VOL-13

REGULATORY DOCKET FILE COPY

UNITED STATES ATOMIC ENERGY COMMISSION

IN THE MATTER OF:

TOLEDO EDISON COMPANY
and
THE CLEVELAND ELECTRIC
ILLUMINATING COMPANY

(Davis-Besse Nuclear Power
Station, Unit No. 1)

Docket No. 50-346

Place - Port Clinton, Ohio

Date - 8 February 1971

Pages 1504 - 1757

Telephone:
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UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

In the matter of:	
TOLEDO EDISON COMPANY and THE CLEVELAND ELECTRIC ILLUMINATING COMPANY	Docket No. 50-346
(Davis-Besse Nuclear Power Station, Unit No. 1)	

Trinity Methodist Church
Conference Room
Adams and Second Streets
Port Clinton, Ohio

Monday, 8 February 1971

The above-entitled matter came on for further hearing, pursuant to notice, at 10:00 a.m.

BEFORE:

WALTER SKALLERUP, JR., Esq., Chairman,
Atomic Safety and Licensing Board.

DR. CHARLES A. WINTERS, Member.

DR. WALTER H. JORDAN, Member.

APPEARANCES:

(As heretofore noted.)

C O N T E N T S

P R O C E E D I N G S

CHAIRMAN SKALLERUP: Will the hearing please come to order?

First, there are a few preliminary comments I would like to make.

Number one, the room has not been set up with a public address system, so that everybody is going to have to raise their voice a few more decibels in order to be heard by all.

Number two, the room, as you can see, is somewhat more confined than the Armory. And we are giving consideration to establishing a no-smoking rule. If the smoke becomes offensive to the Board's noses, we will establish such a rule. So we are going to try the rule of reason first, and see how it goes. So we urge you to slow down on smoking.

There are a few preliminary matters that we want to put into the record.

Pursuant to the Board order of February 2, the hearing is now being held in the Conference Room of the Trinity Methodist Church, Adams and Second Streets, Port Clinton, Ohio.

Please include that in today's transcript.

(The document follows:)

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UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

In the matter of	)	
	)	
THE TOLEDO EDISON COMPANY	)	
AND THE CLEVELAND ELECTRIC ILLUMINATING COMPANY	)	Docket No. 50-346
	)	
(Davis-Besse Nuclear Power Station)	)	

SCHEDULE FOR HEARING

The hearing in the captioned matter will be continued on Monday, February 8, 1971, at 10:00 a.m., local time, in the Conference Room of the Trinity Methodist Church, Adams and 2nd Street, Port Clinton, Ohio.

ATOMIC SAFETY AND LICENSING BOARD

Sgd/ WALTER T. SKALLERUP, JR.,
Chairman

Dated February 2, 1971

CHAIRMAN SKALLERUP: By order dated 3 February 1971 the Board submitted to the Commission in accordance with 10 CFR 2.704(c) for referral its denial of the motion of LIFE to disqualify certain Board members.

Would you please include this in the record?

(The document follows:)

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

In the matter of	)	
	)	
THE TOLEDO EDISON COMPANY	)	
	)	
and	)	
	)	Docket No. 50-346
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY	)	
	)	
(Davis-Besse Nuclear Power Station)	)	

ORDER

During the hearing session of 25 January 1971, Intervenor Living in a Finer Environment, Irwin I. Oster, and William E. Reany moved (Transcript 1026) for an order requiring Dr. Walter Harrison Jordan and Dr. Charles Ernest Winters to disqualify themselves as members of the Atomic Safety and Licensing Board which had been designated to hear this matter pursuant to the Notice of Hearing issued by the Commission on 30 October 1970. No affidavit accompanied the filing of the motion.

Inasmuch as 10 CFR 2.704(c) of the Commission's

regulations concerning disqualification states in part, "The motion shall be supported by affidavits setting forth the alleged grounds for disqualification...", the Board gave the Intervenor the opportunity to provide an affidavit. Subsequently on 27 January, 1971 the Intervenor proffered such an affidavit. (T.1166.)

Comment regarding the motion was made in open hearing on 25 and 27 January 1971, by AEC Staff (T. 1029-1034, and 1169-1170), by the Applicant (T. 1169), and by Dr. Jordan and Dr. Winters (T.1171).

The Board after having considered the motion, the memorandum accompanying the motion, the affidavit in support of the motion, and the arguments thereon, denied the Intervenor's motion (T. 1171).

Accordingly, the motion is hereby being referred to the Commission for appropriate action in accordance with the provisions of 10 CFR 2.704(c) of Commission regulations.

Attached are copies of the Intervenor's motion, the memorandum accompanying the motion, and the affidavit submitted in support of the motion.

Walter T. Skallerup, Jr.
Chairman

Dated: February 3, 1971

CHAIRMAN SKALLERUP: The Board has not yet completed its referral to the Appeals Board in the matter of suspending action by the Director of Regulation on the requested exemption from the Applicant dated 7 January 1971.

Since our last hearing several communications have come to the Board.

Number one, from LIFE, summaries of the testimony of witnesses appearing on behalf of LIFE, namely of Miss Dorothy Good of Berkley, Michigan and Dr. John W. Gofman, San Francisco, California.

Yesterday afternoon I received a telephone communication at my home from Mrs. Lau, who informs me that Mr. Lau has certain additional complications in his illness and would not be able to be here today.

This morning I had a call from Mr. Baron, counsel for the Coalition, who has some pressing obligations that require him to stay in Cleveland this morning, but he hopes to join us during this afternoon's session.

A letter was received from a lady whose name is Esther Beck of Toledo, Ohio. The Board asks that this be included in today's transcript and that the original be sent to the Public Document Room.

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(Letter from Esther Beck follows:)

Gentlemen:

May I express my disapproval of your discontinuance of hearings because a campus organization threatened to walk out. You thereby sacrifice majority welfare for recalcitrant immature noise-makers -- frequently with as little knowledge of nuclear dangers as I possess at 73 years of age.

I have never heard of a nuclear electric plant blowing up and damaging outside property and lives. Has it ever occurred? (In these U. S.)

On the other hand, the history of coal-fired steam power records thousands of deaths and much property damage, particularly steam railroads and steam boats.

It seems to me the welfare of the 98 percent majority is being impaired with 2 percent professional "aginners" and wreckers.

For many years I taught high school only one-fourth mile distant from a black-cloud-belching coal fired steam plant. When the wind was right, we were immersed in smoke and gutty smoke stack emissions covered the neighborhood. Today's hot-house-plant-taxpayer-supported and humored, live-off-somebody else unambitious spongers would cry "discrimination by pollution" and protest, I presume, by at least blocking all progress (if not protest marches and throwing a few bricks or bombs) Thank God.

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Now none of us liked the smoke but most of us were glad to pay the pollution price because electric refrigerators, automatic washers, mangles, irons, toasters, Hoovers, radios, record players were our entertaining and labor saving bonuses -- rewards just around the corner, NOW UNIVERSALLY ENJOYED.

Everytime some crank postpones your approval or enforces modifications in Davis Bessy plant. (I own no direct or indirect interest in Cleveland Illuminating nor Toledo Edison) my and my posterity's power bills probably increase at some future date. Or maybe all of us will lose power at a future crucial hour for how long no-one knows.)

Meanwhile we don't need all these gadgets: air conditioning, electric razors and tooth brushes, humidifiers, electric water heaters, lawn-mowers, TVs. They aren't necessary -- certainly they have not brought contentment.

But the great majority demand them.

Please proceed, and ignore the kooks who pretend college maturation endows them with superior wisdom, IF they want to go home and sulk, GOOD RIDDANCE.

I expect you to protect us all from unreasonable hazards. Sometimes Marxist-influenced half-educated youths are more dangerous than bombs and pollution.

From a contented 73-year-old retired high school, taxpaying teacher who never accepted relief.

/s/ Esther Beck
3115 Parkwood Avenue
Toledo, Ohio

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CHAIRMAN SKALLERUP: Another communication from a gentleman named David A. Huffman of Columbia Station, Ohio. We would appreciate this being included the same way.

(The letter follows:)

February 1, 1971

Mr. Walter Skallerup

Atomic Safety & Licensing Board

Dear Sir,

I urge you to stop the construction of the Davis-Besse Nuclear Power Plant near Toledo. I understand that its operation may pollute Lake Erie and the surrounding area with radioactivity.

Sincerely,

/s/ David A. Huffman

26103 Royalton Road

Columbia Station, Ohio 44028

CHAIRMAN SKALLERUP: Another communication addressed to the Chairman of the Atomic Energy Commission dated January 25, 1971, from John D. Dingell, Member of Congress, from the 16th District of Michigan.

I am informed that this communication already was included in the Public Document Room.

I will hand it to the Reporter for inclusion in today's transcript.

(The letter and telegrams follow:)

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CONGRESS OF THE UNITED STATES

HOUSE OF REPRESENTATIVES

Washington, D. C. 20315

January 25, 1971

Dr. Glenn T. Seaborg

Chairman

Atomic Energy Commission

Washington, D. C. 20545

Dear Dr. Seaborg:

Enclosed is a copy of a telegram I have received with regard to Atomic Energy Commission Docket 50-346.

I would appreciate receiving a report responding to the points raised in this telegram.

Please make this letter and the telegram a part of the public record in this proceeding.

With every good wish,

Sincerely yours,

/s/ John D. Dingell

Member of Congress

Enclosure

(Enclosure follows:)

WESTERN UNION TELEGRAM

CONGRESSMAN DINGLE

HOUSE OFFICE BUILDING, WASH., D. C.

REFERENCE DAVIS BESSE AEC DOCKET 50-346 INTERVENERS

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OUTRAGED BY REQUEST EXTENDING CONSTRUCTION EXEMPTION STOP INTERVENERS CONTENTION RELATE TO STRUCTURES PROPOSED TO BE BUILD UNDER EXEMPTION STOP CLEAR VIOLATION OFUS ATOMIC ENERGY ACT STOP CONSIDERATION OF THIS REQUEST PRIOR FORMAL LICENSING THREATENS VALIDITY OF HEARING STOP PEOPLES RIGHTS PREJUDICED STOP IF GRANTED PROCEEDING CANNOT BE CONDUCTED WITH FAIRNESS STOP LIFE BOX 15 UNIVERSITY HALL BOWLING GREEN STATE UNIVERSITY.

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CHAIRMAN SHALLERUP: The Board would appreciate the opportunity of consulting with counsel in order to establish our agenda for the day.

End #1

(Bench conference.)

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CHAIRMAN SKALLERUP: In the course of our conference, several matters were discussed. One related to the witnesses of LIFE and Mrs. Bleicher will have some comments to make on that. Another referred to rebuttal, which is going to be offered by the Atomic Energy Commission Staff.

Third, rebuttal to be offered by the Applicant, how to accommodate Mr. Lau. A suggestion was made, and I raised the suggestion recently on the phone with Mr. Lau, that the Board, the recorder, counsel and appropriate witnesses go to his home, so that he would be able to conduct his cross-examination and not have to come in here. Mr. Lau said that he was going to see his doctor at 11:30 today and that he would know at 12:30 today whether he would be here this afternoon or whether we would be able to go to his home.

So that is how it stands with respect to Mr. Lau at the moment. Mrs. Bleicher, would you comment on the present posture of the case as far as LIFE's witnesses are concerned.

MRS. BLEICHER: This morning we had scheduled one witness, Miss Dorothy Gude, to appear on behalf of LIFE with direct testimony. Miss Gude has informed us that she would be able to appear. However, upon checking with her superiors in the school system in Michigan she was informed she would not be given permission to be absent from her class

today and therefore she will not be here today, and the implication was that she should not intend to be absent at any time for the hearings here and therefore we now rest our direct case, except for the possible submission of further exhibits.

CHAIRMAN SKALLERUP: And you received a communication from Dr. Oster?

MRS. BLEICHER: I received this morning, when I arrived at the hearing, a written communication from Dr. Oster in which he withdraws as a party to this case.

CHAIRMAN SKALLERUP. The Board is in receipt of a document which was delivered from Dr. Oster which I believe may be -- Mrs. Bleicher, let's compare this. Do you have a letter from him or the statement?

MRS. BLEICHER: I have a statement.

CHAIRMAN SKALLERUP: I am in receipt of a letter addressed to me, dated February 8, 1971, from Dr. Oster. I will read it and ask that it be placed in the record, "Today I would have very much preferred to have presented this in person. Unfortunately, and quite ironically eight hours of classes, two committee meetings and the re-installation of our repaired X-ray machine, all scheduled for today, leave me little time for anything else (even assuming a 12-hour working day). As you will see from the enclosed statement, there is probably not much point in my being present hereafter."

"However, if you should wish to have anything clarified further, please telephone me at 419-372-2631,"

"I have left instructions that I should be called out of class or the conference today if need be. Thank you and with good wishes, I remain sincerely yours. Irwin I. Oster."

There is a postscript. "The toll the hearings have thus far taken in terms of my health is something which I am only alluding to for your own information." I gather Dr. Oster intended that the statement be received as a limited appearance.

MRS. BLEICHER: I have no indication from Dr. Oster of how he intended this statement to be received or whether he intended it to be presented on the record or any other communication about its purpose.

CHAIRMAN SKALLERUP: Have you received a copy of Dr. Oster's statement?

MR. CHARNOFF: I did, Mr. Chairman. I think it is the kind of statement that needs to be put on the record because it suggests somewhat of a change of view by Dr. Oster with respect to this case. I think it would be well to have read into the record the statement by Dr. Oster. It allegedly is a statement, it is headed "Statement by Irwin I. Oster to be presented to the licensing board on February 8, 1971." Copies were given to me, and I assume to the other

parties. I think it would be well to put this statement into the record. It endorses the recommendations of the Regulatory Staff concerning the Davis-Besse plant. And I think considering all of the publicity that has heretofore been given to Dr. Oster's views, it would be well and reasonable to put this statement into this public record.

CHAIRMAN SKALLERUP: The Board hasn't had an opportunity to read his statement, but why don't you give us your comments?

MR. ENGELHARDT: Mr. Chairman, the Regulatory Staff has received a copy of the statement by Dr. Oster. I believe it would be appropriate, in view of the fact that Dr. Oster is a party to this proceeding, that this statement be made a part of the record as his statement, to indicate what his situation is currently with regard to his continuing with this case.

To that extent, since he is a party to this proceeding, I believe that his situation and his statement is somewhat different from that of a limited appearance and it presumably would set the record straight as to whether he intends to continue or why he may not elect to continue with his participation as a party in this proceeding.

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CHAIRMAN SKALLERUP: The Board will go off the record for a new minutes --

MRS. BLEICHER. May I make one statement here?

CHAIRMAN SKALLERUP: Please.

MRS. BLEICHER: I suggest that since the letter from Dr. Oster says if there is any need for further clarification we call him, we could call him and ask whether he intended for it to be in the record or whether he wanted this as a personal communication to members of the Board.

MR. CHARNOFF: It was hardly personal, Mr. Chairman, if it was distributed to the other parties.

MRS. BLEICHER: It was not, however, distributed to the public.

CHAIRMAN SKALLERUP: But this is public business. We will read the statement at this time.

We would appreciate the opportunity of consulting with counsel.

(Bench conference.)

CHAIRMAN SKALLERUP: The Board has examined the written and sworn statement of Dr. Oster and as we discussed with counsel it is our view that it not be considered as evidence in the case but that it be considered as a basis for Dr. Oster's action in withdrawing from the case.

Inasmuch as the very substance of the statement, plus the fact that it has been sworn to and that copies were

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given to other parties in the proceeding it appears to us it was Dr. Oster's intention that the matter be publicly disclosed.

Accordingly at this time it will be read into the record. At the conclusion of that I would request that a copy of Dr. Oster's letter and the original of his statement be referred to the Public Document Room.

"Statement by Irwin I. Oster to be presented to the U. S. Atomic Safety and Licensing Board on February 8, 1971.

"For the past two weeks I have been attempting to reassess my position in regard to the Hearings on the Davis-Besse Nuclear Power Plant. Although at times I had considered discussing aspects of the situation with members of the Regulatory Staff and/or the Commission, prudence dictated otherwise lest some ulterior motive(s) should be read into my decision. I realize that attempts will be made to "find" reasons other than the central one which I will present and I can only urge everyone concerned (as well as those only mildly interested) to accept my explanation at face value. It will soon become apparent that the following has not been calculated to please but rather to be objective and realistic. It represents the result of some very serious deliberations and was not arrived at easily.

"I would be remiss in not pointing out that my

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failure to be present during most of the sessions during the week of January 25th was prompted not only by a very heavy load of commitments to various teaching and research responsibilities but by the beginnings of the above-mentioned reappraisal of the situation. I will now attempt to describe my present position.

'As some of you may remember I had become drawn into the present controversy because I had thought that the utility in question was engaged in an attempt to deny the potential for danger inherent in the utilization of radiation and they in turn believed that such concern should not necessarily be expressed by a geneticist. Be that as it may, and in spite of a degree of bitterness which has developed on all sides and which I would sooner forget, we now find ourselves as Interveners at the current Hearings.

'Needless to say, certain discrete events of the past several weeks have played a significant role in influencing my line of thinking; however, these should only be regarded as contributory rather than direct causes. The seriousness with which the AEC Regulatory Staff headed by Mr. Thomas Englehardt has considered all the issues raised and the care which the Board chaired by Mr. Walter Skallerup has sought to hold a fair and just hearing (as exemplified by the decision on the applicant's request for a temporary construction permit) are amongst many of the other things which have

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impressed me. Moreover, when it became apparent that Dr. Dean Parker, a long-time scientific colleague, who incidentally also happens to work with fruit flies like myself, and I would find ourselves at seemingly opposite ends of the scientific spectrum, my decision to withdraw as an Intervener from this Hearing and as a future witness for the Lloyd Harbor Study Group began to be formed.

"Since views on the biological effects of ionizing radiation held officially by the U. S. Atomic Energy Commission and I do not differ in essentials I cannot with a clear conscience see how my scientific expertise can be utilized to resolve what I consider to be one of the major issues of these Hearings, namely, whether the benefits to be derived from the proposed plant outweigh the potential risks, no matter how large or small. From a purely personal point of view, my concern has never been with the quantitative aspects of the situation. While I still feel that even one life is sacred and has no price, it has become painfully obvious to me that this evaluation must be resolved on other than purely scientific grounds by society as a whole, and not by a single or a group of individuals, no matter how sincere and intense their feelings may be.

"In view of this line of reasoning it necessarily follows that I should endorse the recommendations of the Regulatory Staff concerning the proposed application for a

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construction permit as being entirely consistent with what has transpired up to now in these Hearings. I have become convinced that the present plant will be built in conformity with the majority of society's current views on life and living.

Respectfully Submitted

/s/ Irwin I. Oster

Irwin I. Oster

Bowling Green, Ohio

February 8, 1971

State of Ohio

County of Wood February 8, 1971

Subscribed and sworn to before me this eighth day of February, 1971.

Magdelena Y. Baker, Notary Public

Wood County, Ohio

My Commission Expires February 26, 1973.

/s/ Magdelena Y. Baker

Notary Public"

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construction permit as being entirely consistent with what has transpired up to now in these Hearings. I have become convinced that the present plant will be built in conformity with the majority of society's current views on life and living.

Respectfully Submitted

/s/ Irwin I. Oster

Irwin I. Oster

Bowling Green, Ohio

February 8, 1971

State of Ohio

County of Wood February 8, 1971

Subscribed and sworn to before me this eighth day of February, 1971.

Magdelena Y. Baker, Notary Public

Wood County, Ohio

My Commission Expires February 26, 1973.

/s/ Magdelena Y. Baker

Notary Public

end 3

CHAIRMAN SKALLERUP: Mrs. Bleicher, have you any comment to make with respect to Dr. Gofman appearing as a witness?

MRS. BLEICHER: As we indicated in our list of witnesses which was presented to the Board and to the other parties previously, Dr. Gofman had informed us he would appear as a witness in these hearings.

We have received from Dr. Gofman written statements. However, he has indicated to us that he will not be able to appear personally. He would like his written statements to be incorporated into the record. He would be available for cross-examination by deposition, but he cannot come from California to be here at this time.

CHAIRMAN SKALLERUP: Are you moving that Dr. Gofman's summary be admitted in evidence?

MRS. BLEICHER: Yes, I am.

CHAIRMAN SKALLERUP: Has the Applicant any comment?

MR. CHARNOFF: Yes, Mr. Chairman. I am puzzled by the question that was asked of Mrs. Bleicher and her answer, because it was just a short while ago I understood LIFE to say it rested its direct case.

Now on the specific question of moving that this statement by Dr. Gofman be introduced into evidence, the Applicant would object. We have delayed the hearings from the last phase of the hearings to this phase of the

hearings so that LIFE would have an opportunity to present for the second time summaries of the testimony of its witnesses, so that the Staff then would have an opportunity to prepare its cross and rebuttal.

We find ourselves here at a hearing again with no direct witnesses, number one.

Number two, these hearings require that testimony, if it is offered, also be subject to cross-examination. Any cross-examination not conducted here today necessarily means delay. It would also require opportunity for further rebuttal.

Again we would be talking about further delay.

Therefore it would be objectionable to have the statements by Dr. Gofman offered as evidence in this proceeding.

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MR. ENGELHARDT: Mr. Chairman, on behalf of the Regulatory Staff, I must register our opposition to this motion, if adopted by the Board, would not give the Regulatory Staff any opportunity to conduct any meaningful cross-examination of this witness. To require the Regulatory Staff or any other party in this proceeding to seek out this witness in some remote part of the country at great expense and effort to conduct cross-examination in some other locale seems to me entirely unreasonable in the circumstances of this proceeding, and for these reasons we would be opposed to the inclusion of Dr. Gofman's testimony in the transcript of this proceeding.

CHAIRMAN SKALLERUP: The Board will go off the record.

(Discussion off the record.)

CHAIRMAN SKALLERUP: Will the hearing come to order?

Mrs. Bleicher, the Board has considered your motion and the arguments that have been made on it.

It is our view that the statement of Dr. Gofman not be received as evidence. However, inasmuch as the Board believes its function is to include statements offered by limited appearances as well as by witness for parties to the proceeding, we will include Dr. Gofman's statement in the transcript of the proceeding, this being in large part

because we are trying to develop as complete a case as we can with respect to the challenge to Part 20. And for the convenience of representatives of the Commission, we believe it should be included in the transcript.

MR. CHARNOFF: Mr. Chairman, I would have to object to the statement that you have just made on the basis that, number one, I think that the concept of limited appearances is to afford persons in the locality an opportunity to make statements with regard to the proposed plant that may or may not affect them. I don't think that these hearings have been set up to be the receptacle for letters and telegrams from all parts of the country or the universe, for that matter. But more specifically, the way you stated that, you said that in terms of the issue of Part 20 you want as complete a record as possible. I think that we cannot fail to distinguish between material which is introduced on an evidentiary basis and limited appearances. The limited appearances are not the means for introducing material into the record for the purpose of producing a record as complete as possible for determining an evidentiary matter.

Accordingly, I would object first to it being introduced as a limited appearance, because I think that is out of order.

And, secondly, I would submit to you that if it is admitted as a limited appearance, it is not for the

purpose of making this record as complete as possible with regard to the Part 20 proceeding.

MR. ENGELHARDT: Mr. Chairman, I must share counsel's for the Applicant views with regard to this matter. I too am concerned as to the use of this type of information in this proceeding.

We have so far admitted a statement by Dr. Linus Pauling, and now this statement by Dr. Gofman whose statements were identified as limited appearances.

I don't believe, as counsel for the Applicant has stated, that the intent of a limited appearance was to solicit comments from a broad spectrum of the convenient public, but was to be limited to those people who would be more directly involved or concerned with the particular application.

The introduction of Dr. Pauling's and Dr. Gofman's statements in this record with the prefatory comments that the Chairman has made with regard to at least Dr. Gofman's statement could be interpreted by some as requiring the Staff to present or the Applicant too to present an affirmative defense -- I should say a defense -- of the allegations and contentions made by Dr. Gofman and possibly Dr. Pauling in these statements. This is not the way that we read the Commission's rules with regard to the case that must be made on the evidentiary record.

It would be our position that these statements by Drs. Pauling and Gofman are not evidentiary in nature, which the Board has certainly recognized, and they would not have to be dealt with in any evidentiary way by the Staff with respect to the challenge of 10 CFR Part 20. The only extent to which they could be dealt with, as we see it, would be in the same vein as we would deal with the limited appearances that were made earlier in this proceeding, and that is in some supplemental material that we may prepare later to deal with any questions that they may have raised in these statements.

We are not prepared to do that, we have not prepared that sort of information with regard to these statements, since we were not anticipating that this was the desire of the Board, or any requirement on us.

So that we share the concern of the Applicant's counsel as to the use to be given of statements such as Dr. Pauling and Dr. Gofman, because we may find in this proceeding that there will be other efforts made to introduce, by this back door route, statements of other individuals over whom we have no control and no opportunity to test the validity of their statements, but there they are, and the possibility that they would be used in an influence in any decision that may be made with respect to this application is always, that specter is hanging over our heads.

End #4

So I think it should be clear that as far as we are concerned at least, that our position is that we do not consider these statements of Drs. Pauling and Gofman to be appropriate for limited appearances, and we do not feel that they should be made any part of this record that could be even implied that is being subject to rebuttal by either Applicant or Staff.

CHAIRMAN SKALLERUP: Would you separate your comment? Is your position that it should not be received as a limited appearance period? Or it should not be received as a limited appearance for certain purposes?

MR. ENGELHARDT: I don't believe it should be received as a limited appearance under the Commissions Rules of Practice.

MRS. BLEICHER: Mr. Chairman, as I understand it, what the Chairman is proposing to do is something sanctioned by Section 2.715A of 10 CFR in which it states and I quote, "A person who is not a party may in the discretion of the presiding officer be permitted to make a limited appearance by making oral or written statement of his position on the issues within such limits and on such conditions as may be fixed by the presiding officer. But there is nothing in that that indicates that the person must be from the area as Mr. Charnoff would have us believe. There is no geographic requirement that he live within a certain number of miles.

And it also says that he can state his position on the issues. And this is one of the issues in the proceeding, and I think that the Chairman has indicated they will take it on the basis of a limited appearance, not on the basis of evidence for LIFE. And we have to rely on the Chairman and on the Board being able to make these discriminations.

MR. CHARNOFF: Mr. Chairman, firstof all Dr. Gofman has not requested that this be introduced as a limited appearance statement.

MRS. BLEICHER: Excuse me, Dr. Gofman has asked us to do so.

MR. CHARNOFF: We never heard that request until just this morning.

Secondly, I would refer the Board to Section 3(b)8 of Part 2, the appendix to Part 2. "Boards have considerable discretion as to the manner in which they accommodate the conduct of the hearing to local public interest and the desires of local citizens to be heard.

"Particularly in cases where it is evident that there is local concern as to the safety of the proposed plant, the Board should so conduct the hearing as to give appropriate opportunity for local citizens to express their views while at the same time protecting the legal interests of all parties and the public interest in an orderly and efficient licensing process."

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These hearings are not receptacles for letters from all over the country from people who are perhaps interested in the matters on a generic basis.

CHAIRMAN SKALLERUP: You ended the quote?

MR. CHARNOFF: Yes, sir.

CHAIRMAN SKALLERUP: Would you advise us when you ended the quote?

MR. CHARNOFF: I ended it after "an orderly and efficient licensing process."

MR. ENGELHARDT: Mr. Chairman, that is on page 35 of the consolidated regulations, beginning at the bottom of the first column and extending to the top of the middl column.

CHAIRMAN SKALLERUP: Would you proceed?

MR. CHARNOFF: I ended my statement, sir.

CHAIRMAN SKALLERUP: We will take a 10-minute break.

(Recess.)

CHAIRMAN SKALLERUP: The Board has considered the arguments as to whether Dr. Gofman's statement should be

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received as a limited appearance or not. As the legal member of the Board, I would like to state that I think there was an unfortunate choice of language which might be considered misleading. However, it is the Board's view that this be admitted as a limtied appearance. And we reiterate that it will not be considered as evidence in the

proceeding. By not admitting it as evidence, we believe that we have protected the legal rights of other parties in the proceeding.

MRS. BLEICHER: I would like to make one correction on the copies that you have, Mr. Chairman. It should have after the words "John W. Gofman", it should say "And Arthur R. Tamplin" on your copies. We will submit this to the recorder later.

(Dr. Gofman's statement follows:)

INFERENTIAL STATEMENTS ABOUT 10 CFR PART 20

In the course of my some 23 years of work in this area of research I have independently along with other scientists continously reviewed the Atomic Energy Sommission's "Standards for Portection Against Radiation" (10 CFR Part 20) with the view toward constantly offering recommendations to the Atomic Energy Commission and others for revising these Radiation Standards to comport with not only the most current scientific information but also to revise said Standards so that they adequately protect the health and welfare of man and his environment as is required by the Atomic Energy Act.

As a result of my intensive research in this area, I have been convinced since 1964 that the Radiation Standards in 10 CFR Part 20 currently in force have no scientific basis for support. Since 1964 I have along with others continued and increased my efforts of the studying of this area and I currently hold the same belief and opinion as to the unavailability of scientific support for the current Radiation Standards. In addition, as a direct result of my studies over the last five years, I am more convinced now and it is my expert opinion that the Radiation Standards in force do not inhibit or prevent danger to man and his environment but rather contribute to the promotion of danger.

My research in this area has included not only a

constant review and interpretation of the work of others in the field of radiation research but also includes numerous laboratory studies done by me and my colleagues at the University of California, both with respect to my professional duties and with respect to Atomic Energy Commission grants. These laboratory studies have included testing the effect of radiation doses on living tissues and cell cultures of human beings.

The radiation hazard has recently become appreciated to be far greater both with respect to cancer and leukemia risks, as well as with respect to the even larger hazard of genetic disorders, including the major killing disease of our society, coronary heart disease. My opinion, based upon many years of research and study of mine and my colleagues is that if the average allowable permitted exposure by the current Atomic Energy Commission's Radiation Standards were reached by the United States population there would result:

A. 32,000 extra cancer plus leukemia daths annually.

B. 150,000 to 1-1/2 million extra genetic deaths annually.

C. A 5 percent to a 50 percent increase in mental diseases like schizophrenia, our major mental disorder.

My opinion is based upon the effects of the emission of radiation up to allowable standards permitted by the current

Radiation Standards of the Atomic Energy Commission which govern the emission of radiation and radioactivity from any source which creates nuclear fission for peacetime uses. Therefore these adverse effects can be related to any given source or facility which has or will have authority from the Atomic Energy Commission to emit radiation up to the limit of the current Atomic Energy Commission Radiation Standards in 10 CFR Part 20.

The Standards for the Protection Against Radiation are also unscientific and illegal even if one assumes that they are based upon a safe dose of radiation. This is because the Radiation Standards in 10 CFR Part 20 do not take into account all manner and ways which sources of radiation could be taken or transmitted to man (pathways) so that any monitoring system set up at a facility which emits radiation could not possibly determine with any degree of accuracy whether or not the assumed safe dose of radiation allowable to man under the current Radiation Standards has been exceeded. This is because the Radiation Standards are not so constructed to trace the emissions of radiation from a particular facility to man through all of the pathways. The following are examples of pathways which are not at all considered by the Radiation Standards:

(a) The Radiation Standards allow the radionuclide Cs-137 (Cesium-137) to be emitted in water at a particular

concentration. What is not considered is the fact that fish in fresh waters can concentrate this Cs-137 one thousand-fold into its flesh. Therefore, while the drinking of two liters of water might not result in exceeding the Radiation Standards, the eating of fish flesh so affected by nuclear facility can result in a gross exceeding of the Radiation Standards assumed safe dose.

(b) The Radiation Standards allow the emission of Cs-137 into air from stacks from nuclear facilities. The presumption inherent in the Radiation Standards is that the assumed safe dose will not be exceeded if a person breathes such air. However, the Radiation Standards do not take into account the fact that Cs-137 is well known to fall out or precipitate on land in any down wind region. As a result of the deposition of such Cs-137 upon crops and the foraging of such regions by cows, for example, Cs-137 will find itself in milk produced by such cows. Drinking of reasonable quantities of such milk by humans in such regions or milk transported from such regions to other regions, can and will result in a gross exceeding of the assumed safe dose in persons drinking such milk even though the Cs-137 content of the air meets the so-called allowable Radiation Standards.

Powerful and worldwide evidence indicates, and it is my opinion, that the hazards of radiation to children exceeds greatly that to adults and therefore children drinking

such milk are even in greater danger as a result of such concentrations of radionuclides into their milk supply.

This is synergistically complicated by the fact that the Radiation Standards relate the assumed safe dose to the average human adult, whereas the tolerance to radiation dosages by children, fetuses and therefore pregnant women, is anywhere from 10 to 100 times less than the average human adult. Accordingly, even if there was an assumed safe dose for adults the Radiation Standards do not take into account the variety of such tolerances in other than the normal average adult.

(c) The Standards do not take into account concentrations of other radionuclides which by virtue of all available pathways could reach man and give him an excessive dose of radiation over and above the assumed safe dosage. Other examples of such radionuclides are: Sr-89 (Strontium), Sr-90, Sb-125 (Antimony) and others.

(d) Finally, the possible biochemical concentration processes are not even known for a variety of radionuclides which are or can be emitted from nuclear facilities. Accordingly, it is my opinion that the Radiation Standards are scientifically deficient in that they assume they take into account all available scientific information, but as a matter of science and logic they do not.

It is my opinion that the failure to take into account these pathways make it possible for man to receive from 100 to 1,000 times the assumed safe dose of radiation set forth by the Atomic Energy Commission Radiation Standards.

It. The Atomic Energy Commission Radiation Standards are also scientifically deficient in determining whether or not man can receive the assumed safe dose of radiation since available sources of radiation, other than those licensed by the Atomic Energy Commission, are excluded from consideration. Thus at least the following additional sources of radiation which man is daily subjected to are excluded from any computation of the assumed safe dose of radiation. Some of these sources of radiation are:

(a) radiation from all medical and dental sources;

(b) accumulations of radioactivity in water and air from sources other than a specific facility under consideration;

(c) accumulations of radiation from all of a given category of facilities which emit radiation; and

(d) differences in tolerance of human beings to be able to react safely to any level of radiation dose.

It is, therefore, my opinion that it is scientifically and logically impossible, pursuant to the current radiation standards, to prevent man from receiving radiation in excess of the assumed safe dose because the Radiation

Standards permit a given allowable dose but exclude from consideration other known sources of radiation.

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CHAIRMAN SKALLERUP: Mr. Charnoff, are you ready to proceed with rebuttal?

MR. CHARNOFF: Yes we are, sir. For purposes of the rebuttal, I will address a number of questions to Mr. Roe, Mr. Little and Dr. Goldman. And what I should like to do is to address before lunch the questions to Mr. Roe and Mr. Little. And I would like to ask Dr. Goldman to present a copy of his written rebuttal which is in the form of a series of questions and answers. And it is essentially what we will ask Dr. Goldman after lunch, I would ask him to present a copy of that document to Mrs. Stebbins and to Mrs. Bleicher and Mr. Engelhardt, so that they may have that available to them for their review.

MRS. BLEICHER: I think the record should perhaps show that this morning in the attorney's conference we discussed the matter of my request on behalf of LIFE that copies of the rebuttal be made available to us so that we would have an opportunity to review them for purposes of developing our cross examination, and at that time Mr. Charnoff did indicate to me that he had some of the rebuttal prepared in written form, including Mr. Goldman's testimony.

CHAIRMAN SKALLERUP: And that you would be provided time with respect to the others to prepare?

MRS. BLEICHER: That is correct.

MR. ENGELHARDT: Mr. Chairman, while we are on this subject, if it is appropriate, I would like to identify the prepared testimony of the Regulatory Staff in rebuttal to the direct case of the Intervenors, which we have available now and which I would like to give to counsel for Intervenor LIFE nad will also give to counsel for the Coalition when he arrives this afternoon or I can give it to Mrs. Stebbins.

I am going to give copies of the testimony of Lester Rogers, copies of a report entitled "Evaluation of the Possible Causal Relationship Between Fallout Deposition of Strontium-90 and Infant and Fetal Mortality Trends," which was prepared by Edith Elena Thompkins, and will form a significant portion of her testimony which will be given in rebuttal.

I would also like to give to the Intervenors a copy of a document entitled "A Critical Review of Infant Mortality and Nuclear Power Generation," by E. J. Sternglass, which was prepared by A. K. Davis and Bernd Kahn. These four individuals I have identified will be available to present their testimony in person when the rebuttal testimony of the staff is presented.

Meanwhile, I am going to ask Mr. Wallig to give to Mrs. Bleicher copies of these three documents that I have identified. We will make available similar copies to the

Coalition, to the Applicant and to the Board members when we have assembled a few more copies.

CHAIRMAN SKALLERUP: Have you any reasons for not providing the Board with copies of Dr. Goldman's testimony?

MR. CHARNOFF: You tempt me with that question, Mr. Chairman, but we would be pleased to have Dr. Goldman hand it to you.

CHAIRMAN SKALLERUP: Mr. Charnoff, have you named all of the rebuttal witnesses you intend to call in the course of your rebuttal?

MR. CHARNOFF: Yes, sir.

CHAIRMAN SKALLERUP: Have you, Mr. Englehardt, identified all of the witnesses you intend to call in the course of your rebuttal?

If not, would you supplement the list of witnesses.

MR. ENGLEHARDT: In addition to the witnesses whose testimony or basic testimony that I have already distributed and identified, we will have the following witnesses: Dr. Paul Tompkins, Acting Director of Criteria and Standards of the Radiation Office, Environmental Protection Agency, Dr. Daniel Nelson, Assistant Director, Ecological Science Division, Oak Ridge National Laboratory, Dr. Marvin Goldman, Radiobiology Laboratory, University of California at Davis, Dr. William Bibb, Medical Research Branch, Division of Biology and Medicine of the Atomic Energy Commission and Dr. Dean Parker, Professor of Biology, Univer-

sity of California at Riverside, now a staff geneticist on detached duty with the Biology Branch of the Division of Biology and Medicine of the Atomic Energy Commission.

Those individuals, in addition to those previously identified will constitute the individuals to be offered for rebuttal testimony by the Regulatory Staff.

CHAIRMAN SKALLERUP: Mr. Charnoff?

MR. CHARNOFF: Mr. Roe, we might begin with you.

Whereupon,

LOWELL ROE

was called as a witness on behalf of the Applicant and, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

MR. CHARNOFF: Mr. Roe, Applicant's Exhibit No. 2 is a letter dated August 11, 1970, from the Superintendent of Camp Perry addressed to you. It appears in the transcript on pages 739 thru 742. Have you received more recent assurances from the Adjutant General of the State of Ohio regarding the ordnance firing from the Erie Industrial Park and Mr. Camp Perry showing that such firing will be properly controlled and will not present a hazard to the station?

WITNESS ROE: Yes.

MR. CHARNOFF: Do those assurances appear in a letter dated January 14, 1971 from the Adjutant General, Major General Dana L. Stewart to Mr. Howard B. Fox of the

Toledo Edison Company?

WITNESS ROE: Yes, they do.

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end #5

MR. CHARNOFF: Mr. Chairman, I am going to ask Mr. Churchill to distribute to the parties and to the Reporter three copies of this letter and I would appreciate having it marked as Applicant's Exhibit No. 5.

Since we read Applicant's Exhibit No. 2 into the transcript, I would like to call on Mr. Roe to read the letter to Mr. Fox dated January 14, 1971 from the Adjutant General into the transcript.

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(The document referred to was marked Applicant's Exhibit No. 5 for identification.)

MR. ROE: On the letterhead, "State of Ohio, Adjutant General's Department, Building 110, Fort Hayes, Columbus, Ohio," dated 14 January 1971. Addressed to Mr. Howard E. Fox, Toledo Edison Company.

"Dear Mr. Fox:

"This is in reply to your request for assurance concerning the use and administration of the Danger Zones established in Lake Erie in the proximity of your proposed Davis-Besse Nuclear Power Station. These danger zone regulations have been established by the Corps of Engineers, Department of the Army, as set forth in 33 CFR 204.187 as amended. The Adjutant General, State of Ohio, has been designated as the enforcing agency for Areas I and II which are contiguous to the shore at Camp Perry and the Erie

Industrial Park. As such, the Adjutant General is responsible for the proper conduct of operations involving the use of the Danger Areas. This applies to any ordnance firing from the Erie Industrial Park as well as from Camp Perry.

"Our present firing schedule, which as you know, calls for eight to ten days of firing by our 40 MM battalions one time each year. This takes place generally in the months of June or July. In addition, we fire small arms to include .50 cal machine guns from Camp Perry almost every weekend from April through November. All of our firing is made doubly safe by the use of limiting stakes which assure that the guns cannot be traversed beyond the authorized azimuth.

"The TRW Jet and Ordnance Division has entered into a joint use agreement with us which permits them to test their weapons on Tuesday and Thursday each week from 1300 to 1600 hours from the Erie Industrial Park. Their firing has been done primarily for functional testing and for this purpose, they must fire not more than 10° right or left of true north which keeps their point of aim well within the center of the impact area. At the present time, TRW is not testing and in fact, do not have an active weapons program at this location. They have a sublease with Cadilac Gage, their successor. Any firing from the Erie Industrial Park must be conducted in accordance with strict safety precautions and in accordance with the same procedures in

force for firing from Camp Perry.

"Over the past few years, our firing from Camp Perry into Area II has been on the decline and no increase in this activity is anticipated in the foreseeable future. The limited size of the impact area (Area II) precludes the firing of any ordnance larger than 40 MM Automatic Weapons, except for mortars which are of limited range, and we do not expect that TRW or any other organization will have testing requirements in the 40 MM or smaller range.

"We do expect to have a continuing need to keep Danger Area II in the same size and configuration as presently established. Any further reduction would make it useless for our purpose; however, it is adequate at the present time and no request for any increase is anticipated.

"We are fully aware of both your concern and the Atomic Energy Commission's concern about the possible effect that use of these Danger Areas could have on the construction and operation of the Davis-Besse Station, but we feel strongly that the type of usage and its very limited nature presents no hazard to the station or to the general public.

"We will continue to keep a continuing awareness of your requirements and will keep both you and the AEC fully informed concerning any future proposed changes in our usage should they occur.

"Sincerely yours,

"s/Dana L. Stewart

"Major General

"The Adjutant General."

MR. CHARNOFF: Thank you.

Now, Mr. Roe, Applicant's Exhibit No. 3, appearing in the transcript on pages 742 through 745, was a letter dated November 18, 1970, from Mr. Bernard Dove writing on behalf of the U. S. Air Force, and addressed to Mr. Howard B. Fox of Toledo Edison.

Has the substance of that letter been confirmed in recent correspondence from the Secretary of Defense affirming that the Department of Defense will exercise appropriate controls over military activities in the area to preclude any hazard to the Davis-Besse station?

MR. ROE: Yes.

MR. CHARNOFF: Does that confirmation appear in a letter dated January 14, 1971, on the stationery of the Secretary of Defense addressed to Mr. Davis, the President of Toledo Edison Company, and signed by David Packard, who at the time was Acting Secretary of Defense?

MR. ROE: Yes.

MR. CHARNOFF: Mr. Chairman, I am going to ask Mr. Churchill to hand three copies to the Reporter and to distribute copies to the Board and the other parties to the proceeding and ask that this letter of January 14, 1971

from David Packard to be marked as Applicant's Exhibit No. 6 and received in evidence and ask Mr. Roe to read this letter into the transcript.

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(The document referred to was marked Applicant's Exhibit No. 6 for identification.)

MR. ROE: The letterhead "The Secretary of Defense, Washington, D. C. 20301."

"Dear Mr. Davis:

"This will confirm the procedures governing the military use of the Air-to-Surface Gunnery Range located within restricted air space R-5505 in Lake Erie, Ohio, as described in the letter dated November 18, 1970, to your Assistant, Mr. Howard B. Fox, from Mr. Bernard Dove, Chief, Bases and Units Division, Directorate of Aerospace Programs, Headquarters, United States Air Force. In particular, we would confirm that the range is used only by Air Force training flights out of Lockbourne Air Force Base, Ohio, and these flight routes bypass the Davis-Besse Nuclear Power Station site near Port Clinton, Ohio by eight nautical miles. Air crews are instructed not to fly within a circle of six nautical miles of the Davis-Besse station site. These distances provide more than adequate minimum safe clearance of the sites. These bypass distances could be even further away, if circumstances required, without interfering with

the Air Force training mission.

"Appropriate representatives of the Dpeartment of Defense are aware of the plans for construction and operation of the Davis-Besse Nuclear Station, and will exercise appropriate controls over all military activities in the area to assure that the health and safety of the public will not be jeopardized by any such military activities.

"Sincerely,

"s/David Packard."

MR. CHARNOFF: Thank you.

Mr. Roe, addressing yourself to the capability of the liquid rad waste system proposed for the Davis-Besse plant and described in the PSAR, are you aware of whether there is any proven technology that has a greater capability to remove radioactivity from the liquid effluents from the Davis-Besse plant?

MR. ROE: No, I do not. I would like to amplify this to state that the design of the liquid radioactive processing systems for the Davis-Besse station incorporate the most efficient proven technology for reducing the radioactive content of the processed liquid. This system using degasification, filtration, ion exchange and distillation, removes essentially all gaseous particulate and dissolves solid impurities such that the radioactivity content of processed liquid for most isotopes is many orders of magnitude

below the allowable limits of 10 CFR Part 20. This permits operation of the station in a manner where all processed liquid wastes could be released to the environment and still have the radiation releases be a small fraction of the allowable limits.

The releases of radioactivity in the liquid effluents shown on the tables in response to the AEC question 2.4 and 11.1 contained in Volume 4 of the PSAR are based on certain assumptions, clearly stated in these responses, which result in our showing the greatest quantities of radioactive release that we could conceivably expect.

These principal assumptions are:

1. That the reactor is operating at an equilibrium cycle for a full year with 1 percent of the fuel having cladding failure, and,

2. That all of the processed primary system water is discharged to the lake.

There is certainly no expectation that there will ever be 1 percent failed fuel cladding, and operation of this reactor would not be permitted for any extended period with this amount of fuel cladding failure if it did occur.

These facts make the radioactivity releases shown in the above tables extremely pessimistic, since they are for extreme conditions which would not exist in actual

station operation.

The estimates of the radioactivity released are also based on the discharge of all processed primary system water. However, the liquid radioactivity waste treatment system is also designed so that all processed primary system water can be recycled with essentially none of it being released to the environment.

This recycling capability is the principal feature of any "minimum" or "near zero" treatment system for liquid waste. The principal reason for releasing any of this processed water is to prevent a build-up of tritium in the primary and associated systems to a level which could present a safety problem to the plant operating personnel.

Since there is no feasible way to remove tritium from the water, the only way to prevent a high concentration build up over a longer period of time within the primary system is to release a certain portion of processed primary system water.

As is the case for other assumptions associated with the tables showing radioactive release, the estimate for the release of fission-produced tritium through the fuel cladding to the primary system is conservative, in that it results in a higher value that what is expected from actual operation with the type of fuel cladding which will be used.

The most prudent and responsible way to operate the station and in fact the manner in which it will be operated is to release only enough processed waste to maintain the tritium concentrations in the primary and associated systems at a sufficiently low level so as to not have an in-plant safety problem.

This release of processed effluents necessary to maintain tritium levels in the station to reasonable levels would not release excessive quantities of tritium to the environment, and the release of all radionuclides from this type of operation will be only a small fraction permitted by 10 CFR Part 20.

The annual dosage to the most exposed member of the general public resulting from these discharges will be less than 1 percent of the dosage received from natural background radiation present in this general area.

End #6

MR. CHARNOFF: Thank you.

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MR. CHARNOFF: Mr. Chairman, I might note that in part of the last question to Mr. Roe and the next one or two questions to Mr. Roe relate to some of the testimony by Dr. Sternglass on behalf of the Coalition.

If you will recall, we had objected to a good part of that testimony as being irrelevant. And the Board had ruled that we should deal with some of these matters on cross and on rebuttal. This is why we are introducing some of this matter. It is not for purposes of suggesting that certain aspects of this are matters in controversy in this hearing.

MR. CHARNOFF: Mr. Roe, addressing yourself now to the capability of the gaseous rad waste system, do you reaffirm the commitment made in Mr. Sampson's letter of November 6, 1970, to Dr. Peter Morris that Toledo Edison will hold up the gaseous wastes for a 60 day period of station operation, and in no event will the retention period be less than 30 days.

MR. ROE: Yes, I do.

MR. CHARNOFF: Now, assuming a minimum holdup period of 30 days, do you expect any cesium-137 or cesium-138 or strontium-90 to be released in the gaseous effluents or to result from the decay of any of the isotopes in the gaseous effluents?

MR. ROE: No.

MR. CHARNOFF: Mr. Roe, at our previous hearing

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session questions were asked with respect to the feasibility of evacuation of the low population zone in the unlikely event that it should be necessary while snow or flood conditions may exist.

Have you further testimony with regard to the emergency evacuation program, taking into account the possibility of snow and flood conditions?

MR. ROE: Yes. I would like to supplement the previous testimony of Mr. Novak in regard to an emergency evacuation program relating to the Davis-Besse station with this additional information. We have been in contact with the Department of Civil Defense of the Adjutant General's Office of the State of Ohio.

That Department has full-time personnel who have had special training and up to 12 years' experience in civil defense matters, including population evacuation. They advise that they have the know-how and will provide ourselves and local government units with guidance in setting up an adequate evacuation program.

The areas in which they will advise us include the securing of training for personnel, determination and evaluation of the problems involves, and developing techniques and procedures for solving them, developing a warning system, communication systems, methods of moving people, including coping with weather conditions to be expected in the area,

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feeding and housing, traffic control, and security for the area. We have already contacted the Ottawa County Commissioner the Sheriff, the Ottawa County Engineer and the Civil Defense Director, Oak Harbor Fire Department, and the State Highway Department and the Highway Patrol.

They have all indicated a complete willingness to cooperate and indicated that they presently have equipment which could be coordinated for an evacuation program in connection with the Davis-Besse station.

The Ottawa County Engineer has stated that it is feasible to evacuate the Sand Beach and Long Beach areas within the low population zone under any weather conditions within a two-hour period.

He has further stated that there is sufficient equipment now available in Ottawa County to assure that this be accomplished. The County has a fleet of five trucks equipped with snow blades that are capable of removing snow drifts over 12 feet in height. These trucks are maintained at a location five miles south of the station.

The State Highway Department presently has a fleet of five trucks equipped with snow blades that are located in Oak Harbor. All trucks, both county and state, are radio-equipped. Additional equipment is available within the area that could also be used for snow emergencies if required.

All fire departments within Ottawa County have

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boats available for emergencies, and there are two amphibious vehicles presently available in the county.

The Coast Guard Station at Marblehead also has boats mounted on trailers for emergency use. The State Division of Wildlife has boats located at Crane Creek, a few miles west of the station that are available for emergencies.

From our investigation and planning in this regard, we have ascertained that a completely adequate avacuation program can and will be developed and maintained and that adequate equipment is now available in this area for this purpose.

MR. CHARNOFF: Thank you, Mr. Roe.

DR. JORDAN: Could I ask a question, perhaps of the Staff at this moment.

I noticed in the Federal Register of December 24, 1970, there were certain proposed plans or amendments to Part 50 for coping with emergencies.

Are those amendments or rules and regulations now in effect? And do they apply to the Davis-Besse station?

MR. ENGELHARDT: I believe that those rules are effective. I will have to assure myself in talking with my technical witnesses as to just what the immediate status is.

But I believe these proposed rules are effective just as the amendments to another regulation were effective, which we discussed in our previous session.

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These, I believe, Dr. Jordan, reflect regulations regarding emergency planning which were proposed for comment, for an extended period of time, by the Commission, before they were promulgated as effective regulations.

And as is the case generally with a rule proposed for adoption by the Commission, the Commission Staff tends to apply those to the applications then pending. However, in response specifically to your question, I will have to consult possibly during the luncheon recess with the technical members of the Staff to determine how this particular emergency plan for the Davis-Besse plant complies with the intent of the new regulation.

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DR. JORDAN: That is fine. If you do that after lunch, it would suit me fine.

MR. ENGELHARDT: While we have a moment, Mr. Chairman, I heard Mr. Charnoff identify Applicant's Exhibit 5 and 6 and offer them in evidence. I did not hear the Chairman rule on that proposal. I just wanted to be sure I didn't miss something or that the record is complete.

CHAIRMAN SKALLERUP: I nodded my head and assented.

(The documents referred to, heretofore marked Applicant's Exhibit Nos. 5 and 6 for identification, were received in evidence.)

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MR. CHARNOFF: Let me, in dealing with Dr. Jordan's inquiry, call on Mr. Roe to take the rule that was referred to by Dr. Jordan, which was I think made effective as of January 22, 1971, and as to each item called for by that rule, would you please show in your response, Mr. Roe, just where each of these matters are discussed in the PSAR, and summarize that material.

MR. ROE: Yes.

Item A called for as the organization for coping with emergencies and the means for notification in the event of an emergency of persons assigned to the emergency organization.

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MR. CHARNOFF: Excuse me, Mr. Roe. This is Item A of Appendix E, and II, which is the outline of what the Preliminary Safety and Analysis Report should contain in the way of emergency procedures.

Is that correct?

MR. ROE: That is correct.

MR. CHARNOFF: Thank you. Would you proceed, please.

MR. ROE: The response to Item A as stated in the PSAR, Section 12.4.1, insofar as possible the station will be self-sufficient in handling emergency conditions.

Emergency procedures will specify the duties of individuals assigned to the station during any such emergency. Initiation of emergency procedures will be by the shift supervisor on duty at that time. Communication at the station will be with the station's self-sufficient communications system supplemented by Walkie-Talkies where needed.

Notification of any additional off-site personnel required for emergency operations will be by public telephone directory from the station supplemented by radio communication to selected company control centers, which in turn may forward necessary communications.

Item B, under II of Appendix E says, "Contacts and arrangements made or to be made with local, state and federal governmental agencies with responsibility for coping with

ln4 is also anticipated that the local civil defense corporations will aid in off-site emergency procedures. This should be civil defense and others.

Item D, under Appendix E, asks for features of the facility to be provided for on-site emergency first aid and contamination and for emergency transporation of individuals to off-site treatment facilities.

Within the station will be an access control area through which personnel must pass when entering and leaving potential radiation areas in the auxilliary building and the containment structure. All personnel leaving will be monitored with friskers and portal whole body counters.

Decontamination and first aid facilities will be available at this location. Additional whole body counting will be performed on passing through the station gatehouse. Areas within the office building located at the opposite side of the turbine building from the containment and auxilliary buildings will also be available for emergency first aid and possible decontamination.

A vehicle will be maintained at the station site for emergency transportation of injured individuals from the site.

Item I, II, Appendix E. Provisions to be made for emergency treatment of individuals at off-site facilities. Several area hospitals have been contacted regarding their

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emergencies, including identification of the principal agencies."

In the response, the PSAR, Section 12.4.1 states, those agencies which might be expected to have a role in the station emergency procedures. The agencies listed might be involved in emergency evacuation, radiation monitoring, decontamination and radiation exposure treatment during emergency conditions.

Initial contact has been made with a number of these organizations, including the Ottawa County Civil Defense Corporation, the Ottawa County Sheriff's Office, the Oak Harbor Fire Department and the others I just listed, including the State Highway Patrol and the State Garage.

Item C of II in Appendix D calls for measures to be taken in the event of an accident within and outside of the site boundary to protect health and safety and prevent damage to property and the expected response in the event of an emergency of off-site agencies.

Our response, PSAR Section 12.4.1.1, through 12.4.1.5 state the anticipated measures that will be taken in the event of an accident at the station to protect health, safety and property. It should be noted that there will be no private property situated within the station exclusion area.

The radiation monitoring teams to be established in the emergency procedures will also be capable of surveying outside of the site boundary in the event of an accident. It

potential for treating injuries which could involve radiation exposure. Three have indicated a willingness to work with us to plan for such emergencies. Use of their facilities will be outlined in the station emergency procedures.

Item F, in Appendix E, the training program for employees and for other persons not employees of the licensee whose services may be required in coping with an emergency.

Our response: Supervisory personnel at the station will be required to participate in public health service courses relating to reactor safety and hazards evaluation, and management of radiation accidents. All station personnel will be required to participate in in-house training presented by the station chemistry and health physics group and other staff members in order to prepare them for duties required during emergency procedures.

This training will be done well in advance of the start of nuclear operations at the station. Where needed, the station chemistry and health physics group and other staff members will provide training for nonemployees so that they may capably perform assigned duties relative to the station emergency procedures.

The last item that is asked for in Appendix E is Item G, features of the facility to be provided to assure the capability for plant evacuation and the capability for facility entry in order to mitigate the consequences of an accident

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or, if appropriate, to continue operation.

Our response: while normal exit from the auxilliary building and containments will be via the access control area, emergency exit doors are provided at other key locations for these areas.

PSAR Section 5.2.1.8.4 describes the containment personnel and emergency location. Emergency procedures will describe steps to be taken by individuals who use emergency exits in order to monitor them for potential radiation contamination and to initiate decontamination if necessary.

Sufficient emergency equipment such as radiation monitors, air samplers, protective clothing and respiratory protection equipment will be stored at a location remote from the site for use when reentering potential radiation areas at the station.

Station reentry would be expected to be via a normal entrance path, including through the access control area for the auxilliary buildings and containment. Entry through the emergency exits will be possible but will be under administrative control. Access to the control room, which is shielded from the containment, does not require passage through the controlled access area, although during a maximum hypothetical accident turbine building access from which the control room is entered will be controlled.

In addition to the normal station access road,

MR. CHARNOFF: We have one question for Mr. Little, in response to a question asked of him by Dr. Davies on pages 895 and 908 through 910 of the transcript.

Dr. Davies on behalf of the Coalition asked Mr. Little to provide information with regard to the carbon dioxide and moisture content of uranium dioxide pellets in the fuel.

XXX Whereupon,

WILLIAM LITTLE

was called as a witness on behalf of the Applicant and, having been previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

MR. CHARNOFF: Mr. Little, do you have that answer now?

MR. LITTLE: Yes.

Dr. Davies expressed concern over carbon dioxide and moisture content in uranium dioxide fuel at concentrations of approximately 0.24 to 0.29 weight percent, and 3.14 weight percent respectively.

The behavior of these impurities has been studied and current fuel specifications require a total carbon content approximately 20 times less than the values of concern, and a total moisture content approximately 1,000 times less than the value Dr. Davies mentioned.

In addition to carbon and moisture, the fuel specifications carefully control the maximum concentrations of fluorine, nitrogen, chlorine, and rare earths.

MR. CHARNOFF: Thank you, Mr. Little.

We have further rebuttal to offer by examination of Dr. Goldman which I assume from your schedule you would like to have immediately after lunch. Otherwise that would conclude our rebuttal.

CHAIRMAN SKALLERUP: Could we have a conference with counsel for a moment, please?

We will break for lunch and resume at 2.

(Whereupon, at 12:15 p.m., the hearing was recessed, to reconvene at 2:00 p.m., this same day.)

End #8A

AFTERNOON SESSION

(2:00 p.m.)

CHAIRMAN SKALLERUP: Will the hearing please come to order?

At the conclusion of our session this morning Mrs. Bleicher advised she would not be in attendance this afternoon. During the noon recess Mr. Baron called to say he would not be present this afternoon.

Counsel and the Board had a meeting with Mr. GlennLau during the noon recess. Mr. Lau had been unable to see his doctor this morning because his doctor had been called away on an emergency operation,and he anticipated seeing him this afternoon at two. So he will not be here this afternoon. Mr. Lau has indicated he is attempting to obtain a live witness, or live witnesses, to testify with regard to the snowfall in the area of the proposed plant and that he would call tonight and advise us of his more concrete plans in that respect.

I had a phone call from Dr. Oster, and I returned it and he was teaching, so I was unable to reach him. Apart from that I know of no other developments that have occurred since our last session. And now we are prepared to go ahead with Dr. Goldman on his rebuttal testimony.

MR. CHARNOFF: Mr. Chairman, this will be a series of questions and answers, questions addressed to Mr. Goldman

and answers by Mr. .dman. And we will essentially follow the material that we handed out to the parties this morning and to members of the Board before lunch. And for her convenience we have given a copy to the reporter.

CHAIRMAN SKALLERUP: Off the record for a moment.

(Discussion off the record.)

CHAIRMAN SKALLERUP: On the record again.

Whereupon,

MORTON GOLDMAN

resumed the stand as a witness on behalf of the Applicant and, having been previously duly sworn was examined and testified further as follows:

DIRECT EXAMINATION

BY MR. CHARNOFF:

Q Dr. Goldman, on transcript pages 1262, 1263, 1273 and 1274, Dr. Sternglass asserted that the gaseous releases from all nuclear facilities, whether boiling water reactors, pressurized water reactors or fuel reprocessing plants, are essentially the same, the difference being only "one of degree depending on hold-up time." This statements appears on Page 1262, lines 16 and 17. Would you comment on the validity of this assertion by Dr. Sternglass?

A At the outset, I would characterize Dr. Sternglass' statement with regard to gaseous waste comparisons as naive at the very least. By comparing the several types of

sources on the basis of gross curie releases alone, Dr. Sternglass has exhibited an apparently total ignorance of the different radiation and decay characteristics and hence the biological significance of these three greatly different sources of gaseous wastes. Boiling water reactors of the type currently in operation provide on the order of 30 minutes decay for gases between their release to the reactor coolant and their discharge from the plant stack; as a result, the discharges from a boiling water reactor stack consist of a predominantly short-lived mixture of radionuclides, 95 percent of the activity so discharged having a half-life of less than 10 hours, 50 percent of less than two hours.

Furthermore, the average energy released per atomic decay for these gases is almost seven times that for the longer lived constituents discharged from the pressurized water reactor. Since the gaseous discharges from these stations are made through a tall stack, the constraint on discharges is based on the gamma dose to the individual beneath the elevated plume at the most exposed point on the site perimeter. Both calculations and monitoring at operating stations have confirmed that if this criterion is observed, then resulting exposures from deposited materials will always delivery substantially smaller doses to other members of the population, especially considering the substantial dilution that must

RMS/rms4

occur before the elevated plume diffuses down to the ground level for deposition to occur.

Pressurized water reactor gaseous emissions consist exclusively of long-lived noble gases because of the hold-up inherent in the closed primary coolant cycle as well as the decay provided in waste gas hold-up systems. Short-lived gases decay within the reactor coolant system before transfer of gases to the gaseous waste decay tanks occurs, and as indicated by the cross-examination of Dr. Sternglass, there are no particulate radioactive daughters of the gases resulting from fuel clad defects and emitted after 30-60 days decay. Any particularte daughters formed during the decay period are removed essentially completely by the high efficiency filtration provided between the gas decay tanks and the discharge point

The fuel recovery plant is at the opposite end of the decay spectrum from the boiling water reactor. Before fuel is processed so as to release the radioactive gases, it is stored for a substantial period of time to permit decay of the most short-lived radioisotopes including radioactive iodine; a minimum decay period prior to processing is usually on the order of 120 to 180 days. Therefore, essentially all of the rare gases with the exception of krypton-85 have decayed. This nuclide does not decay to form a particulate radioactive daughter and its decay energy is sufficiently low that it provides essentially no genetically

RMS/rms5

significant dose, but primarily a dose to the skin and outer surface of the body. The doses from fuel recovery plant gaseous wastes are considerably different in kind and magnitude from those of a boiling water reactor or a pressurized water reactor, and in no case can they all be equated with each other merely in terms of gross curies.

Q On Transcript Page 1304, Dr. Sternglass indicated that a monitoring program would not detect the isotopic discharges from the plant, and that such a program would not provide a sufficient basis for appropriate action. Would you comment on this?

A Discharges of radioactive material to the environment from nuclear power facilities can be detected quite readily by environmental monitoring programs. The results of those programs and a history of plant operations provides an entirely adequate basis for assessing the significance of radioactive materials released from a plant.

Environmental monitoring at nuclear power reactors under normal operating conditions provides assurance of adequate control over radioactive effluents from the plant and a means of estimating the resulting radiation exposure of the population. The basis for determining the effectiveness of environmental monitoring programs in assessing plant operations does not depend solely upon the character and amount of radioactivity released from a particular

RMS/rms6

plant, but also upon the sensitivity for determining the concentrations of radioactivity in various environmental media using currently available analytical techniques.

For example, gaseous radioactivity releases from a nuclear power plant may be detected in the environment at a dose level as low as 1 millirem per month, which is approximately 2 percent of the 500 millirem per year dose permitted to the maximum individual in the general population by 10 CFR 20. Similarly, airborne particulate activities may be measured using air filtering devices with a sensitivity of approximately 0.05 picocuries per cubic meter. This is approximately 0.05 percent of the Part 20 MPC for unidentified beta-gamma emitters in air.

A similar rationale can be applied to the measurement of radionuclides in liquid effluents. For example, the minimum detectable level of activity in water for beta-gamma emitters, exclusive of tritium, is about one picocurie per liter. This corresponds to about one percent of the MPC for unidentified beta-gamma emitters in water, which is a more restrictive limit than that for any individual radionuclide expected to be present in nuclear power plant effluents.

In general, using conventional gamma spectrometer techniques with minimum sample volumes and counting times, the minimum detectable activity level for any individual

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radionuclide would not exceed 50 picocuries per sample, on a very conservative basis.

Assuming an average sample of a food item weighed 1000 grams, this minimum detectable level of activity corresponds to approximately 0.3 percent of the most restrictive MPC for nuclides expected in reactor plant effluents, that is strontium-90. Even in the case of tritium, about which attention seems to have centered, the detectable level (200 picocuries per liter) is 0.006 percent of the maximum permissible discharge concentration to unrestricted areas.

In each of these examples, I have assumed the use of conventional methods of analysis for environmental media. With this degree of sensitivity readily achieved by presently available methods, appropriate action can be taken long before any environmental build-up of significance to health can occur.

Q Dr. Goldman, you are familiar with the statement by Dr. Sternglass with regard to the average dose from gases discharged at this station, approximating five millirem per year per capita as indicated in transcript page 1269. Would you indicate whether or not you have made or caused to me made calculations of the average dose from gases discharged from this plant, and if you have done this, what their magnitude is?

A Yes, I have made such calculations which are

RMS/rms8

contained in a report NUS-729, "Effects of Estimated RAdioactive Effluents from the Davis-Besse Nuclear Power Station" which was prepared for the Toledo Edison Company and completed in November of last year.

MR. CHARNOFF: Just one moment, Dr. Goldman,

Mr. Chairman, I am going to ask Mr. Churchill to hand three copies of the document just identified by Dr. Goldman to the reporter and copies to the Board and to the staff and to Mrs. Stebbins who is present here today. We will make copies of this document available to counsel for the other intervenors when they reappear at this hearing. I would like to have this document marked as Applicant's Exhibit No. 7 and have it introduced into evidence.

CHAIRMAN SKALLERUP: It is so ordered.

(The above-mentioned document was marked for identification as Applicant's Exhibit No. 7 and was received in evidence.)

BY MR. CHARNOFF:

Q Dr. Goldman, would you proceed with your answer?

A We calculated the radiation doses from the projected gaseous effluents and for the approximately 28,000 curie maximum annual release estimate based on the conservative assumption that one percent of the fuel rods have defective cladding and using meteorological data from Toledo.

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The 1980 population projections from the Davis-Besse PSAR were used with source and dispersion data to obtain population dose distributions. The results of these calculations indicate that even using the most pessimistic assumptions of gaseous release, a hypothetical individual spending 24 hours a day every day on the site boundary at the most exposed position would receive about .75 millirem per year, or about .15 percent of the 500 millirem per year individual dose limit specified in Part 20. The average dose to the population within a 50 mile radius from the plant due to gaseous release would be less than 0.001 millirem per year or about one/one-hundred thousandth of the population dose limit specified by the NRC and the NCRP in Report No. 39.

Q Based on your examination of the site data, would you feel that your estimates of the dose would be significantly different if the site data were to be used rather than the meteorological data from Toledo?

A No.

Q To what extent do your dose calculations for the gaseous releases take into account the possibility of reconcentration of the radioactive effluent in the food chain?

A They would not and did not consider reconcentration for the gaseous releases since, as indicated in the cross-examinationof Dr. Sternglass and in the answer to the Board's

RMS/rms10

question at the prehearing conference, there are no radioactive materials emitted in the gaseous wastes other than noble gases and these are not reconcentrated.

Q On this basis then, is there any support whatsoever for the value of 5 millirem per year as projected by Dr. Sternglass on Transcript page 1269?

A None whatsoever.

Q Dr. Goldman, does this report which has been identified now asApplicant's Exhibit No. 7 also deal with liquid effluents from the Davis-Besse plant?

A Yes. The doses to persons using drinking water supplies taken from the lake at Camp Perry, Port Clinton and Toledo-Oregon were calculated based on the expected discharges from this plant, as well as the dose from eating fish taken from the lake. The dose to an individual at the closest water system intake (that at the Camp Perry-Erie Industrial Park) is less than one-hundredth of one millirem per year from the ingestion of water and of fish at that location. The average dose per person within a 50 mile radius is about 3 ten-thousandths of one millirem per year from expected liquid discharges.

Similar calculations can be made for local individual ground water supplies assumed to be replenished by lake water at the concentrations appropriate to the distance from the plant. For example, there are homes in the Sand Beach

area which are supplied by shallow wells, which may be as close as 1000 meters from the discharge point. At this distance, the concentrations in lake water and hence the doses from its use might be twice those at Camp Perry. Neglecting any purification that might occur in filtering through the sand to these wells, the resulting dose to an adult might be 0.015 millirem per year or 30,000 times lower than the part 20 limit would permit.

Assuming that the doses to a small child are inversely related to body mass only (that is, the intake of food and water by a child is as great as for an adult) they might be a factor of 10 greater than those to the adult. The dose to an average child from liquids discharged from Davis-Besse would be three-thousandths of one millirem per year, and the dose to a fetus from activity ingested by the mother during the first trimester would not be as great as one millirem.

MR. CHARNOFF: At this point, Mr. Chairman, I would like to introduce, as Applicant's Exhibit No. 8, a document which has been referred to on several occasions in this hearing and during the last days of this hearing. It is entitled NCRP Report No. 39, "Basic Radiation Protection Criteria." It sets for the the recommendations of the National Council on Radiation Protection and Measurements. And it was issued on January 15, 1971.

RMC/rms14

Both of these documents are concerned with the effects of tritium on litter size, body size and organ size of rats following the ingestion of tritiated water. The more recent study extended the dose levels study, but the results were essentially the same. The smallest tritium level which Cahill and Yuile believed significant was 10 microcuries of tritium per milliliter.

And in their document, and I quote, they stated, "Continuous exposure to a tritiated water activity of one microcurie per milliliter during pregnancy was found to be consistent with the production of offspring in which the only deviations from the controls noted were increased length and a slight increase in weight of the liver and heart at birth.

Comparing the doses from these levels to the maximum permissible dose, one finds that the 10 microcurie per milliliter level leads to a dose to the rat embryo and fetus of about three rads per day. This would be about 2000 times the maximum permissible dose for the individual in the general population. The one microcurie per milliliter level would lead to about 3/10ths rad per day or about 200 times the 0.5 rem per year limit.

In terms of release from the Davis-Besse plant my calculations show a maximum dose to be on the order of 10^{-6} or one-millionth of a rad per year from tritium. This

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This would be one hundred million to one billion times smaller than the experimental doses referred to by Cahill. Therefore, in terms of the significance of the experimental results as they relate to the Davis-Besse operation and 10 CFR 20, it would be my estimate that even assuming a linear dose effect relationship to exist there is no living population in the U.S. large enough to show the effects of such doses, that is, those on the order of one-millionth of a rad per year.

Q Thank you.

CHAIRMAN SKALLERUP: That Cahill Yuile question doesn't appear in this material.

MR. CHARNOFF: That is basically the only item in here that is not in the document we handed out.

CHAIRMAN SKALLERUP: Will you be able to provide the Coalition and LIFE with a copy of that?

MR. CHARNOFF: Yes, sir.

DR. WINTERS: There is also one other. Back here when you introduced NCRP No. 39.

MR. CHARNOFF: That is right. That is not new information in the sense that it was previously discussed with Dr. Sternglass. It was simply set up there to compare with the dose that Dr. Goldman had calculated.

DR. WINTERS: The subsequent question and answer was not in the document.

rms16

BY MR. CHARNOFF:

Q Dr. Goldman, considering Drs. Gofman and Tamplin's statements with respect to the present AEC standards and based on your examination of the Davis-Besse plant environment and the dose projections therefrom, could you comment on the validity of the contentions of Drs. Gofman and Tamplin?

A They are completely without foundation for several reasons. First, with specific reference to Dr. Tamplin's comments on the inapplicability of the secondary standards or MPC values, he totally fails to take into account the primary standards contained within 10 CFR 20 which provide over-riding limits on the blind application of the MPC values.

For example, under 20.105, Permissible Levels of Radiation in Unrestricted Areas, paragraph (1) limits the individual dose to 0.5 rem per year. Section 20.106(e) limits the quantity discharged from facilities if intake of radioactive materials from air, water or food by a suitable sample of an exposed population group would exceed one-third the intake represented by the MPC values. This limits the dose via intake from all sources to that equivalent to 170 millirem per year. Further, since the so-called "suitable sample" depends on the particular isotope being considered, this section would also specifically limit the

RMS/rms17

discharge of materials which resulted in excessive exposure of critical population groups such as children, if it were significant. The requirement for such a sample was specifically referenced by FRC in their intake guidance for radio-iodine by children in the FRC Memorandum for the President of September 13, 1961, published in the Federal Register of September 26, 1961, in recommendation 3(a), which defined guidance on daily intake, and stated:

"In the case of iodine-131, the suitable sample would include only small children."

Second, it is physically impossible to expose a significant portion of the population in the vicinity of this or any nuclear plant to more than a very small fraction of the 170 millirem per year contemplated in Part 20 and the FRC guides, while still meeting the maximum limit for individual exposure.

For example, discharges in liquid waste from the Davis-Besse plant, as from any other nuclear plant, are required tomeet MPC values at the point of discharge prior to dilution in the receiving body of water. Assuming that at this plant this were an accessible surface discharge rather than the inaccessible subsurface discharge, an individual taking his daily water and fish from the discharge pipe at the expected concentrations would receive approximately 10 millirem per year whole body dose from the

ingested radionuclides. As indicated previously, the average per capita exposure within 50 miles from liquid waste, considering both water and reconcentrated radionuclides in fish, would be about 3 ten-thousandths of one millirem per year, for a ratio of maximum individual to average per capita dose of 30,000 from this source.

Thus, if the liquid discharge were to increase to just meet the Part 20 limits of 500 millirem per year, the average per capita dose would be 500 divided by 30,000 or less than 0.02 millirem per year.

Similarly, the ratio between the maximum dose to the hypothetical individual at the downwind site boundary and the average per capita dose within 50 miles from gaseous releases is on the order of 400. Therefore, if the hypothetical individual were to receive 500 millirem per year from gaseous discharges, the average per capita dose would be a factor of 400 lower, or slightly over one millirem per year. It is impossible, therefore, to reach the general population dose limit of 170 millirem per year in the vicinity of the Davis-Besse plant without exceeding site boundary dose limits by factors in excess of 100.

I have performed similar calculations for a number of nuclear power plants and although these ratios vary somewhat depending upon plant type and the local environment characteristics, it is physically impossible to expose a

significant portion of the population to a dose of more than a few percent of the population dose limit, without greatly exceeding individual dose limits at the discharge point or site boundary.

Further, in regard to the misinterpretation of the application of the MPC values by Dr. Tamplin, the presence of more than one radionuclide in a discharge requires as indicated in the footnote to Appendix B of 10 CFR 20 that where there is a mixture in air or water of more than one radionuclide their combined limit must be such that in total intake in air or water would not exceed the 500 millirem value.

Thus, one cannot evaluate the adequacy of Part 20 for radioactivity releases from an actual nuclear power plant in terms of any single isotope taken alone at full MPC, which is what Dr. Tamplin appears to do in his cesium calculations.

Q Dr. Goldman, Table 2.4-1, Volume 4 of the Preliminary Safety Analysis Report has one column which reads, "Normal concentration of station discharge." Would you explain what was meant by the term "station discharge" in the title.

Does this mean discharge to Lake Erie?

A As mentioned on page 2.4-2 of Volume 4 of the PSAR, no credit was taken for concentration reduction by dilution of the waste in the discharge system. Therefore, the

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normal concentration at the station discharge referred to in that table 2.4-1 represents in fact the concentrations at the outlet of the station rad waste system before any dilution. As described to AEC question 2.3 in volume 4 of the PSAR, these processed wastes, those that have their quantities shown in the table, will be further diluted by at least a factor of 8.75 times 10^{-3} before these are discharged to Lake Erie.

In my calculations I used these corrected or modified concentrations, that is, taking into account the dilution available from other normal plant water.

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Q In ICRP Publication 8, Dr. Tamplin indicated the ICRP has stated, and I am quoting Dr. Tamplin, that "1 rad of radiation to 1 million people at large produces some 20 cases throughout the lifetime of those people." Is Dr. Tamplin's paraphrase of ICRP Publication 8 correct?

A No. Dr. Tamplin has apparently confused the working assumption of the ICRP with respect to the linear hypothesis to be a firm prediction of effects by that group. ICRP has made many statements concerning their use of the linear dose-effect hypothesis and in ICRP Publication 8 they state:

"No direct evidence is available for the effect of doses given at intensities lower than those normally employed during radiography. Extrapolation to low dose rates requires the assumption that, under the conditions of human exposure, leukaemia is induced by a mechanism in some respects comparable to the induction of gene mutation. It may be noted that in some circumstances a decrease in the dose rate by several orders of magnitude may decrease the mutation rate by a factor of about 5 (see Chapter III,3.2.4.).

"On the assumption of a linear relationship, the total leukaemia risk would appear to be of the order of 20 cases per million persons per rad. Longer period of observation may suggest that this is an underestimate for high dose rates. However it may be an overestimate for low dose rates. If the dose response relationship is not linear below

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100 rads, the real effect may be substantially less."

On this basis, the statement by Dr. Tamplin that a given population dose will produce a given biological response when this dose is delivered at a low rate and with a maximum value several orders of magnitude lower than those at which leukemia or other cancers have been observed in adult populations is no more than a very conservative assumption. This would be very much the same as assuming that the rate of induction of lung cancer and emphysema in 3-pack-per-day smokers can be used to predict with certainty the incidence of these diseases in 1-pack-per-year smokers.

Q Dr. Goldman, on page 1503 of the Transcript, Dr. Tamplin indicated that in Appendix IV of ICRP Publication 14, "they indicate that because they are now seeing more cancers in other sites, some six times more than they anticipated, that the present standards for whole body exposure is high by a factor of 10." Are you familiar with ICRP Publication 14 and its Appendix IV, and can you comment on that statement by Dr. Tamplin?

A Yes, I am familiar with that document. Appendix IV is entitled, "The Derivation of Numerical Values for Dose Limits: An Example for Discussion." This appendix attempts to arrive at a "notional dose limit for whole body exposure as determined by somatic effects derived from the appropriate sum of the relative sensitivities of the component parts of the

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whole body." This appendix does not indicate that present standards for whole body exposure are high by a factor of 10 as claimed by Dr. Tamplin. It does state and I quote from page 111:

"It will be seen that the dose limits derived in the manner set out in this appendix agree within a factor of two to three with currently recommended dose limits for all tissues and all organs with the single exception of the skin. The closeness of this agreement is a matter of some interest although it depends entirely on the choice of numbers on the sensitivity scale and on the scale of hurt and suffering."

Further, in the summary on page 116 of this appendix to ICRP Publication 14, the following statement is made:

"Our tentative classification of the relative radiosensitivity of tissues and organs to cancer induction can be combined with a naive assessment of the relative hurtfulness of different kinds of cancer to give an apparently rational relation between the dose limits for individual tissues and organs in the body. This is surprisingly close to what is implied in the current recommendation of the ICRP except in the case of the skin."

I can only assume that Dr. Tamplin is unable to read, since there is no mention in those statements or in the remainder of Appendix IV that the present standard for whole body exposure is high by a factor of 10, particularly

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in view of the Foreword to this publication which contains the statement:

"The Commission hopes that the publication of the reports, while not necessarily implying recommendations for present action, will stimulate discussion on matters having direct relevance to its work and to the development of the fundamental principle of radiological protection."

Q Does the Gofman-Tampling thesis rest largely on an assumed doubling dose for cancer, as well as the assumption that the general population can receive an average dose of 170 mrem?

A Yes.

Q What did ICRP 14 say with respect to assuming a doubling dose for cancer?

A ICRP Publication 14 states (Page 58):

"In radiological protection the radiation dose required to double the natural cancer incidence is sometimes used in assessing acceptable risks from somatic exposure by analogy with the concept of doubling dose used in assessing the genetic risks from exposure of the gonads. This concept of doubling dose for somatic hazards is a specific example of the misuse of the ratio of cancer rates. The natural incidence of stomach cancer in men or women in five different countries varies between 65 and 706 per million living (Segi and Kurihara, 1963, cited by Dolphin and Eve, 1968) so that for a

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fixed risk per rad the doubling dose varies more than ten-fold and will induce between 65 to 706 additional cases of stomach cancer per million persons depending on the particular population to which attention happens to be drawn. Superficially the "doubling dose for cancer" may appear a reasonable concept because the overall incidence of all forms of cancer taken together happens to be roughly similar in many different countries. However, there are complex reasons for this and where acceptable risks and individual varieties of cancer are concernad, the only reasonable parameter to use is the actual number of cases induced by the exposure under consideration."

Further, on pages 81 and 82 of ICRP 14 they state:

"There is no support in Tables III.8 and III.9 for the hypothesis that the sensitivity of an organ to induction of malignant disease is proportional to the natural incidence of malignant disease in that organ. If this had been true, then far more cases of induced stomach cancer should have occurred in the Japanese than were observed: the incidence of leukaemia (Doll, Payne and Waterhouse, 1966) and even allowing for attenuation of dose with depth below the surface of the body there should have been more induced cases of stomach cancer than of leukaemia."

Q Dr. Goldman, on page 1505 of the Transcript, Dr. Tamplin quoted from ICRP Publication 9 on page 14, paragraph 83, specifically on Line 11 of that transcript page, he quotes

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ICRP Publication 9 as stating:

"It should be emphasized that the limit does not in fact represent a proper balance between possible harm and probable benefit."

Is that a correct quote?

A No, it is not. That paragraph reads:

"It should be emphasized that the limit may not in fact represent a proper balance between possible harm and probable benefit, because of the uncertainty in assessing the risks and the benefits that would justify the exposure."

The difference between does not and may not seems to me to be significant.

Q Dr. Goldman, in both his direct testimony and his cross-examination by the staff, Dr. Tamplin indicated his judgment that the present radiation standards should be reduced by a factor of 10 and specifically on page 1539, expressed concern about a potential future requirement for retro-fits in the nuclear power industry, if in fact the dose standards should be changed. Based on your experience with nuclear power facilities, would it be your judgment, assuming a future change in the dose standards, that such retro-fitting would be necessary at Davis-Besse?

A No, data from plants operating at the present time and evaluation of designs of plants presently under construction or proposed for operation indicate very clearly that plants

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presently in operation or proposed would have no substantial difficulty in meeting reduced standards of that magnitude at some time in the future, on the basis of annual average discharges. For short periods of time, however, unforeseen plant component outage might result in discharges which temporarily exceed the 10 percent values suggested by Dr. Tamplin.

Certainly operating data from existing plants indicates that doses to the maximum individual and most certainly to the average individual in the vicinity of a plant are substantially less than 10 percent of the present AEC standards.

Q Dr. Goldman, are you familiar with the Dresden Nuclear Power Station and with its gaseous discharge history?

A Yes. I have been responsible for the conduct of the meteorological program at Dresden Nuclear Power Station for about three years. As part of that program, we have been provided with the gaseous discharge data for the station and have calculated the gaseous dose distributions in the vicinity of the plant using the source data and meteorological data which we analyze.

Q Based on your knowledge of the source and the meteorological data which you have analyzed for the Dresden station, would you say that Dr. Sternglass' asserted relationship between gaseous discharges and the incidence of infant mortality in its vicinity is valid?

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A No. The reason for this is based on the following factors: First, if there is any association whatsoever between infant mortality and the quantities of gaseous radioactivity discharged from the Dresden Station, it lies in the dose delivered to the populations at risk. This dose is dependent not only on the quantity of gas discharged but also upon the meteorological conditions that would lead the discharged gases into the affected areas. Based on the data indicated in Dr. Sternglass' paper, Livingston County to the south and southwest and Kankakee County to the southeast had increases in infant mortality rates between 1964 and 1966 of 140 percent and 43 percent, respectively.

Yet our observations of meteorological data at the Dresden site and our calculations of the resulting dose distribution in the environs of the plant indicate quite clearly that the predominant downwind direction from the plant is not southwest through southeast as suggested by Dr. Sternglass but rather north to northeast, almost directly opposite.

Yet the counties that lie to the north to northeast and which would be receiving the great dose relatively speaking, although much less than one mrem per year on an absolute basis, are Kendall and Will Counties, which experienced changes in infant mortality rates during the same two-year period of minus 31 percent and plus 5 percent, respectively.

There is, therefore, absolutely no correlation

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between dose delivered from the Dresden discharges and infant mortality rate changes as indicated by Dr. Sternglass, as based on and determined from actual releases and actual site meteorology.

end 9

Q Did the testimony by Davis and Harward of the U. S. Public Health Service before the Illinois Pollution Control Board in December 1970 find that there was no basis for Dr. Sternglass' allegation regarding a possible relationship between the Dresden gaseous releases and infant mortality in Illinois?

A Yes. In the summary of their testimony, they stated: "This analysis of the epidemiologic data presented by Sternglass does not support his contention that an association exists between exposure to the radioactive emissions from Dresden and infant mortality. In contrast, the data can not" --

CHAIRMAN SKALLERUP: And they have underlined in the original "can not" be.

THE WITNESS: -- "be interpreted to mean that no effects were produced by the radiation exposure. However, if radiation from the Dresden reactor contributes to infant mortality or respiratory deaths in Illinois or Chicago, it has not been demonstrated by this study."

BY MR. CHARNOFF:

Q Did the National Council on Radiation Protection and Measurements recently publish its recommendations with respect to radiation exposures and doses?

A Yes, in NCRP Report 39.

MR. CHARNOFF: And that is identified as Applicant's Exhibit No. 8.

BY MR. CHARNOFF:

Q In that document, dated January 15, 1971, did the NCRP recommend any change in the basic radiation protection standards as they apply to the general public?

A No.

Q Is the NCRP's recommended average population dose limit based upon genetic considerations?

A Yes, in NCRP Report No. 39, paragraph 247, they quote: "The dose equivalent to the gonads for the population of the United States as a whole from all sources of radiation other than natural radiation, and radiation from the healing arts shall not exceed a yearly average of 0.17 rem (170 mrem) per person (see paragraph 162)."

Q Did the NCRP in the same document in paragraph 251 in the middle of that paragraph say: "It is also expected that the dose limit of 0.5 rem (500 mrem) per year for any critical organ of an individual member of the public, combined with the average population dose limit of 0.17 rem (170 mrem) per year for critical organs, will have the effect of controlling the actual population exposures well below the stipulated limits. No specific evidence can be established that would seem to warrant further reduction of average or individual dose limits for members of the public, at this time. The low dose and low dose rate of the radiation exposure of the population still provide adequate safety

factors."

A Yes.

Q Is the NCRP chartered by Congress?

A Yes.

Q What is its Congressional charter? Would you read from the Congressional charter the objects and purposes of the NCRP?

A Yes. Section 3 -- this is from the National Council on Radiation Protection and Measurments, an Act of July 14, 1964, Public Law 88-376, 78 statues 320, Section 3 states: " The objects and purposes of the corporation shall be:

"1. To collect, analyze, develop and disseminate in the public interest information and recommendations about (a) protection against radiation (referred to herein as 'radiation protection'), and (b) radiation measurements, quantities and units, particularly those concerned with radiation protection.

"2. To provide a means by which organizations concerned with the scientific and related aspects of radiation protection and of radiation quantities, units and measurements, may cooperate for effective utilization of their combined resources and to stimulate the work of such organization.

"3. To develop basic concepts about radiation quantities, units, and measurements, about the application

of these concepts, and about radiation protection.

"4. To cooperate with the International Commission on Radiological Units and Measurements, and other national and international organizations, governmental and private, concerned with radiation quantities, units, and measurements and with radiation protection."

Q Does the membership of the NCRP include men and women recognized as experts in radiation protection and doses?

A Yes.

Q Are you familiar with the guidance published by the FRC since its inception?

A Yes.

Q Is it your judgment that the radiation protection standards in 10 CFR Part 20 are consistent with and based upon the FRC guidance?

A Federal Radiation Council recommendations, approved by the President, which encompass standards included in Part 20 were promulgated in their Reports Nos. 1 and 2. FRC Staff Report No. 1 (May 1960) established basic Radiation Protection Guides for radiation workers, a whole body dose for individuals and an average gonad dose for the population. FRC Staff Report No. 2 (Sept. 1961) established Radiation Protection Guides for thyroid, bone and bone marrow doses to the general population and specified daily

intake guides corresponding to these Protection Guides for Ra-226, I-131, Sr-89 and Sr-90.

With respect to maximum individual whole body dose, the FRC whole body dose guidance for individuals in the general population is established as 0.5 rem/year (Staff Report No. 1, p. 38); 10 CFR 20.105(a) establishes a maximum dose to an individual from radiation in unrestricted areas of 0.5 rem/year. Further, concentrations of those radionuclides listed in Appendix B, Table II for which the whole body is the critical organ are so calculated as to produce a whole body dose of not more than 0.5 rem/year by ingestion of 2.2 liters of water per day or by inhalation.

With respect to average population gonadal dose, FRC establishes a genetically significant dose limit of 5 rem in 30 years, (Staff Report No. 1, p. 38) or an average of 0.17 rem per year for the total population. AEC establishes in 20.106(e) a basis for limiting intake by a "suitable sample of an exposed population group" to one-third the intake represented by the concentration limits in Appendix B, Table II.

Since the concentration limits represent a dose of 0.5 rem per year, one-third of that intake would represent 0.17 rem per year, in agreement with the FRC Guide.

With respect to the intake limits for Ra-226, I-131, Sr-89 Sr-90, three intake ranges for these radionuclides were

established in FRC Staff Report No. 2, with the upper limit of Range II corresponding to the FRC average organ dose guidance. These values are for:

Radium-226	20 picocuries per day
Iodine-131	100 picocuries per day
Strontium-90	200 picocuries per day
Strontium-89	200 picocuries per day

The Appendix B, Table II concentrations for Radium-226, Strontium-90 and Strontium-89 represent three times these intakes by an adult, corresponding to the maximum individual dose guides. The values for "a suitable sample of an exposed population" as limited in 20.106(e) would be one-third, and conform exactly with FRC intake values. The Appendix B, Table II values for I-131 -- and for the other Iodine isotopes -- are not based on adults, but rather on the biological parameters of a small child as the "suitable sample," and represent intake values which are also for the maximum individual child, three times the average value presented in FRC Report No. 2.

With respect to "as low as practicable," the FRC Guidance (Report No. 1, p. 37) states: "every effort should be made to encourage the maintenance of doses as far below this guide as practicable." 10 CFR 20.1(c) states: "(licensees) should, in addition to com-lying with the requirements set forth in this part, make every reasonable effort to maintain

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radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as far below the limits specified in this part as practicable."

On the basis of this comparison, it is clear that 10 CFR 20 is in complete conformance with published guidance of the FRC.

Q Dr. Goldman, in the Underground Uses of Nuclear Energy Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, U. S. Senate, held in August, 1970, did Dr. Roger Egeberg introduce a statement by the National Academy of Sciences Advisory Committee to the FRC commenting on the allegations by persons such as Drs. Gofman and Tamplin calling for an immediate reduction in the radiation protection standards?

A Yes.

Q Would you please read that statement into this record?

A This is a letter addressed to Dr. Charles L. Dunham, M.D., National Academy of Sciences, Division of Medical Sciences, Washington, D. C.

"Dear Dr. Dunham:

"The Advisory Committee to the Federal Radiation Council has prepared the following statement and would appreciate having this statement forwarded to the President of the National Academy of Sciences through your office.

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"Recently the adequacy of radiation protection standards has been questioned. Allegations have been made that insufficient attention has been paid to human data that have become available in the past few years and that as a result that risks to the public are being grossly underestimated, and that maximum permissible levels should therefore be reduced immediately.

"Radiation Protection Standards are formulated by several independent national and international bodies, namely, the NCRP, ICRP, FRC. In addition, periodic scholarly reviews of pertinent data are provided by UNSCEAR. Recent reviews by these groups (ICRP 1966-69: UNSCEAR '64, '66, '69) have considered in depth essentially all of the available data relevant to the setting of standards. These bodies have found no evidence that warrants a downward revision of the basic radiation standard of 5 rems per 30 years or 170 mrems per year to the general population.

"Pertinent data have been under continuous review by the NAS-NRC Advisory Committee to the FRC. This Committee has specifically reviewed the statements presented before Congressional Committees and elsewhere to support the allegations referred to above and conclude that these statements contain no data that would significantly alter the base upon which current standards were established. There is no evidence available to the Committee that exposure of the public will

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increase at a rate that would in any way justify an emergency revision of the existing standards.

"Because of the allegations and widespread public concern the Committee feels it must plan further consideration of the interpretation of data relative to estimating risks associated with low levels of radiation exposure and the utilization of such interpretations for establishment of radiation standards.

"The public's attention has for the most part been directed to hazards associated with nuclear power production. This apprehension is, paradoxically, partly a result of the detailed public information now available on radiation hazards of nuclear power and the relative lack of information on the hazards of other modes of power production. What is needed is a comprehensive study of the biological hazards of non-nuclear power production, therefore, the Committee feels that simultaneously there should be a comprehensive comparison of the biological and social costs of nuclear versus alternative sources of energy. Furthermore, there exists a need for clarification of the philosophy underlying decisions involving the weighing and apportionment of risks versus benefits in standards setting.

"This Committee is especially aware of a need to consider radiation standards within the context of the broader aspects of societal needs and is anxious to contribute in any

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way possible as the matter develops.

Sincerely,

Dr. Cyril L. Comar

Chairman, Committee."

end 10

MR. CHARNOFF: Thank you.

Mr. Chairman, we have completed our rebuttal testimony.

I do want before closing this portion of the hearing to introduce as Applicant's exhibits a number of documents which were referenced during the last phase of the hearing, and they were documents the Board had requested copies of and we are pleased to submit them to you and to the other parties as exhibits in this proceeding.

The first is a document which was referenced on transcript page 1227 entitled "More on Radioactive Fallout" published by the Committee on Environmental Hazards of the American Academy of Pediatrics, and a newsletter supplement dated April 15, 1970. That you will recall was a document we used in cross-examining Dr. Sternglass, and I would like to have that identified as Applicant's Exhibit No. 9 and ask Mr. Churchill to hand three copies of that document to the Reporter and to the members of the Board and to the Intervenors.

Perhaps it would be best if I simply read through these and then have Mr. Churchill hand them all out at one time.

CHAIRMAN SKALLERUP: It is so ordered on No. 9.

(The document referred to was marked Applicant's Exhibit No. 9, for identification, and was received in evidence.)

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MR. CHARNOFF: Before proceeding with No. 10, may I ask a question of the Regulatory Staff?

There was reference to a document entitled "Radiological Surveillance Studies at a Boiling Water Nuclear Power Reactor," by Kahn et al, U. S. Public Health Service. Is that a document the Staff is planning to use as a basis for testimony of any of the witnesses tomorrow?

MR. ENGELHARDT: No.

MR. CHARNOFF: Then we will introduce that document as Applicant's Exhibit No. 10. It is entitled "Radiological Surveillance Studies at a Boiling Water Nuclear Power Reactor" published by U. S. Department of Health, Education, and Welfare, Public Health Service, Environmental Health Service, bearing the number BRH/DER 70-1.

This document was referenced on transcript pages 1238 and 1267.

DR. JORDAN: Is the boiling water reactor referred to there the Dresden reactor?

MR. CHARNOFF: It includes the data on the Dresden reactor. Yes, it is exclusively the data on the Dresden reactor. It was the document Dr. Sternglass made reference to.

CHAIRMAN SKALLERUP: It is so ordered, Exhibit No. 10.

(The document referred to was marked Applicant's Exhibit No. 10, for identification, and was received in evidence.)

MR. CHARNOFF: Are you presenting a document entitled "The Critical Review of Infant Mortality and Nuclear Power Generation" by E. J. Sternglass presented by Mr. A. K. Davies and E. Howard?

MR. ENGELHARDT: Yes.

MR. CHARNOFF: I will pass that then and let the Staff introduce that document.

On transcript page 1264, reference was made to a document by Daniel F. Cahill and Charles L. Yuile, it was also mentioned in the rebuttal testimony by Dr. Goldman. The article was entitled "Some Effects of Tritiated Water on Mammalian Fetal Development" by Cahill and Yuile, University of Rochester, School of Medicine and Dentistry. It is published in the Proceedings of the 9th Annual Hanford Biology Symposium, Richland, Washington, May 5-8, 1969.

We would have that marked as Applicant's Exhibit No. 11 and introduce that into evidence.

CHAIRMAN SKALLERUP: It is so ordered.

(The document referred to was marked Applicant's Exhibit No. 11, for identification, and was received in evidence.)

MR. CHARNOFF: Next we would like to identify as

Applicant's Exhibit No. 12 the testimony of Dr. Victor Bond, Brookhaven National Laboratory, hearings before the Joint Committee on Atomic Energy, 91st Congress, "Environmental Effects of Producing Electric Power," Part 2, Volume 1, 1970, pages 1361 through 1373, and we had referenced this document on page 1266 in connection with cross-examination of Dr. Sternglass on tritium.

We would mark that as Exhibit No. 12.

CHAIRMAN SKALLERUP: This is to be an exhibit of yours to be received in evidence? Was the testimony there given under oath and open to cross-examination?

MR. CHARNOFF: I am trying to recall whether the Joint Committee does administer oaths. Perhaps the Staff knows.

MR. ENGELHARDT: Not to my knowledge do they administer any oaths for witnesses who appear at such hearings.

MR. CHARNOFF: They do examine the witness, but I guess it is not under oath.

MR. ENGELHARDT: That is correct.

MR. CHARNOFF: Why don't we just mark this, sir, as Applicant's Exhibit No. 12 and not offer it into evidence. I was just making it available to members of the Board because it had been referred to in the cross-examination.

CHAIRMAN SKALLERUP: It is so ordered on that basis.

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(The document referred to was marked Applicant's Exhibit No. 12, for identification.)

MR. CHARNOFF: The next is a document entitled "Radioactive Waste Discharges to the Environment from Nuclear Power Facilities" published by U. S. Department of Health, Education, and Welfare, Public Health Service, Environmental Health Service bearing the number BRH/DER 70-2. It was referenced on transcript page 1422 and it contains on page 15 a table, number 8, entitled "Total Annual Gaseous Waste Discharged Noble and Activation Gases)Curies)" listing a number of pressurized water reactors, boiling water reactors and a high temperature gas cooled reactor.

You will recall this was the table referenced first I believe by Dr. Sternglass and used by us in cross-examining Dr. Sternglass.

We would mark this as Applicant's Exhibit No. 13.

CHAIRMAN SKALLERUP: It is so ordered.

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(The document referred to was marked Applicant's Exhibit No. 13, for identification, and was received in evidence.)

MR. CHARNOFF: Dr. Sternglass also referenced some studies by Dr. Alice Stewart and we cross-examined Dr. Sternglass in connection with that study. And I believe we even asked him to read a section from it. Therefore we

introduce as Applicant's Exhibit No. 14 a document published in The Lancet on Saturday, June 6, 1970 entitled "Radiation Dose Effects in Relation to Obstetric X-Rays and Childhood Cancers," by Alice Stewart and G. W. Kneale.

This was referenced on transcript 1426 and some other pages.

Again we would offer that not as evidence, but simply as Applicant's Exhibit 14.

CHAIRMAN SKALLERUP: It is so ordered.

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(The document referred to was marked Applicant's Exhibit No. 14, for identification.)

MR. CHARNOFF: That would conclude --

I believe we have now provided the Board with all of the documents that have been mentioned at one time or another, except possibly for the documents that the Staff will apparently introduce. And that would conclude our rebuttal testimony in this proceeding.

I might only suggest, Mr. Chairman, that if Mr. Lau is permitted to produce additional direct testimony we would reserve the right to offer rebuttal testimony in response to that testimony. Other than that, I believe we are concluded with our rebuttal testimony.

DR. JORDAN: With regard to Dr. Goldman's answers to one of the questions, he ended up with the statement --

I have trouble referencing it for your benefit, because there are no page numbers -- but he ended up --

MR. CHARNOFF: Perhaps you could identify the question, Dr. Jordan and we can find it on that basis?

DR. JORDAN: Very well.

The question was: "Dr. Goldman, considering Drs. Gofman and Tamplin's statements with respect to the present AEC standards and based on your examination of the Davis-Besse plant environment and the dose projections therefrom, could you comment on the validity of their contentions."

The testimony seemed clear except when we got to the last paragraph. He ended up by saying, "Thus, one cannot evaluate the adequacy of Part 20 for radioactivity releases from an actual nuclear power plant in terms of any single isotope taken alone at full MPC, which is what Dr. Tamplin appears to do in his cesium calculations."

This confused me, because it seemed to me in that case of the cesium calculations, he was surely considering a single isotope rather than, as you say, you cannot evaluate it in terms of any single isotope taken alone or at full MPC.

Would you care to add additional clarification for my benefit now on that or at a later time?

THE WITNESS: I can attempt to clarify it now, Dr. Jordan.

What I was trying to say, perhaps not too well, in that answer, was that with respect to any nuclear power facility in the real world, the relationship of materials discharged from the plant with respect to each other is pretty well established by the physical and chemical characteristics of the system which is operating.

DR. JORDAN: I understand that.

THE WITNESS: And that it is physically and chemically, if not impossible, then highly unlikely, that one could have any particular isotope without having in more or less fixed proportion to it a number of others. And, therefore, one cannot look at the existence or the fraction of MPC at which a single isotope alone exists without considering in the real sense and with a real plant what other materials must accompany it based on the nature of the plant and the processes which give rise to the wastes.

So that one can evaluate certainly any isotope from the point of view of its own ability to meet its own MPC in theory and to go through a numerical calculation which in fact can be made to show that if this were to be the case, then some other consequence would follow, as Dr. Tamplin did.

The only thing I was trying to indicate in this answer is that with respect to reactors in general and with Davis-Besse in particular, this is impossible in the real

world. Cesium or any other isotope does not exist alone in a vacuum.

DR. JORDAN: I understand now what you were saying. However let me say it this way, that 10 CFR 20 would apply, say, to a cesium processing plant, and would, therefore, in that event perhaps apply to concentrations of cesium in the gaseous effluents from a cesium plant and there would be a single isotope.

THE WITNESS: That is correct. Again though let me add that the MPC by itself is not the constraint on discharge from a plant. There are other sections of Part 20 that require considerations other than just the numerical values in the appendix. These are the other sections that I referenced particularly 2106(e), which requires consideration of reconcentration and total exposure from all sources.

DR. JORDAN: Very well.

MR. CHARNOFF: Mr. Chairman, I don't know whether this is the right time to do it or perhaps it would be appropriate for final argument, but I would simply like to offer with respect to the specific question asked by Dr. Jordan at the very end, namely, what would happen with regard to a cesium processing plant, that in this hearing we are not examining, as I understand the regulations and the Commission's memorandum in Calvert Cliffs, we are not conducting a general rule-making hearing as to the validity of Part 20

independent of the plant that we are examining.

And while I understand Dr. Jordan's question to elicit a certain response, I think that there is a legal framework in which this Board has to evaluate the issue as posed by LIFE.

I would like to go on at length about this at some appropriate time and it may not be now, it may be in final argument. But I know we have had a number of opportunities where this question has almost been touched upon. And I would submit that there is certainly not a clear statement by the Board as to how it understands this issue in this hearing.

I would submit too that insofar as there are hints in the transcript as to what the Board's understanding is, that in my judgment the Board is in error in looking at this as a Part 20 issue without regard to the issue which is the subject of this hearing.

DR. JORDAN: Mr. Charnoff and I have brushed across this a time or two before and I agree that there is somehow or other some misunderstanding. And I believe, Mr. Chairman, that it would be well at some time soon to get this misunderstanding cleared up. Whether this is the appropriate time or not, I don't know.

CHAIRMAN SKALLERUP: There are two matters involved. One may be the existence of a misunderstanding.

The other is trying to understand what Dr. Goldman meant. And I think there is nothing wrong in asking that kind of question.

MR. CHARNOFF: No, and I didn't object to the question.

DR. JORDAN: I think I am all right on what Dr. Goldman meant, I now understand that. But Mr. Charnoff brings up the same question we had before, what is under contention.

MR. CHARNOFF: We have had this question touched upon a little bit in the transcript and a little bit at bench conference. I would submit that a careful reading of the Calvert Cliffs memorandum is in order to establish what it is that we are looking at in this case. And whether this is the time to do it, Mrs. Bleicher is not here, so perhaps this is not the right time to do it.

I would simply like to note for the record that this is not an objection to Dr. Jordan's question, it was a helpful question, but in terms of understanding the issue in this case, that this Board is to look at and that we are to in effect litigate, I would submit to you that the few remarks that have been made and that appear on the record don't suggest at all thatthe Board or perhaps the parties have quite clearly focused on the extent to which a Part 20 challenge is appropriate in a licensing hearing, as

set forth by the Commission in the Calvert Cliffs proceeding.

CHAIRMAN SKALLERUP: Well, it would seem to me, Mr. Charnoff, that we ought to have the Intervenors present before we discuss this.

And secondly, I think on the face of it, the time to discuss it, the appropriate time to discuss it, would be when Mrs. Bleicher, as she suggested this morning in our conference, raises questions about burden of proof.

MR. CHARNOFF: I don't know that it is related to burden of proof. But I would agree certainly we ought to argue this out on the record before you when Mrs. Bleicher is present. Because I think it is a critical question and I don't think we have sharpened this issue at least to the point where we all understand each other's positions or to where we are all in agreement.

CHAIRMAN SKALLERUP: Apart from whether we are in agreement as to what Calvert Cliffs said too.

MR. CHARNOFF: I won't comment.

CHAIRMAN SKALLERUP: We will take a 10-minute break.

End #11 (Recess.)

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CHAIRMAN SKALLERUP: Will the hearing please come to order.

I have been requested to advise the audience that there is a Chrysler outside with plate 6771 C and the lights are on.

Mr. Engelhardt.

MR. ENGELHARDT: Mr. Chairman, I have two preliminary matters to begin our rebuttal. One deals with a question raised by Dr. Jordan before the luncheon recess with regard to the applicability of a regulation recently published by the Commission, published in the Federal Register at Volume 35, page No. 19567.

It was published in the issue of the Federal Register dated December 24, 1970. I would like to ask Mr. Robert Tedesco, who has been sworn and been a witness in this proceeding, to state the extent to which the application for the Davis-Besse construction permit complies with the provisions of that amended regulation.

Whereupon,

ROBERT TEDESCO

was recalled as a witness on behalf of the applicant and, having been previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

XXXXX MR. TEDESCO: Mr. Chairman, our review of the Davis-Besse project included those aspects associated with the

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station emergency plan.

To cope with unlikely emergency conditions affecting on and off-site activities that may occur during the lifetime of the facility. Information in this regard was requested from the applicant in Question 8.1 on February 12, 1970.

The information that we requested was received in Amendment 3 dated April 22, 1970, and appear in Section 12.4.1 of the PSAR. On December 24, 1970, the Atomic Energy Commission published Appendix E to 10 CFR 50 entitled, "Plans for Coping with Emergencies."

In this appendix the information that applicants should provide in their application for a license was identified. Our review of the Davis-Besse project was completed on November 2, 1970, which was the date of our Safety Evaluation. Our comments on this matter are given in Section 10.4 of our Safety Evaluation.

However, we have reviewed the information supplied by the applicant in terms of its applicability to meet the Appendix E. It is our conclusion that the information provided in Section 12.4.1 of the PSAR satisfies the intent of Appendix E. In this regard, we cite II, of Appendix E, entitled, "Preliminary Safety Analysis Report."

There are listed seven categories. The first category in Title A relates to the organization

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for coping with emergencies. This information can be found in 12.4.1 of the PSAR.

Category B relates to contacts and arrangements to be made with state and local and federal agencies. This information may be found in Section 12.4.1 of the PSAR.

Category C relates to measures to be taken within and outside the site. This information may be found in Section 12.4.1.1, 12.4.1.2, 12.4.1.3 and 12.4.1.4.

Category D relates to features of the facility to be provided for on-site emergency and transportation to off-site areas. This information is available in Section 12.4.1.6 of the application.

Category E relates to provisions for emergency treatment and that information is available in Section 12.4.1.6.

Category F relates to the training program and this information is described in Section 12.4.1 of the application.

The last category is Category G and it relates to features to assure the capability for evacuation if necessary and this information is contained in Section 12.4.1.2 and 5 the application.

CHAIRMAN SKALLERUP: Mr. Tedesco, would you please check the citations you gave against the Transcript when you receive it tonight and let us know if there are any changes.

MR. TEDESCO: Yes, sir.

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CHAIRMAN SKALLERUP: Thank you.

MR. ENGELHARDT: Mr. Chairman, there is one other matter that I would like to provide for the record.

Earlier today the applicant offered as I believe Exhibit 6 a letter from Mr. Packard, Acting Secretary of Defense, to Mr. Davis of the Toledo Edison Company.

This letter was transmitted to the Regulatory Staff under cover of a letter from Mr. Carl Walske, Assistant to the Secretary of Defense for Atomic Energy.

To complete the circuit and to assure that the record is clear that the ATomic Energy Commission has received a copy of this letter from Mr. Packard directly from the Department of Defense, I would like to offer the transmittal letter as Staff Exhibit 3.

I identified this transmittal letter as a letter dated 19 January 1971 addressed to Dr. Peter A. Morris, Director, Division of Reactor Licensing, signed by Carl Walske, Assistant to the Secretary of Defense, Atomic Energy.

MR. CHARNOFF: Would it be well to have that letter read into the Transcript, Mr. Chairman, in light of the fact that the Secretary Packard letter was read into the record?

CHAIRMAN SKALLERUP: Yes.

end 12 #13

MR. ENGELHARDT: I will ask Mr. Tedesco to read that letter. We have sufficient copies to provide for all

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parties and to the Board.

CHAIRMAN SKALLERUP: Would you distribute them first, please?

MR. TEDESCO: The letter is dated 19 January, 1971 from the Office of the Secretary of Defense, Washington, D. C., 20301. The letter is to Dr. Peter A. Morris, the Director, Divisions of Reactor Licensing, U. S. Atomic Energy Commission, Washington, D. C., 20545.

"Dear Dr. Morris:

During the recent public hearings concerning the proposed Davis-Besse Nuclear Power Station, several questions arose with regard to the control of military aircraft on training flights originating at Lockbourne Air Force Base, Ohio. On January 14, 1971, Mr. Packard, Deputy Secretary of Defense, wrote to Mr. Davis, President of the Toledo Edison Company, confirming the Department of Defense's awareness of the plans for the construction and oepration of the Davis-Besse facility as well as the operational constraints now in effect for Air Force training flights in the vicinity of the proposed nuclear plant site. I am forwarding as an enclosure a copy of Mr. Packard's letter for your information.

Sincerely,

/s/ Carl Walske

Carl Walske

Assistant to the Secretary

of Defense (Atomic Energy)"

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CHAIRMAN SKALLERUP: It is so ordered as Staff Exhibit 3.

(The document referred to was marked Staff Exhibit No. 3 for identification and received in evidence.)

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MR. ENGELHARDT: Mr. Chairman, I would like to call as our first rebuttal witness, Mr. Lester Rogers.

He has not previously been sworn and I would ask you to administer the oath.

Whereupon,

LESTER ROGERS

was called as a witness on behalf of the Atomic Energy Commission and, having been first duly sworn, was examined and testified as follows:

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DIRECT EXAMINATION

BY MR. ENGELHARDT:

Q Mr. Rogers, would you please state your name, your address, and give a summary of your present responsibilities and your educational and professional qualifications?

A My name is Lester Rogers. My address is U. S. Atomic Energy Commission, Bethesday, Maryland. I am Director, Division of Radiological and Environmental Protection, U. S. Atomic Energy Commission.

In this position I am responsible for the development

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of regulations designed to limit exposures of workers and the general public to radiation from materials and activities licensed by the Atomic Energy Commission and for the implementation of those requirements of the National Environmental Policy Act of 1969 directed to the preparation of environmental statements required for AEC licensed activities.

I hold a bachelor of science degree in chemistry and mathematics from the University of Southern Mississippi, graduate level studies include completion of a one-year National Research Council fellowship in radiological physics (health physics) at Oak Ridge National Laboratory and courses in physical chemistry and mathematics at Tulane University and the University of Tennessee, respectively. I am a certified health physicist, American Board of Health Physics, 1960.

I am a member of Committee 4, International Commission on Radiological Protection. I am also a member of the Technical Electronic Product Radiation Safety Standards Committee, Department of Health, Education and Welfare.

My professional experience totals 20 years. This experience includes one year on the faculty of Ohio State University as Superintendent, Office of Radiation Safety; two years as Chief, Health Physics and Safety Division, U. S. Army Chemical Center, Edgewood, Maryland; and 17 years in radiation protection programs with the Atomic Energy Commission.

Thirteen years of this experience has been with the

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AEC REgulatory Program in the development of radiation protection standards. Experience in the Atomic Energy Commission includes positions as Chief, Licensing Branch, Isotopes Division, Oak Ridge, Tennessee; Assistant Director for Materials Standards, Division of Licensing and Regulation; U. S. AEC Scientific Representative for South America, Buenos Aires, Argentina; Deputy Director, Division of Radiation Protection Standards, U. S. AEC, Washington, D. C.; Director, Division of Radiological and Environmental Protection (formerly the Division of Radiation Protection Standards).

I have previously served as Chairman of the Federal Interagency Committee on Regulations for Transport of Radioactive Materials; as a member of Subcommittee 10, National Council on Radiation Protection and Measurements; consultant to the International Atomic Energy Agency (IAEA) on Toxicity Classifications for Radionuclides; and U. S. representative on IAEA panels to develop regulations for the safe transport of radioactive materials.

Q Mr. Rogers, are you familiar with the allegations of LIFE with respect to the inadequacies of 10 CFR Part 20?

A Yes.

Q Are you also familiar with the testimony of Dr. Sternglass and Dr. Tamplin at this hearing concerning the deficiencies as they see it of 10 CFR Part 20 limits.

A Yes, I am familiar with it.

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Q Would you please discuss the basis for the Atomic Energy Commission regulations found in 10 CFR Part 20 that relate to radioactive releases and how these regulations are applied to control releases of radioactivity from nuclear power reactors during normal operations to assure the public health and safety?

end

DR 14
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MR. ROGERS: The construction and operation of nuclear power plants in the United States is carried out under a comprehensive Federal program of licensing and regulation administered by the Atomic Energy Commission. The program is designed to protect health and safety from exposure to ionizing radiation that may result from radioactivity reaching the environment either from accidental releases or in effluents released during the normal operation of nuclear facilities. This testimony is limited to a discussion of regulations that apply to the controlled release of radioactivity in air and water.

The regulatory framework for controlling levels of radioactivity in effluents from nuclear power plants is set out in the Commission's regulations Part 20 and Part 50 published under Title 10 of the Code of Federal Regulations. Part 20, "Standards for Protection Against Radiation," sets the general standards for protection against radiation, including limits on levels of radioactivity released to the environment.

Part 50, "Licensing of Production and Utilization Facilities," establishes general design, construction, and operating requirements for nuclear power plants and other nuclear facilities. It also sets forth requirements for obtaining a permit to construct and a license to operate a nuclear power plant. Each of these regulations, their interrelationship in controlling releases of radioactivity to the environ-

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ment, and their implemention in the licensing process will be discussed.

First I would like to discuss the basis of the AEC Regulatory standards. An understanding of the integrity of the system within which radiation protection standards have been developed is fundamental to an understanding and evaluation of the validity of the standards. The formal procedur and scientific bases for developing and establishing standards for protection against ionizing radiation are among the most comprehensive of any applied to environmental stresses.

The scientific information required in radiation protection standards setting activities is developed through investigations and analyses by the medical and scientific communities throughout the world and provides the basis for recommendations by various standards setting bodies.

The National Academy of Sciences in the United States, the Medical Research Council in the United Kingdom, and the United Nations Scientific Committee on the Effects of Atomic Radiation have played a particularly outstanding role in evaluating the available data on biological effects and estimating risks from exposure to ionizing radiation. These bodies have issued comprehensive reports on the biological effect of ionizing radiation that form, in large part, the scientific basis for the standards.

The general radiation protection standards,

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applicable to all licensed activities, set forth in Part 20 were first published as an effective regulation in 1957. At the outset the Part 20 regulation was based on the recommendations of the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP).

Since 1959 official guidance for control of exposures to radiation has been provided to Federal agencies through recommendations of the Federal Radiation Council (FRC), established in 1959. The FRC is directed to advise the President"...withrespect to radiation matters, directly or indirectly affecting health, including guidance for all Federal agencies in the formulation of radiation standards...". The basic recommendations of the FRC, NCRP and ICRP are mutually compatible.

The Federal Radiation Council recommends a radiation protection guide of 0.5 rem per year for whole body exposure of individual members of the public. For the total population, it is recommended that the average genetically significant exposure should not exceed 5 rems in 30 years or an average annual exposure of 170 millirems per year.

For purposes of controlling levels of radioactivity in the environment, the Federal Radiation Council provides that, as an operational technique, where it is impractical to determine individual radiation doses, exposures will be considered to meet radiation protection guides, if the

rms 4

estimated average doses to a suitable sample of the exposed population do not exceed one-third of the radiation protection guides applicable to individual members of the public or 170 millirems per year for whole body exposure. The FRC guides are not intended to apply to radiation exposure resulting from natural background or the purposeful exposure of patients by practitioners of the healing arts.

In discussing these standards, it is helpful to compare them with radiation exposures that we all incur from natural background radiation. Such a comparison appears in Exhibit 1.

MR. ENGELHARDT: Mr. Chairman, we have three exhibits appended to this testimony. I would propose to defer the offer of these exhibits until the witness has completed his presentation of the testimony, unless the Board would find it more convenient for the record if we identified and offered these exhibits as they are identified in the testimony,

CHAIRMAN SKALLERUP: The Board will go off the record.

(Discussion off the record.)

CHAIRMAN SKALLERUP: On the record.

THE WITNESS: In addition to the numerical guidance on dose limits, ICRP, NCRP and FRC have generally recommended that exposure to radiation bekept as low as practicable. The ICRP adds "...that it is important to ensure that no

rms 5

single type of population exposure takes up a disproportionate share of the total."

The ICRP and NCRP have published tables of recommended maximum permissible concentrations of radionuclides in air and water. These concentrations are estimated to be the highest concentrations of the respective radionuclides which may be permitted in air or water used continuously by a "standard" man without resulting in a radiation dose that would exceed a maximum permissible occupational dose. For application to individual members of the general public these limits are reduced by a factor of 10. In its Report No. 1, the Federal Radiation Council recommended that concentration guides then in use by Federal agencies, i.e., the maximum permissible concentrations published by the ICRP or NCRP, be used on an interim basis.

In its Report No. 2, the FRC included specific guidance for exposures of the general public to strontium-89, strontium-90, iodine-131, and the radium-226 that differed from the then current recommendations of the ICRP and NCRP. Subsequent modifications of ICRP and NCRP limits have eliminated some of these differences.

These are the basic guidelines within which the AEC regulations to control releases of radioactivity to the environment have been formulated.

It is noted that under the President's Reorgani-

rms 6

zation Plan No. 3 which became effective on December 2, 1970, the functions of the FRC were transferred to the new Environmental Protection Agency. Also transferred to EPA is that part of the AEC's authority, as administered by its Division of Radiation Protection Standards, to develop and set generally applicable environmental radiation standards for the protection of the general environment. The AEC continues to have the responsibility for the implementation and enforcement through its licensing and regulatory authority of the radiation standards developed by EPA.

Now I would like to discuss the Part 20 provisions on releases of radioactivity in effluents. The objectives of the Commission's regulatory program as related to the to the protection of the environment from releases of radioactivity in effluents from the normal operation of nuclear facilities are:

(1) to limit releases of radioactivity to the environment from each nuclear facility or other licensed activity so that exposures of the general public to ionizing radiation from the cumulative effects of all licensed atomic energy activities, when added to exposures from other sources, are not likely to exceed radiation protection guides recommended by the FRC and approved by the President;

(2) to provide reasonable assurance that levels

rms 7

of radioactivity added to the environment are well below levels that could result in perceptible adverse effects on the ecology of the environment; and

(3) to provide reasonable assurance that appropriate efforts are made to keep releases of radioactive materials in effluents to unrestricted areas as far below limits specified in the regulations as practicable.

For purposes of regulations, the AEC has considered it impractical to impose legal limits on licensees expressed as dose to individuals in the population or to population groups. Rather, regulatory requirements are formulated as limits on concentrations and/or quantities of radioactivity in air and water effluents released to the environment. The requirements are designed to provide reasonable assurance that resultant exposures of individual members of the public generally and of the population as a whole from nuclear activities from all important pathways of exposure are well within recommended radiation protection guides.

Appendix B to Part 20 regulations lists, for approximately 250 radionuclides, limits on concentrations in air and water which, with few exceptions, are one-tenth of the most restrictive maximum permissible concentrations for a 168-hour week listed in ICRP Publication 2. Concentrations listed for strontium-89, strontium-90, radium-226, and various radionuclides of iodine are

derived from recommendations of the FRC contained in its Report No. 2. Where there is a mixture of radionuclides in effluent air or water, the sum of the respective ratios of actual concentration to concentration limit must not exceed unity.

Concentration limits specified in the Part 20 regulation are applicable to average concentrations in air or water as released to the environment; that is, at the boundary of the area to which access is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials. Concentrations may be averaged over a period of time not greater than one year. Average concentrations to which individual members of the public may be exposed are substantially less.

In practice, types and quantities of radioactive materials released and dilution in the environment are such that resultant radiation doses to the most highly exposed individuals are small fractions of applicable radiation protection buides, and average exposures of population groups are much lower.

The radiation dose limits recommended by the ICRP and NCRP and the radiation protection guides established by the Federal Radiation Council apply to total exposures to all sources of radiation except natural background and medical procedures. The limits applied by the AEC under the provisions

rms 9

of Part 20, to concentrations of radioactivity in effluents make it improbable that radiation doses to the public from such radioactivity will exceed small fractions of limits applicable to total exposures from all sources of interest. It is necessary, however, for the AEC and other regulatory agencies to keep in mind the possibility that some combination of separately regulated sources of exposure might result in total doses in excess of these limits.

This possibility is of especial concern in the regulation of nuclear facilities (e.g., uranium processing mills, reactor fuel chemical reprocessing plants and nuclear power plants) wjich may release large volumes of air or water containing a mixture of radionuclides. In such cases the total quantity of each type of radionuclide released may be more critical with respect to limiting exposures of the public than are concentrations in effluent air and water.

end 14

Part 20 clearly recognizes this concern in providing that, in addition to limiting concentrations in effluent streams, the Commission may limit total quantities of radioactive materials released in effluents during a specified period of time if it appears that in any situation the daily intake of radioactive material from all pathways of exposure (air, food and water), by a suitable sample of an exposed population group, averaged over a period not exceeding one year w ald otherwise exceed the daily intake resulting from continuous exposure to air or water containing one-third the concentration of radioactive material specified as limits in the regulations. In effect, this provision would limit the dose to the critical organ of the suitable sample of an exposed population group from all sources of exposure to one-third the dose limit for individuals in the population recommended by the FRC, NCRP and ICRP.

It is intended that this provision of the regulation be implemented in the licensing process if it appears likely that sufficiently large quantity of radioactivity will be released that exposures to people offsite will be a significant fraction of radiation protection guides. In such cases, it would be necessary to make an assessment of the types and quantities of radionuclides released, their chemical and physical behavior in the environment, including biological concentration factors, important pathways to

humans, population groups likely to be exposed and predict doses to such groups. Quantity limits based on such a study would then be derived so that actual exposures to the public from all pathways would be well within radiation protection guides.

For some nuclear activities it may not be practicable to comply with the concentration limits at the point of release from a restricted area as specified in the regulation. The regulation provides for Commission approval of concentration limits higher than those specified in the regulation on a case-by-case basis provided the applicant demonstrates that he has made a reasonable effort to minimize the radioactivity contained in effluents to unrestricted areas and that exposures of individuals and of a suitable sample of exposed population groups do not exceed the exposure criteria specified in the regulation.

In administering the regulatory program, the Commission also subscribes to the general principle that, within radiation protection guides, radiation exposures to the public should be kept as low as practicable. This general principle has been a central one in the field of radiation protection and the nuclear industry for many years. Experience shows that licensees have generally kept exposures to radiation and releases of radioactivity in effluents to levels that are well below Part 20 limits.

The Commission published on December 3, 1970, amendments to Part 20 that expresses in the regulation the intent that consistent with PRC guidance all AEC licensees should make every reasonable effort to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as far below the limits specified in Part 20 as practicable. I will later discuss amendments to Part 50 that were published at the same time to improve the regulatory framework to further assure that radioactivity in effluent releases from nuclear power reactors are maintained as low as practicable.

The implementation of this general principle will help to assure that any one class of activity does not contribute a disproportionate share of total exposure to the public and the cumulative effects of all sources of exposures will remain well within radiation protection guides.

Now I would like to speak more specifically to the application of Part 20 and Part 50in the licensing of nuclear power plants.

I have discussed the Part 20 general standards for the control of radioactivity in effluents released to the environment from nuclear facilities. I would now like to discuss more specifically how these standards are applied in the licensing process for nuclear power plants.

The Part 50 regulation requires a utility to apply

to the Commission for a permit to construct and for a license to operate a nuclear facility. Prior to issuance of a construction permit, the applicant is required to provide detailed information concerning the proposed site including population distribution near the site, meteorology, hydrology, and special environmental conditions. For liquid effluents the information includes an analysis of surface drainage, dilution provided in bodies of water, water usage and possible reconcentration of radionuclides in aquatic life that may be an important pathway to exposure of people. For gaseous effluents information is provided on such factors as wind speed, wind direction and persistence, severe weather conditions and topographic features. Information on the design and operation of radioactive waste treatment and fission product removal systems is also provided. Preoperational and operational monitoring programs for both onsite and offsite are described in detail to demonstrate that reliable data will be developed on any increase in environmental levels of radioactivity. This ifnormation is provided to demonstrate that radioactive material from both accidental and normal releases can be controlled.

The proposed site is evaluated by the regulatory staff to ascertain its suitability for a specific nuclear power station. As a practical matter the suitability of a site for a particular reactor is governed primarily by

primarily by considerations related to accidental releases. The waste treatment technology available for controlling planned routine releases is capable of limiting the quantities of radioactivity to such low levels that such releases are not an important factor in site selection. However, the detailed environmental data developed are useful for evaluating the consequences of either accidental or normal releases of radioactivity.

The information on environmental paramenters and the design of the waste treatment system submitted by the applicant is analyzed and in many areas independent calculations, based on conservative models, are performed to verify the validity of the applicant's conclusions.

The expertise of other Federal agencies in such fields as meteorology, hydrology, and ecology is brought to bear in the safety reviews. The U. S. Fish and Wildlife Service recommendations are requested on potential radiological effects on aquatic life and wildlife, the technical capabilities of the U. S. Geological Survey is regularly used with respect to the hydrological aspects of the site and of the U. S. Weather Bureau with respect to meteorology. Experts from AEC national laboratories, universities and private organizations are routinely consulted on special problems. The design of the reactor and environmental aspects of its operation are also reviewed by the independent

statutory Advisory Committee on Reactor Safeguards.

Now I would like to discuss the derivation of limits on radioactive material in liquid and gaseous effluents.

In licensing the operation of a nuclear power plant, an upper operating limit is established in the license on concentrations or quantities of radioactive material in liquid and gaseous effluents.

Whereseveral nuclear power reactors or other nuclear facilities are located on a single site, the combined releases of radioactivity from normal operations from all facilities at that site may not exceed Part 20 limits or facility license conditions impelementing these limits.

This means that for gaseous releases the cumulative total release limit established for the site would be the same regardless of the number of reactors located on the site (i.e., as the number of facilities at the site increases, the internal limits on the several facilities are adjusted so that the total release limit for the site is not exceeded). The Part 20 limits on concentrations of radionuclides in liquid effluents released from the site are also the same regardless of the number of reactors on a site.

I want to emphasize that the release limits established in the license as technical specifications are upper limits beyond which the reactor is not allowed to

operate. The Part 50 regulation as amended effective January 2, 1971 provides, among other things, that in order to keep releases of radioactive materials to unrestricted areas during normal reactor operations, including expected operational occurrences, as low as practicable, each license authorizing operation of a nuclear power reactor will include technical specifications requiring that operating procedures for the control of effluents be established and followed and that equipment installedin the radioactive waste system be maintained and used. The technical specifications will also require the submission of a report to the Commission every six (6) months specifying the quantity of each of the principal radionuclides released to unrestricted areas in liquid and gaseous effluents during the previous six (6) months of operation, and such other information as may be required by the Commission to estimate maximum potential annual radiation doses to the public resulting from effluent releases. If quantities of radioactive materials released during the reporting period are significantly above design objectives, the report shall cover this specifically. On the basis of such reports and any additional information the Commission may obtain from the licensee or others, the Commission may from time to time require the licensee to take such action as the Commission deems appropriate.

In establishing and implementing the operating

procedures, the licensee shall be guided by the following considerations: Experience with the design, construction and operation of nuclear power reactors indicates that compliance with the technical specifications described above will keep average annual releases of radioactive material in effluents at small percentages of the limits specified in Part 20 and the operating license. At the same time, the licensee is permitted the flexibility of operation, compatible with considerations of health and safety, to assure that the public is provided a dependable source of power even under unusual operating conditions which may temporarily result in releases higher than such small percentages, but still well within the limits specified in Part 20 and the operating license. It is expected that in using this operational flexibility under unusual operating conditions, the licensee will exert his best efforts to keep levels of radioactive material in effluents as low as practicable.

Specifically as related to noble gases, external exposure from gaseous releases is due almost entirely to isotopes of the noble gases of xenon and krypton. In deriving the release rate limits, "annual average site meteorology" based on site data is determined and a total dilution factor is derived from the meteorology, topography, stack air flow and elevation and site boundary distance. The release rate is derived so as to limit the annual average exposure rate

at the site boundary or at the point of maximum ground level exposure offsite (whichever is more restrictive) to not more than 500 millirems per year from external radiation. This means that if the reactor were releasing radioactive gases at the limit, an individual present outdoors on the site boundary or other point of highest exposure rate offsite 24 hours a day, 365 days a year is not likely to receive an external whole body exposure in excess of 500 millirems per year.

Nuclear power reactor waste treatment systems are designed to limit releases of radioactivity in effluents to small percentages of AEC limits. It is not expected that actual releases will approach the upper limits during normal operations. However, it is of interest to examine theoretical estimates of the potential annual average radiation dose that the population living in the vicinity of nuclear power plants could receive if the plants did release noble gases at the limit.

Theoretical values of the dose from zero altitude releases of beta-emitting isotopes typical of pressurized water reactors (PWR) and 100-meter stack releases of gamma-emitting isotopes typical of boiling water reactors (BWR) normalized for a dose rate of 500 millirems per year at a site boundary distance of 500 meters (.31 miles) are shown in Exhibit II. The dose rates shown are for outdoors.

Gamma dose rates indoors would be less perhaps by a factor of two depending on the shielding properties of the building. The dose rates become smaller with increasing distance from the source. At a distance of 15 miles the theoretical dose rates would be about 2.5 millirems per year for a BWR and about 1 millirem per year for a PWR. At distances beyond 30 miles and 20 miles, respectively, the dose rates would be less than 1 millirem per year.

The theoretical average annual dose to the population living in the vicinity of these power plants, if noble gases were released at the limit, are functions of the population distribution with respect to the wind direction frequency distributions and the distance from the emitting point from the site boundary where the controlling dose rate of 500 millirems per year exists (dose rates at other locations on the site boundary would be equal to or less than 500 millirems per year). Using realistic population distributions and wind direction frequencies for 13 different power reactor sites, the theoretical average population dose rate for the whole population included within a circle with a radius of 50 miles of these plants would be approximately 1 millirem per year.

Actual operating experience for theirteen (13) nuclear power plants in 1969 is shown in Exhibit III. This experience shows that eight (8) of the plants released less than 0.1

percent of the limit; three (3) plants released 1 percent (1%) or less of the limit; one (1) plant released 3.6 percent of the limit; and one (1) plant released 31 percent of the limit. It is estimated that average exposures to the total population living within a radius of 50 miles of these plants were less than one-one hundredth (0.01) of 1 millirem.

End #15

DB16 lnl

To control exposures from airborne radioactiv. materials that may enter terrestrial food chains, the calculations of stack release limits for halogens (primarily radioiodines), and particulates with a half-life greater than eight days include a reduction factor of 700 applied to Part 20 air concentrations. These materials are leased in such small quantities that they contribute very little to external exposure or to exposure by inhalation of the materials in air.

Although this factor of 700 was derived for iodine-131 in milk, it is applied as a measure of conservatism to all radionuclides in particulate form with a half-life greater than eight days. The release rate for iodine-131 is sufficiently conservative that an individual could receive his entire milk supply from cows grazing near the point of highest iodine deposition. The radiation exposure to the thyroid of such an individual would be less than 1.5 rems per year, if the reactor was operating at the upper limit.

Experience has shown that actual releases of iodine from power reactors have been less than a few percent of limits. Environmental monitoring programs around power reactors have shown no measurable exposures to the public from iodine-131 or particulates.

Liquid Releases.

Licenses authorizing the operation of nuclear power reactors limit concentrations in liquid effluents in

ln2

the condenser coolant discharge canal prior to release offsite to concentrations given in Appendix B, Part 20. The concentration permitted for any one radioisotope must take into account other radioisotopes that may be present. Under this requirement an individual member of the general public could obtain all his drinking water supply from the power reactor condenser coolant discharge canal without exceeding radiation protection guides developed by the FRC, the NCRP and the ICRP.

If the licensee desires to compute the gross activity limit taking into account only those radionuclides known to be present in the mixture, he must determine the radioisotopic composition of the radioactivity in the effluent.

The licensee may elect to forego some or all of such determinations if he uses more restrictive limits which assume that all of the unidentified radioisotopes in the mixture have the same concentration limit as does the most restrictive radioisotope which has not been determined to be absent from the unidentified portion of the mixture.

The limit of 1 x 10 -7 uc/ml selected by most of the licensees is sufficiently restrictive that it can be used for any mixture of fission and corrosion products without any identification of the specific radionuclides present in the mixture. The typical radionuclides present in water effluents from power reactors are such that, if the licensee wishes to identify them and measure their

ln3 concentrations by radioisotopic analysis, limits which are less restrictive than 1 x 10 -7 uc/ml by a factor of 100 or more could be selected.

A rough assessment can be made of the potential exposure through drinking water supply and food pathways from radioactivity released in liquid effluents by considering the isotopic ratios of the principal radionuclides present in water cooled power reactor liquid effluents (e.g., Cs-137, I-131, I-133, Sr-90, Sr-89, Na-24, BaLa-140, Mo-99, Co-60, Co-58, Mn-56, CR-51), and then by considering known biological concentration factors in salt and fresh water organisms, and dietary habits.

Such an assessment indicates that if the concentration of radionuclides commonly present in power reactor effluents do not exceed an annual average concentration of 1 x 10 -7 uc/ml, in the condenser coolant discharge canal, the value used by most operating power reactors, no environmental dilution would be required to permit an individual to obtain his entire drinking water supply from the effluent and ingest 150 grams of fish per day, grown in the effluent -- an average of one-half pound per meal for approximately 240 meals per year -- without exceeding about one-third the FRC radiation protection guide for an individual in the population.

Quantities of effluent water returned to the environment from nuclear power reactors are so large that the

ln4

quantities of radioactivity which the operator of the reactor is likely to release in water result in concentrations very small compared to the limits specified in the regulations. Taking into account the large factors of environmental dilution normally available, the quantities of radionuclides released are generally too small to result in measurable exposures of the public from any pathway of exposure.

Environmental monitoring programs carried out by licensees, State Health Departments, the Division of Surveillance and Inspection of the Radiation Office, EPA, formerly in the Bureau of Radiological Health of the U. S. Public Health Service, and the AEC confirm this assessment. For this reason, it has not been necessary to apply specific quantity limits, in addition to concentration limits, on effluents from nuclear power plants.

Summary of Experience and Measures to Keep Radioactivity in Effluents as Low as Practicable.

In summary, experience with licensed light water cooled power reactors to date shows that radioactivity in water and air effluents have generally been kept at less than a few percent of the limits specified in Part 20. Environmental monitoring programs and detailed studies carried out in the environs of nuclear power plants by licensees, State Health Departments, the Division of Surveillance and Inspection of its Radiation Office of the Environmental Protection Agency,

ln5

Environmental Radiation -- formerly the Bureau of Radiological Health of the U. S. Public Health Service -- and the Atomic Energy Commission have in most cases revealed little or no increase in environmental radioactivity resulting from plant operations.

The Commission published on December 3, 1970, amendments to its regulations to become effective on January 2, 1971, that will help to further assure that radioactivity in effluent releases is indeed maintained as low as practicable by requiring:

(1) that a description of the design objectives and the waste treatment equipment and handling technology that will be included in the design of power reactors to keep levels of radioactivity in effluents as low as practicable be included in each application for a permit to construct a power reactor;

(2) that waste treatment equipment installed in the reactor be maintained and used during operation of the reactor; and

(3) that the licensee report on a semi-annual basis the quantities of radioactivity released in air and liquid effluents and specifically cover in the report any releases significantly above design objectives. On the basis of such reports and other information, the Commission may from time to time require the licensee to take such action as the

ln6

Commission deems appropriate.

We are confident that the design and operation of nuclear power plants within these requirements will assure that radiation exposures to the public living in the near vicinity of these plants from radioactivity released in effluents will be less than a few percent of exposures from natural background radiation.

Average annual exposure to the total U. S. population from this source of exposure are not likely to exceed a small fraction of one millirem.

end 16

DB 17

MR. ENGLEHARDT: Mr. Chairman, at this juncture I would like to identify and then to offer three exhibits that are an integral part of Mr. Rogers' testimony. I would like first to ask Mr. Rogers to identify the title of the documents that I would identify as Exhibit 1.

THE WITNESS: Exhibit 1 is comparative information on radiation exposures.

MR. ENGELHARDT: Mr. Rogers, did you prepare the information contained in this Exhibit 1?

THE WITNESS: Yes, I prepared this information.

MR. ENGELHARDT: And from what source did you obtain this information?

THE WITNESS: The information on radiation background in the United States was prepared from measurements which have been done throughout the country and appear in several reports, one in a report by New York Operations Office. The levels of 70 to 200 millirem are levels which are generally agreed upon as the radiation levels which are in the United States.

The values for the special areas, Brazil, India and France, were obtained from the United Nations Scientific Committee on Effects of Atomic Radiation, out of their reports. Of course the Federal Radiation Council guides were obtained from FRC Report No. 1.

The first detectable clinical effects of whole body

rms 2

exposures, the ranges we have given here are ranges that are well accepted in the literature where the first acute effects adhere. The additional exposure to cosmic radiation from living in Denver, Colorado and Port Clinton, Ohio, was based on approximate radiation levels in Port Clinton as compared to radiation levels in Denver, Colorado. That is about a difference of 70 millirem per year by living in Denver. The additional exposure from living in a stone or brick house as compared to a wooden house, this generally is higher by values that range up to more than 50 millirems per year.

This was obtained from data out of reports by the United Nations Scientific Committee on Effects of Atomic radiation. And the values which I list here as examples of exposure in the vicinity of nuclear power reactors are based on our own calculations, our own estimates, and on data which wehave obtained from licensees and from environmental monitoring programs.

MR. ENGLEHARDT: Mr. Chairman, I would offer this as STaff Exhibit No. 4.

CHAIRMAN SKALLERUP: It is so ordered

(The above-mentioned document was marked for identification as Staff Exhibit No. 4 and was received in evidence.)

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INSERT

STAFF EXHIBIT 4

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EXHIBIT 1

REM - Radiation Dose Unit

MILLIREM - 1/1000 of a Rem

RADIATION EXPOSURES

(COMPARATIVE INFORMATION)

ANNUAL WHOLE BODY EXPOSURES FROM NATURAL BACKGROUND RADIATION (Cosmic Radiation; Radioactivity in Rocks, Soil Building Materials, Radioactivity in Body)

United States	70-200 Millirem (.07-12 Rem)

Special Areas	Average	Population
Brazil-Monazite Sand Areas	500 Millirem (.5 Rem)	30,000
India-Monazite Sand Areas	1300 Milliram (1.3 Rem)	100,000
France-Granitic, schistous,	180-350 Millirem (.18 - .35 Rem)	7,000,000 (1/6th French Population)

FEDERAL RADIATION COUNCIL (FRC) GUIDES - ANNUAL WHOLE BODY EXPOSURE:

Occupational Exposure	5000 millirem (5Rem)
Individual in Population	500 Millirem (.5 Rem)
Suitable Sample Population Group	170 Millirem (.17 Rem)

FIRST DETECTABLE CLINICAL EFFECTS - ACUTE WHOLE BODY EXPOSURES: 25,000 - 100,000 Millirem (25 - 100 Rem)

zms 2

ADDITIONAL EXPOSURE TO COSMIC RADIATION FROM LIVING IN DENVER, COLORADO, RATHER THAN PORT CLINTON, OHIO: (About 70 Millirem per year)

ADDITIONAL EXPOSURE FROM LIVING IN A STONE OR BRICK HOUSE AS COMPARED TO A WOODEN HOUSE: Generall higher by values that range up to more than 50 millirem per year.

ANNUAL WHOLE BODY EXPOSURE FROM TYPICAL OPERATING POWER REACTOR TO PERSONS LIVING NEAR SITE BOUNDARY:

Persons living near site boundary	5 Millirem (.005 Rem)
Average to persons living within 4 miles	Less than 1 Millirem (.001 Rem)

RMS 3

MR. ENGELHARDT: May we turn now to the next exhibit which we will offer for identification as Staff Exhibit 5, although the document itself has a heading of Roman II.

Would you identify this Exhibit, Mr. Rogers? Would you identify the heading?

THE WITNESS: Yes. This is dose rates from noble gas as a function of distance for a boiling water reactor and a pressurized water reactor, normalized to give 500 millirems per year at 0.31 miles.

Also there is a graph which provides the same kind of information and these two documents are based on our own calculations in our own Division.

MR. ENGELHARDT: We would offer this document as Staff Exhibit 5.

DR. JORDAN: Is the difference between the PWR and BWR chiefly due to the stack height?

THE WITNESS: Chiefly.

CHAIRMAN SKALIERUP: It is so ordered.

(The above-mentioned document was marked for identification as Staff Exhibit 5 and was received in evidence.

(The document follows.)

INSERT

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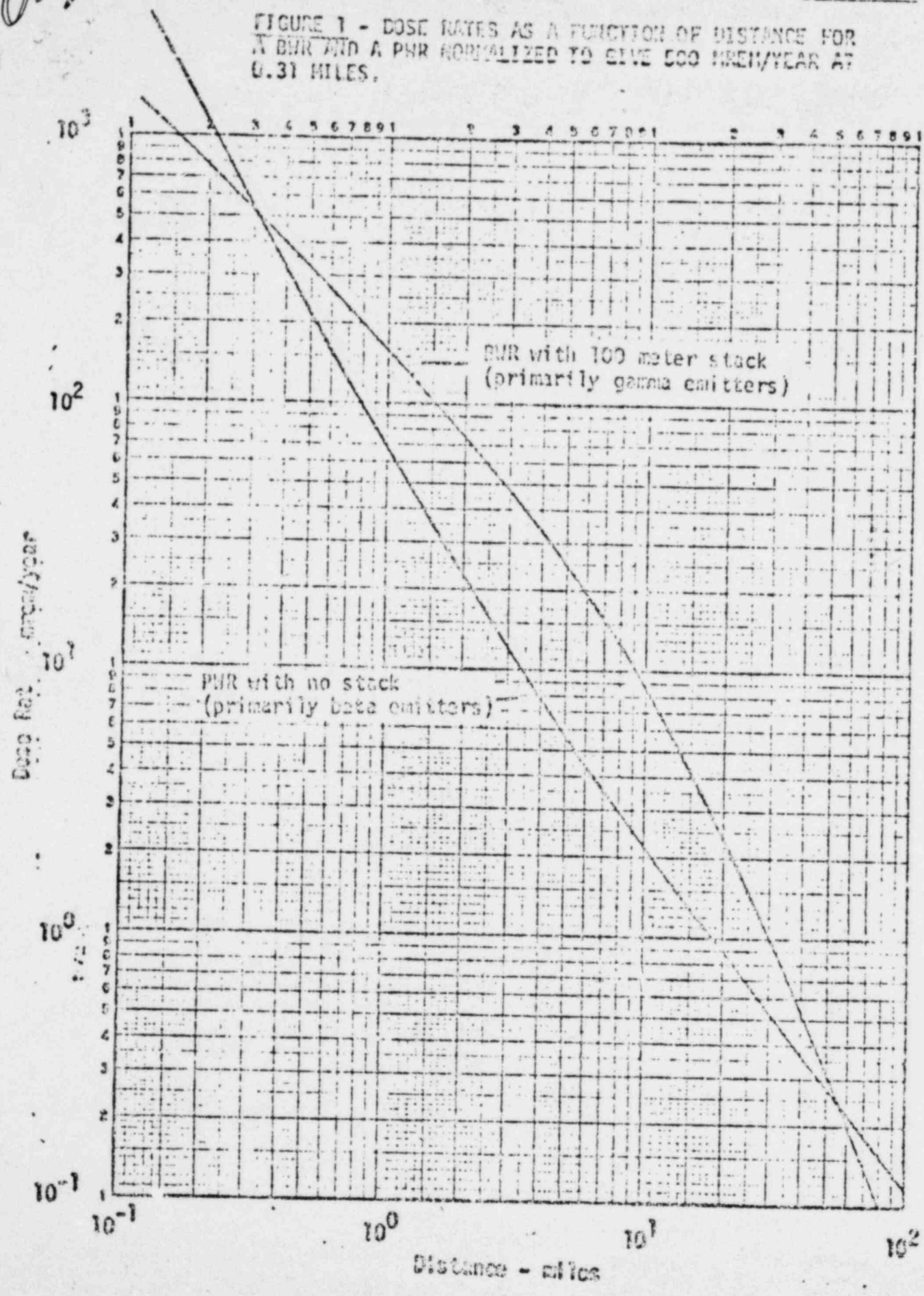
EXHIBIT II

FIGURE 1 - DOSE RATES AS A FUNCTION OF DISTANCE FOR A BWR AND A PWR NORMALIZED TO GIVE 500 MREM/YEAR AT 0.31 MILES.



STAFF EXHIBIT NO. 5

DOSE RATES FROM NOBLE GASES AS A FUNCTION OF DISTANCE FOR A BOILING WATER REACTOR (BWR) AND A PRESSURIZED WATER REACTOR (PWR) NORMALIZED TO GIVE 500 MILLIREMS PER YEAR AT 0.31 MILES

Distance in Miles From Reactor	Dose Rate Per Year	
	PWR with no stack (primarily beta emitters)	BWR with 100-meter stack (primarily gamma emitters)
0.31	500	500
1.	70	160
5	6	25
10	2	8
20	1	3
30	0.5	1
55	0.25	0.25

Theoretical average annual dose rate calculated for whole population within circle with radius of 50 miles of nuclear power plants assuming 500 millirems/year at boundary:

Approximately 1 millirem per year.

Estimated average exposures to total population living within radius of 50 miles of operating plants based on actual operating experience of 13 nuclear power plants in 1969:

Less Than One-one-hundredth (0.01) of 1 millirem per year.

RMS 4

MR. ENGELHARDT: Mr. Rogers, I would now call your attention to a document which we will identify as Staff Exhibit 6 which appears in your material as Exhibit Roman III.

THE WITNESS: Let me elaborate on Dr. Winters' question. There is also some effect with respect to the radionuclide mix because of the BWR, primarily gammameters, and PWR is primarily krypton-85. It is due to the holdup time, of course, between the two reactors. I might say the BWR values, I want to emphasize this, are based on a 30 minute holdup period. But the stack also does have an effect with respect to the curves.

DR. JORDAN: Thank you.

MR. ENGELHARDT: Would you identify the document I just indicated as Staff Exhibit 6 which on your document appears as Exhibit Roman III?

THE WITNESS: This is experience on releases of radioactive material in nuclear power reactor effluents for 1969.

MR. ENGELHARDT: I note this is a four-page exhibit.

THE WITNESS: That is correct.

MR. ENGELHARDT: Consisting of I believe three tables and a footnote for the tables.

THE WITNESS: That is correct.

MR. ENGLEHARDT: Where does this information come

rms 5

from or what is the source of this information?

THE WITNESS: The source of this information is data which licensees have been gathering under their requirements to monitor the levels of radioactivity which are released, nd also information which has been gathered by our own Division of Compliance.

end 17

DB18 1nl 1

DR. JORDAN: I have a question on page 2 of Exhibit 3. There I note for example that Dresden is a permissible limit of 22 million curies, while some others are down to maybe 3,000 curies. What accounts for such a big difference in the permissible limit?

THE WITNESS: With respect to Dresden 1, this happens to be a very good site, both with respect to the meteorology, and also the stack height, the higher the stack, the larger the quantities.

And I might also say that some of the early reactors had a limit which was somewhat lower than the actual calculated maximum limit according to the traditional or typical method of calculating releases.

MR. ENGELHARDT: I would like to offer this exhibit as Staff Exhibit 6.

CHAIRMAN SKALLERUP: It is so ordered.

(The document referred to was marked Staff Exhibit No. 6 for identification and was received in evidence.)

(Staff Exhibit No. 6 follows.)

Stop Ex 6

EXHIBIT III

EXPERIENCE ON RELEASES OF RADIOACTIVE MATERIAL
IN NUCLEAR POWER REACTOR EFFLUENTS - 1969

TABLE I - RELEASES OF RADIOACTIVITY FROM POWER REACTORS IN LIQUID EFFLUENTS, 1969

	MIXED FISSION & CORROSION PRODUCTS			TRITIUM	
Facility	Released (Ci)	Concentration Limit[1] (10-7 μCi/ml)	Percent of Limit[2]	Released (Ci)	Percent of MPC[3]
DRESDEN 1	9.5	1	22	~6	< 0.001
SAN ONOFRE	8	1	14	3500	0.2
HUMBOLDT BAY	1.5	1	8.7	< 5	< 0.001
NINE MILE POINT	0.9	1	8.2	< 1	< 0.001
BIG ROCK	12	22	5.6	28	0.01
OYSTER CREEK	0.48	1	4.1	5	0.001
SAXTON	0.01	1	2.5	< 1	0.008
INDIAN POINT 1	28	37	1.5	1100	0.07
CONN. YANKEE	12	12	1.4	5200	0.24
GINNA	0.02	1	0.4	< 1	< 0.001
LA CROSSE	8.5	300	0.11	~25	0.003
YANKEE	0.019	1	0.07	1200	0.14
PEACH BOTTOM	< 0.001	1	0.002	40	0.031

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MR. ENGELHARDT: To clarify the record and avoid the possibility of confusion, in Mr. Rogers' testimony the three exhibits which we have just offered have been identified as Exhibits I, II and III. In the course of identify of these exhibits and their offer into the record, we have changed the numerical designation of those exhibits.

Exhibit I is now Staff Exhibit 4. Exhibit II is now Staff Exhibit 5, and Exhibit III is now Staff Exhibit 6.

I have one further question to ask of Mr. Rogers and that will complete his rebuttal testimony and he will then be available for examination by the Board of the parties.

Mr. Rogers, in Dr. Tamplin's testimony on pages 1505 to 1508 of the Transcript, he implied that under certain circumstances that cesium-137 could be released from a nuclear power reactor in excess of the concentrations allowable.

Does Part 20 permit routine release of radioactivity in effluents that would result in doses above the radiation protection guidelines in any situation?

THE WITNESS: No. I think as has been made clear in my testimony Part 20 contains a provision, in 2.106(e), and I would like to read that section of the regulation, "In addition to limiting concentrations in effluent streams, the Commission may limit quantities of radioactivity materials released in air or water during a specified period of time if it appears that the daily intake of radioactive material

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from air, water or food by a suitable sample of an exposed population group averaged over a period not exceeding one year would otherwise exceed the daily intake resulting from continuous exposure to air or water containing one-third the concentration of radioactive materials specified in Appendix B, Table 2 of this part."

And the implementation of this provision of Part 20 would not permit doses above the radiation protection guides in any situation.

DR. JORDAN: I would like to make sure that it is perfectly clear. You are saying now that if for example cesium-137 were to exist at the plant boundary in a concentration given by Table 2 of 10 CFR 20, you don't disagree that a dose to a person there might be higher, but what you say is that the 10 CFR 20, the other paragraph, will take care of that situation and thereby require that the concentration limit be held below the Table 2, sufficiently so that the dose to a member of the population there will still fall within the 170 millirem per year.

Is this right?

THE WITNESS: That is correct.

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CHAIRMAN SKALLERUP: How do you employ the phrase "averaged over a year"?

THE WITNESS: The phrase "averaged over a year" is a permitted average which is recommended by all of the standard setting groups, FRC, ICRP, and NCRP, with respect to doses to population groups.

As a practical matter, the Part 20 regulations provide that with respect to effluents from power plants or any kind of activity, that the instantaneous or short-term concentrations may go above the concentrations in Part 20, as long as the average concentration over the period of the year does not exceed the Part 20 values.

CHAIRMAN SKALLERUP: When does the year begin and end?

And question 2, could you have all of your concentration on 31 December and then you divide it by 365?

THE WITNESS: As a matter of practice, the year begins January 1 and ends December 31 in terms of the way we apply the regulation.

CHAIRMAN SKALLERUP: Then you could have your dose on the last day of the year and it would average out on an average yearly basis?

THE WITNESS: That is correct.

Now in the present technical specifications there are some further limitations on the averaging which provide that the level shall not go above 10 times the concentrations

in the Appendix B over any period I believe of 15 minutes.

DR. JORDAN: As a matter of practical experience, in the case of iodine 131, the limits if there are cows grazing nearby will be probably reduced by a factor you say of 700?

THE WITNESS: Well, it is reduced by a factor of 700 whether there are cows there or not. We simply apply the factor of 700 pretty much across the board.

DR. JORDAN: Then why doesn't 10 CFR 20 automatically change the table under iodine 131?

THE WITNESS: Well, I think your question is, why isn't the factor of 700 in Part 20, since we use it as a routine? And there is really no particular reason why.

DR. JORDAN: You do actually use it routinely though, whether cows are there or not.

THE WITNESS: That is right, for power reactors.

DR. JORDAN: Are there any other isotopes in which you find it necessary to do this?

THE WITNESS: Not -- as a matter of fact, we haven't really found it necessary for iodine, because the quantities are so extremely low. As a matter of fact we do apply it to all particulates, airborne, air releases in particulate form with half lives greater than eight days. It is not needed based on the quantities which are actually released. But as a matter of practice, a matter of

conservatism and a matter of simplification, administrative simplification, we simply apply the 700 across the board.

DR. JORDAN: I see. It is the same factor of 700 to all particulates as well as iodine.

THE WITNESS: That is right, with a half life of eight days, that is correct, sir.

DR. JORDAN: I see.

MR. ENGELHARDT: Mr. Rogers of course will be available tomorrow for any additional examination by the Board members or by the Intervenors at the time we complete the remainder of our rebuttal testimony.

CHAIRMAN SKALLERUP: Thank you, Mr. Rogers.

Have you another witness?

MR. ENGELHARDT: No, sir.

We have other witnesses, but I would prefer if agreeable -- it is now 5 o'clock -- to bring those witnesses to start tomorrow morning at whatever time we open.

CHAIRMAN SKALLERUP: Any further matters to raise today, Mr. Charnoff?

MR. CHARNOFF: No, sir.

CHAIRMAN SKALLERUP: That being the case, we will adjourn until 9 o'clock tomorrow morning here.

(Whereupon, at 5:00 p.m., the hearing was adjourned, to reconvene at 9:00 a.m., Tuesday, 9 February 1971.)

End #19