Transcript of Proceedings

UNITED STATES OF AMERICA

PRESIDENT'S COMMISSION ON THE ACCIDENT AT
THREE MILE ISLAND

DEPOSITION OF: ROBERT E. ALEXANDER

Bethesda, Maryland

August 13, 1979

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DEPOSITION OF: ROBERT E. ALEXANDER

Room 218
5650 Nicholson Lane
Bethesda, Maryland

August 13, 1979
2:17 o'clock p.m.

APPEARANCES:

On Behalf of the Commission:

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On Behalf of NRC:

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P R O C E E D I N G S

MR. PEARSON: Okay, on the record. Let's begin with the oath.

Whereupon,

ROBERT E. ALEXANDER

having been first duly sworn was called as a witness in this case and was examined and testified as follows:

DIRECT EXAMINATION

BY MR. PEARSON:

Q. Have you ever had a deposition taken before?

A. Yes, I believe I have.

Q. Okay, I would just like to make you aware that the testimony you give is of the same force and effect as it would be if you were in a court of law. Consequently, if any questions are unclear or in any way incomplete, just stop me and I'll explain or paraphrase or rephrase or whatever is necessary.

A. Okay.

Q. Now let's start with your name and your current job title.

A. Robert E. Alexander, Chief, Occupational Health Standards Branch, Office of Standards Development, Nuclear Regulatory Commission.

Q. Could you tell us quickly what your educational background is?

A. I have a Bachelor's Degree from Howard Payne College in Texas, and I've done graduate work since then.

Q. And what is your Bachelor's Degree in?

A. Mathematics.

Q. And your graduate work?

A. Mathematics and physics.

Q. And where did you go to school for your graduate work?

A. ~~Howard Payne College.~~ Texas Christian University and UCLA

Q. ~~Same place.~~ When did you get your graduate degree?

A. ~~In 1954.~~ I have no graduate degree.

Q. And since 1954 have you taken any further courses or educational training of some sort?

A. Yes, I've taken some courses in mathematics and physics.

Q. Under the auspices of the NRC?

A. No.

Q. Who taught those courses and where were they?

A. They were at Texas Christian University and UCLA.

Q. Okay. Have you taken any courses since you've been with NRC that they have sponsored?

A. I've taken a few very short courses in management development type. Nothing longer than three days.

Q. Since your graduation from college could you just characterize for us quickly your employment history?

A. Yes, I became employed in health physics work immediately at Convair, Ft. Worth. I went from there to -- I was an operational health physicist at Convair. I went from there to Atomics, International, in 1958.

I was a consultant for the United Nations in Indonesia and Greece in 1961 and 1962, and then back to Atomics International until -- where I was Supervisor of the Safety Program until 1968, when I came with NASA Headquarters.

I was Chief of the ~~Ecological~~ Environmental Health Branch there until 1972, when I came with the AEC.

Q. When you came with the AEC in what capacity did you come? What was your position at that point?

A. I was a staff member of the Occupational Health Standards Branch.

Q. And when did you assume your present position?

A. I don't remember the exact date, but it was in 1974.

Q. Okay. I have a document here which you have just given me, entitled, "Robert E. Alexander". Would you identify the document for us, please?

A. Yes, that's a brief resume of mine. It covers the same material I just spoke of.

Q. Okay, is this document accurate to the present time?

A. Yes.

MR. PEARSON: Okay, this will be Deposition Exhibit Number 1.

(The items referred to were marked for identification as Exhibit 1 and Exhibit 2.)

BY MR. PEARSON:

Q Would you characterize for us, please, what your present employment responsibilities are?

A Yes, my responsibilities are the supervision of the Occupational Health Standards Branch, which, at the present time, has ten members total.

Our job is to ensure that workers in NRC-licensed activities are adequately protected from the hazards of nuclear radiation. To accomplish this purpose, we develop regulations, regulatory guides and topical reports.

Q Okay, of the ten members of your staff are you referring to ten professional members?

A No, one is a secretary; that includes a secretary.

Q And the other nine, including yourself, are professionals?

A Yes.

Q Could you characterize what the particular jobs of the professionals are?

A They are all engaged in approximately the same type of activity. It begins with the identification of a problem in radiological health protection, occupational

radiological health protection, the development of a workable and effective solution and then the coordination of this solution with the other offices in NRC and the public and, finally, the issuance of the regulatior guide or ~~new reg~~ NUREG report.

Q Well, do the people, the other professionals in this branch, have other job titles? Or are they simply assistants to yourself?

A No, we refer to them either as health physicists or senior health physicists.

Q So all of them would be in that category?

A Yes.

Q Health physicists or senior health physicists.

A Yes.

Q Okay. Do you have any minimal education or experience requirements for the professionals within your branch?

A No. Most of them either have a PhD or a Master's degree, and since applicants for new positions normally have either a Master's degree or a PhD, I think it might be rare for us to employ someone less than that level these days.

But as far as a minimum criterion is concerned for the branch, none has been officially established.

Q Would it be possible for you to provide us with some statements of professional qualifications of the other

professionals in your office?

A Most certainly.

Q Okay, fine.

A You mean now? Right now?

Q No, not right now, but at some later time.

A ~~Mm-hmm.~~ Certainly.

Q Okay. Let's speak, if we can, for a moment, concerning the types of regulations that your branch works on or generates. How does your regulatory work correlate with that of Mr. Parsont's branch?

A ~~Mr.~~ Dr. Parsont's branch is a fairly new branch, and we haven't had a great deal of time to gain experience in the inter-working relationships. ~~The~~ -- primarily, I think, we ~~depending~~ on his branch for epidemiological work, and work-- and radio-biology work.

So whenever a problem in those two areas arises, we tend to turn to him.

Q Mm-hmm. What kinds of regulations do you write?

A The regulations we work on are primarily 10 CFR Part 19 and Part 20. These regulations pertain to the protection of workers. Not altogether to protection of workers, but most of the regulations that we have, the Commission has, that are intended to protect workers are found in those two regulations.

Q Are there other places where the --

A. Yes.

Q. Where would they be?

A. Yes, in Part 34, regulations pertaining to radiography safety appear. Also in Parts 30 and 40, 50 and 70, regulations applicable to worker protection appear. And occasionally we do work on a rule change in one of the other parts.

But primarily our work is in Part 19 and Part 20.

Q. Do you work on regulations that actually establish permissible radiation levels --

A. Yes.

Q. -- that workers are allowed to receive?

A. Yes, that's our job.

Q. So your office determines what those radiation levels should be in the regulations?

A. Well, in my branch we develop and then coordinate with the other offices the level -- the radiation dose limits that should be recommended to the Commission for a final determination.

Q. With which other offices do you coordinate these recommendations?

A. We coordinate with the Nuclear Materials Safety and Safeguards Office, the Nuclear Reactor Regulation Office, the Office of State Programs, the Office of Inspection and Enforcement, the Office of Research and the Executive -- no,

that's E-L-D --

VOICE: O-E-L-D.

THE WITNESS: Office of --

VOICE: Executive Legal Director?

THE WITNESS: The Executive Legal Director. I believe that's it.

BY MR. PEARSON:

Q Okay. How would you go about considering a rule-making proposal or package? What steps would you take?

A Oh, there's a long answer to that question; I'll be as brief as I can. What you're asking for is ~~the~~ a description or synopsis of the rule-making process. When a problem in occupational health protection that can be solved or helped with a rule change is brought to our attention, we first prepare a value impact statement.

It's a preliminary value impact statement, in which we scope the problem and attach to a task initiation form which is distributed to the other offices to get their concurrence that this is a problem that should be addressed in the Office of Standards Development.

Once the concurrence is obtained, a task leader is appointed, or and given full responsibility for carrying the task through to completion, whether it be preparation of a topical report or the issuance of a regulatory guide or an actual rule change.

The task leader develops a solution, develops alternative solutions, prepares the necessary documents, which might be a Federal Register notice for a rule change or a regulatory guide would be the guide itself. or a report would be the report itself, prepares the associated documents, the final value impact statement.

In the case of a rule change, a Commission paper, which is an executive summary for the Commission. The appropriate letters to the committees, the four committees on Capitol Hill.

A -- I can't remember exactly what we call it right now, but what it is is a news release that's used by the Office of Public Affairs to announce this item. And for the effective or final publication, an analysis of the public comments.

This is all pulled together in one package, and the first time is published for comment. After the public comments come in, the task leader analyzes those, prepares an analysis which shows our reasons for either accepting or rejecting each comment, and changes the guide or the proposed rule in accordance with public comment, and then goes back to all of the offices here within the staff to negotiate their concurrence.

And then we go forward to the Commission for a final vote as to whether or not the regulations shall become

a law.

Q Is that the first time it gets to the Commission?

A No, I'm sorry if I didn't make that clear. Before it's published in the Federal Register for comment, the rule changes do go to the Commission. The guides and reports do not.

They are issued over the authority of the office director for Standards Development, Mr. Minogue. The rule changes, however, do go to the Commission before they're published in the Federal Register, unless they're of a minor--very minor clarifying nature, in which case the Executive Director for Operations has the authority to publish them.

Q When the Commission gets the rule-making recommendations from the staff for the first time, what does it do?

A Well, that varies. If they agree with us fully they simply write the Executive Director for Operations a letter, memorandum, authorizing the publication in the Federal Register.

If they have questions that they want resolved before their final vote or determination, a memo to that effect will come, and we have to develop an additional paper to resolve these questions.

Or they may simply decline our recommendation. They may choose an alternative other than the alternative we recommended, in which case we have to rewrite the Federal

Register notice.

In one case I recall -- this wasn't the Nuclear Regulatory Commission -- but I think it's apropos to your question. It was the Atomic Energy Commission, but the Nuclear Regulatory Commission could do the same thing.

One rule change that was recommended to the Commission, the Commission contracted with some additional scientific personnel outside the NRC staff, changed the regulation based on recommendations from those scientists significantly, and then published it as an effective rule.

So there's quite a variety of things that can happen once we make our recommendation to the Commission.

Q Can the Commission, at that point, simply determine that the staff recommendation is wrong and indicate there should be no more rule-making consideration for this matter?

A Yes.

Q And that would then constitute a denial of the petition which may have started the rule-making proceedings in the first instance?

A Yes, if it was a petition. But that -- in that case it would be a denial. Another possibility that has happened to us that I didn't mention was simply to do nothing.

The Commission isn't constrained to act. And I

have one rule change that's been before them for about three years that they've never acted on.

Q What rule change is that?

A That's the rule change on -- to protect the embryo ~~in~~ or the fetus from radiation.

Q You have no word as to why they haven't acted on that package?

A No, the memorandum that we have from the Commission simply states that the Commission has taken this rule change under advisement, and we haven't heard from them since.

Q Is it the Commission's task, at that point, to determine whether to go forward or to determine whether the regulation in the recommended form should be published in the Federal Register?

Is that the two options the Commission has?

A I don't believe I understand what you mean by "go forward".

Q Go forward into the Federal Register.

A Oh, to be published in the Federal Register; yes. The Commission's determination is whether or not to authorize the publication of the rule change for comment, or to authorize its publication in effective form.

Q Would the Commission, at that point, ever order hearings?

A Yes.

Q What kind of hearings would they order, and under what circumstances, if you can answer that?

A I'm not the best one to ask that question to, because in my experience, since 1972 here, in the Occupational Health Standards Branch, we've never held a hearing. We are right now in the process of holding the first one that I will have been directly involved in.

That is to be a joint hearing with EPA and OSHA on the subject of the adequacy of occupational dose limits that are now being used in this country. And the Commission-- in this case, the Commission did direct us to arrange for this hearing.

Q Is this in response to the NRDC petition?

A That's how the whole thing arose; it was the staff's response to the NRDC petition, which was submitted some time ago to the NRC.

Q Normally, then, after the Commission would give its okay to place a particular recommendation into the Federal Register, the remaining steps would be to secure the public comments, to analyze them and then to announce in the Federal Register the promulgated version of the regulations.

A Yes.

Q Would the Commission get a second look at the regulation after the comments are in and analyzed?

A. We normally include in the first Commission paper--by "first Commission paper" I mean the paper which requests authority to publish the proposed rule for comment.

We have a statement which says that if no substantive comments are received we will go ahead and publish the rule in effective form without coming back to them. So at the time that that statement is presented in the staff paper, at the time the Commission votes on a proposed rule, they might very well be voting on an effective rule.

So they take it very seriously. And that statement, normally, is there. In my experience, I don't remember any case where we ever failed to get substantive comment, so we've always, in my experience, gone back to the Commission with an effective rule, explaining to them how we handled the public comments.

Q. Rule-making begins, I take it, either by a petition from an outside party, or by some initiative within the NRC; is that accurate?

A. I think we've had requests for rule-making, I'm sure we have, which did not constitute a petition. We've had what might be called suggestions from people outside the NRC that we have examined and have, at times, accepted the suggestions and gone ahead then on our own initiative to start a task.

Q. To your experience, has your branch ever initiated

rule-making proceedings without some suggestion or petition from outside persons?

A. Yes, most of them.

Q. How many, on an estimated number, have you initiated? How many rule-making proceedings?

A. Well, that would be difficult to say. I could go back through our records, but we carry at all times on the order of eight to 12 rule-making tasks. We finalize anywhere from two to six per year, and I'd say that certainly 75 percent of those are -- the idea for the task was initiated within my branch.

Q. What kinds of factors prompt you to initiate a rule-making package?

A. There are several. If we feel that an area of occupational radiation protection needs strengthening in some way. For example, health physics measurement accuracy is something we're placing a great deal of emphasis on.

Making the occupational ALARA concept inspectable and enforcible is something we're placing emphasis on. And when we identify a problem of this nature, and as soon as our schedule will permit, we do initiate a rule change to effect an improvement.

Q. Would it be fair to say that your in-house analysis of the regulations in place are often the basis upon which new rule-making procedures are begun?

A. Well, I wouldn't put it exactly that way, because it's an analysis of the existing rules in comparison with health physics practices and the effects of the application of these in the workplace combined, which lead us to the initiation of a task.

Q. Once you've decided to proceed with the particular rule-making package, for example, with respect to a permissible radiation level, what kinds of factors do you consider in making the proposals you make or in reaching the decisions that you reach?

A. Basically, we consider two types of risk, and then other considerations spring from those two basic ones. We consider, first, the risk to the individual, and compare that risk as best we understand it with risks that are accepted in other, safer industries.

But we also -- the second, we also take a hard look at a second type of risk, which is the risk to the worker population. In other words, we look at both the individual dose and the collective dose,

The collective dose being the total dose to an entire worker population. ~~The~~ -- both considerations bear heavily on the selection of a numerical dose limit. The objective is to have the individual risk as low as we can get it, without raising the collective risk.

Unfortunately, the only way to reduce the overall

risk, whether it be to the individual or to the population, is to reduce the radiation levels in the workplace, or to reduce in some manner the amount of time that a person has to be exposed to these levels, or a combination of both.

That's the only way you can actually reduce the amount of radiant energy absorbed by human tissue, and that is the only way you can reduce the risk.

Now at a certain level that becomes extremely expensive, to the point where -- you can reach a point where it becomes so expensive that it would appear imprudent to continue the operation.

What we have tried to do in our analysis of the dose limit question is to determine at what point the collective dose would be -- would rise considerably above what it is now with the dose limits we're using.

And it's very difficult to determine, but from data that we've received, primarily from the industry, since they are the only ones who have these answers, it would appear that the -- though the individual dose limit could be reduced to somewhere on the order of two and a half rems per year, and below that then the collective dose starts going up rather dramatically.

Q. Mm-hmm.

A. For example, three analyses we have from the industry of what would happen if the Commission were to grant the

NRDC petition and reduce the present dose limit by a factor of ten, one analysis indicates that the collective dose at that particular plant would go up by a factor of 4.5 or 450 percent.

Another one indicates a 90 percent, as I recall, increase. And the third one indicates a 20 percent increase. We don't know whether the 20 percent or the 90 percent or the 450 percent number is right.

But what we do know is that whatever the number is, it would be very costly if these dose limits were reduced, and if the result were an increased risk rather than a decreased risk, then all of that expenditure would not only be wasted, but it would be invested as it were in radiation-induced cancers.

We're not very anxious to do that.

Q. Well, when you indicate that a particular regulatory switch may be costly, what role do costs play in your final decision-making?

A. At the present time, and I hope it continues that way, we are not using a dollars-per-man-rem criteria in occupational health protection. The way our Appendix I to Part 50 does for reactor effluent controls, ~~and~~ if you're familiar with that one, the criterion is $1000 per man-rem, and if a particular effluent clean-up system would result in a cost of less than $1000 per man-rem, it is required.

If the cost is more than $1000 per man rem, it's not required. ~~We~~ -- We do not use such a criteria in occupational health protection at the NRC for four, what I consider to be very good, reasons.

I hope we never do. I don't know whether you want to get into --

Q Briefly.

A -- those or not. All right, I'll be as brief as I can. First, to use the dollars-per-man-rem criterion, inextricably associates your thinking, ~~of~~ or the thinking of the NRC or the government, with the value of a human life.

For example, $1000 per man rem-means approximately $10 . llion to save a human life. A hundred dollars per man-rem means $1 million; $50 per man-rem, $500,000. Most of us would prefer to avoid associating dollars with the prevention of fatal cancers.

The second problem has to do with hazard pay. We think that once the government establishes an occupational dollars-per-man-rem value associating so many dollars with one rem, that the labor unions will demand hazard pay ~~appro-~~ accordingly, ~~priately.~~

So many extra dollars for so many rems received. When that happens, the worker tends to be less cooperative about saving his dose, and most -- many of them want the dose, in order to get the money.

The second disadvantage here is that employers tend to substitute pay for safety measures, when the pay is cheaper than the safety measures. Okay, that's the second reason.

~~The~~ -- let's see, the third reason is that over the past 30 years or so employers have voluntarily accepted ~~that~~ (you can almost say that they do so historically) ~~now~~ certain safety features, which, ~~if they accept these voluntarily, and~~ if they were subjected to any reasonable dollars-per-man-rem criterion (and, incidentally, I think the criterion would be somewhere between $50 and $100 per man-rem)

~~But even if it were $1000 per man rem,~~ many of these safety measures couldn't be justified, that are already being provided. And so you would have the federal government taking official action to reduce the degree of safety provided in the workplace.

The fourth reason, which is the most important, is that in making a determination on a dollars-per-man-rem basis, as to whether or not to provide a safety feature, you have to first calculate the cost.

Well that can be done in a fairly straightforward manner that most people would accept. But then you have to calculate the number of man-rems that will be saved in order to get the ratio of dollars per man-rem.

Q Mm-hmm.

A And then with some trial calculations we've done in my branch, we've determined that you can very readily make assumptions in the calculation of the number of man-rems to be saved which can make that answer come out any way you want it.

So even if we had a regulation like that, it would have virtually no effect on the licensees, because they could make their analyses -- they could decide beforehand whether or not they wanted to provide the safety measure, and then make their analysis come out that way.

We don't think that's any way to regulate an industry. So we're against it.

Q So you said the NRC is moving away from that concept?

A Well, I said the staff is. I can't really speak for the NRC. I'm hoping that they won't force that down our throats.

Would you like for me to explain what we are moving toward?

Q Yes.

A I don't want to leave a vacuum here.

Q That was the next question.

A That's the next question. Okay, we feel that the occupational ALARA concept is the answer. We feel that what the Commission needs to do is to establish teeth in the

occupational ALARA concept, to make the concept both inspectable and enforcible through regulation changes that we have before them right now.

We feel that the criteria to be used -- it might be described as the best state of the art criteria. That is, for the safety -- instead of looking at dollars we would look at safety measures.

And those that have been successful -- already been and are being successfully used by licensees, we would accept that as prima facie evidence that they're cost-effective, or else they wouldn't -- probably wouldn't be using them, but we're not making them use them.

We only make them meet the dose limits, not -- now we're talking about maintaining levels lower than the dose -- the regulatory dose limits.

Q ALARA only applies to making levels lower than what --

A Yes.

Q -- are the established levels within the regulation?

A Yes.

Q Okay.

A So that we want to require in the regulations that licensees develop their own occupational ALARA programs, and we want in most cases to incorporate those programs into their license, so

they become like individualized regulations for that particular licensee, based on his situation,

And to use ~~this~~ a criteria in our evaluation of ~~our~~ his program the best state of the art technology in occupational radiation protection.

Q In this scheme, would you have minimum standards for ALARA programs, for facilities? And if a plant didn't move far enough in that direction it would not be licensed?

A Yes, we would do that through the regulatory guide procedure. Now that doesn't mean that a license reviewer would be close-minded. If we had listed a best state of the art technique in our regulatory guide for a given type licensee, and then he could come forward with an alternative measure that he felt in his particular case was just as good or better, then I'm certain our reviewers would accept it.

Q Did you take into account the financial solvency or strength of the particular utility in determining what would be an ALARA level for that utility?

A I really don't know; I have no basis for answering that question.

Q Let me ask you, back-tracking for a minute, you indicated that you are considering both the individual dose and the collective dose to the worker population. When an individual dose limit is promulgated by the NRC, is the NRC, by that act, stating that it believes that exposure of

an individual to this amount of radiation will cause no adverse health effects?

A. No.

Q. Okay, what is the NRC stating to the world when it passes an individual dose limitation?

A. I can't speak for the NRC, but I think I can answer that question as a representative of the NRC staff, and in answering that question I'll be telling you the sort of words and ideas that we would be presenting to the Commission in trying to influence their decision or help them with their decision.

We accept as a policy what is called the "linear, non-threshold dose effect curve", which states that there is no cut-off point below which there is no hazard. Or, stated another way, that there is some hazard all the way down to zero dose, and that the probability of experiencing an effect is reduced as the dose goes down, but the probability doesn't become zero until the dose becomes zero.

Q. So, ideally, you would like to see a zero dose.

A. Yes, but of course that would detract from the usefulness of nuclear materials and reactors.

Q. Right --

A. So what we try to do is select a point somewhere on this curve which would -- which, if received year in and year out by a worker, would create for that worker a risk

similar to the risk accepted in the safer industries in the United States, such as manufacturing.

Now this attempt suffers somewhat from the fact that radiation-induced cancer and genetic effects are not directly comparable with accidental death. For one thing, in industry the accidental deaths occur to people much younger than ~~the~~ those who might experience radiation-induced cancers.

Because of the latent effect, it can be 20 years or more for cancer to appear at the advanced stage, whereas these accidental deaths tend to occur to younger people, to younger men.

So the number of years of life lost is much greater in industry than it is for the radiation-induced cancers. That's not true of other industrial diseases, but we simply don't have the data for other industrial diseases on which to make our comparison.

So we're almost limited by circumstance to making our comparison with accidental deaths, and that's what we do.

Q. How complete is the data on accidental deaths?

A. Those data are very complete.

Q. Is there -- can you quantify, as a number, the risk that employees in the manufacturing industries have for an accidental death, which is then the number to which the radiation standards that you promulgate are compared? Do you

follow my question?

A. Yes. I don't believe I can recall those numbers. I have them at my desk. I do recall the number for mining and quarrying, which is I believe the most dangerous, most hazardous -- one of the most hazardous.

There are some -- there are a few that are more so, but that is one of the most hazardous, and I recall the data indicate that about six people out of 100 who work at that sort of thing will lose their lives on the job due to an accident.

Q. Six people out of 100. I would imagine on the manufacturing side you get quite a bit of --

A. I think it's almost a factor of ten lower than that, but I'm sorry I can't remember the numbers.

Q. But I would think that on the manufacturing side of the balance sheet you get quite a bit of different conflicting data as to the risks that different industrial activities present to workers.

How do you take that data and combine it, for comparison purposes?

A. Well, we don't do it quite that analytically. We will take a table, such as those published by the National Safety Council, where they list by occupation the accidental death rate.

They usually do that, I believe, per 100,000 people.

Q Mm-hmm.

A Now for radiation, the risk factor is approximately ten to the minus four, which means that 10,000 people -- if 10,000 people receive one rem each, that one of them ~~is likely to~~ may die of radiation-induced cancer.

So that's a fairly low risk. If you multiply that by five, i.e., get up to five rems per year, and then by 50, for a 50-year life span, you get to a much larger number (250). It turns out that the number of rems that a person can receive under those conditions is 250 rems in a lifetime.

Most of us consider that to be too much radiation. We wouldn't want to receive that much. We wouldn't want anybody to receive that much. The amount of radiation that people are actually receiving lifetime is about 1/10 of that.

So that the limits, where they're set right now, seem to be working, creating a safe occupation, except for a very few people. Now what we're concerned about is that very few people, as more and more of these power plants come on line, they start growing to a larger number of people.

And I think we're going to have to very carefully watch that situation as time goes by. Right now, even at the reactor power plants, the average dose per year is only about 7/10 of a rem, so that the average worker is very well protected, in comparison with other industries.

There are a few people that are getting -- by

"few" I mean several hundred, who ~~are bringing~~ -- are getting much more than 7/10; it's closer to five rems per year.

And even a few that get more than that, under our dose-averaging formula --

Q You mean this will just occur statistically?

A Yes.

#1 end ph

Q Okay.

#2 ph

A So I believe I've given you a fairly complete answer of our analysis of the dose limit question. Of course, ~~we~~-- it's been the policy of the NRC and its predecessor, the AEC, to comply with the guidance of the Federal Radiation Council, whose authority now resides with the EPA.

The EPA is currently reviewing occupational health protection standards, and will issue new guidance in the future. And I feel it's very safe to say that the NRC will almost undoubtedly follow that guidance, when it is issued.

We contribute to their deliberations.

Q In what way?

A They have formed an Interagency Committee, Advisory Committee, to work with them and advise them in the development of their guidance. I am the representative for the NRC, and have been ~~to,~~ ever since this review started several years ago; I've been to almost all the meetings.

Q Okay. Then you have a good sense of what they're coming out with and when they will come out with it?

A. I have a yes to the first question; no to the second.

Q. Okay. What about the sense that you have with respect to what they're going to come out with?

A. Well, would you like for me to review that very briefly?

Q. No, we can get that from another source.

A. Okay.

Q. But I would just like it for general information. Do you think the standards that they're going to come out with are going to be roughly analogous to the ones in place now by the NRC, or will they constitute a major shift from the present standards?

A. I think in the case of -- let me divide my answer into two parts: one dealing with external radiation protection and the other dealing with protection from airborne radioactivity, which would be a source of internal exposure.

In the case of external exposure, the guidance that they are leaning toward right now in the EPA would not be a dramatic change in present practices. In the case of internal dose protection, for several radio-nuclides, their guidance would result in standards for concentrations of radioactive material in air that are much lower than we are presently using.

Q. Do you have any documents or memoranda or criteria

that describe essentially what you've described for me thus far with respect to how -- what factors are considered when you are promulgating standards?

A Yes, I believe almost every statement I've made is referred to in the SECY 78-415.

Q Okay, would it be possible for us to get a copy of that?

A Yes, I have it immediately.

MR. PEARSON: Okay, great, let's identify that as Number 3 for the deposition, SECY 78-415.

(The item referred to was marked for identification as Deposition Exhibit 3.)

MR. DIXON: What was Number 2?

MR. PEARSON: That was the statements of the professional qualifications of the persons within your branch, in Mr. Alexander's branch.

THE WITNESS: Incidentally, did you want a general statement or a statement for each individual?

MR. PEARSON: I'd like a statement for each individual, if possible.

THE WITNESS: Okay.

BY MR. PEARSON:

Q You indicated before that you take both individual and collective doses into account.

A Yes.

Q Is that because you are not absolutely -- well, let me see if I can phrase this right to see if I understand it completely. As I understand it, you would believe that the individual dose limits that you promulgate represent a reasonable occupational risk for employees of commercial energy production facilities, nuclear reactors.

But you realize that the greater number of people that are exposed, even to this reasonable risk, would result in a greater number of cancers in the population. And, hence, for that reason, you also consider the collective dose, the number of employees that would be exposed, as part of your decision-making.

A I believe I may have led you astray just a little bit, if I'm guessing correctly, based on what you just said. You see, the main consideration for the collective dose is as follows: the individual dose limits can be met by a licensee without doing anything to reduce the risk, merely by bringing in extra workers he can comply with the individual dose limits.

Q I see.

A To the extent that that is done, the risk isn't reduced at all, and may ever be increased, as we discussed before, by large factors. So the only way to limit the risk is to limit the collective dose, and then, with the

collective dose objective or limits, you can't meet those by bringing in additional people.

The only way you can meet those is by reducing the dose rates or reducing the working times or both, that is reducing the risk.

Q All right, now, if -- would there be situations when your collective dose rate would allow an increase in the individual dose rate?

A No.

Q No.

A No, the individual dose rates are fixed, and not subject to being raised.

Q So the collective dose rate is, as I understand it, then, placed in the regulations in order to ensure that some change is made to limit the amount of radiation you --

A Well --

Q --for people is limited.

A There are no collective dose limits in the NRC regulations.

Q Well, then, I'm confused.

A I said that we considered the collective dose in establishing our recommendations for individual dose limits.

Q Okay.

A And while there are individual dose limits in the regulations, no mention is made of the collective dose

limit.

Q So then how -- you've indicated the possibility that a utility could simply run in more and more employees.

A Yes.

Q Is there anything in the regulations to prohibit that?

A None, no.

Q Do you consider that a shortcoming?

A Yes.

Q Is there anything being done within the NRC to change that particular regulatory posture?

A Yes. We will submit very soon a recommendation to the Commission on the concept of occupational ALARA, a rule change to make occupational ALARA inspectable and enforcible.

That's the rule change I mentioned to you, which would require individual occupational ALARA programs. We will issue, for each type of facility, if the Commission goes along with us, a regulatory guide, which talks about the appropriate content for these ALARA programs.

One of the things that will be recommended in these guides is the establishment of collective dose objectives.

Now these collective dose -- now this is not a particularly strong move on our part; this is our first venture in the area of any sort of collective dose limits.

We would simply be telling our licensees, "You should, as an annual procedure, establish collective dose objectives in your plant and try to meet ~~it~~ them, and to the e ent that you don't meet ~~it~~ then, our inspectors will be talking to you about why, and what can be done to -- why you didn't meet ~~it~~ them and what could be done to meet ~~it~~ them next year."

But ~~that~~ dose objectives would not be in the regulations, ~~and they would not --~~ they also would not be in the license, so that a licensee who failed to meet his objective could not be cited by the NRC.

Q Oh, is there any move afoot to place collective dose limitations within the regulations, or in some more enforcible form?

A Well, I have personally advocated that, but I haven't been able to develop any appreciable support. So, other than just those efforts on my part, I can't say that there is any general movement by the staff in that direction.

Q Okay. Let me just make sure I have one point clear. When the existing individual dose rates that are contained in the regulations were considered, when other dose rates have been considered, have collective dose limitations been part of that decision-making process?

Has that been --

A Do you mean when Part 20 was first written?

Q Yes.

A. My impression is that back in the fifties, when those dose limits were first established, that much less consideration was given to collective dose, ~~to that problem,~~ and that the risk to the individual was the primary consideration at that time.

Later on, in more modern times, the dose -- the old dose limits have been evaluated, in terms of their effect on the collective dose.

Q. I see. And are the old limitations still in force, however?

A. They are -- it depends on how far back you go. They haven't been changed since I believe 1959. The external dose limits for the whole body are really three rems per quarter.

~~Now~~ I'm talking now for the ICRP and the NCRP. Their recommendations are three rems per quarter, with a lifetime limit of five years for -- pardon me, five rems for every year beyond the age of 18.

Q. Okay. But that's basically an individual dose; you didn't take into account collective -- you said --

A. I think collective dose played very little -- had very little to do with the establishment of those --

Q. Mm-hmm.

A. -- of those limits.

Q. How would one, if you can answer this in some way

that a layman could understand it, how would one reconsider an individual dose level in terms of the collective dose implications that it would have?

A. I had reference to that a moment ago, and in my opinion the way that should be done is that the individual dose limit should be made as low as you can get it, without increasing the collective dose.

Q. And how does one make that determination? How do you know when the cut-off point will be that the collective dose would increase?

A. Unfortunately, we're limited to data from our licensees. They are the only ones that have the information. We can't sit here and come up with those data. They are the only ones who can tell us when the collective dose would start going up and how much it would go up if we lowered the dose limits.

The information that they've provided for us so far indicates to me that the collective dose wouldn't start going up appreciably until the individual limit got below two and a half rems per year.

But it goes up very fast, very rapidly as you get to smaller dose limits.

Q. Let's switch the subject for a minute. When you are fashioning dose limitation regulations or other regulations, what is your interrelationship with the Occupational Safety and Health Administration, if any?

A. We have some contact with them. They have, in their regulations for the radioactive sources that they regulate, tended to use Part 20, with very few modifications, ~~in their regulations.~~

And we make an attempt, whenever a major change to Part 20 is coming along, to coordinate with them. And, in addition to that, we participate with them on various committees that affect radiation protection, such as the Advisory Committee to the EPA.

Q. Do you have any standard procedures for involving other agencies in your rule-making process?

A. We really don't, other than inviting them to comment at the same time the public is invited to comment. Unless, for a particular reason, there is a particularly important or sensitive area where we feel, on an ad hoc basis, that special coordination is indicated.

Q. Okay. What kind of work has the NRC done over the past, say, ten years with respect to studying the health effects of ionizing radiation?

A. I believe there are only two ways to do that. One is epidemiological study of human experience, and the other is the irradiation of animals. I believe that -- now, let's see, your question -- you want to go back ten years, which is somewhat past the beginning of the NRC.

I don't suppose you'd consider changing your

question to include the NRC only, because if you want to know about the AEC's work, I'm certainly not the best qualified ~~to do it.~~ person to ask.

And if you go back ten years you're going to be including about six years of AEC work.

Q. Okay, let's go back to the beginning of the NRC.

A. Okay.

Q. See how you feel there.

(Laughter)

A. That I'm much more comfortable with. We haven't funded any epidemiological work, as yet, although probably from talking to Dr. Parsont you found out that we are beginning to get into that.

As far as animal studies are concerned, ~~the only~~ -- there may be animal studies that I don't know about, but the only two animal studies that I know of that our Research Office has funded are one study to investigate the effects of what are referred to as "hot particles".

These are very, very tiny particles that are intensely radioactive that can be deposited in the lungs, and the effects are not as well understood as for other types of radiation.

We have funded a study of hot particle effects at the Loveless Foundation.

Q. Is that study now complete?

A. No, it's still in progress.

Q. And when was it funded, roughly? What year or month, if you know?

A. ~~I believe -- I would --~~ I'm not sure, I think around 1975 was when the work started. The only other one involving radiation of animals that I know of is one being done for me at the University of Rochester, to study the effects of uranium principally on the bone and kidney, due to exposure to ~~UO2-F2~~. UO_2F_2.

Q. And what is that?

A. Well, when uranium hexafluoride, which is a ~~gas,~~ gaseous form of uranium used in the enrichment process, when it becomes airborne it hydrolizes almost immediately to a chemical ~~formula~~ compound referred to as ~~UO2-F2,~~ UO_2F_2; it is a highly soluble form of uranium.

And its behavior, or metabolism, in the body isn't as well understood as other compounds. ~~And~~ I've been uncomfortable with that, because we have a regulatory guide on bioassay for uranium in which we had to simply state that this guide does not include consideration of ~~UO2-F2~~. UO_2F_2.

~~So~~ We instigated these animal studies to try to get some answers, so that when we revise that guide we can give recommendations for bioassay for ~~UO2-F2.~~ UO_2F_2.

Q. Do you see a need --

A. That's bioassay, B-I-O-A-S-S-A-Y, that's one word.

Q Do you see a need for further investigation by the NRC with respect to the health effects of ionizing radiation?

A Yes, I think ~~that there are --~~ that other questions will arise in addition to the one I just described for UO_2F_2, ~~UO2-F2~~, questions that, unfortunately, I can't sit here and predict right now.

And I also believe that a certain amount of epidemiology should be done. I am very skeptical that any definitive results will be available to us for the very low doses that apparently many people insist be investigated in these epidemiological studies, because even ~~at the most pessimistic,~~ using the most pessimistic risk factors the incidence of radiation-induced cancer is so near or so small compared with the incidence due to other causes that I don't think they'll be able to see any difference, even if it's there.

I would think that the epidemiological studies should be restricted to people who are getting very significant occupational radiation exposures, exposures near the dose limits.

I think if they were followed very carefully, and if the risk factors we're using are not sufficiently conservative, that would be discovered.

Q So is it your view that studying the much lower

exposure levels is not a worthwhile task, because you probably wouldn't have reliable study results anyway; is that what you're saying?

A. That's what I'm saying. I'm not an expert in that area, so I doubt if my testimony there would account for much in most people's minds.

Q. No, but your impressions are certainly much more knowledgeable than ours. Okay.

A. What I'm saying is that if the results from the studies of people who receive these very low levels of radiation, if certain statisticians ~~come on in and~~ say, "We don't see any", I think they usually refer to them as "~~extra~~ excess cancers","the number of ~~extra~~ excess cancers is not statistically significant", I don't think that a statement like that from those epidemiologists will satisfy anybody's curiosity as to whether or not those low levels cause cancer.

Q. Mm-hmm.

A. And we'll be essentially at that time where we are right now, wondering whether those low levels cause cancer or not.

Q. Do you foresee any time in the future when studies--

A. No.

Q. -- could be at all effective?

A. No.

Q. In addition to working with regulations that

establish dose limitations, what other kinds of regulations do you work with?

A Well, the dose limitations are a -- the limitation work is really a small part of the -- what should I do? Give you some examples of regulations and some examples of the regulatory guides?

Q Well, let me just see if --

A I could give you a ~~little collection~~ list of items that we have been working on and are working on for inclusion in your record.

Q Okay, let's do that; that would be helpful.

A Okay, I have that available in my desk right now.

MR. PEARSON: Okay, we will make that Identified Exhibit Number 4, how shall I describe it? A synopsis of types of regulations with which you are now concerned.

THE WITNESS: Types of work.

MR. PEARSON: Types of work?

THE WITNESS: Yes, that's what you asked me. You said other than --we have guides and the topical reports that we're working on.

MR. PEARSON: Okay.

(The item referred to was marked for identification as Deposition Exhibit 4.)

BY MR. PEARSON:

Q. Let me see if I have this clear in my own mind. You would work on, for example, some regulations that would establish radiation limits or doses that would be permissible and would you also, then, put in place regulations with respect to the operation of a commercial reactor or a commercial energy-generating facility to assure that those dose limitations would not be exceeded?

Would you work on regulations of that sort?

A. Probably not. Historically, the way we have worked is to establish, in Part 20, the basic standards for radiation protection, and then to establish in the other parts, such as Part 50 for reactors, any requirements of a systems or facility nature that are necessary to comply with Part 20.

Normally, my branch does not get involved in the latter.

Q. In the Part 50?

A. In the Part 50 type work.

Q. Which branch gets involved with that?

A. Well, that involves, as I understand it, several different branches. We have, in our own office here, three branches that are engineering-type branches that I believe get involved in setting that sort of standard.

And then ~~in~~ the reactor licensing office, NRR, ~~they~~ gets involved very deeply in the review of the various systems, ~~and where~~ when the licensee comes forward and says, "We

wanted to comply with the regulations using this system ~~with a system that does this~~", those people have to review it and decide whether or not they can believe the licensee.

Q Oh, I see. But even in Part 20, for example, there will be some regulations with regard to placing warning signs and --

A Yes.

Q -- restricting areas of that sort.

A Yes.

Q Would you be involved in those regulations?

A Oh, yes.

Q How would you make a determination of that sort with respect to restricting areas; is there any criteria that you follow? Or is it more a common sense judgment?

A No, the restricted area is very carefully defined in Part 20. That is the area inside of which the licensed activity is to take place. ~~And~~ we have it very carefully defined, and we have a graduated scale of requirements that must be met by the licensee inside that restricted area, depending on the degree of hazard.

If there's very little hazard, draining may be the only requirement, for example, a small amount of draining. The draining is to be commensurate with the hazard.

Q Mm-hmm.

A If there's a little more hazard we require posting

of radiation areas inside the restricted area. If the hazard is a little greater we require the use of a dosimeter to measure the dose.

Then adding on routine surveys, using radiation-detection equipment, air sampling, bioassays, alarm systems, on and on and on, depending on how much hazard is present inside the restricted area.

Q. And this decision would be made on a case-by-case basis for each facility?

A. Yes, ~~they~~ applicant's are required to describe what they're going to do and how they're going to comply with what we call our performance requirements in Part 20; how they're going to do that.

And we do issue regulatory guides to tell them one way of complying. If they'll do it this way they're guaranteed acceptance. But they don't have to do it exactly that way; they can describe another way --

Q. I see.

A. -- which we will review.

Q. The restricted area, you said, is the area in which the licensed activity takes place.

A. Yes.

Q. Would that generally be the area of the site over which the utility has control?

A. Yes.

Q Would the unrestricted area, then, generally be the area in the vicinity of the plant which would be occupied, perhaps, by the public?

A Yes. The unrestricted area is, for example, ~~that~~ The fence around the plant, ~~the unrestricted area is~~ all the area outside of ~~that fence~~; the restricted area is everything inside the fence.

Q Okay, now in Part 20 there are different dose limitations for exposures within the restricted area than for exposures within the unrestricted area. What's the rationale for having different exposures in those two areas?

A The principal rationale is degree of control. Within a restricted area, we specify what's to be therein, how things are to be done, how things are to be controlled. And we feel that the levels that have been recommended as being comparable with other -- we've gone over this -- with other industrial risks can be allowed, with that degree of control.

Outside the restricted area we have no real control. The only thing we can do is to limit the effluents that are released, and the radiation levels at the boundary of the restricted area.

The second reason is that --

Q Let me stop you for a second. You're saying that it's the state of the art, then, that inside you control up

to the level that you possibly can, and outside you can control it more so, so the limitations would be less; is that accurate?

A. No, that's not what I meant to convey. I meant to convey that ~~it's~~ — we think it's safe to allow the higher limits on the inside, because we can prescribe the safety measures that are to be taken to make sure it doesn't go even higher.

Q. Okay.

A. Whereas outside the plant, in people's homes and so forth, we can't prescribe any safety measures. We don't even require them to wear dosemeters or anything like that. The control isn't there.

So to compensate for that lack of control we impose safety measures on the licensee, so that he cannot create outside that fence the same dose levels that he can create inside the fence, where he does have the control that we've prescribed.

Q. Okay, you confused me at the very end there. It's like a safety factor. There's less control in the unrestricted area --

A. Then you have the safety factor --

Q. -- then you'd lower it. And so even if there were some mistakes made, the levels of exposure in the unrestricted area would not exceed the occupational restricted area

levels; is that a fair characterization of what you're saying?

A. I'm not sure I followed you.

Q. Okay, let me try again.

A. I'm not sure what it --

Q. Okay. The unrestricted area has a lower dose limitation because you don't have any control over that area; correct?

A. Much less control.

Q. So you can't measure what the exact day-to-day exposure to that area will be.

A. Yes.

Q. But it would be your thinking that by setting the level low, that even if there were some exposures in excess of the low unrestricted level, that exposure would not reach any unsafe degree.

Is that -- I'm trying to characterize what you are saying. Is that not right?

A. I suppose that's about right.

Q. Is it wrong in any way?

A. Well, I'm not sure.

(Laughter)

Let me follow up on that a little bit more. The second reason for restricting the degree of hazard in unrestricted areas more is that it's populated with very

young people and very sick people.

And still a third reason is that the exposures inside the plant are accepted voluntarily, whereas in the public they're involuntary.

Q Okay, I'd like to address the question of voluntary exposures. Does the NRC have a policy concerning voluntary exposures at all?

A You mean exposures above the limits? For example, in an emergency?

Q Yes.

A No. We've never established anything like that.

Q Does the NRC have any prohibitions that it imposes upon operators of utilities with respect to even voluntary exposures?

A Yes.

Q What are they?

A ~~Well, even --~~ We have our dose limits in Part 20, and even if a worker volunteers to accept a larger exposure for some reason, it would still be a violation of the regulations.

Q Okay, that's a flat, across-the-board rule without exception?

A Yes.

Q And that would apply even during the time of an emergency?

A Yes.

Q Okay. Do the regulations require notice to persons working in a utility as to what dose they would receive or could expect to receive at a particular job or on a particular day?

A Well not on a particular job or during a particular day, but we do require ~~that the --~~ a couple of things. We require for any exposure report that is submitted to us that a copy be given to the involved workers.

So that would include any sort of an over-exposure.

Q Mm-hmm.

A And we require that if a worker requests a report of his dose, that the licensee give it to him.

Q If the worker requests it, that the licensee give it to him?

A Yes.

Q Why is that? I'm unclear on that point.

A Well, we don't require that the licensee automatically notify the worker of his dose, but if the worker requests ~~it~~ a report, he gets it.

Q Oh, okay, right. I misunderstood what you said. What requirements do you have of utilities with respect to keeping track of the amount of dose that workers have?

A We require that they measure the dose, if it's expected that the dose will exceed 25 percent of our dose

limit.

Q For a particular day, you mean, or --

A No, for a quarter, for a calendar quarter. For any dose, then, that is measured, using a personal dosimeter, well, or a survey instrument, for that matter, in whatever way it's measured, we require that the records of that exposure be maintained on a form that we prescribe, although we allow them to use their own form as long as exactly the same information is present.

Q Mm-hmm.

A And those records have to be kept until the Commission authorizes their disposal.

Q Do you have any particular measurement techniques that must be followed?

A No. No, the way the regulations are written now, some examples of types of dosimeters are mentioned, but not prescribed. Now we do have one program going right now to improve the dose-measuring situation.

We have some evidence that some dosimetry processors do not perform with an acceptable degree of accuracy, and we right now have a program going to correct that problem.

Q Is the type of monitoring of doses that you require, monitoring of whole-body doses, as compared to internal doses?

A Well, that's right. We require whole-body dose

measurements, and measurements of the dose to the extremities, in the regulations. As far as internal dose is concerned, from radioactive materials that are taken into the body, we go about that in two ways.

The primary way is limiting the concentration of radioactive material in air. We have a table of values in Part 20, and require that the concentrations to which the workers are exposed be maintained below those concentrations.

And we require an over-exposure report at any time they are exceeded. But we also, in addition to that, on a highly-individualized basis, require bioassays. ~~A bioassay~~, that term is used to refer to the measurement of radioactive material in excreta, or the direct measurement of radioactive material in the body by using a detector placed over the body.

Q Mm-hmm.

A Those requirements are placed in individual licenses, ~~rather than trying --~~ we haven't been able to make up sufficiently generalized language for the regulations. It virtually has to be done on an individual basis.

We have issued several regulatory guides on the subject of bioassay, and we have others in progress.

Q When you are talking about fashioning individual license conditions --

A Yes.

Q -- would you place in an individual license a condition, for example, that would indicate that there has to be a certain number of first-aid kits placed at certain locations?

Would that be part of the regulatory process in implementing 10 CFR 20?

A No, 10 CFR 20 is restricted to radiation ~~dose~~ protection considerations.

Q Right. So this would be 10 CFR 50, I assume.

A Well, I don't think that ~~-- that would be --~~ something like that would be in the NRC regulations at all, since the Commission's responsibility is restricted to radiation protection.

The type of device you're talking about ~~there~~ would be more likely to be found in OSHA regulations.

Q Okay, and OSHA regulations would apply to the working place?

A Yes.

Q So am I correct, then, in thinking that the NRC would have no regulations in place for respirators, for example?

A Respirators we do regulate, because ~~radioactive materials in air can be --~~ you can protect a worker, using a respirator, from radioactive materials in air, and so we do

regulate the use of respirators very closely.

Q What are your regulations there?

A Rather extensive. We have a paragraph, ~~in~~ 20.103, that tells the licensees that they must, if they are going to take any credit for the use of a respirator ~~,~~"

Q Mm-hmm.

A ~~--~~ and note that distinction, if they want to use a respirator but take no credit for it, in other words to go ahead and report it to us as an over-exposure if somebody is exposed to a greater concentration than in Appendix B of Part 20, that's fine, they can go ahead and use the respirators all they want to.

~~But if they are going to take any credit for them~~ for protection of the person, then they have to establish a respirator program as described in Regulatory Guide 8.15.

~~And~~ they are also restricted to using respirators that are certified by NIOSH. So we regulate respirator use very closely.

Q So is there also training that has to be done for use of respirators?

A Training is included; yes.

Q And that's part of the--

A Required training is described in the guide, and also testing, individual testing of the effectiveness.

Q But whether or not to use this entire program

is at the option of the utility?

A That's at the option.

Q And assuming that one exercises the option, and decides to have this, what kind of credit does it get?

A ~~The week~~ let me introduce the term "protection factor". The protection factor offered by a respirator is the factor of difference between the radionuclide concentration inside the mask and outside the mask.

For example, a protection factor of 100 means that the concentration inside the mask is only one percent of the concentration outside the mask.

Q Okay.

A So they're required to measure the concentration outside the mask, and then they can use this protection factor to determine the concentration inside the mask. And if they followed our program in every respect, as described in Reg Guide 8.15, they can use that protection factor in determinining the concentration to which the worker was exposed.

~~Now~~ we have the protection factors measured for us through contract to Los Alamos Scientific Laboratory.

Q I see. Now, are there other items, besides respirators, to which this protection factor option exists? Perhaps clothing, protective clothing?

A No, ~~I don't~~ I believe that's the only instance

in which we use that concept.

Q Okay. Now it seems that a respirator would be a means by which to limit the dose, okay?

A The internal dose; yes.

Q The internal dose that somebody gets.

A Yes.

Q But having a First Aid Center would not be a limitation on a dose, but that would, rather, be some sort of recovery for a person who has been exposed. Are you drawing the line, then, to say that the NRC would have regulations with respect to items that would limit the dose, but would not have regulations with respect to items that would enable someone to receive fast medical attention or recover from a dose already received?

Is that the line you're drawing?

A I'm drawing a line of authority, but not necessarily a line of interest. ~~For example, even though I'm not sure -- Pat might help us there -- I'm not sure we have --~~ to begin with, we have authority only over the licensees; not the workers.

We have no authority over the workers themselves. If a worker receives an over-exposure and is possibly potentially injured, I'm not sure we have any authority over the licensee as to what he shall do about that, unless that happens to appear as a condition of his license.

Q Mm-hmm.

A But we certainly have a lot of interest, and ~~we have --~~ our Inspection and Enforcement Office has physicians under contract who will be taken to the site to assist the physicians at the site, in the care and treatment of the over-exposed individual.

Q Is it fair to say that the NRC licensing process would not require a utility to have physicians on site?

A I can't be certain, but I've never heard of such a condition.

Q How about --

A I don't believe there is one. I can't be certain.

Q Does the NRC have any rules with respect to the availability of potassium iodide for worker use on site?

A No, ~~the regulations,~~ the regulatory guides are silent on that point right now. That is a question under evaluation.

Q When did evaluation of that question begin?

A I can first remember that being discussed as long ago as 1974.

Q In earnest, at that point?

A The discussions at that point were whether or not to establish a research program to determine the side effects. I believe it was decided against, on the basis that enough about the side effects is probably already known

to enable a decision.

And also about that same time, or not long after that, the NCRP made a recommendation about the use of potassium iodide, so it appeared that a research program wasn't really necessary, but it was more a matter of decision-making based on information that was already available.

Q What's the status of this issue now within the NRC?

A The Nuclear Reactor Regulation Office is right now evaluating the use of potassium iodide and is preparing a report for the Commission which, I presume, although I'm not sure, would make a recommendation to them as to what should be done.

I do not think that that study, ~~the draft I saw didn't include -- I don't believe it~~ included worker protection in its scope. I believe it was dealing with the use of potassium iodide in connection with a nuclear accident as far as the public is concerned.

Q Mm-hmm, okay. Let's change our focus for a bit, now. I'd like to ask you a couple questions about your personal involvement with the accident at Three Mile Island.

A That won't take long.

Q I didn't think it would. When did you first hear about the problem, and what was your response to the first information you had?

A. I first heard about it -- I don't remember the date, but here at work. Somebody had heard about the problem at Three Mile Island, and came to me and told me in my office that there was a problem there, that the extent of it wasn't known at that time.

Q. Did you or your office take any actions or contact any persons or have any discussions with respect to the accident --

A. When you say "my office" do you mean my branch?

Q. That's correct; your branch.

A. Well, I didn't. And I really don't know whether any members of my branch did or not. It was a situation in which we had no direct responsibility or authority. Our function from the beginning was one of support, as needed by the other offices with direct responsibility and authority, such as the NRR and the Inspection and Enforcement Office.

And we did, as the days went by, provide a limited amount of support to -- primarily to the inspectors, in the Office of Inspection and Enforcement.

Q. To those personnel from I and E on the site?

A. Both on-site and primarily over at the I and E building, the East-West Building, at their control center, emergency control center. I had two people who were essentially put on loan to them, to man the control center at night.

#2 end

Q I see.

A I believe they each worked about two weeks over there and then --

Q When did they first go to the Center?

A Well, I have a record of all that. I can't remember. It must have been several days after the accident first occurred on the order -- probably on the order of a week before we were called on to help.

Q Were you surprised that you were not called on to help prior to that?

A That I wasn't called on? No, ~~I don't --~~ I don't think that ~~that~~ surprised me. Things went just about as I expected that they would. I thought that they would probably need a limited amount of help from my branch, and we were able to provide it.

Q Who did you send from your branch?

A The two men who went over to East West to help were Dr. Alan Brodsky and Dr. Harry Pettingill. The only other person in my branch I believe that was of direct help to I&E was my expert on respirators whose name is Jerry Caplin, C-A-P-L-I-N. He did quite a bit of work for them and also brought to bear the expertise of the respirator laboratory at Los Alamos Scientific Laboratory.

Q How did he bring that expertise to bear?

A Well, we actually arranged for visits to Three Mile Island by Mr. Alan Hack ~~who is --~~ who heads up the respirator

laboratory for us at Los Alamos.

Q When did you arrange for that visit?

A I didn't do it personally, and I really have no knowledge of the arrangements.

Q Is it your sense that that didn't occur until at least a week after the beginning of the accident?

A I think so. He visited there twice and ~~we expect --~~ we expect probably to send him there again ~~as the --~~ as the recovery operation gets into full swing.

Q What type of support did your branch, including those two gentlemen you mentioned, give? What exactly did you do or what were you called upon to do?

A I don't know very much about it. ~~They didn't --~~ they were essentially placed on loan there. Their assignments didn't come through me so that all I know ~~is --~~ about their work is just casual references to it that they've made ~~to as --~~ when they came back from being on loan to I and E. I think that -- it's my impression that they were there ~~as --~~ to offer health physics assistance as various questions arose during the night. I think that they did health physics evaluations of potential releases of radioactive material and things ~~like that~~ of that nature for the people in the control center on the Three Mile Island incident.

Q Since Three Mile -- well, first of all, does that fairly well characterize the activities of you and your branch

A Yes.

Q -- with respect to the whole accident? Are there any other events or meetings or discussions?

A Yes. Sometime after the accident, perhaps six weeks, along in there, Brodsky and Pettingill were again requested to work for an extended period of time, on the order of two weeks each, ~~and~~ -- over there at East West. It is my understanding that what they did was to assist I and E people in the review of tapes, of taped interviews that were taken during -- virtually during the progress of the accident or perhaps immediately thereafter.

I'm not sure exactly -- I never did understand exactly what Pettingill and Brodsky were doing with respect to those tapes, but apparently they were simply doing things like explaining to the person who was transcribing the tapes what a technical term that had just been used was in order to get an accurate transcription.

Q What tapes were these? Do you know?

A Well, they were tapes in the possession of the Office of Inspection and Enforcement so I presume they were tapes of interviews between I and E people and employees and others at Three Mile Island.

Q I see. So they were actually tapes that were generated at Three Mile Island itself --

A Yes.

Q -- rather than, for example, tapes of telephone conversations into the Incident Response Center or something of that sort.

A ~~it's my~~ I'm not sure but ~~I~~ it's my understanding that they were the former.

Q Okay, fine. Since the TMI involvement, has your office or your branch become involved in any studies or analyses of the event?

A Yes. I believe Dr. Brodsky was asked to evaluate the seriousness of a skin contamination incident that occurred.

Q Would that be a person whose extremities were exposed while taking a sample or something?

A I believe so.

Q What is the status of that analysis or examination?

A Well, he completed that some time ago and transmitted it to the appropriate people in I and E.

Q Has your branch undertaken any studies or commissioned any studies because of the TMI incident?

A Not yet. We have recommended that a ~~new reg~~ NUREG report be developed which would offer guidance to our licensees with respect to the use of respirators and preparation for the use of respirators under emergency conditions.

Q Do you expect to make any further suggestions as to studies or modifications of procedures due to TMI?

A Yes. I believe that the involvement of my branch

in the TMI incident ~~is~~ -- hasn't even yet begun. The reason for that is that ~~the~~ -- the real recovery operation hasn't started yet. That's when the occupational exposure will occur.

Q How are you gearing up for that?

A Well, I've appointed one man to establish the necessary contacts with the health physicists -- both I and E health physicists and utility health physicists at Three Mile Island -- to establish contacts with them and to start collecting dose data so we can follow the accumulation of the collect~~ed~~ive dose at Three Mile Island. I have asked ~~the~~ -- that everybody be on the lookout for conditions during the recovery that could have been mitigated if things had been built differently or installed differently or treated differently so that ~~we~~ -- in case anything like this happens again, the exposure to the workers during recovery can be minimized.

These, of course, are issues amenable to correction through a standards effort, through standards setting.

Q Through regulation development. Is that what you mean?

A Yes, or guides.

Q Do you expect that your involvement will take any course beyond what you have just described, your involvement in the post-TMI story, as it were?

A ~~I~~ -- unless something unanticipated comes up that

is really outside of our present responsibility where our assistance would be needed, that would be the only way I can imagine that we would get involved any more deeply than I've just indicated.

Q Will you be getting involved, either directly or indirectly, with any studies that are now under way with respect to exposures to ionizing radiation?

A I don't know of what studies you might be referring to. ~~If they have --~~ if any studies of exposure to workers are conducted there, I'm sure my branch would be involved in the review, probably not in the management or conduct of the studies.

Q Your branch is not initiating any studies as of --

A No.

Q Okay. Is there any topic or information that we haven't covered that you would like to mention before we conclude, any point either about the event or any point you would like to make with respect to the material we have covered, anything of that sort?

A I would like to understand better how all of the basic information we covered today before we got to TMI relates to your purposes.

Q Okay. I'll be glad to explain that but there's no need to put that on the record I assume.

A I see.

Q Anything else? Anything of your testimony that you would like to supplement on the record? I gather the answer is no.

A No.

Q Okay, fine. We will conclude the deposition.

(Whereupon, at 3:58 p.m., the deposition was concluded.)

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REPORTER'S CERTIFICATE

DOCKET NUMBER:

CASE TITLE: DEPOSITION OF ROBERT E. ALEXANDER

HEARING DATE: August 13, 1979

LOCATION: Bethesda, Maryland

I hereby certify that the proceedings and evidence herein are contained fully and accurately in the notes taken by me at the hearing in the above case before the PRESIDENT'S COMMISSION ON THE ACCIDENT AT THREE MILE ISLAND and that this is a true and correct transcript of the same.

Date: August 14, 1979

Official Reporter
Acme Reporting Company, Inc.
1411 K Street, N.W.
Washington, D.C. 20005

Robert E. Alexander

Robert E. Alexander began his work in health physics at Convair - Fort Worth immediately following graduation from Howard Payne College, BA, Mathematics, in 1954. After three years as a reactor health physicist, he joined Atomics International as Lead Engineer, Health Physics Services. Later, he was appointed Responsible Engineer for the Radioactive Materials Disposal Facility. During 1961 and 1962 he served as advisor in radiation protection to the governments of Indonesia and Greece, under the auspices of the International Atomic Energy Agency.

Returning to Atomics International, he was appointed Responsible Engineer for the safety analysis report, SNAP-10A Reactor Flight Test, and later became Radiation Engineering Supervisor. Subsequently, health physics, industrial hygiene, and industrial safety were added to his responsibility. In 1968 he joined NASA Headquarters and served as Chief of the Radiological Health Branch until coming to the AEC (NRC) in 1972. He is presently Chief of the NRC Occupational Health Standards Branch.

He is a past President of the Health Physics Society (HPS) Southern California Chapter, past Secretary-Treasurer of the HPS Baltimore-Washington Chapter, and was the Chairman of the HPS Public Relations Committee for four years. He organized the Atomic Energy Information Service, a cooperative activity of the HPS, ANS, AIF, and AEC, and served as its Executive Director for three years. He also organized the Speakers Bureau for the Los Angeles Section of the ANS. He is certified by the American Board of Health Physics.

CERTIFICATE

I certify that I have read this transcript and corrected any errors in the transcription that I have been able to identify, except for unimportant punctuation errors.

Date: Aug 21, 1979

R E Alexander

ROBERT E. ALEXANDER