintenance of records of cumulative exposures of workers and implementation of appropriate measures to assure that lifetime exposure of workers repeatedly exposed near the limits is minimized.

The types of work and activity which involve worker exposure to radiation vary greatly and are administered by many different Federal and State agencies under a wide variety of legislative authorities. In view of this complexity, Federal radiation protection guidance can address only the broad prerequisites of an effective ALARA program, and regulatory authorities must ensure that more detailed requirements are identified and carried out. In doing this, such authorities may find it useful to establish or encourage the use of 1) administrative control levels specifying, for specific categories of workers or work situations, dose levels below the limiting numerical values recommended in this guidance; 2) reference levels to indicate the need for such actions as recording, investigation, and intervention; and 3) local goals for limiting individual and collective occupational exposures. Where the enforcement of a general ALARA requirement is not practical under an agency's statutory authority, it is sufficient that an agency endorse and encourage ALARA, and establish such regulations which result from ALARA findings as may be useful and appropriate to meet the objectives of this guidance.

The numerical radiation protection guidance which has been in effect since 1960 for limiting the maximum allowed dose to an individual worker is based on the concept of limiting the dose to the most critically exposed part of the body. This approach was appropriate, given the limitations of scientific information available at that time, and resulted in a set of five independent numerical guides for maximum exposure of a) the whole body, head and trunk, active blood-forming organs, gonads, and lens of eye; b) thyroid and skin of the whole body; c) hands and forearms, feet and ankles; d) bone, and e) other organs. A consequence of this approach when several different parts of the body are exposed simultaneously is that only the part that receives the highest dose relative to its respective guide is decisive for limiting the dose.

Current knowledge permits a more comprehensive approach that takes into account the separate contributions to the total risk from each exposed part of the body. These recommendations incorporate the dose weighting system introduced for this purpose by the ICRP in 1977. That system assigns weighting factors to the various parts of the body for the risks of lethal cancer and serious prompt genetic effects (those in the first two generations); these factors are chosen so that the sum of weighted dose equivalents represents a risk the same as that from a numerically equal dose equivalent to the whole body. The ICRP recommends that the effective (i.e. weighted) dose equivalent incurred in any year be limited to 5 rems. Based on the public response to the similar proposal published by EPA in 1981 and Federal experience with comparable exposure limits, the Federal agencies concur. These recommendations therefore replace the 1960 whole body numerical guides of 3 rems per quarter and 5(N–18) rems cumulative dose equivalent (where N is the age of the worker) and associated critical organ guides with a limiting value of 5 rems effective dose equivalent incurred in any year. Supplementary limiting values are also recommended to provide protection against those health effects for which an effective threshold is believed to exist.

In recommending a limiting value of 5 rems in any single year, EPA has had to balance a number of considerations. Public comments confirmed that, for some beneficial activities, occasional doses aproaching this value are not reasonably avoidable. On the other hand, continued annual exposures at or near this level over substantial portions of a working lifetime would, we believe, lead to unwarranted risks. For this reason such continued annual exposures should be avoided, and these recommendations provide such guidance. As noted earlier, these recommendations also continue a system of protection which combines limiting values for maximum dose with a require-

ment for active application of measures to minimize doses—the ALARA requirement. This has resulted in steadily decreasing average annual doses to workers (most recently to about one-fiftieth of the recommended limiting value), and, to date, only a few hundred out of millions of workers have received planned cumulative doses that are a substantial fraction of the maximum previously permitted cumulative dose over an occupational lifetime. EPA anticipates that the continued application of the ALARA requirement, combined with new guidance on avoidance of large cumulative doses, will result in maintaining risks to all workers at low levels. EPA will continue to review worker doses with a view to initiating recommendations for any further modifications of the dose limitation system that are warranted by future trends in worker exposure.

Certain radionuclides, if inhaled or ingested, may remain in and continue to irradiate the body for many years. These recommendations provide that radionuclides should be contained so as to minimize intake, to the extent reasonably achievable. When avoidance of situations that may result in such intake is not practical, the recommendations distinguish between pre-exposure and post-exposure situations. With respect to the former, Federal agencies should base control of prospective internal exposure to radionuclides (e.g. facility design, monitoring, training, and operating procedures) upon the entire future dose that may result from any intake (the committed dose), not just upon the dose accrued in the year of intake. This is to assure that, prior to exposure to such materials, proper account is taken of the risk due to doses in future years.

With respect to post-exposure situations, most significant internal exposure to radionuclides occurs as the result of inadvertent intakes. In the case of some long-lived radionuclides, it may also be difficult to measure accurately the small quantities corresponding to the recommended numerical guidance for control of committed doses. In such cases, when workers are inadvertently exposed or it is not otherwise possible to avoid intakes in excess of these recommendations for control of committed dose, it will be necessary to take appropriate corrective action to assure control has been reestablished and to properly manage future exposure of the worker. In regard to the latter requirement, provision should be made to continue to monitor the annual dose received from radionuclides in the body as long as they remain in sufficient amount to deliver doses significant compared to the limiting values for annual dose. These recommendations extend those of the ICRP, because it is appropriate to maintain active management of workers who exceed the guidance for committed dose in order that individual differences in retention of such materials in the body be monitored, and to assure, whenever possible, conformance to the limiting values for annual dose.

These recommendations also incorporate guidance for limiting exposure of the unborn as a result of occupational exposure of female workers. It has long been suspected that the embryo and fetus are more sensitive to a variety of effects of radiation than are adults. Although our knowledge remains incomplete, it has now become clear that the unborn are especially subject to the risk of mental retardation from exposure to radiation at a relatively early phase of fetal development. Available scientific evidence appears to indicate that this sensitivity is greatest during the period near the end of the first trimester and the beginning of the second trimester of pregnancy, that is, the period from 8 weeks to about 15 weeks after conception. Accordingly, when a woman has declared her pregnancy, this guidance recommends not only that the total exposure of the unborn be more limited than that of adult workers, but that the monthly rate of exposure be further limited in order to provide additional protection. Due to the incomplete state of knowledge of the transfer of radionuclides from the mother to the unborn (and the resulting uncertainty in dose to the unborn), in those few work situations where intake of radionuclides could normally be possible it may also be necessary to institute measures to avoid such intakes by pregnant women in order to satisfy these recommendations.

The health protection objectives of this guidance for the unborn should be achieved in accordance with the provisions of Title VII of the Civil Rights Act of 1964, as amended, with respect to discrimination in employment practices.* The guidance applies only to situations in which the worker has voluntarily made her pregnancy known to her employer. Protection of the unborn may be achieved through such measures as temporary job rotation, worker self-selection, or use of protective equipment. The guidance recognizes that protection of the unborn is a joint responsibility of the employer and worker. Workers should be informed of the risks involved and encouraged to voluntarily make pregnancies known as early as possible so that any temporary arrangements necessary to modify exposures can be made. Conversely, employers should make such arrangements in a manner that minimizes the impact on the worker.

The recommended numerical guidance for limiting dose to workers applies to the sum of dose from external and internal sources of radiation. This procedure is recommended so as to provide a single limit on the total risk from radiation exposure. Therefore, in those cases where both kinds of radiation sources are present, decisions about the control of dose from internal sources should not be made without equal consideration of their implication for dose from external sources.

The guidance emphasizes the importance of recordkeeping for annual, committed, and cumulative (lifetime) doses. Such recordkeeping should be designed to avoid burdensome requirements for cases in which doses are insignificant. Currently, regulatory records are not generally required for doses small compared to regulatory limits for annual external and internal doses. Under this guidance such regulatory practices would continue to be appropriate if due consideration is given to the implications of summing internal and external doses and to recordkeeping needs for assessing cumulative doses. To the extent reasonable such records should be established on the basis of individual dosimetry rather than on monitoring of exposure conditions.

In summary, many of the important changes from the 1960 guidance are structural. These include introduction of the concept of risk-based weighting of doses to different parts of the body and the use of committed dose as the primary basis for control of internal exposure. The numerical values of the guidance for maximum radiation doses are also modified. These changes bring this guidance into general conformance with international recommendations and practice. In addition, guidance is provided for protection of the unborn, and increased emphasis is placed on eliminating unjustified exposure and on keeping justified exposure as low as reasonably achievable, both long-standing tenets of radiation protection. The guidance emphasizes the importance of instruction of workers and their supervisors, monitoring and recording of doses to workers, and the use of administrative control and reference levels for carrying out ALARA programs.

These recommendations apply to workers exposed to other than normal background radiation on the job. It is sometimes hard to identify such workers because everyone is exposed to natural sources of radiation and many occupational exposures are small. Workers or workplaces subject to this guidance will be identified by the responsible implementing agencies. Agencies will have to use care in determining when exposure of workers does not need to be regulated. In making such determinations agencies should consider

*The Civil Rights Act of 1964, as amended, provides that "It shall be an unlawful employment practice for an employer (1) to fail or refuse to hire or to discharge any individual, or otherwise to discriminate against any individual with respect to his compensation, terms, conditions, or privileges of employment, because of such individual's . . . sex . . . or (2) to limit, segregate, or classify his employees or applicants for employment in any way which would deprive or tend to deprive any individual of employment opportunities or otherwise adversely affect his status as an employee, because of such individual's . . . . sex . . ." [42 U.S.C. 2000e-2(a)]. The Pregnancy Discrimination Act of 1978 defines "because of sex" to include because of or on the basis of pregnancy, childbirth, or related medical conditions [42 U.S.C. 2000e(k)].

both the collective dose which is likely to be avoided through regulation and the maximum individual doses possible.

Implementation of these recommendations will require changes that can reasonably be achieved only over a period of time. It is expected that Federal agencies will identify any problem areas and provide adequate flexibility and the necessary transition periods to avoid undue impacts, while at the same time assuring reasonably prompt implementation of this new guidance.

Upon implementing these recommendations, occupational exposure should be reduced. It is not possible to quantify the overall exposure reduction that will be realized because it cannot be predicted how efficiently these recommendations will be implemented or how much of existing exposure is unnecessary. These recommendations reduce the maximum whole body dose that workers may receive in any one year by more than half (i.e., from 3 rems per quarter to 5 rems per year), require that necessary exposure to internal radioactivity be controlled on the basis of committed dose, require that internal and external doses be considered together rather than separately, and provide increased protection of the unborn. We also expect the strengthened and more explicit recommendations for maintaining occupational exposure "as low as reasonably achievable" will improve the radiation protection of workers. Finally, these recommendations would facilitate the practice of radiation protection by introducing a self-consistent system of limits in accordance with that in practice internationally.

Recommendations

The following recommendations are made for the guidance of Federal agencies in their conduct of programs for the protection of workers from ionizing radiation.

1. There should not be any occupational exposure of workers to ionizing radiation without the expectation of an overall benefit from the activity causing the exposure. Such activities may be allowed provided exposure of workers is limited in accordance with these recommendations.

2. No exposure is acceptable without regard to the reason for permitting it, and it should be general practice to maintain doses from radiation to levels below the limiting values specified in these recommendations. Therefore, it is fundamental to radiation protection that a sustained effort be made to ensure that collective doses, as well as annual, committed, and cumulative lifetime individual doses, are maintained as low as reasonably achievable (ALARA), economic and social factors being taken into account.

3. In addition to the above recommendations, radiation doses received as a result of occupational exposure should not exceed the *limiting values for assessed dose to individual workers* specified below. These are given separately for protection against different types of effects on health and apply to the sum of doses from external and internal sources of radiation. For cancer and genetic effects, the limiting value is specified in terms of a derived quantity called the effective dose equivalent. For other health effects, the limiting values are specified in terms of the dose equivalent [1] to specific organs or tissues.

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[1] "Dose equivalent" is the product of the absorbed dose, a quality factor which varies with the energy and type of radiation, and other modifying factors, as defined by the International Commission on Radiation Units and Measurements.

Cancer and Genetic Effects. The effective dose equivalent, H_E, received in any year by an adult worker should not exceed 5 rems (0.05 sievert).[2] The effective dose equivalent is defined as:

$$H_E = \sum_T w_T H_T ,$$

where w_T is a weighting factor and H_T is the annual dose equivalent averaged over organ or tissue T. Values of w_T and their corresponding organs and tissues are:

Gonads	0.25
Breasts	0.15
Red bone marrow	0.12
Lungs	0.12
Thyroid	0.03
Bone surfaces	0.03
Remainder [3]	0.30

For the case of uniform irradiation of the whole body, where H_T may be assumed the same for each organ or tissue, the effective dose equivalent is equal to the dose equivalent to the whole body.

Other Health Effects. In addition to the limitation on effective dose equivalent, the dose equivalent, H_T, received in any year by an adult worker should not exceed 15 rems (0.15 sievert) to the lens of the eye, and 50 rems (0.5 sievert) to any other organ, tissue (including the skin), or extremity [4] of the body.

Additional limiting values which apply to the control of dose from internal exposure to radionuclides in the workplace are specified in Recommendation 4. Continued exposure of a worker at or near the limiting values for dose received in any year over substantial portions of a working lifetime should be avoided. This should normally be accomplished through application of appropriate radiation protection practices established under Recommendation 2.

4. As the primary means for controlling internal exposure to radionuclides, agencies should require that radioactive materials be contained, to the extent reasonably achievable, so as to minimize intake. In controlling internal exposure consideration should also be given to concomitant external exposure.

The control of necessary exposure of adult workers to radioactive materials in the workplace should be designed, operated, and monitored with sufficient frequency to ensure that, as the result of intake of radionuclides in a year, the following *limiting values for control of the workplace* are satisfied: (a) the anticipated magnitude of the committed effective dose equivalent from such intake plus any annual effective dose equivalent from external exposure will not exceed 5 rems (0.05 sievert), and (b) the anticipated magnitude of the committed dose equivalent to any organ or tissue from such intake plus any annual dose equivalent from external exposure will not exceed 50 rems (0.5 sievert). The committed effective dose equivalent from internal sources of radiation, $H_{E,50}$, is defined as:

$$H_{E,50} = \sum_T w_T H_{T,50} ,$$

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[2] The unit of dose equivalent in the system of special quantities for ionizing radiation currently in use in the United States is the "rem." In the recently-adopted international system (SI) the unit of dose equivalent is the "sievert". One sievert = 100 rems.

[3] "Remainder" means the five other organs (such as liver, kidneys, spleen, brain, thymus, adrenals, pancreas, stomach, small intestine, upper large intestine, and lower large intestine, but excluding skin, lens of the eye, and extremities) with the highest doses. The weighting factor for each such organ is 0.06.

[4] "Extremity" means the forearms and hands, or the lower legs and feet.

where w_T is defined as in Recommendation 3 and the committed dose equivalent, $H_{T,50}$, is the sum of all dose equivalents to organ or tissue T that may accumulate over an individual's anticipated remaining lifetime (taken as 50 years) from radionuclides that are retained in the body. These conditions on committed doses should provide the primary basis for the control of internal exposure to radioactive materials.[5]

In circumstances where assessment of actual intake for an individual worker shows the above conditions for control of intake have not been met, agencies should require that appropriate corrective action be taken to assure control has been reestablished and that future exposure of the worker is appropriately managed. Provision should be made to assess annual dose equivalents due to radionuclides retained in the body from such intake for as long as they are significant for ensuring conformance with the limiting values specified in Recommendation 3.

5. Occupational dose equivalents to individuals under the age of eighteen should be limited to one-tenth of the values specified in Recommendations 3 and 4 for adult workers.

6. Exposure of an unborn child should be less than that of adult workers. Workers should be informed of currrent knowledge of risks to the unborn[6] from radiation and of the responsibility of both employers and workers to minimize exposure of the unborn. The dose equivalent to an unborn as a result of occupational exposure of a woman who has declared that she is pregnant should be maintained as low as reasonably achievable, and in any case should not exceed 0.5 rem (0.005 sievert) during the entire gestation period. Efforts should be made to avoid substantial variation above the uniform monthly exposure rate that would satisfy this limiting value. The limiting value for the unborn does not create a basis for discrimination, and should be achieved in conformance with the provisions of Title VII of the Civil Rights Act of 1964, as amended, regarding discrimination in employment practices, including hiring, discharge, compensation, and terms, conditions, or privileges of employment.

7. Individuals occupationally exposed to radiation and managers of activities involving radiation should be instructed on the basic risks to health from ionizing radiation and on basic radiation protection principles. This should, as a minimum, include instruction on the somatic (including *in utero*) and genetic effects of ionizing radiation, the recommendations set forth in Federal radiation protection guidance for occupational exposure and applicable regulations and operating procedures which implement this guidance, the general levels of risk and appropriate radiation protection practices for their work situations, and the responsibilities of individual workers to avoid and minimize exposure. The degree and type of instruction that is appropriate will depend on the potential radiation exposures involved.

8. Appropriate monitoring of workers and the work place should be performed and records kept to ensure conformance with these recommendations. The types and accuracy of monitoring methods and procedures utilized should be periodically reviewed to assure that appropriate techniques are being competently applied.

Maintenance of a cumulative record of lifetime occupational doses for each worker is encouraged. For doses due to intake of radioactive materials, the committed effective dose equivalent and the quantity of each radionuclide in the body should be assessed and recorded, to the extent practicable. A summary of annual, cumulative, and committed effective dose equivalents should be provided each worker on no less than an annual basis; more

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[5] When these conditions on intake of radioactive materials have been satisfied, it is not necessary to assess contributions from such intakes to annual doses in future years, and, as an operational procedure, such doses may be assigned to the year of intake for the purpose of assessing compliance with Recommendation 3.

[6] The term "unborn" is defined to encompass the period commencing with conception and ending with birth.

detailed information concerning his or her exposure should be made available upon the worker's request.

9. Radiation exposure control measures should be designed, selected, utilized, and maintained to ensure that anticipated and actual doses meet the objectives of this guidance. Establishment of administrative control levels[7] below the limiting values for control may be useful and appropriate for achieving this objective. Reference levels[8] may also be useful to determine the need to take such actions as recording, investigation, and intervention. Since such administrative control and reference levels will often involve ALARA considerations, they may be developed for specific categories of workers or work situations. Agencies should encourage the establishment of measures by which management can assess the effectiveness of ALARA efforts, including, where appropriate, local goals for limiting individual and collective occupational doses. Supervision should be provided on a part-time, full-time, or task-by-task basis as necessary to maintain effective control over the exposure of workers.

10. The numerical values recommended herein should not be deliberately exceeded except during emergencies, or under unusual circumstances for which the Federal agency having jurisdiction has carefully considered the reasons for doing so in light of these recommendations. If Federal agencies authorize dose equivalents greater than these values for unusual circumstances, they should make any generic procedures specifying conditions under which such exposures may occur publicly available or make specific instances in which such authorization has been given a matter of public record.

The following notes are provided to clarify application of the above recommendations:

1. Occupational exposure of workers does not include that due to normal background radiation and exposure as a patient of practitioners of the healing arts.

2. The existing Federal guidance (34 FR 576 and 36 FR 12921) for limiting exposure of underground miners to radon decay products applies independently of, and is not changed by, these recommendations.

3. The values specified by the International Commission on Radiological Protection (ICRP) for quality factors and dosimetric conventions for the various types of radiation, the models for reference persons, and the results of their dosimetric methods and metabolic models may be used for determining conformance to these recommendations.

4. "Annual Limits on Intake" (ALIs) and/or "Derived Air Concentrations" (DACs) may be used to limit radiation exposure from intake of or immersion in radionuclides. The ALI or DAC for a single radionuclide is the maximum intake in a year or average air concentration for a working year, respectively, for a reference person that, in the absence of any external dose, satisfies the conditions on committed effective dose equivalent and committed dose equivalent of Recommendation 4. ALIs and DACs may be derived for different chemical or physical forms of radioactive materials.

5. The numerical values provided by these recommendations do not apply to workers responsible for the management of or response to emergencies.

These recommendations would replace those portions of current Federal Radiation Protection Guidance (25 FR 4402) that apply to the protection of workers from ionizing radiation. It is expected that individual Federal agencies, on the basis of their knowledge of specific worker exposure situations.

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[7] Administrative control levels are requirements determined by a competent authority or the management of an institution or facility. They are not primary limits, and may therefore be exceeded, upon approval of competent authority or management, as situations dictate.

[8] Reference levels are not limits, and may be expressed in terms of any useful parameter. They are used to determine a course of action, such as recording, investigation, or intervention, when the value of a parameter exceeds, or is projected to exceed, the reference level.

will use this new guidance as the basis upon which to revise or develop detailed standards and regulations to the extent that they have regulatory or administrative jurisdiction. The Environmental Protection Agency will keep informed of Federal agency actions to implement this guidance, and will issue any necessary clarifications and interpretations required to reflect new information, so as to promote the coordination necessary to achieve an effective Federal program of worker protection.

If you approve the foregoing recommendations for the guidance of Federal agencies in the conduct of their radiation protection activities, I further recommend that this memorandum be published in the **Federal Register.**

Lee M. Thomas,

Administrator, Environmental Protection Agency.

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United States
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REVISION OF 10 CFR PART 20

"STANDARDS FOR PROTECTION

AGAINST RADIATION"

STAFF PRESENTATION TO THE COMMISSION

NOVEMBER 10, 1988

SUMMARY OF PRESENTATION

- RECOMMENDATIONS ON RADIATION PROTECTION
- NRC ACTIONS
- OBJECTIVES OF PART 20 REVISION
- SIGNIFICANT NEW REQUIREMENTS
- IMPACTS OF PART 20 REVISION
- IMPACT ON FUEL FABRICATION FACILITIES
- ACRS COMMENTS
- SUMMARY OF BENEFITS OF PART 20 REVISION

RECOMMENDATIONS ON RADIATION PROTECTION

1977	ICRP ISSUES PUBLICATION 26.
1979	ICRP ISSUES PUBLICATION 30.
1981	EPA ISSUES DRAFT FEDERAL GUIDANCE ON OCCUPATIONAL EXPOSURE.
1986	ICRP ISSUES PUBLICATION 48.
1987	PRESIDENT APPROVES FEDERAL GUIDANCE ON OCCUPATIONAL EXPOSURE.
1987	NCRP PUBLISHES NCRP REPORT 91.

NRC ACTIONS

1957	ORIGINAL PART 20 PUBLISHED.
1978	STAFF TASK GROUPS FORMED TO REVIEW ICRP-26 RECOMMENDATIONS.
1980	ADVANCE NOTICE OF PROPOSED RULE-MAKING PUBLISHED.
80-85	DRAFTS REVIEWED BY NRC STAFF.
1986	PROPOSED RULE PUBLISHED.

OBJECTIVES OF PART 20 REVISION

- Conform to new Federal Guidance (ICRP 26).
- Incorporate lessons learned from 30 years of implementing Part 20.
- Add explicit dose limits for the public (ICRP 26).
- Update scientific basis for intake and concentration limits (ICRP 26, 30, 48).

SIGNIFICANT NEW REQUIREMENTS

- LIMIT ON SUM OF INTERNAL AND EXTERNAL DOSES RATHER THAN SEPARATE LIMITS.
- DOSE LIMIT OF 3 REM/QUARTER REPLACED BY 5 REM/YEAR.
- DELETION OF CUMULATIVE 5(N-18) DOSE LIMIT (N = AGE).

SIGNIFICANT NEW REQUIREMENTS

- CHANGE FROM LIMITS ON SPECIFIC ORGAN DOSES TO LIMIT ON SUM OF ORGAN DOSE WEIGHTED BY ORGAN RISK FACTORS.
- EXPLICIT LIMIT (100 MREM/YR) ON DOSE TO MEMBERS OF THE PUBLIC (OLD IMPLICIT LIMIT 500 MREM/YR).
- LIMIT ON DOSE TO THE EMBRYO/FETUS FOR DECLARED PREGNANT WORKERS.

SIGNIFICANT NEW REQUIREMENTS

- ANNUAL REPORTING OF INDIVIDUAL DOSES TO THE WORKER.
- LOWER LIMITS ON DISPOSAL OF RADIOACTIVE WASTE INTO SANITARY SEWERS.

IMPACTS OF PART 20 REVISION

- GREATER COMPLEXITY OF RULE.
- NEW CONCEPTS AND TERMS WILL REQUIRE REVISED PROCEDURES AND TRAINING.
- ANNUAL DOSE REPORTS TO WORKERS.
- COSTS TO CONTROL DOSES FROM CERTAIN LONG-LIVED RADIONUCLIDES COULD BE SIGNIFICANT FOR FUEL FABRICATION FACILITIES.

IMPACT ON FUEL FABRICATION FACILITIES

- SUBJECT OF ACRS COMMENT
- LETTERS RECEIVED FROM NUMARC AND FUEL FABRICATION COMPANIES
- INDUSTRY COMMENTS EMPHASIZE CONTRAST BETWEEN TWO APPROACHES FOR LIMITING THE RISKS FROM LONG-LIVED RADIONUCLIDES--COMMITTED DOSE CONTROL VERSUS ANNUAL DOSE CONTROL.

IMPACT ON FUEL FABRICATION FACILITIES

- THE ISSUE HAS AS ITS FUNDAMENTAL BASIS NEW SCIENTIFIC INFORMATION INDICATING AN INCREASE IN RISKS FROM INHALATION OF INSOLUBLE URANIUM AND THORIUM

IMPACT ON FUEL FABRICATION FACILITIES

- INCREASED RISK ESTIMATES ARE BASED ON NEW MODELS AND DATA ON DISTRIBUTION AND RETENTION OF RADIONUCLIDES IN THE BODY AND NEW MODELS FOR CALCULATING ORGAN DOSES.
- THE NEW SCIENTIFIC INFORMATION WAS INCLUDED IN ICRP PUBLICATIONS 26, 30, AND 48.

COMMITTED DOSE

- NRC PRACTICE FOR THE PAST 30 YEARS (CURRENT PART 20) REQUIRES RISKS FROM INHALATION OF LONG-LIVED RADIONUCLIDES TO BE CONTROLLED BY LIMITING COMMITTED DOSE.
- CONSISTENT WITH NEW FEDERAL GUIDANCE.

COMMITTED DOSE

- COMMITTED DOSE MEANS THAT DOSES FROM FUTURE DECAY OF LONG-LIVED RADIONUCLIDES RETAINED IN THE BODY ARE COUNTED AS THOUGH THEY OCCUR IN THE YEAR OF INHALATION.

ANNUAL DOSE CONTROL APPROACH

- ASSESS INTERNAL DOSES ACTUALLY OCCURING DURING THE YEAR BOTH FROM INTAKES IN THAT YEAR AND INTAKES IN PREVIOUS YEARS.
- INDUSTRY PROPOSAL IN LIEU OF CURRENT APPROACH BASED ON COMMITTED DOSE.
- CONSIDERED IN PROPOSED RULE BUT DISCARDED FROM FINAL VERSION.

IMPLICATIONS OF ANNUAL DOSE APPROACH

- IF WORKER DOSE LEVELS ARE CONTROLLED SOLELY ON THE BASIS OF ANNUAL DOSE, RISKS FROM RADIOACTIVE DECAY OF RADIONUCLIDES REMAINING IN THE BODY AFTER THE WORKER LEAVES EMPLOYMENT WILL HAVE BEEN IGNORED IN ESTABLISHING CONTROLS.

IMPLICATIONS OF ANNUAL DOSE APPROACH

- IF THE ANNUAL DOSE SYSTEM IS USED, WHEN WORKERS CHANGE JOBS WITHIN THE NUCLEAR INDUSTRY THEIR FUTURE EMPLOYERS WOULD HAVE TO TAKE OVER THE TASK, AND ABSORB THE COSTS, OF ACCOUNTING FOR DOSES FROM PREVIOUS INTAKES.

IMPLICATIONS OF ANNUAL DOSE APPROACH

- ALSO, CURRENT DOSES FROM INTAKES INCURRED DURING PREVIOUS EMPLOYMENT WOULD LIMIT THE ADDITIONAL DOSE THE WORKER COULD RECEIVE ON THE NEW JOB, PERHAPS TO THE POINT THAT THE NEW JOB WOULD BE JEOPARDIZED.

RECOMMENDATION

- THE COMMITTED DOSE APPROACH SHOULD BE CONTINUED TO ASSURE (A) CONTROL OF DOSES IS BASED ON TOTAL RISK FROM LONG-LIVED RADIONUCLIDES, (B) THAT THE LICENSEE RESPONSIBLE FOR EXPOSURES DEALS WITH THEM RATHER THAN PASSING RESPONSIBILITY ON TO FUTURE EMPLOYERS, AND (C) THAT THE EMPLOYEE'S FUTURE EMPLOYABILITY IS NOT JEOPARDIZED.

SPECIFIC ACRS COMMENTS

- ALLOW USE OF ANNUAL DOSE CONTROL IN LIEU OF COMMITTED DOSE.
- ANALYZE HEALTH EFFECTS OF DISCHARGE OF EXCRETA FROM MEDICAL PATIENTS TO SANITARY SEWERS.
- EXEMPT SMALL QUANTITIES OF RADIOACTIVE SOURCES FROM SECURITY REQUIREMENTS.

SPECIFIC ACRS COMMENTS

- MONITOR ONLY THOSE TRANSPORTATION PACKAGES HAVING WARNING LABELS FOR EXTERNAL RADIATION.
- MODIFY CERTAIN DEFINITIONS.

SUMMARY OF BENEFITS OF PART 20 REVISION

- Conformance with 1987 revised Federal Guidance on occupational protection.

- Consistency with national and international radiation protection standards.

SUMMARY OF BENEFITS OF PART 20 REVISION

- NEED TO UPDATE TECHNICAL BASES FOR INTAKE AND CONCENTRATION LIMITS.
- INCORPORATES MANY YEARS OF EXPERIENCE IN IMPLEMENTING RADIATION PROTECTION UNDER CURRENT PART 20.
- EXPLICIT DOSE LIMITS FOR MEMBERS OF PUBLIC.

11/10/88

SCHEDULING NOTES

TITLE: BRIEFING ON FINAL RULE ON STANDARDS FOR PROTECTION AGAINST RADIATION - PART 20

SCHEDULED: 10:00 A.M., THURSDAY, NOVEMBER 10, 1988 (OPEN)

DURATION: APPROX 1-1/2 HRS

PARTICIPANTS:

ENVIRONMENTAL PROTECTION AGENCY (EPA) — 5 MINS

- J. WILLIAM GUNTER, DIRECTOR
  CRITERIA AND STANDARDS DIVISION

OTHER ATTENDEES:

- ALLAN C.B. RICHARDSON, CHIEF,
  GUIDES AND CRITERIA BRANCH

NUCLEAR INFORMATION AND RESOURCE SERVICE — 5 MINS

- DIANE D'ARRIGO

GE NUCLEAR ENERGY — 5 MINS

- PAUL STANSBURY,PH.D.

NUMARC — 5 MINS

- JOE F. COLVIN
  EXECUTIVE VICE PRESIDENT AND CEO

EDO — 45 MINS

- VICTOR STELLO, JR.

RES

- BILL MORRIS

OTHER ATTENDEES:

- ERIC BECKJORD, RES
- RICHARD CUNNINGHAM, NMSS
- HAROLD PETERSON, RES