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UNITED STATES 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, Unit No. 1)

RETURN TO REGULATORY CENTRAL FILES
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Place - Port Clinton, Ohio

Date - 10 December 1970

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UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

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(Davis-Besse Nuclear Power :
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Ohio National Guard Armory
135 W. Perry Street
Port Clinton, Ohio

Thursday, 10 December 1970

The above-entitled matter came on for hearing pursuant to notice, at 9:00 a.m.

BEFORE:

WALTER E. SKALLERUP, JR., Chairman of the Board

DR. WALTER H. JORDAN, Member

DR. CHARLES E. WINTERS, Member

APPEARANCES:

(As heretofore noted.)

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C O N T E N T S

discretionary with the Board. And such certifications are normally dealt with, or I should say such certifications are made by an Appeal Board normally when a question of novelty or first impression is raised by the person moving this action.

There is also a procedure, Mr. Chairman, which permits a Hearing Board to certify its ruling with regard to a motion or matter in a proceeding to the Appeal Board for confirmation during the course of the proceeding. And this has been done in connection with other proceedings, where, for example, in the Palisades proceeding a question was raised as to whether a Board could proceed with a hearing with just two members present. There were motions and there were briefs filed by the parties with regard to that matter.

The Board ruled and then referred its ruling to the Appeal Board for confirmation or for consideration at any rate.

In both situations, Mr. Chairman, the matter of certifying to the Appeal Board is wholly within the discretion of the Board itself. And there is no appeal from that decision by the Board until such time as the Board issues its initial decision, at which time the party denied may appeal this matter to the Appeal Board.

With regard to the request by the three petitioners yesterday which the Board denied, the petition to intervene which the Board denied, in my view there is no new or novel matter raised in connection with that petition, and I find no basis in reviewing that matter, myself, I would be of the opinion that the matter does not involve a certification of a question, because there is no real question to the Appeal Board.

However, the Board could, if it so desires, refer its ruling, not certify a question, but refer its ruling to the Appeal Board. But this is a matter within the discretion of the Hearing Board itself and certainly is not a required procedure under the Commission's Rules of Practice.

The petitioner in this instance will have an opportunity to appeal the ruling of the Hearing Board to the Appeal Board within the 20-day period allowed for such appeals after the issuance of the initial decision.

CHAIRMAN SKALLERUP: Thank you.

The Board will go off the record.

(Discussion off the record.)

CHAIRMAN SKALLERUP: The Board has considered Miss Evans' request in the light of the applicable regulations and in its discretion does not believe there is sufficient ground to refer the ruling of the Board to the Appeals Board.

End #1

The next item of business will be the petition of Mr. Lau.

Mr. Knight?

MR. KNIGHT: Thank you, Mr. Chairman. I believe the disposition of this matter as we left it yesterday was the Board had deferred any action on the status of our petition pending our efforts during the course of the evening to expand and to make considerably more specific the latter half of our contentions in our petition, Part 2, page 3, wherein we undertook to make some contentions regarding the engineering standards with respect to the proposed reactor.

It is not the position of Mr. Lau at this time or at any time hereafter to do anything with his petition other than to eliminate those matters which are not under contention and that is the function of the Board and Mr. Engelhardt's staff, and I am certain that is what we all want to do, eliminate those matters which are not under contention, over which there is no issue.

On the other hand, we have reams and volumes and great quantities of technical data on which it is possible, I suppose , to adequately specify in a given number of points exactly what concerns us by engineering standards.

Those matters to which I refer, the PSAR and all of the technical data are not technically a part of the record yet. Accordingly, we do not feel that we can accurately specify any more fully than we have at this stage exactly what the Petitioner's concerns are going to be and are presently about engineering standards. We feel that is we are afforded an opportunity to undertake discovery proceedings, to cross-examine, once these matters are part of the record, that we will then very precisely and very specifically with greater clarity be able to delineate precise issues and eliminate everything else that is not relevant.

And we stand vulnerable at any time, now or hereafter, provided the Board permits our intervention as our petition now stands, to motions to strike on the part of the Applicant or any other manner of eliminating those contentions which are shown to be irrelevant.

So we would urge the Board to permit us to intervene with the statement of the issues as we have made them on page 3 and 4 under Part 2 of our petition and in the alternative, if the Board is not disposed to do that at this time, we would ask for some time within which fully to comply with the exact specificity requirements that the Staff might recommend and the Board approve.

CHAIRMAN SKALLERUP: Mr. Charnoff?

MR. CHARNOFF: Mr. Chairman, I think we are witnessing here is an attempt here to, if you will, develop a standard ticket for admission into AEC hearings. There is, as everyone is familiar, a contest going on, two contests going on up in

Michigan involving two other reactors belonging to a different utility. Any examination -- this applies as well to the Coalition's petition and certainly this particular point in Mr. Lau's petition -- is evidently simply a parity of contentions that have been made in another case.

I think what the Board has to consider is whether or not unfounded allegations, without any basis but parroted in some format style is going to be sufficient to allow people into hearings and then to commence fishing expeditions. If this is going to develop here, this will develop at every hearing in the country; that all the people have to do is simply say, "I am troubled by the plant and here is my ticket of admission. Now let me start delaying things until I can find out if there is anything wrong."

I submit, humbly, sir, that I think a very profound decision has to be made by this Board on this kind of matter-as it applies to this kind of contention. It is evident that if there is no specific contention in mind, that to justify anything other than a statement or statements such as what he has made here, the fact that somebody somewhere in the country has said something does not provide a basis in my mind for allowing hearings to commence without any shred or any scintilla of foundation for that kind of statement.

The Commission's rules of practice call very specifically for fair and orderly processes. They call for prehearing conferences to determine the matters in controversy well before the hearing begins. This has to be based upon matters that are ɔced in contention with some reasonable specificity as provi ed in Section 2.714.

I 't want to restate everything I said yesterday with regard to the material in item 2 except to express the fac that I am more firmly convinced than ever after our discussions with Applicant's counsel and counsel for Mr. Lau that we are dealing with nothing except a totally unfounded allegation which has no basis in any specificity or any specific detail at all.

There is no willingness on the part of Mr. Lau to provide a single engineering standard that he thinks we should follow that we are not following to support his statement that generally accepted engineering standards have not been applied in the design of the reactor.

In talking about the NSSS, he has not and is unable to provide a single instance where that particular contractor has had a history of design and fabricating failures in its previous experience with nuclear reactors. He cites a 1969 Fortune Magazine article, which I have read again, which simply indicates that the management of that particular company had substantial difficulties in producing reactor vessels on time.

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Any fair reading of that article would show that, if anything, the safety standards that are enforced by the Atomic Energy Commission here were one of the things that caused substantial delay.

But it did not indicate in any respect that those safety factors were not being observed.

For my part, I am willing to stipulate now that that article can be made a part of the record. But there is nothing in that article that suggests any basis for a statement that that particular supplier has had any history of design or fabricating failures.

Now the same thing applies with regard to the allegations with regard to the construction manager in this case. There is a reference to the fact that somebody somewhere said something.

But there is no ability on the part of the Intervenor to show, (a) whether there is any basis for that particular statement, or, (b) how it applies in any relevant way to this particular case, where this reactor is just being undertaken, as compared with whatever the experience was elsewhere, where there are very firm commitments in the application with regard to the construction program and the quality assurance program.

It seems to me that if we are to allow Intervenors to come in on these kinds of flimsy charges, they have to have

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the burden of going forward and identifying something that is quite specific so that we know whether there are in fact any matters in controversy.

The purpose here is not to let people in and then find out whether there are in fact no matters in controversy.

Again, with regard to the Oyster Creek facility, I would simply restate the fact that there is no ability of the Intervenor here, or the petitioner here, to identify in what regard we might be doing something that was done at Oyster Creek that might have caused any difficulties there.

Again, I would offer to you the fact that the difficulty at Oyster Creek was the subject of a question by the Atomic Energy Commission Staff and it was responded to, it is in the PSAR, and any examination of that clearly shows that particular problem is gone.

If the Intervenor wants to ask a question with regard to our use of that material, I would certainly permit that. But it seems to me what we have to do is decide right now whether or not the Intervenor has any foundation at all for the e allegations which would provide a basis for his participation and then a basis for any discovery.

But to allow discovery simply for purposes of delay and for fishing expeditions on the basis of no foundation of fact or no foundation with any specificity would, it seems to me, be a violation of everything the rules of practice

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are designed to assure does not occur.

CHAIRMAN SKALLERUP: Mr. Engelhardt?

MR. ENGELHARDT: Mr. Chairman, this is an administrative proceeding which is being conducted under rules which implement the Administrative Procedure Act of the United States which control the conduct of proceedings such as this.

The basic underlying tenet of the Administrative Procedure Act and certainly the implementing procedures of the Atomic Energy Commission as set forth in 10 CFR Part 2 require that the basic fairness be applied with regard to the rights of the parties to these proceedings.

I think that here in this proceeding we have to weigh that doctrine very carefully.

On the one hand we must be fair to the Applicant, who has a need to provide electric service to the customers in their service area, and this particular plant will provide such power and it is obviously, from all that can be determined here, something that is needed and should not be delayed.

On the other hand, we have the problem faced by the petitioner in this proceeding, and that is some vague concern with regard to the matters specified in his petition under Item 2.

As best I can determine from discussions with the petitioner and his attorney, there is no basis for the concerns

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expressed at the moment.

They are vaguely concerned, they have a feeling there may be something that they should be concerned with, but they cannot at this time be specific in identifying exactly what it is.

The question now is shall we permit a petitioner or Intervenor to participate in our proceeding or to make allegations essentially unfounded allegations and have that as a sufficient basis for participating in the proceeding and possibly delaying the expeditious conclusion of the proceeding by instituting discovery and delay for the purpose of determining whether his vague concerns have any foundation at all.

Or is it the better approach to require that an Intervenor or petitioner have his allegations well founded or at least reasonably founded initially and bring them to the attention of the Board and raise them during and test them out during the course of the proceeding.

The problem that we have here is that we have no specific allegations, but only, as the petitioner has indicated, something that cannot be specified with any degree of detail at this time.

The only alternative to denying this element of the petition to intervene, I think, because of the unfounded basis of the allegations, would be to consider allowing a

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short period of time, provided there is no delay in this proceeding, for the Intervenor or petitioner as he is at the moment, to perfect this element of his contention and to provide to the parties and to the Board a statement of specific contentions within a short period of time and to then go forward with the proceeding on that basis with opportunity for the other parties to comment on the detailed specification.

This, of course, would be giving the petitioner another bite. This is the second -- he has already had a second bite. We are now giving him a third bite of the apple to perfect the petition or to amend his petition to intervene.

And I think that there is an open question in my mind as to whether at this stage, with the vagueness of the allegations involved, such an opportunity should be given.

But it is something the Board should consider in the event that they feel uncomfortable with regard to denying this particular allegation of the petitioner and removing it as an issue in this proceeding.

CHAIRMAN SKALLERUP: Mr. Knight?

MR. KNIGHT: I would just remind the Board that currently two proceedings in Michigan are in process, one of which involves a much more substantial financial consideration of the Applicant than does this hearing, wherein the proceedings are stopped and stalled not at the construction

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stage, but at the operating stage -- they are seeking an operating license rather than construction license.

Great expense is being incurred daily in that matter. We feel, granted somewhat vaguely, that engineering standards are a very pertinent issue in that matter and we feel the same engineering standards that are in issue in that case are a legitimate issue in this case.

And we feel that it is much more important to the public and to everyone concerned that these issues be identified and settled at this stage of the game rather than after having devoted millions and millions of dollars to construction, only to have operation delayed at the subsequent hearing for the operating license.

That is all we would have in response to Mr. Charnoff and Mr. Engelhardt.

CHAIRMAN SKALLERUP: The Board will take a short recess.

(Recess.)

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CHAIRMAN SKALLERUP: The Board unanimously agrees that contention number 1 in Mr. Lau's petition is properly raised and that contention number 2 is deficient.

However, the Board notes that this Petitioner has an obviously direct affected interest that has been amply demonstrated in his petition, unlike other Petitioners to intervene in this proceeding.

The Board is divided as to whether Mr. Lau should be allowed to further amend his petition. A majority of the Board has decided not to allow the Petitioner to further amend his petition.

Accordingly, as of now, Mr. Lau is admitted as an Intervenor.

MR. ENGELHARDT: Mr. Chairman, may I raise a question? Mr. Lau has been permitted to intervene in this proceeding. Is it for the limited purpose of raising the issue specified in his contention number 1? Is it within those limitations? Or is he permitted to intervene on some other basis?

CHAIRMAN SKALLERUP: The Board in exercising its discretion determined that Mr. Lau's petition to intervene be conditioned upon being limited to allegation number 1. The Board will now consider the petition of the Coalition.

MR. KNIGHT: Mr Chairman, might I be recognized at this point?

CHAIRMAN SKALLERUP: Mr. Knight.

MR. KNIGHT: I would move the Board at this time to certify to the Appeals Board the decision the Board has made here this morning with respect to Mr. Lau's petition as a question of new and novel impression which I know is a matter of discretion with the Board. For the record I wish to make that motion.

CHAIRMAN SKALLERUP: Your motion is noted. The Board will act upon the motion and advise you when it has acted.

Would the Applicant and Staff counsel care to respond at this time to the motion of Mr. Knight? Or take time and respond at a later time?

MR. CHARNOFF: I would request an opportunity to consider that at a later time, Mr. Chairman.

MR. ENGELHARDT: Mr. Chairman, I will defer then until a later time to deal with that point.

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CHAIRMAN SKALLERUP: Now with respect to the petition of the Coalition, at a prehearing conference held November 23, 1970, a petition to intervene filed by the Coalition for Safe Nuclear Power was considered. The Board found the petition deficient according to the AEC regulations relating to intervention. It granted the Coalition the opportunity to amend the petition.

Among the guides set forth by the Board under AEC regulations was that the petition should set forth the interests of the petitioner, how that interest may be affected by the Commission action, and the contentions of the petitioner in reasonably specific detail.

Further, that contentions relating to matters outside of the jurisdiction of the AEC would not be considered.

Subsequently the Coalition filed an amended petition for intervention dated December 5, 1970.

The Board has considered the petition as amended, in light of the comments expressed by the Applicant, AEC Staff counsel, counsel for the petitioner and in the light of the requirements of AEC regulations. The Board has determined that the petitioner shall be and hereby is granted leave to intervene conditioned upon the following terms: The Coalition is a party to this proceeding, and members of the Coalition are limited to those appearing in the record of this hearing as having provided the requisite affidavits.

Two, the following contentions numbered as they appear in the amended petition are deemed by the Board to be deficient under the regulations of the AEC for one or more of the following reasons:

A. Not reasonably specific, not in the initial petition, not in issue in the proceeding, not relevant, redundant or repetitious. Contentions falling into this category are: 16(d), 17, 18, 19, 20, 21, 22, 23, 24, 25, 29, 30, 31, 32, 35, and we note there are two number 36s. The 36 which begins on page 32, 36(a), 36(d), 36(e). The 36 which appears on page 30, 37, 38, 39, 40, 41, 42.

B. As not meeting the requirements of the Calvert Cliffs conditions: 26, 27, 28, 34, and 36(c).

The following contentions are deemed properly raised under AEC regulations as herein after set forth: Number 15, to the extent that the Commission violated its own guidelines in siting reactors. 10 CFR 100. 16(a), 16(b), 16(c).

As to 16(b) and 16(c), it appears to the Board that (b) and (c) are unlikely events unless preceded by failure of the emergency core cooling system as contended in 16(a). Number 33. An allowable contention for the purpose only of examing the critical exposure routes.

Number 36(b) --

MR. BARON: Excuse me, Mr. Chairman, what was that last word?

CHAIRMAN SKALLERUP: Routes, r-o-u-t-e-s.

As to those matters set forth on page 34 of the petition under the term "Reservations" --

MR. CHARNOFF: I am sorry, Mr. Chairman, after contention 33 with your note, did you mention another one?

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CHAIRMAN SKALLERUP: Yes, 36B as in "baker."

MR. CHARNOFF: Thank you.

CHAIRMAN SKALLERUP: As to those matters set forth on page 34 of the petition under the term "reservations," inasmuch as they are a series of questions and not contentions, as contemplated by the regulations, and deal in large measure with matters outside the jurisdiction of the Commission, they are deemed by the Board to be deficient and as such are not proper matters for consideration in this hearing.

Accordingly under these terms the Coalition for Safe Nuclear Power is deemed a party to the proceeding.

Before proceeding with the next item on the agenda, a request has been made by Mr. Samuel Howerth to make a limited appearance. Mr. Howerth.

LIMITED APPEARANCE OF SAMUEL HOWERTH,
PORT CLINTON, OHIO.

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MR. HOWERTH: Good morning.

Mr. Chairman and members of the Board: My name is Samuel Howerth and I am a contractor here in Port Clinton, Ohio. Last evening the Village Register carried an account of a statement made by Donald Terrill, a Toledo Edison spokesman who is reported to have said that four key construction and scientific personnel assigned to the proposed plant already live within the 20-mile radius.

Mr. Chairman, I and other residents of this area respectfully submit that this information is insufficient as

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a guarantee for our safety.

Before this facility is licensed for operation by the AEC, we wish to know the following:

(1) What are the names of the two top executive nuclear physicists connected with the operational phase of Davis-Besse?

(2) What will be their exact address within the 20-mile radius which surrounds Davis-Besse?

(3) What will be the exact terms of their employment contract? How long will it last? What financial penalties and advantages will it contain to assure their presence in our community for a suspended period of time with their families?

(4) When will the children of these men, if they have families, be enrolled in any one of our schools in our county?

Mr. Chairman, we feel that we are entitled to this information as residents, as utility users and as citizens. We do not wish to unnecessarily make public display of the private lives of others.

However, the public interest in obtaining an absolute guarantee of safety makes necessary these disclosures.

Mr. Chairman, in closing my remarks, I would like to express what I am sure is the belief of all concerned citizens of this country, and that is that in questions of

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human life and environment we must deal not in probabilities but absolutes.

God be with you in your decision.

Thank you, Mr. Chairman.

(Applause.)

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DR. JORDAN: This member of the Board is particularly concerned that physicists are being singled out to be sacrificed, shall we say, so to speak.

I would just as soon it be opened up to biologists and other scientists; lawyers, no.

(Laughter.)

MR. BARON: Mr. Chairman, yesterday or perhaps the day before Dr. Perrin had been permitted to make a limited appearance, although having been listed as a part of the Coalition.

Mrs. Stebbins has indicated to me a desire to, shall we say, step out for the moment from her chairmanship of the Coalition in order to make a limited appearance with regard to matters that are now no longer in the petition.

I don't know if this is possible at this point. But I am expressing her request.

MR. CHARNOFF: We would have no objection to that, Mr. Chairman.

MR. ENGELHARDT: The Staff would have no objection.

CHAIRMAN SKALLERUP: It is an unusual situation,

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but come ahead, Mrs. Stebbins.

LIMITED APPEARANCE OF MRS. STEBBINS, CHAIRMAN, CITIZENS FOR CLEAN AIR AND WATER.

MRS. STEBBINS: Gentlemen, I am Evelyn Stebbins, Chairman of Citizens for Clean Air and Water. This is an organization of over 400 members and we have approximately 27 different organizations represented in our membership also.

I have long been interested in, to start with, clean water, Lake Erie, and my concern for Lake Erie is a broader concern, the totality of what we are doing to our environment.

Our Citizens for Clean Air and Water adopted a position paper last summer and we would like to enter this into the record.

Citizens for Clean Air and Water, Inc., feels that the following criteria should be met before nuclear power electric generating plants are built in Ohio:

(1) Designs for nuclear plants should be improved to make them safe enough to be fully insurable by private insurance companies, and the Price-Anderson Act should be repealed.

Studies on possible damage that could be caused by a nuclear accident from a nuclear plant, approximately 160,000 kilowatts, 30 miles from a large city, showed that there

1n5 could be property damage up to $7 million, 150,000 square miles of property could be affected, 3,400 people could be killed, and an additional 43,000 people could have shortened lives due to cancer or leukemia.

Subsequent studies on a slightly larger plant, 300,000 kilowatts, showed 133,000 people could be killed, 181,000 people could receive immediate injuries, and 245,000 people could have shortened lives due to cancer or leukemia.

No property damage estimates were made in this report. This report, incidentally is "The Theoretical Possibilities and Consequences of Major Accidents in Large Nuclear Power Plants," published by the Atomic Energy Commission in 1957.

The second report was "Studies by Engineering Research Institute, University of Michigan, Regarding the Enrico Fermi Nuclear Plant Located Near Detroit, Michigan."

Because of the risk of nuclear power plants, private insurance companies would not insure nuclear plants for potential damage, and, therefore, private utilities were reluctant to build such plants. In 1957, Congress passed the Price-Anderson Act, to be effective ten years, which provided $500 million of insurance plus whatever private insurance might be available, $60 million, and exempted power companies for any further liability.

In 1965, Congress extended the Price-Anderson

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Act to 1977. Utility companies testified at hearings that they would not build nuclear plants unless this law exempting them from loss in case of nuclear catastrophe was extended.

Designs for nuclear plants should be improved to reduce discharge of radioactive waste to the air to the levels recommended by Dr. Gofman and Dr. Tampling, and eliminate discharges to adjacent waterways.

The Atomic Energy Commission licenses nuclear plants and sets standards which permit power companies to discharge certain allowable amounts of radioactive wastes to the air and adjacent waterways.

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Federal Regulation Radiation Council has said "On the assumption that there is no threshold, every use of radiation involved the possibility of some biological risk either to the individual or to his descendants."

Radionuclides are carcinogenic, capable of producing cancer, mutagenic, capable of producing mutations in future generations, and teratagenic, capable of producing birth defects.

Two scientists from the Lawrence Radiation Laboratory, University of California, Dr. John W. Gofman, and Dr. Arthur R. Tamplin, were requested by the AEC to do research on biological effects of radiation.

They recently testified before a Congressional Committee that the present AEC allowable radiation dosage to the population from the peaceful atomic energy activities will cause many thousands of cases of cancer and leukemia, and that many, if not all, causes of death increase, and in about the same proportion as does cancer mortality.

They recommend that the AEC's allowable radiation dosage be reduced immediately to at least one-tenth of the present allowable levels, or even less.

The State of Minnesota in attempting to protect the health and welfare of its citizens, has set stnadards which would limit release of radioactive wastes to 2 percent of the AEC allowable standards, and has been in court, supported by eleven other states, fighting to uphold its position that it has the right to set more stringent standards than the AEC to enable them to protect their citizens.

Dietary needs of all vegetable and animal life dictate the intake of specific elements. Those elements, whether radioactive or not, will concentrate even in the lowest and most basic forms of life. They are then passed up food chains, such as the grass-to-cattle-to-milk-t-man. As they progress up these chains, the concentrations increase, sometimes by hundreds of thousands of times.

A study of the Columbia River has indicated the radioactivity of the river plankton was 2,000 times greater than the radioactivity of the water. The radioactivity of the fish and ducks feeding on the plankton was 15,000 and 40,000 times greater respectively; the radioactivity of young swallows fed on insects caught by their parents in the river was 500,000 times greater; and the radioactivity of the egg yolks of water birds was more than a million times greater.

We are looking at the same sort of biological build-up in the food chain which is facing us with our very unfortunate over-use of DDT. We are at the point now with the DDT where a small amount, for instance, in a study in Long Island Bay showed .000003 parts per million;each time this DDT went up the food chain it increased to the hundredths part per million, to the tenths parts per million, to two parts per million in the fish; and finally to 25 parts per million in birds, where we are destroying the reproductivity of these birds.

We are faced at this time with looking at the same sort of significant factor on this radioactivity. As we put this plant in in Port Clinton, you have determined that you will not consider other environmental factors; that these are not important.

The National Environmental Policy Act has required you, has required you to consider all parts of the environmental and yet this Atomic Energy Board sits here and refuses to consider the total impact upon the environment.

(Applause.)

This Board is not representing the people. We live in a Democracy, a government of the people, by the people and for the people. You get your power from the people. You are to respect our wishes. You are to act in our interests for the people.

We are at a point in our environment where our technological backlash is in a capacity where we can destroy the entire ability of this earth to support life on this planet.

Furthermore, in the case of DDT, and this will probably be proved true many years later, after it is too late to turn back, because radioactivity can be even worse than the

...Michigan, the fish, the salmon they pu in for commercial fisheries and for sport fishing is so cont inated with DDT that it is unfit for human consumption.

The commercial cannery that was built was unable t use the 19,000 pounds of salmon. And furthermore, the fish eggs that were stripped from the salmon and taken to the fish hatcheries, the fish hatched, but they died a few days later. The eggs yolks they lived off after they hatched were so full of DDT it killed them.

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Down in Louisiana we have rivers and streams and areas where there are no longer any young trout. Why? The very distinct possibility, we don't know, we don't have enough research, but the very distinct possibility that DDT is doing this same thing, that the fish can no longer reproduce.

I submit that this Board must consider all parts of the environment, that they cannot be so blind as to say, well, the radiation from this plant is very light, very small, and not think about the radiation that will come from this plant and the next plant and the next hundred plants that are being planned. And the radiation that is going to come from each and every one of these fuel reprocessing plants. And the radiation that is being put into the water from the long term storage, where we haven't solved the technology, where the Atomic Energy Commission says we will solidify the wastes and then they go ahead into a project to drill into the ground to pump these radioactive poison wastes down into the bedrock, in spite of the fact that geologists have said this isn't what we should do, there is too much chance of doing this.

Why are they doing it?

Well, it is cheaper this way. We can't afford to do things that are cheaper. We have got to spend the money to protect the environment. We have got to stop thinking about just our limited use here today of the environment. But who

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they could probably find. They didn't put in a dry tower. They are putting in one that is going to fog, that can cause climatic problems in the area.

I see them saying, we are interested in the people around here. We live here too, they told us. But are they willing to spend -- another thing they told us was, you know, why do you want to get involved in this intervention, because you are just going to cause the people to pay higher rates.

Well, I will tell you here why we are involved. We are involved because we want the safest, the best possible protection for the people, for the residents, for the environment.

Point four of our position paper is that the methods for disposal of radioactive wastes should be improved and the cost of this disposal should be borne by industry, not subsidized by the Federal Government.

The radioactivity wastes should be solidified and radioactive gases should not be released into the atmosphere. The power companies are saying that, you know, nuclear power is compatible with the cost of coal power. But what are all these subsidies that the Federal Government is giving the nuclear power industry? If they were added into the costs, these are hidden costs.

I think this pretty well covers our position -- I left one out, I am sorry.

The next item of business will be the petition of Mr. Lau.

Mr. Knight?

MR. KNIGHT: Thank you, Mr. Chairman. I believe the disposition of this matter as we left it yesterday was the Board had deferred any action on the status of our petition pending our efforts during the course of the evening to expand and to make considerably more specific the latter half of our contentions in our petition, Part 2, page 3, wherein we undertook to make some contentions regarding the engineering standards with respect to the proposed reactor.

It is not the position of Mr. Lau at this time or at any time hereafter to do anything with his petition other than to eliminate those matters which are not under contention and that is the function of the Board and Mr. Engelhardt's staff, and I am certain that is what we all want to do, eliminate those matters which are not under contention, over which there is no issue.

On the other hand, we have reams and volumes and great quantities of technical data on which it is possible, I suppose , to adequately specify in a given number of points exactly what concerns us by engineering standards.

Those matters to which I refer, the PSAR and all of the technical data are not technically a part of the record yet. Accordingly, we do not feel that we can accurately

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Our fifth position was that the development of nuclear power should be done on a limited basis, in remote areas, until plant designs are improved and ecological studies of the surrounding areas should be made for at least a 10-year period.

All of the nuclear plants presently licensed by the AEC are for research and development. Please correct me if I am wrong. And such plants are potentially dangerous to people and the environment.

Emphasis should be given to the development of a nuclear program which might be less harmful. And in the area of research, we should be looking into other types of electrical power than just atomic power. The possibility of using solar energy is one.

Thank you very much for allowing me to express my opinion.

(Applause.)

MR. KNIGHT: Mr. Chairman, the Board has previously granted Mr. Lau permission to make a limited appearance. We undertook to seek an amplification of that to make him, to permit him to intervene as a party. Mr. Lau has indicated to me he would also like to make a statement as a limited appearance, as has just been done.

Would the Board entertain that at this time?

CHAIRMAN SKALLERUP: The Board will go off the record.

(Discussion off the record.)

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CHAIRMAN SKALLERUP: The Board is willing to permit you to make such a statement, Mr. Lau, provided it relates to matters that are not included in your Section 1 of your petition to intervene.

It is our understanding that was your intention.

MR. LAU: That is my intention.

XXX LIMITED APPEARANCE OF GLENN LAU, PORT CLINTON, OHIO.

MR. LAU: I would like to talk about something that I hope will be answered somewhere in the hearing. Actually two things. One that is going on right now and one that is a possibility of happening.

There is a possibility of what they call a meltdown in the reactor. If this should happen I would like the Applicants to describe somewhere in these proceedings exactly what would happen and define what they refer to as the hole to China and what happens when this molten hot metal hits water and turns into a bomb.

Now I am going to talk about something I don't know anything about from the standpoint of being an outdoors man and not a hydrologist. I am not even sure if that is the right word. But I do know that presently at the site there are some complications that I will not be able to bring up in my testimony on what I have been allowed to intervene on but I would like to state now. They describe water tables and water supplies that are sampled from 12 to 30 feet approximately and I must say that I take the report, I understand the report to be that of describing that the flow is towards the lake, of the underground water supply, and that is the only references other than the technical data. But the truth of the matter is during summer months when wells have tendencies to get dry I am sure that there has to be some consideration during this period of time, when maybe the water flows the other way into these water supplies that may endanger people in the surrounding areas.

I would like an investigation or somebody to answer my allegations into the fact that wells now are dry because of the plant's operational procedures in the vicinity of where the reactor is going to be. And we are going through one of the wettest periods that I remember in years and years around here. What happens to this radioactive water when it reverses its cycles and goes back into these water supplies?

Edison or somebody is paying by check to some people now to have water hauled in. This is a dangerous consideration.

I do not state these things because of lack of knowledge. There are many other things that as a layman I do not technically know about. But living close to the site I have a chance to examine it.

I will not go any further at this time, but I would like those two specific points some time in the hearing

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answered.

I will recess my comments to the intervention problems.

CHAIRMAN SKALLERUP: Mr. Lau and Mrs. Stebbins, it is the intention of the Board to get answers to the questions you raise in the course of the hearing and in the event that the Applicant nor the Commission staff cover this material, it is our intention to press for the information.

MR. LAU: Thank you.

DR. WINTERS: I have been trying to keep very careful notes on all of the questions that have been asked.

MR. LAU: I am sure it is a matter of record.

CHAIRMAN SKALLERUP: The next item of business is the opening statement by counsel for the AEC Regulatory Staff. Before we come to that time, we will take a five-minute recess.

MR. ENGELHARDT: Mr. Chairman, just a point of clarification.

I believe the next order of business is the opening statement by the Applicant. I believe that is the normal agenda, just to give the Applicant an opportunity to prepare himself, if the Board agrees, before we recess, that should maybe be clarified.

CHAIRMAN SKALLERUP: I made a mistake. The next item of business is the opening statement by Applicant's counsel.

End #10

(Recess.)

CHAIRMAN SKALLERUP: The hearing will come to order. Mr. Baron?

MR, BARON Mr. Chairman, I will respectfully request at this time before beginning with the opening remarks to be permitted to make what I would consider to be some procedural motions. I believe this would be the proper time.

CHAIRMAN SKALLERUP: Do these relate to your petition?

MR. BARON: It relates to the petition; it relates to the entire proceeding.

CHAIRMAN SKALLERUP: I think this is the proper time for such motions.

MR. BARON: Initially I desperately sought some authority within the title 10 for this particular motion. I didn't find any in point, but I think the motion I am about to make will be proper and well taken. It pertains to the Board itself.

The Licensing Board is created by the virtue of the Atomic Energy Commission Act, and of course, Title 10. The authority and power given to the Board members is quite similar in my opinion to the authority and power vested in a Judge and jury. It is common knowledge that when a Jude and jury are to preside over a contested matter the parties to that matter have the right to inquire as to any possible bias, prejudies, personal feelings respecting the issues.

With all due respect to the three Board members here lnl

assembled, I am doing this as an attorney and certainly not on a personal basis. I would then request of the Chairman to first rule upon whether I have the right to make such an inquiry, not only for the Coalition for Safe Nuclear Power, but on behalf of Mr. Knight and his client.

CHAIRMAN SKALLERUP: I think the thing to do is to make your motion and when it is out on the table, we can take what steps are appropriate in light of the motion.

MR. BARON: My motion then is to permit the Intervenors to inquire of the individual members of the Board as to their technical background, their possible involvements with utility companies as such, and that type of matter, to indicate or to assure the parties that the Board members have no personal bias or something upon which a personal bias or prejudice might be founded.

CHAIRMAN SKALLERUP: Is that the extent of the motion?

MR. BARON: Well, as to specific areas, I have not delineated them any further. I am suggesting, though, that kind of thing.

CHAIRMAN SKALLERUP: You are raising a question, would it be appropriate to make such a motion?

MR. BARON: No, I am making the motion. I am asking you for a ruling as to whether I can proceed to do what I asked for permission to do.

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CHAIRMAN SKALLERUP: What I cannot understand is if that is the extent of your motion or if you intend to raise other matters?

MR. BARON: I would probably, consulting with Mr. Knight, ask beyond that point -- I am not going to ask about your private lives or anything of that nature -- ask about technical backgrounds, any connections with utility companies as such, any connection with companies manufacturing or supplying parts to nuclear reactors and so forth.

Perhaps you will forgive me, stockholdings in companies of that nature.

I feel that these matters might be relevant, and again you will forgive me, possibly cause challenge to the Board as it is presently constituted.

CHAIRMAN SKALLERUP: I think it is desirable that the motion be finite, clear and specific.

Perhaps you should take some time with counsel for Mr. Lau and prepare your motion in writing, so that we know precisely what it is you are talking about.

Does counsel for the Regulatory Staff have any comment to make?

MR. ENGELHARDT: Mr. Chairman, it is a rather unique motion. It is not specifically provided for in the provisions of the Commission's rules of practice.

However, in Section 2.704(c) of the Commission's

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rules of practice the[illegible] is an application that if a party deems the presiding officer or the Board in this instance to be disqualified, he may move that the presiding officer disqualify himself.

"The motion shall be supported by affidavits setting forth the alleged grounds for disqualification."

"If the presiding officer does not grant the motion, he will refer it to the Commission, which will determine the sufficiency of the grounds alleged."

This is the extent to which the Commission's rules provide for any action which may be based on information available to a party to the proceeding. I think what Mr. Baron is proposing is to turn this proceeding into a form of discovery at this point to determine whether he can elicit from the Board some possible grounds for a motion, an ultimate motion to disqualify the Board on the basis of information that he may obtain from questioning the Board members as to the points he identified.

But there is no specific provision made for this type of a procedure in the Commission's rules.

CHAIRMAN SKALLERUP: Would you care to comment on the Commission's rules with respect to financial disclosures on the part of Board members to the Commission?

And matters of conflict of interest?

MR. ENGELHARDT: To the extent, Mr. Chairman, that

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I am familiar with the details of those matters, I think that I would like to in particular refer Mr. Baron to 10 CFR Part 7 of the Commission's regulations, which deals with advisory boards and this includes the boards which constitute this Atomic Safety and Licensing Board, in which certain matters are dealt with.

In addition, I think it is more appropriate, as I look through these, to refer from Part 7 to Part 0 of the Commission's regulations, which deal with the conflict of interest requirements set forth by the Commission for not only employees of the Commission, but for members of special boards such as the Atomic Safety and Licensing Board in this proceeding.

And this does require the members, individual members of the Board, to divulge to the Atomic Energy Commission the extent of stockholdings and the extent of their interests in organizations and activities which might create a conflict in connection with their designated activities for the Commission.

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In the case of the Atomic Safety and Licensing Board, this area is particularly thoroughly examined to assure that there are no conflicts with regard to holdings and connections with certain industries and certain suppliers to tend to bias any decision that might be made by the Board.

I would commend Part 7, but particularly Part 0 to Mr. Baron.

I think he may find that he will obtain some of the answers to his answers to his questions as to what the extent of the disclosures are that are required of Atomic Safety and Licening Board members, to assure that there is no conflict of interest in the cases over which they preside.

MR. BARON: Mr. Chairman, I appreciate the comments of Mr. Engelhardt. I must admit that I had overlooked this particular section. I believe that on the basis of what he has indicated -- and I am sure it is quite accurate -- I will withdraw the motion. But proceed to my second one.

We have heard much conversation throughout the last couple of days about other actions, other pending licensing hearings dealing with plants in Midland, Palisades, and so on. I would move to the Board, pursuant to Section 2.716 to consolidate or request the Commission to consolidate for hearing this proceeding, along with all such pending proceedings. Of course this motion is made with the intent that the Board determine that such action would be conducive to the ends of justice.

I am merely paraphrasing the words of that section now.

CHAIRMAN SKALLERUP: Have you prepared a brief in support of your motion?

MR. BARON: No, sir.

CHAIRMAN SKALLERUP: The Board would appreciate receiving a brief in support of your motion.

Would counsel for the Applicant care to comment on that motion?

MR. CHARNOFF: Pending review of any such brief that might be filed by Mr. Baron, Mr. Chairman, certainly we would oppose such a motion. Mr. Baron quoted only a part of Section 2.716, which provides for consolidation of two or more proceedings if the Commission finds that such action will be conducive to the proper dispatch of its business and to the ends of justice.

We would submit, sir, that this case is sufficiently different, the Applicants here have no relationship to the applicants in the other cases. The Palisades case involves a nuclear steam supply system which was supplied by a different nuclear steam supply systems supplier than the one we are using. The Midland proceeding involves a construction permit involving a nuclear power station which has a certain amount of commonality with this in that the nuclear steam supply system there is the same as ours, and I believe the Bechtel organization is involved there, I am not sure. But that particular facility

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is substantially unqiue and different in that it involves the utilization of steam produced by that facility for industrial processes at Dow Chemical facility.

The site of the Midland facility has many characteristics very different than the site for the Davis-Besse facility. There is so much in the way of substatntial differences between the sites, between the owners, and between the interests of the applicants in those cases with respect to schedule that there would not seem to be either an achievement of dispatch, proper dispatch of the Commission's business, or any achievements of any ends of justice by consolidating those cases with this particular case.

The intervenors in those cases such as they may be have interests which are uniquely related to those particular facilities and do not relate to this particular facility.

The Intervenors in this particular case have interests related to this facility, not at all related to the interests in hose facilities. And we would strongly oppose any such motion for consolidation.

CHAIRMAN SKALLERUP: Mr. Engelhardt?

MR. ENGELHARDT: Mr. Chairman, I think as the motion presently stands, there is insufficient good cause shown for the granting of the motion. The rules specifically require that good cause be shown before consolidation.

I think the difficulty with regard to consolidation, a motion to consolidate the various hearings at this point is that the issues are so different in each of these proceedings that I don't believe there is any basis for consolidation.

The issues as of this morning, with regard at least to the Intervenors' contentions and positions, have now been fixed by the Board. These issues are peculiar to this particular application and to this site. And I do not believe that there is any basis for granting a motion to consolidate which would accomplish the proper dispatch of the Commission's business, or to achieve the ends of justice.

I think that it would really create a great deal of confusion and would tend to delay the proceeding, and not only delay this proceeding if it were so granted, but it could very well delay other proceedings.

It also must be borne in mind that a motion for consolidation such as this would involve such a new and novel question as to the effect on not only the Commission's procedures, but the effect on other pending cases that it would be highly doubtful in my mind that the Board would be well advised to grant such a consolidation motion without certainly referring the matter to the Atomic Safety and Licensing Appeal Board under the provisions of the Commission's Rules of Practice.

So on the basis of the contents of the present motion, which Mr. Baron just made, I feel that it is deficient on its face, and that it does not meet the requirements of 2.716 and should be denied.

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MR. CHARNOFF: Mr. Chairman, might I just add a remark here?

2.716 specifically speaks about a motion for good cause shown or on its own initiative, the Commission may consolidate these proceedings.

As used here, the term "Commission" does not include the Atomic Safety and Licensing Board. I would suggest that if Mr. Baron seeks to proceed with his motion, it should properly be made direct to the Commission and not to this Board.

MR. ENGELHARDT: Mr. Chairman, I am not so sure that is entirely clear as to the scope of the authority as to who it is that may consolidate. That is why I suggested that if the Board were to consider this motion, or to act on such a motion affirmatively, that it is the type of question that certainly should be referred to the Atomic Safety and Licensing Appeal Board, because it is certainly a matter of first impression, it raises a novel question that could have significant effects on a number of cases, not just this one.

CHAIRMAN SKALLERUP: The Board will go off the record.

(Discussion off the record.)

CHAIRMAN SKALLERUP: The hearing will please come to order.

The Board has considered Mr. Baron's motion and finds that it is defective in that it has not complied with the AEC regulation 2.716, which requires that good cause be shown to consolidate and further that such action will be conducive to the proper dispatch of the Commission's business and the ends of justice.

However the Board is willing to not rule on the motion at this time to provide Mr. Baron with an opportunity to provide a brief and obtain the comments of the Applicant and Staff with respect to the brief, and then the Board will act in light of that information.

MR. BARON: I appreciate that, Mr. Chairman. Efforts will be made to supply the Board with a brief in the very near future on the subject.

I would like to proceed with the next item at this time.

Paraphrasing what Mr. Engelhardt said, that last motion was a matter of first impression perhaps, perhaps this whole proceeding is a matter of first impression for me and others here assembled. And we are, shall we say, groping in trying to properly find our way through all of these regulations?

My next motion deals with Section 2.714, Subsection d. The second sentence of Subsection d indicating that the granting of a petition to intervene does not change or enlarge the issues as specified in a notice of hearing unless otherwise expressly provided in the order allowing intervention.

That would seem to indicate to me, Mr. Chairman, that the Chair does have some discretion to go beyond that original notice. I recognize that our petition to intervene was granted and certain conditions and limitations were imposed upon us. But at this time I would move the Board, under the authority, or what I deem to be the authority given it by this section, to enlarge the issues to cover the questions raised as to radiation standards of the Atomic Energy Commission; secondly, to cover the issues of transportation which have been raised; thirdly, to cover the issues raised by the National Environmental Policy Act; to cover the issues raised by the Water Quality Control Act; and I believe fourthly, to cover the questions I think raised by the enactment of the Environmental Protection Agency.

If I may go on, in light of that motion, to then reconsider our motion to consolidate this action or to seek advice on such consolidation with other similar actions, regardless of the type of plant. These points which I have just raised I believe will be found in these other pending actions.

MR. ENGELHARDT: Mr. Chairman, I don't think that this motion has sufficient specificity to it to permit an intelligent comment at this point. This is a matter that I think the Intervenor should elaborate on and be more specific as to just what he considers the issues to be which should be enlarged, and permit the Staff to comment either in writing or orally later in this proceeding as to the scope of what he has in mind.

I think this is matter that without further clarification would be difficult for at least the Staff to comment on until it knows exactly how Mr. Baron proposes to enlarge the issues.

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MR. CHARNOFF: I certainly share the views that Mr. Engelhardt has just expressed, but let me add some of my own. I don't know that I would read the second or third sentence of 2.714(d) as granting the Board the authority that Mr. Baron contemplates it might do.

I would note for the record that the Board has issued the order granting petition to intervene and it did specify that those which are proper contentions and issues in this proceeding and those which are not.

So we are now talking about past history. And I would add to that that subjects such as those mentioned by Mr. Baron have already been considered either in other cases or by the Commission specifically.

For example, on Part 20, the Commission has expressly in the Calvert Cliffs decision defined that which is proper and that which is inappropriate for challenge to Part 20 in a licensing proceeding as distinguished from a rule-making proceeding.

There have been a number of cases, including the Northern States Monticello case, where the Board specifically excluded consideration of issues with regard to transport of spent fuel from the facility on the same grounds that this Board did.

With regard to the National Environmental Policy Act, the Commission's rule published on December 4th made it

...argement of these licensing heari... ...der nonradiological matters does not apply to a ...ing such as this one at this time.

The same rule including the earlier proposals a... rules published by the Commission pursuant to the National Environmental Policy Act make it very clear that the Water Quality Improvement Act of 1970, sometimes known as the Muskie Act specifically provided a procedure for consideration of water quality matters by appropriate state agencies.

And that not only did that act in effect override the National Environmental Policy Act insofar as its area of concern, but the Commission made it very clear it would not consider Water Quality Improvement Act matters in these hearings, including those beginning later on.

Then when Mr. Baron talks about the Environmental Protection Agency, I must say I have to doubly underscore Mr. Engelhardt's concern or question with regard to clarification.

That agency has come about as a result of certain executive orders. There is no specific legislation involved here that has any particular bearing on this proceeding so I am at a total loss as to what, if anything, Mr. Baron has in mind.

So I think this is almost a frivolous motion at this point.

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MR. ENGELHARDT: Mr. Chairman, I think the motion could well be interpreted as a motion to some extent for reconsideration of the Board's order allowing the intervention in the first instance.

However, I do not believe that I have sufficient information on the intents of Mr. Baron's motion to make a comment at this time and I think it would be appropriate, if the Board so desires, that he be given an opportunity to lay out his contentions in a written motion so we know exactly what he has in mind and we can then deal with the matter in such a way as to be helpful both to the Board and fair to the parties.

CHAIRMAN SKALLERUP: The Board will go off the record.

(Discussion off the record.)

CHAIRMAN SKALLERUP: The hearing will come to order.

The Board in acting on Mr. Baron's motion recalled that Mr. Baron raised 2.714(d) in connection with his statement in support of granting the petition for leave to intervene, the amended petition that is.

And the Board has considered all of the issues that Mr. Baron has raised in this motion, except for one, namely, that these issues should be consolidated with like issues in other proceedings.

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Accordingly the Board denies the Coalition's motion and makes this further comment, that if with respect to consolidating these issues with other issues is concerned, Mr. Baron might want to consider including that in his previous motion for which the Board has requested a brief.

MR. BARON: Mr. Chairman, if I may then move on --

MR. CHARNOFF: Excuse me, Mr. Chairman.

Just a matter of procedure I think here. Before Mr. Baron goes on, if we are going to be visited with briefs for which replies will be invited, I take it Mr. Baron is appearing on behalf of the Coalition, and Mr. Knight is appearing on behalf of Mr. Lau, I think it would be helpful for the record if both gentlemen were invited to make full appearances on the record with their addresses, so we would know where we might address them.

CHAIRMAN SKALLERUP: Mr. Baron, didn't you make yours at the prehearing conference?

MR. BARON: I did at the prehearing and I believe also at the opening of this hearing.

CHAIRMAN SKALLERUP: And Mr. Knight did when he first appeared here.

MR. KNIGHT: Yes, sir.

CHAIRMAN SKALLERUP: I believe it is in the record.

MR. CHARNOFF: I am sorry, I think that is correct.

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I apologize, Mr. Knight.

But I don't believe we have Mr. Baron's address.

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CHAIRMAN SKALLERUP: Well, Mr. Baron, repeat it again.

MR. BARON: I will be glad to.

The name is Russell C. Baron; office address is 930 Keith Building, Cleveland, Ohio 44115.

CHAIRMAN SKALLERUP: Telephone?

MR. BARON: The telephone number is, I believe, area code 216-781-3858. I will be happy to hear from you.

At this time, Mr. Chairman, I wish to address my remarks to something which is a basic and almost integral part of our being capable to carry on with these proceedings; and that is with regard to the transcript itself. I know quite well the terminology of Section 2.750. I know quite well the cost of the stenotypist and the transcribing of the daily record.

With all due respect to the stenotypist, I couldn't help but smile when she handed me a copy of the contract and I noted the cost o.. having the daily transcript prepared. I am sure the costs are well deserved, but we find ourselves in a position, as I am sure many, many other Intervenors have found themselves to be in; we cannot afford it.

Now this is a subject which I discussed at great length with my clients and explained to them quite clearly the necessity of having such a document available.. I know that the public library here in Port Clinton is given a copy to post for public consumption. And I believe that a second copy is sent to Washington for public perusal. As much as I like Port Clinton, I find it to be a very comfortable, quiet town; unfortunately the library's hours just about coincide with the hours that this hearing goes on. And I don't think they will give me a night key so I can go in after the hearings are concluded here so I can then look at the preceding day's posted transcript.

So despite the provisions of Section 2.750 and hopefully under the provisions of Section 2.718, the Chair can somehow find its way to order that a copy be made available to us. With all candor, I have familiarized myself with a method used in another jurisdiction to accomplish the result that I am seeking, and that was, to make available the copy that would either go to the public library or to the Commission to the Intervenor on the affidavit of the Intervenor's counsel that in the event someone from the public wanted it, he would certainly do everything in his power to get it to that individual.

If this can't be done, Mr. Chairman, I really don't know what we are going to do as to being fully and adequately prepared to go ahead with each day's proceeding.

CHAIRMAN SKALLERUP: The Boardwill go off the record.

(Discussion off the record.)

CHAIRMAN SKALLERUP: The Board would wish to confer with counsel for Mr. Lau, Mr. Baron, the Staff counsel and Applicant's counsel.

(Bench Conference.)

CHAIRMAN SKALLERUP: Mr. Baron, in light of the conference we have had, would you consider withdrawing your motion for the time being?

MR. BARON: Yes, sir. One more time, Mr. Chairman.

CHAIRMAN SKALLERUP: I would like to inform the audience what happened here. We were exploring the possibility of providing counsel for the Intervenors with the public copy that is now being setnt to the Ida Rupp Library here in town, and with the understanding that in the event any people of public would want to see that transcript, there would be information at the library of how to get a hold of the transcript, and there would be an obligation on the part of the attorney having the transcript at that time to make it available to members of the public.

I am informed that this has occurred in prior proceedings, and that it has worked and we are going to give it a try this time.

Mr. Baron?

MR. BARON: Mr. Chairman, I respect the time that has been given to us in these procedural matters. I respect the preparation and the effort that has been made on behalf of the Applicant and the Staff.

I anticipate though that we are now getting to the point where the merits of this matter will be considered. I am not exactly sure as to the method by which we will proceed, but anticipating that Applicant will present the contents of the PSAR and its case in chief in a oral motion of some type, I would perhaps now prematurely move that at the conclusion of that, we postpone the hearing for a specific length of time during which the Intervenors -- speaking on behalf of my clients -- would have the opportunity to find the necessary witnesses to either support or not support the issues to which we have been limited.

I recognize that all of us here wish to get home perhaps for the week end, and if we can now go in that direction, but at least with some understanding as to time during which I would have an opportunity to prepare these briefs and to seek the assistance of technical witnesses.

CHAIRMAN SKALLERUP: I want to be sure I understand your motion. I think it is essential we come to an agreement on time. The Board is of the view that we can do a number of things before having such a recess and in the interest of clarifying the matter, so that all parties have an equal understanding of whatwe are talking about, let me suggest that this is the agenda we would follow:

First, the opening statement by Applicant's counsel, the summary and oral statement by Applicant, opening statement by AEC staff counsel, summary and oral statement by AEC staff, offering in evidence of the application and other documents specified in Section 2.743-G of the Commission's Rules of Practice. And if Intervenors' counsel cares at that point to make an opening statement or make it later, and I would ask first Mr. Baron if this is an accurate understanding of your motion and then if it is, I would ask the Applicant and the counsel for the Commission Staff to comment.

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MR. BARON: The outline which you just described, I have no objection to. I am assuming that at the conclusion, at that point there would be some type of recess -- I shouldn't say recess -- I should say adjournment for some several weeks or perhaps months hence, whatever the Board deems appropriate. That is my motion.

CHAIRMAN SKALLERUP: Would it be possible, Mr. Baron, for you to state in your motion the time that you are requesting?

MR. BARON: In discussing this with Mrs. Stebbins, since I must rely upon her as to the source of the engineers and technicians, and she having consulted with Dr. Oster, from whom we had anticipated receiving much support in that area, it has been indicated to me now and before that we had in mind ninety days.

CHAIRMAN SKALLERUP: Are you asking for ninety days?

MR. BARON: Yes, sir.

CHAIRMAN SKALLERUP: We would appreciate comments from the Applicant and the Staff.

MR. CHARNOFF: Mr. Chairman, first, may I obtain a clarification from the Board? As I see it, looking at the agenda proposed by the Staff for the public hearing, you were proposing to cover items 4, 5, 6, 7, 11, 8, and I did not go further.

We would propose that we certainly proceed with items 12 and 14, perhaps without the cross-examination if there is to be an adjournment; and perhaps the Staff would wish to go ahead and put on its direct case, item 17, today.

I don't think any of these matters take that long, because much of this testimony is in writing and we can produce it rather quickly.

Now with regard to the motion, I guess when I heard ninety days, I guess I have one word: Objection - and a very strong one. It seems to me that what I understood Mr. Baron to say was that he was looking to Dr. Oster to help with obtaining witnesses. A number of witnesses that were mentioned by Dr. Oster as potential witnesses in the statement here made by Vicki Evans I guess, relate -- my knowledge of those persons -- to the area of Part 20 challenges, rather than the matters which are admitted contentions for consideration in this hearing.

If that be true, then it seems to me no recess or no adjournment at all is required because we need not have an adjournment to muster witnesses for issues that are not before this Board. So that I would think that again this underscores the general observations I have been making here that we are dealing with Intervenors who really have not done any preparation at this point.

On the other hand, I am sympathetic particularly to both Mr. Baron and Mr. Knight who came into the proceeding themselves rather late. I would proper that we go as far as we can, taking cross-examination today. If it turns out they are not at all prepared to proceed with cross-examination, I think we could certainly talk in terms of an adjournment to next week or the week after.

But if we are talking about an adjournment beyond that, then we are talking about very severe penalties to the Applicant without any showing that the adjournment will be of any material benefit to the Intervenors.

I recognize that the second week from now ends on Christmas Day and I understand the difficulties that would have for all of us. But I would like to make it a matter of record, perhaps many persons sitting immediately behind me will grimace when I say this, that the Applicant would beseech you that if we have an adjournment, that we resume either next week or the week after, and if that not be possible, even the following week; that is the week of the 28th.

We earnestly would put before you the fact that there still is no showing of what the Intervenors would expect to do at this particular time that is relevant to these motions; that any proceeding of this matter involves a balancing of a substantial number of interests including those of the Intervenor of course and ourselves and our customers. And a delay at this point should be, if it is to be given at all, should be extremely minimal.

I think that is all I can say at this moment, Mr. Chairman. I might wish to speak to this again if it appears like we are talking about anything else than a week or two.

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MR. ENGELHARDT: Mr. Chairman, I think that in all fairness to the Intervenors they should be given a reasonable period of time in which to prepare for cross-examination and for preparation of their testimony.

I wonder if I might offer a suggestion with regard to this matter?

Possibly Mr. Baron's estimate of the time necessary to prepare his case was based on conversations that may have been held prior to the Board's ruling on the extent of his case or the extent of his participation in this proceeding. And if so, whether it might be possible for Mr. Baron maybe during the lunch recess to consult with his client and go over the issues that have been permitted to be raised by this petitioner in the petition, to determine whether the 90 days is really a realistic time or whether that could be shortened, in which case we might be able to come to some accommodation as to what is a reasonable period of time, possibly something between the dates that have been suggested by the Applicant and the dates that have been proposed by Mr. Baron.

It seems to me that 90 days at least at this point is an unreasonable length of time. I wonder if next week would not be equally unreasonable in the context of where we are in this proceeding at the moment.

I think maybe some discussion by Mr. Baron with his client might clarify this point and we might be able to reach some accommodation with regard to what is reasonable and fair for the presentation of evidence by all of the parties.

MR. DARON: I certainly will talk with Mrs. Stebbins about that. The point is well taken.

I would like to make one observation, Mr. Chairman, related to yesterday. With all due respect to Mr. Charnoff, the Applicants filed an application a year ago, over a year ago to construct the plant, for a license to construct the plant. They knew exactly what was contained in Title X as to the possibilities of intervention. With all of their capabilities and with all their astuteness and with all of the wisdom that is amassed in their executive offices, it would seem to me they should have anticipated that some effort to intervene might have been forthcoming, especially since these things were coming to light across the country.

Despite such opportunity to anticipate this kind of thing, they elected to go ahead at their own risk, as I said yesterday, to start putting up a site. They took that gamble, that is the word I used yesterday. They didn't have to. They could have sat on their hands and waited until such time as they had that license in their pocket.

I can appreciate the fact that there are hundreds of men employed out there. I can appreciate the fact that highly trained technical and skilled men are hard to find. I can appreciate the fact that upon completion of the construction of this site, those men may go off somewhere else to another job and the contractors and so forth will have to scout around again for similarly trained men. But that is the gamble that was taken by the Applicant.

I am not saying that we cannot find those people that we need within 60 days. I hope I can find them within two weeks so I know where I am going. But if the basic opposition to what I would consider a reasonable extension, continuance, is due to the fact of labor problems, very practical problems of construction, I think it would be in order -- I don't really ask for the answer, but merely make the observation -- to find out what those costs would be, how a delay of shall we say 60 days would really affect the furtherance of a project which was begun on an "if come" basis, if you will.

The project is intended to last until 1974 if I am not mistaken and then it isn't going to go into the works, they are still going to have to seek an operating license. And who knows what opposition they may meet or face at that time. If that schedule is so highly refined that they can specifically indicate that a delay in this proceeding of approximately 60 days will throw the whole kit and caboodle to the wind, I would have some grave doubts as to the capacity of their technicians to plan the job. I would assume that built into the entire program timetable there are areas of unexpected delays.

This is something that I submit should not have unexpected. This is something that should have been antic and perhaps planned for.

End #17

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CHAIRMAN SKALLERUP: Would you care to r Mr. Charnoff.

MR. CHARNOFF: Yes, I would.

We did anticipate an intervention. Anybo reading the papers in this area would have anticipat intervention. But we anticipated intervention by pa were, according to the newspapers, certainly with re the Coalition this is true, that had been working tow this intervention for several months, if not maybe a

The Coalition has been in being, as I said by their own terms, several months.

We anticipated an intervention by persons w would be prepared with specifics as to the points of controversy, who would be prepared to go ahead with the hearing, including, I might say, in addition to the Coa certainly Dr. Oster, who is going to be working with th Coalition apparently, who was involved with preparing fo as far back as last April by public documents.

What we are asked now to do, though, is to ste aside and wait so that unprepared intervenors can now ca delay without any indication as to how they might procee without any real plans as to what they might do, without real idea of what the matters in controversy are.

With regard to the scheduled question, the ques of what we are doing at the site is only coincidental to t ln2 question of getting on with this.

Mr. Baron is not familiar with the area of construction. The fact is we are on what constructors call the critical path. If we don't get going in January with the construction permit work, we are automatically adding to the end time of the availability of this plant.

I am informed that the cost alone of adding month by month to the delay of the plant at the end of 1974, based upon various contract matters, including escalation factors and so on, and not including the cost of replacement power which might be required, run in excess or about $1.4 million a month.

We are not talking pennies, we are talking about very significant costs both to the Applicants and ultimately I might suggest, Mr. Chairman, they are costs to the members of the public who have an interest in keeping the cost of electricity as low as possible.

So that we are talking about very significant dollars, we are talking about delays caused by Intervenors who have not used the time that they have obviously had to prepare themselves for this case.

Mr. Baron was handed a copy of the PSAR two weeks ago. We got nothing very specific in contentions and he is obviously not prepared to even begin cross-examination today.

Now, whether one week delay is unreasonable, I

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certainly would say, as to Mr. Engelhardt's remarks, that this is not a negotiating game, when Mr. Baron said 90 days, I said one week, so let's find something somewhere in the middle.

Anything in the middle puts us into January and automatically builds a delay into the process. We are looking forward to getting on with this hearing and hopefully concluding it by Christmas.

We anticipated prepared Intervenors, we prepared ourselves to go on and this is what we are looking for. We recognize if a short interval is necessary, we will take it. But a short interval in our terms is a short interval for people who have undertaken to be responsible for participating in this hearing as aprties, not as limited appearers.

At this moment I guess I have nothing more to say.

MR. KNIGHT: Mr. Chairman?

CHAIRMAN SKALLERUP: Mr. Knight.

MR. KNIGHT: As to Mr. Lau and his petition to intervene, and I suspect as to Mr. Baron and his client, regardless of the culpability of us two Intervenors in being unprepared, and regardless of the culpability of Toledo Edison in taking a gamble that Mr. Baron talked about, I think the facts of the matter are that a delay to us, or rather the failure to grant us the time to prepare, a reasonable period of time, is not just an inconvenience, it is fatal.

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It is a denial of a hearing for us. I think if you attempt to schedule this, the convening of this matter before the termination of the upcoming holidays, that we have just exactly that situation.

I don't like to engage in bargaining tactics either. But I think realistically we have to look beyond the events that are upcoming for the holidays. We have transportation problems, airline congestion, we have strikes affecting communications currently in progress.

I just wanted to stress that on behalf of Mr. Lau the failure for us to have adequate time to prepare is utterly fatal.

CHAIRMAN SKALLERUP: What period of time are you requesting, Mr. Knight?

MR. KNIGHT: I am in full agreement with Mr. Baron. He has originally spoken of 90 days, and he has spoken also of 60 days.

Ninety days is reasonable, so is 60 days. Beyond that I am not prepared to say that 30 or 45 or 50 days is unreasonable.

MR. CHARNOFF: Mr. Chairman, this request by Mr. Knight has to be viewed in terms of the very limited contention that Mr. Lau is permitted to consider. Judged in that context, the question of anything in the nature of the time periods he is talking about is totally unreasonable.

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CHAIRMAN SKALLERUP: The Board will go off the record for a moment.

(Discussion off the record.)

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CHAIRMAN SKALLERUP: After conferring with counsel for the Applicant, the Commission staff, and the Intervenors, the Board has requested that the Intervenors consider the nature of the case that they are going to make, pursuant to their petitions, and the witnesses they will need, so that the Board will be in a position to make a practical judgment as to the element of work involved and the amount of time which will be required to accomplish that work.

So at this time we will recess for lunch and in order to provide these individuals with adequate time to discuss the matter thoroughly, we will reconvene at 2 o'clock.

(Whereupon, at 12:10 p.m., the hearing was recessed, to reconvene at 2:00 p.m., this same day.)

End #19

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AFTERNOON SESSION

(2:00 p.m.)

CHAIRMAN SKALLERUP: Will the hearing please come to order.

Mr. Baron, we notice that Mrs. Stebbins is not present. Is she expected to arrive shortly?

MR. BARON: Yes, sir, I do. I think she is back at the hotel on the phone.

CHAIRMAN SKALLERUP: We will wait for her a few minutes if you prefer.

MR. BARON: Fine.

CHAIRMAN SKALLERUP: What we had in mind was having a conference between the Board and the spokesmen for the parties in the proceeding. And by spokesmen, I mean the attorneys who are doing the actual speaking in the interest of an orderly discussion.

In the event you need to return to discuss matters with co-counsel or any other parties, you would be free to do so in the course of the conference. But we think by reducing the conference to this size, we would be able to proceed more quickly.

So if you are willing, we will proceed with the conference now.

MR. BARON: Fine.

(Bench conference.)

CHAIRMAN SKALLERUP: The Board had a conference with the parties to the proceeding with respect to the date for reconvening after adjourning this week and the Board has determined that we should reconvene at 10 o'clock Tuesday morning January 5 for the purpose of proceeding with the substance of the hearing.

MR. CHARNOFF: Are you planning to move on to another matter, Mr. Chairman? If you are, I would like to make one remark with regard to the announcement just made.

CHAIRMAN SKALLERUP: Yes, the Board was prepared to ask you for the opening statement.

MR. CHARNOFF: May I just comment, and I think it is important to put this on the record, that an element of the discussion at the bench with regard to the adjournment to January 5 was to allow the Intervenors to prepare their case and that the understanding was that the Intervenors, if they are to have any direct case, are to have it ready and available that week and not simply to reconvene the 5th and announce what their direct case might be some time in the future.

Am I correct in that understanding?

CHAIRMAN SKALLERUP: Mr. Baron?

MR. BARON: You are absolutely correct. I have indicated already that if we are to have a case, it will be in my hands and fully prepared and we will be prepared to proceed on the 5th of January.

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I will advise you prior to that date one way or the other.

MR. CHARNOFF: Thank you.

Does the same apply, as I understand it it does, to Mr. Knight?

MR. KNIGHT: Yes, that is correct.

MR. CHARNOFF: Thank you very much.

MR. KNIGHT: Mr. Chairman, might we have a clarification from the Chair as to the matters on the agenda that are contemplated to be covered for the balance of the day?

CHAIRMAN SKALLERUP: Yes, Mr. Knight.

Has the Regulatory Staff an additional copy of the proposed agenda that was prepared and circulated at the pre-hearing conference to give Mr. Knight?

MR. ENGELHARDT: We gave counsel for the Intervenors copies earlier today.

End #20

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CHAIRMAN SKALLERUP: We believe we are at number 4, opening statement by counsel for Applicant. And we believe at this time we could proceed through to at least 17 except for the cross-examination by Intervenors, which you may wish to put off until a later date.

MR. KNIGHT: Yes, I would request permission to be excused for the balance of the day from the Chairman, reserving the right to so cross-examine and reserving the right to make an opening statement on behalf of the Intervenor.

CHAIRMAN SKALLERUP: At a later date?

MR. KNIGHT: Yes.

CHAIRMAN SKALLERUP: Mr. Charnoff?

MR. CHARNOFF: We have no objection to that, Mr. Chairman.

MR. ENGELHARDT: Mr. Chairman, we have no objection. However, there is one matter pending that Mr. Knight can raise in the morning session with the Board, namely, a request that a ruling of the Board be referred to the Appeal Board.

I don't know whether we should take that up and discuss it and dispose of it right now while Mr. Knight is here or however.

CHAIRMAN SKALLERUP: It would be desirable; I am glad you brought it up. The Board has not acted on that and it would be desirable to hear comments with respect to Mr. Knight's motion.

His motion, as I understand it, was the Board to certify to the Commission that it had denied the second part of his petition for the purpose of obtaining guidance with respect to the propriety of the Board's action.

Is that a correct restatement, Mr. Knight?

MR. KNIGHT: I believe that is essentially correct. I would have to refresh my recollection of the exact wording from the record.

MR. CHARNOFF: The issue as I understand it is the question of certification to the Appeal Board of your ruling with respect to contention number 2 in the amended petition. Obviously, Mr. Chairman, from the Applicant's standpoint this is a matter which under the rules is solely left to the discretion of the Board where it properly belongs.

We don't have a particular point of view involved here. I just would like to make some observations. It is not unusual for Boards or inappropriate for Boards; as a matter of fact, it is contemplated by Section 2.714 that you grant petitions to intervene subject to certain conditions and under the rules and the appendix to the rules, the concept is that at this early stage the matters in controversy would be clearly defined and ruled upon.

We believe the Board's position with respect to item 2 is clearly supported by the record of the hearing to date and I won't get into the merits of that. Our position would be very simple: We certainly would have no objection and it is not an appropriate matter for the Applicant to object to on this sort of thing.

We would not have any objection if the Board did see fit to certify the ruling to the Appeal Board at this time. I think we have nothing more than that.

MR. ENGELHARDT: Mr. Chairman, I must assume the request was made pursuant to 2.730 of our 10 CFR, Part 2, which in particular is subparagraph F, which states: "No interlocutory appeal may be taken to the Commission from a ruling of the presiding officer. When in the judgment of the presiding officer a prompt decision is necessary to prevent detriment to the public interest or unusual delay or expense, the presiding officer may refer the ruling promptly to the Commission."

This I believe is the more appropriate provision for referral, for the Board to consider referral, than would be the certification of a question which involves something that may be considered a little more unusual in regard to the novelty of the matter.

In particular I would here refer to Appendix A to 10 CFR, Part 2, and in particular to Section 3, paragraph C-2 which states: "A question may be certified to the Commission for its determination when the question is beyond the Board's authority, or when a major or novel question of policy, law or procedure is involved which cannot be resolved except by the

Commission, and when the prompt and final decision of the question is important for the protection of the public interest or to avoid undue delay or serious prejudice to the interests of a party."

It states: "For example, the Board may find it appropriate to certify novel questions to the Commission as to regularly jurisdiction of the Commission, or the right of persons to intervene."

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With respect to the request by the Intervenor in this instance, it would appear appropriate that the matter be dealt with under the provisions of 2.730. However, if the Board desires to consider the matter as a certification of a question, as a novel matter which should be disposed of, then, Mr. Chairman, the Board may wish to consider this as a possibility, and that is whether the determination of the petitioner's petition to intervene can be accommodated at the same time as the issues for the proceeding are narrowed.

In the course of this particular proceeding, the Board has followed a procedure which involves using the Section 2.714 for determining specificity of contentions as a means for narrowing the issues for consideration which is customarily involved as one of the activities during the prehearing conference.

And it is in this context that the Board may desire to seek guidance from the Appeal Board if they feel that this is a sufficiently novel procedure to warrant approval at this stage before we complete this proceeding.

If the Board were to follow that procedure, then the reference I read from Appendix A would be the appropriate course of action to follow. If, on the other hand, as I also mentioned, the Board merely considers the Intervenors' request for certification under 2.730, then it need only refer to the content of 2.730 if for whatever guidance may be ln2 available there in reaching its determination as to whether or not sufficient basis has been provided, sufficient cause has been presented by Intervenor to warrant the referral of his ruling to the Board, to the Appeal Board, under the provisions of that section of the rules of practice.

CHAIRMAN SKALLERUP: Mr. Baron, did you have a comment?

MR. BARON: I have no comment as to that issue, of course. I had something else in mind, if you have disposed of that particular point.

CHAIRMAN SKALLERUP: No, we haven't.

MR. BARON: All right.

If you have no comment, I will ask Mr. Knight if he has any comments in light of the discussion.

MR. KNIGHT: No, I have nothing further to say for the record in support of the motion.

CHAIRMAN SKALLERUP: Then the Board will go off the record and make a determination at this time.

(Discussion off the record.)

end 22 CHAIRMAN SKALLERUP: The hearing will please come

#23 to order.

Mr. Knight, the Board has considered your motion and denies the motion, and this is without any prejudice on your part to appeal at the time of the initial decision in this matter.

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MR. KNIGHT: Mr. Chairman, may we inquire at this time with respect to availability of transcript?

CHAIRMAN SKALLERUP: I believe it would be appropriate to have another conference.

I would explain to the audience that we have these conferences so we may speak quickly to one another and accomplish what we would like to accomplish with a degree of speed rather than do it rather formally on the record and on any occasion we have such a conference we will disclose completely to you what the nature of the conference has been.

(Bench conference.)

CHAIRMAN SKALLERUP: I believe we have been able to satisfactorily arrange for the counsel for the Intervenors to obtain a copy of the transcript and I would then ask if we are now prepared for the opening statement by counsel for the Applicants.

MR. CLINK: Where is the stuff going to be located so the public can see it.

CHAIRMAN SKALLERUP: The public's copy is located in the library. And during the noon recess we checked with the library to see whether it had been in active use and the fact of the matter is that it has been in active use and, therefore, we are not going to disturb the library as being a depositary of the transcript.

MR. CLINK: Thank you.

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MR. BARON: Mr. Chairman, I too would like to be excused at this time from further participation in the hearing until the 5th of January.

I am doing that with the understanding that what is to follow next is basically outlined on the agenda and is basically the introduction into the record of the PSAR and all of the items of which we have already been given copies anyway and we will not be prejudiced in any area of cross-examination or any other motions we might want to make.

DR. JORDAN: It is the Board's understanding that the Intervenors may wish to retire now because they have other things to do, and this will in no way prejudice their case, they will have all of the information and all of the testimony presented here.

So we feel it is completely fair to them to do so and I gather the Intervenors so agree, so we will excuse you.

MR. BARON: Gentlemen of the Board, we will see you on the 5th.

end 23

MR. CHARNOFF: I want to be sure that Mr. Baron has copies, I think we have given Mr. Baron at the prehearing conference a copy of our summary of the application and a copy of our financial qualifications testimony and this morning I gave him our written answers to the Board's questions at the prehearing conference.

I don't want to simply give him -- there were a couple of minor changes in the financial qualifications testimony of Cleveland Electric which we will be introducing here today. I sent an updated copy to the Board and the Staff last week. I do want to hand a copy of this to Mr. Baron now.

I understand that Mr. Knight is also interested in leaving now, and I don't know what we have given you at this point. I think we have only given you the answers to the Board's questions.

Is that correct?

I would like to be sure that I give you now a copy of -- let me do this one at a time.

Mr. Churchill, will you give a document entitled "Financial Qualifications of Cleveland Electric Illuminating Company, Testimony of Richard A. Miller" dated November 27, 1970 to Mr. Baron.

Now, Mr. Knight, I want to be sure to give to you a copy of our summary description, a copy of Applicants' response to questions asked by the Board and a similar copy of the November 27 testimony of Cleveland Electric on its financial qualifications, and a November 6 copy of the financial qualifications of Toledo Edison, together with -- I ought to give this to Mr. Baron too -- a copy of the educational and professional qualifications of Mr. Granville H. Olds, who is substituting for one of the panel members sponsoring the technical testimony.

These are the documents which we will be introducing today, incorporated into the record as if read.

MR. KNIGHT: Mr. Chairman and Mr. Charnoff, we acknowledge receipt of all of these documents and in parting we wish to thank you for the kind consideration you have accorded us. We look forward to reconvening on the 5th of January.

MR. CHARNOFF: May I make a note here which I will do formally later?

When we introduce this testimony for incorporation into the transcript as if read, I do intend to express a reservation in terms of adding further direct testimony when we reconvene on the matters that have been identified as matters in issue of concern in this hearing.

You will see this in the transcript in any event, but I simply wanted to advise Mr. Baron and Mr. Knight that we contemplate supplementing the direct testimony in limited amounts dealing specifically with the matters or contentions that have been admitted as relevant to this matter.

End #2

MR. CHARNOFF: Thank you, Mr. Roe.

Mr. Chairman, that concludes the summary oral statement contemplated under item 5 of the agenda.

MR. WALLIG: If the Board please, it will be the purpose of this statement to discuss two matters: First, we will briefly discuss the general procedures followed by the AEC in reviewing applications for power reactor licenses.

Secondly, we would like to identify the evidence that the Regulatory Staff intends to present at this proceeding. First we would like to emphasize that this hearing today is only one of the phases in the Commission review of the safety of the proposed power reactor project.

Generally, the review by the Atomic Energy Commission is divided into three main stages: (a) The construction permit stage; (b) the operating license stage; and (c) the continuing review of the operations which is conducted throughout the entire life of the plant.

We are now at the first stage. At this first stage, the construction permit stage, four separate groups consider the adequacy of the application for this construction permit. When an application is received it is the duty of the Regulatory Staff of the Commission to conduct a thorough comprehensive review of this application and to obtain any additional information which may be required and which is available at that point.

Next, a review by the Advisory Committee on reactor safeguards, the ACRS. You have heard it referred to many times in this proceeding as the ACRS. This body is composed of independent experts from across the nation who are skilled in the various technical disciplines connected with nuclear power reactors.

In a few moments Mr. Powell, who is the project leader for the review of this reactor, will read a statement which will describe the procedures followed in the review by the Regulatory Staff and the ACRS.

The third stage of this review process is the public hearing before the Atomic Safety Analyzing Board which has commenced this week. The purpose of such a public hearing is to provide an additional review of the adequacy of the application, to see if it supports the issuance of a construction permit.

The public hearing provides an opportunity for members of the public to become more aware of the protective measures that are taken to assure that the public health and safety will not be endangered as a result of the construction of this plant.

Further, it offers an opportunity to members of the public to participate in the proceeding, either by means of a limited appearance, as we have had this week, or by members of the public for means of intervention.

That takes us now to the fourth stage of the review process. The fourth review is either made by the Commissioners themselves or as delegated in this proceeding in the notice of hearing, to the Atomic Safety Analyzing Appeal Board. The Atomic Safety Analyzing Appeal Board occupies the same position as an Appeal Board does to a trial court in our court system. Because of the extensive questioning of the Applicant by the Staff which usually extends over a period of several months, in this case fifteen months, and which results in amendments to the preliminary safety analysis report, there is usually very little cross-examination by the Staff of the Applicant's witnesses during the public hearing proceeding.

In this particular case, our questions, the answers provided by the Applicant, can be found in the amendments pertaining to the preliminary safety analysis report.

We would like to now emphasize the second and third stages of the review, that is, review at the operating license stage and the continuing review of the operations.

End 27

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In the event that the Applicants are granted a construction permit as a result of this hearing, they will not be granted a license to begin operation of the plant until the completed facility has been tested and inspected and the entire project has again been reexamined by the Commission.

When the Staff and the ACRS have completed this second review, the Commission will not necessarily hold another public hearing. It will, however, publish a notice of proposed action, that is, it will publish a notice that it intends to issue an operating license to the Applicant.

It will also provide in this notice means by which interested members of the public may intervene and request a public hearing.

Thirdly, when and if the operating license is granted, the Commission's review will continue, primarily in the form of periodic inspections of the facility by the Atomic Energy Commission Division of Compliance.

That concludes the brief description of AEC licensing procedures.

Our evidence in chief in this proceeding will be the safety evaluation of 132 pages, which is dated November 2, 1970.

This document was prepared by the Division of Reactor Licensing of the United States Atomic Energy Commission. This is the document that is referred to many times as the safety evaluation, which has been made available to the members of the public.

On Tuesday morning we put out approximately 100 copies and the public seems to have taken great interest in them, because none exist anymore. We might also add it has been made available to the parties, the Board, and to state and local officials.

Copies of this document are also in the Ida Rupp Library here in Port Clinton, and in the Commission's Public Document Room in Washington, D. C.

This document will be sponsored into evidence by our witnesses, Mr. Robert Tedesco and Mr. Raymond Powell.

We will also have as testimony statements of professional qualifications of our witnesses and as to financial qualifications, an affidavit of Mr. Charles J. Lovejoy concerning his preparation of this statement of his professional qualifications.

Also as an exhibit we will have the detailed statement on the environmental considerations offered and put into the record for the limited purpose of showing compliance with Appendix D of 10 CFR Part 50.

This statement has been made available to the public, has been provided to the parties, to the Board, to the state and local officials. It is also available at the Public Document Room here in Port Clinton and in Washington.

MR. ENGELHARDT: Mr. Chairman, one last thing before Mr. Knight leaves, I want to be sure that he is aware of the contents of the Staff's prepared case in this proceeding. We have prepared and will offer in evidence a staff safety evaluation.

We will also offer the technical qualifications of the AEC Regulatory Staff who sponsor that safety evaluation. And we will offer for a limited purpose the detailed statement of environmental considerations required to be made part of it, or to accompany this application under the provisions of the Appendix D of 10 CRF, Part 50.

In addition we will offer jointly with the Applicant a document which we refer to normally as Joint Exhibit A, which constitutes a collection of relevant documents relating to this application.

I believe that you were given a copy of that a few moments ago. If the other material that I have identified are not in your possession, or Mr. Lau's possession, we will be happy to make those available if you or Mr. Lau will tell us you are missing these documents. We think you have them all, but if not, we will be happy to make sure you do get copies.

MR. HARAMIS: I am a member of LIFE and the Bowling Green group and I wish to protest the fact of denial of our right to intervene in this case. I wish to be entered on the record.

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CHAIRMAN SKALLERUP: Mr. Charnoff?

MR. CHARNOFF: Perhaps to everyone's great surprise, I am not going to make an opening statement and I am simply going to call on Mr. Lowell Roe, who is the chief mechanical engineer of the Toledo Edison Company to make the summary oral statement by the Applicant that is contemplated by 10 CRF, 2, Appendix A, Section 3-C-1.

I have asked Mr. Roe to perhaps stand at the microphone to read this statement. We have given thirty copies of this document to the stenographer, and Mr. Churchill has now distributed copies of the statement by Mr. Roe to the parties and to the Board. I believe there were extra copies of the same statement made available at the rear of the room yesterday and if there are some extras, they are still there now.

Mr. Roe, would you please stand at the microphone.

End 26

(ORAL STATEMENT OF LOWELL E. ROE FOLLOWS:)

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

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

Oral Statement by Lowell E. Roe
Before the Atomic Safety and Licensing Board
At the Public Hearing on December 8, 1970

My name is Lowell E. Roe. I am Chief Mechanical Engineer of The Toledo Edison Company. I am responsible for the coordination of the engineering and licensing activities for the Davis-Besse Nuclear Power Station.

In keeping with the statement of the general policy appended to the Atomic Energy Commission's Rules of Practice, I shall briefly describe the features of the Davis-Besse Nuclear Power Station which assure the safety of the public.

The decision to build the Davis-Besse Station was based upon forecasts of power requirements of the Central Area Power Coordination Group (CAPCO for short) with which The Toledo Edison Company and The Cleveland Electric Illuminating Company are associated. The decision was also based upon a study of the comparative cost of fossil and nuclear power generation and an evaluation of the safety and reliability of nuclear units.

The Davis-Besse Station will utilize a pressurized water nuclear steam supply system furnished by The Babcock & Wilcox Company. Our unit is the 14th nuclear reactor sold by Babcock & Wilcox, with the 15th and 16th reactors going to the Tennessee Valley Authority. The Davis-Besse reactor will be fueled with slightly enriched uranium dioxide pellets which will be sealed in zircaloy metal tubes. Uranium dioxide type fuel has been used in commercial reactors for well over ten years and the technology established by this experience gives support to our confidence in the safety of such fuel. We have ordered the first core load of fuel from The Babcock & Wilcox Company because they have demonstrated their technical and manufacturing capability in this respect. They have successfully fabricated fuel for the U.S. Nuclear Navy as well as for commercial and research reactors.

The Bechtel Company has been chosen as the architect-engineer to design the station and to provide construction management services during its construction. Bechtel has designed some 22 nuclear power generating units utilizing pressurized water reactors, the same type as we are installing. These 22 units amount to over 15,000 megawatts of nuclear powered pressurized water generating capability. In designing the station, we have looked at the maximem probable acts of nature, such as, extreme floods, hurricanes, earthquakes, and tornadoes. Our facilities will be designed and constructed to safely withstand all of these events. Other consultants used in the station design are Woodward-Clyde Associates for the foundation and earthquake evaluations and The Great Lakes Research Division, at the University of Michigan, to examine maximum meteorological events that could cause a flood. In addition, for two years, we have had a 300-foot instrumented tower on the site at which another consultant has been recording site meteorological conditions. This consultant, Travelers Research Corporation, has also calculated the maximum hurricane and tornado conditions that could be expected at this location.

Small amounts of processed waste material will be discharged in the normal operation of the station. These discharges will be carefully controlled and monitored. Their radiation levels will be well within the limits established by applicable regulations and will be kept as low as practicable. An environmental radiation monitoring program is being developed. The purpose of this program will be to measure natural radiation levels that already exist in the lake and the vicinity of the site before it goes into operation. These reference levels will be compared to measurements that will be made after the station is in operation to determine what change, if any, has occurred. Reports on these findings will be submitted to the State Department of Health, the Atomic Energy Commission, and the U. S. Fish and Wildlife Service. The average radiation dose from natural sources in this area has been estimated to be about 125 millirems per year. Our studies have shown that a person residing on the closest site boundary, after the unit is in operation, would be exposed to an additional dose of much less than 5 millirems per year which is the additional radiation dose a person would receive by living at an elevation 400 feet higher than this area.

Elaborate precautions are being taken to make certain the radioactive fission by-products do not accidentally escape from the fuel to the environment. There are five containment barriers which act to prevent accidental release of radioactivity. The first of these is the fuel pellet itself which tends to retain the radioactive fission products. Second, the fuel pellets are confined in zircaloy metal tubes designed to withstand greater temperatures and pressures than those to which they will normally be subjected. The third barrier is the reactor coolant system boundary which includes the steel reactor pressure vessel which is 8½ inches thick, stainless steel lined, and which confines the core. A fourth barrier is a 1½-inch thick steel vessel, 130 feet in diameter, and

285 feet high which is called the containment structure. This large steel containment will be built in accordance with ASME Pressure Vessel code requirements. This barrier prevents the release of harmful amounts of radioactivity to the environment in the unlikely event of an accident severe enough to breach the other barriers. The fifth barrier is a separate concrete structure, 2½-feet thick, which totally encloses the steel containment.

Protective and redundant instrumentation will continually monitor plant conditions and the instrumentation is designed to anticipate and prevent the violation of pre-set operating limits. Should it be necessary, this instrumentation can automatically shut the reactor down by inserting control rods. In the event of a loss-of-coolant accident, other equipment will automatically inject coolant containing boric acid into the reactor pressure vessel to cool the core and maintain subcriticality.

The Atomic Energy Commission regulations require that an applicant for a construction permit analyze the design of the nuclear power station in terms of a number of hypothetical accidents and to provide engineered safety feature systems to mitigate the consequences of these accidents. These accidents would include what is termed a maximum hypothetical accident or the design-basis accident. While this accident may not be credible, it is a fact that the plant must be designed and constructed to withstand it. This illustrates the great care which is taken to assure the public safety.

The safety features would automatically reduce the pressure in the containment in the event of an accident and thereby minimize any leakage from it. The equipment for these safety features consists of redundant units designed so that a malfunction of one unit will not preclude the required performance of the particular system. Multiple on-site power sources, consisting of two diesel generators, ensure the operation of these engineered safety features and their capability to bring the station to a safe shutdown condition with a complete loss of off-site power.

The Davis-Besse site, containing more than 900 acres, is in Ottawa County, northwest of the Toussaint River on Lake Erie. Since we are conscious of the environment, we have reserved approximately 500 acres of marshland for wildlife. This marsh area will be managed by the U. S. Bureau of Sports Fisheries and Wildlife. In addition, we have agreed to install a cooling tower so that our station will have a minimal temperature effect on Lake Erie. This tower will be approximately 450 feet high and the tower effluent will be discharged well above temperature inversions. Thus, the tower will not contribute to ground fogs which occur in this area particularly at night and in the early morning. The station equipment will be housed in an architecturally attractive structure and we believe the community will be pleased with its appearance.

The station and all the equipment will be fabricated and installed in accordance with high-quality standards, and will be subject to rigorous quality control and quality assurance. The construction will be periodically reviewed by the Division of Compliance of the Atomic Energy Commission for conformance to the approved design and compliance with the quality control and quality assurance requirements.

Our application and testimony emphasizes the concepts and criteria to be used for the final design in the construction of Davis-Besse Nuclear Power Station. The proposed design concepts and criteria have been reviewed in great detail by the Division of Reactor Licensing of the Atomic Energy Commission and also by the Advisory Committee on Reactor Safeguards. Before we begin operation of the station, our final design and our planned operating and emergency procedures will be subject to yet another rigorous review by the Atomic Energy Commission and other governmental agencies. On the basis of our work to date, we expect to solve to the satisfaction of the Atomic Energy Commission, any future problems we encounter in reaching the final design, and we are confident that the proposed nuclear station can be safely constructed and operated at the proposed site.

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Finally, we will, of course, offer redirect or rebuttal testimony as deemed necessary to the presentation of the AEC Regulatory Staff's case.

Thank you.

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MR. ENGELHARDT: Mr. Chairman, we would like to call upon Mr. Powell to provide the Board with a statement regarding the review that was conducted by the Regulatory Staff of this application.

CHAIRMAN SKALLERUP: May I ask how long Mr. Powell's statement will be?

MR. ENGELHARDT: I have been informed it will be approximately 10 minutes.

CHAIRMAN SKALLERUP: Fine.

You may proceed.

(Summary Statement by the Division of Reactor Licensing, U. S. Atomic Energy Commission, in the Matter of The Toledo Edison Company, The Cleveland Electric Illuminating Company as Participants in Davis-Besse Nuclear Power Station as Presented by Mr. R. Powell follows:)

DEC 8 1970

SUMMARY STATEMENT

BY THE

DIVISION OF REACTOR LICENSING

U.S. ATOMIC ENERGY COMMISSION

IN THE MATTER OF

THE TOLEDO EDISON COMPANY

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

AS PARTICIPANTS IN

DAVIS-BESSE NUCLEAR POWER STATION

DOCKET NO. 50-346

On August 1, 1969, The Toledo Edison Company and The Cleveland Electric Illuminating Company (herein collectively referred to as the applicants) applied to the Atomic Energy Commission for a construction permit and facility license for the proposed Davis-Besse Nuclear Power Station. The plant will be located on the southwestern shore of Lake Erie in Ottawa County, Ohio, approximately 21 miles east of Toledo, Ohio.

The Davis-Besse Nuclear Power Station will be owned and financed by the applicants as tenants-in-common. The Toledo Edison Company will have the responsibility for the design, construction, and operation of the facility.

When filed with the Commission, the application for the Davis-Besse plant was assigned to Reactor Project Branch No. 2 (now designated as Boiling Water Reactor Branch No. 2) within the Division of Reactor Licensing. The Reactor Project Branches of the Division of Reactor Licensing have the responsibility for the safety review analysis, and evaluation of applications for construction permits and operating licenses.

During the period since August 1, 1969, the staff of the Division of Reactor Licensing has conducted a technical evaluation of the safety of this proposed plant using standards and criteria developed by the Commission. Some aspects of the review were undertaken by specialists in such fields as instrumentation and control, site characteristics, and structural design. In the course of this evaluation, we have held meetings with representatives of the applicants and their principal contractors, Babcock & Wilcox and Bechtel Corporation, to discuss safety-related aspects of the plant design. In our review, we identified matters which required further information and the applicants submitted eleven amendments to the application to provide this information.

In addition, we have requested and received advice from consultants on site-related subjects and on plant structural design. Advice was obtained from: (1) Air Resources Environmental Laboratory, Environmental Science Services Administration (Weather Bureau) on site meteorology, (2) the U. S. Geological Survey on hydrological and geological aspects of the site, (3) the U.S. Coast and Geodetic Survey in seismicity aspects of the site, (4) the Fish and Wildlife Service on environmental monitoring, and (5) John A. Blume and Assoicates regarding structural seismic design aspects.

The reports of these agencies and consultants are included as appendices to our Safety Evaluation, dated November 2, 1970.

In our review, design features of the Davis-Besse plant were frequently compared with similar features of other reactor facilities including the Prairie Island Nuclear Power Station, Three Mile Island Nuclear Power Station Units 1 and 2, Arkansas Nuclear One, and Oconee Unit 1 which have been previously reviewed and approved by the Commission.

The applicants have established a quality assurance program in accordance with the criteria set forth in Appendix B to 10 CFR Part 50 of the Atomic Energy Commission's regulations "Quality Assurance Criteria for Nuclear Power Plants." On the basis of our review of the applicant's organization and quality assurance program as described in the applicant's PSAR, we conclude that the program is adequate for the plant structures, systems, and equipment which are important to safety.

The proposed reactor is designed to operate at an initial power level of 2633 thermal megawatts (MWt) with an expected ultimate power level of 2772 MWt. The design of the engineered safety features, including the containment structure and emergency core cooling systems, and calculations of certain postulated accidents have been analyzed by the applicants and evaluated by the staff for the higher power level of 2772 Mwt. Evaluation of the thermal, hydraulic and nuclear core characteristics of the reactor was performed for a power level of 2633 MWt. Before operation at any power level above 2633 MWt is authorized, the applicants must provide supporting analyses and data for our evaluation to assure that the core can be operated safely at the higher power level.

The Davis-Besse plant is being designed and will be constructed to be safe under all operating conditions including startup, power generation, power load changes, shutdown, and refueling. In the unlikely event any of the postulated accidents should occur, including the loss-of-coolant accident, the engineered safety features would provide sufficient emergency coolant to assure that the plant could be maintained in a safe shutdown condition and that significant releases of radioactivity would be extremely unlikely to occur. We have considered the radiological effects on the environment and conclude that the offsite radiation levels resulting from normal plant operation, as well as from postulated accidents, are within established regulations or site guidelines of 10 CFR Part 20 and 10 CFR Part 100, respectively.

As a consequence of our review several design changes or additional requirements were made which have safety implications. The applicants have agreed to the following actions:

1. The reactor vessel cavity will be designed to withstand the loadings resulting from the double-ended rupture of the largest pipe in the primary coolant system (break area of 14.1 $ft.^2$).

2. The facility structures and critical systems will be designed to accommodate an operating basis earthquake acceleration of 0.08g and a design basis earthquake acceleration of 0.15g to assure safe shutdown of the plant under either of these conditions.

3. Restraints will be provided for the main steamline and primary coolant piping so that in the unlikely event of a failure of these lines the containment and the piping necessary to assure core cooling would not be damaged in their unrestrained movement.

4. The emergency ventilation system was changed to provide filtration of radioactive iodine from all areas where radioactive iodine could occur as a result of postulated accidents.

5. The applicants will install two activated charcoal filters in series in the emergency ventilation system to reduce the radiation doses from iodine released to the environment as a result of postulated accidents to well below the 10 CFR Part 100 guidelines values.

All applications for authority to construct nuclear power plants, including the proposed Davis-Besse plant, are reviewed by the Commission's Advisory Committee on Reactor Safeguards (ACRS). The ACRS conducts an independent review of the safety of the proposed facility and advises the Atomic Energy Commission on the results of its review. Accordingly, the ACRS has reviewed this application and in its letter of August 20, 1970, to the Chairman regarding the application for the Davis-Besse Nuclear Power Station made several comments and recommendations with respect to various technical features of the proposed reactor. We have considered each of these and will be guided by all of them in our continuing review of this facility. The ACRS letter concludes:

> "The Committee believes that the above items can be resolved during construction and that, if due consideration is given to these items, the Davis-Besse Nuclear Power Station can be constructed with reasonable assurance that it can be operated without undue risk to the health and safety of the public."

On September 10, 1970, the Commission granted an exemption from the provisions of Section 50.10(b) of 10 CFR Part 50 to permit the applicants to perform subgrade concrete and reinforcing steel placement for the shield building and auxiliary building.

The construction permit sought for this facility is the first step in the Commission's regulatory process which will continue throughout the lifetime of the plant. In order to determine that all of the Commission's safety requirements have been satisfied, and prior to issuing an operating license for this plant, the Division of Compliance will conduct periodic inspections during construction and the final design and safety analysis will be thoroughly evaluated by the regulatory staff of the Division of Reactor Licensing and the Advisory Committee on Reactor Safeguards in a manner similar to the review process at this, the construction permit state. The plant would then be operated throughout its lifetime only in accordance with the Commission's regulations and the provisions of the operating license, including technical specifications, and subject to the AEC facility inspection program.

This summary of the scope of the Commission's safety review of this project indicates the consideration which has been given by the regulatory staff and the Advisory Committee on Reactor Safeguards to those design features of the Davis-Besse plant which are important to safety.

As discussed in our Safety Evaluation, we have concluded that there is reasonable assurance that the Davis-Besse Nuclear Power Station can be built and operated as proposed without undue risk to the health and safety of the public.

MR. WALLIG: That completes the opening statement for the Staff.

CHAIRMAN SKALLERUP: The next item on our agenda would normally be the opening statements by counsel for the Intervenors. These statements will be made some time after the opening of the hearing on January 5.

Next, statement by persons making limited appearances.

In order to accommodate those members of the public that wanted to make limited appearance, we took them out of order and we had them, as you will recall, on the first day of this hearing.

The next item is preliminary responses by Applicants and Staff to questions raised and statements made by persons making limited appearances.

DR. JORDAN: The matter of responses to the many questions raised by persons making limited appearances here has been of some concern to me and I want to be sure -- we all recognize it is the obligation of the Staff to respond to these questions.

If possible, however, I would like to know approximately when it will be so the audience themselves, the people who raised the questions, will have a chance to be here.

Is thereanything we can do about that, Mr. Charnoff?

MR. CHARNOFF: Yes, sir, Mr. Jordan.

At our bench conference with you we proposed that we follow the pattern that had been established in some other cases in this regard, and I notice on the agenda there is item 19, which provides for a supplemental responses to limited appearances. That follows the conclusion of all of the testimony and precedes only the questioning of any witnesses by the Board members.

I would propose that we will be ready and we will submit our responses to all of the questions in the limited appearance statements, including those made by the persons affiliated with the Coalition and Mr. Lau in connection with that item.

DR. JORDAN: That part is all right to me.

I would just like to make sure that somehow the people that have raised the questions will know approximately when that will be. Some notice can be given perhaps a day or two in advance.

MR. CHARNOFF: Of course nobody knows how long the hearing will take. Once we reconvene on the 5th, I am hopeful we could get to this item on the 6th of January.

DR. JORDAN: Yes, I don't know quite how to get around it, but I would like to see the people here who raised the questions. If they don't want to come, some of this is going to be pretty dull and they would probably like to come only at that time.

So anything you can do toward alerting the people as to the time would be helpful.

MR. CHARNOFF: Anything the Board can do to expedite getting to item 16, we will be glad to cooperate.

DR. JORDAN: Right.

CHAIRMAN SKALLERUP: The next item on the agenda, introduction of application, amendments, and correspondence as joint exhibit.

MR. WALLIG: Yes, Mr. Chairman.

As is customary in these proceedings, in accordance with Section 2.743(g) of the Commission's Rules of Practice, the record of the application, the supporting documents relating to that application will be offered now.

We have assembled this material as a joint exhibit. We believe the Applicant will join us in this presentation.

MR. CHARNOFF: That is correct.

MR. WALLIG: This document consists of the basic application, the AEC Regulatory Staff correspondence requesting additional information, responses thereto by the Applicant and some additional correspondence concerning this case.

This large body of data and items, all of which are described in an index attached to this exhibit, have been provided to all of the parties to the proceeding, to the Board, to the state and local officials. It is in the public document rooms both here and in Port Clinton and in Washington.

I would like to request this exhibit be marked for identification as Joint Exhibit A for the Staff and Applicant and I request that the index to this exhibit be incorporated into the record as if read, and that Joint Exhibit A be received in evidence at this time.

CHAIRMAN SKALLERUP: It is so ordered.

(The document referred to was marked Joint Exhibit A, for identification, and was received in evidence.)

(The Index to Correspondence follows:)

DOCKET NO. 50-346

THE TOLEDO EDISON COMPANY

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

(1) Letter from The Toledo Edison Company transmitting: Application for construction permit and facility license, including General Information portion and Volumes I, II and III of the Preliminary Safety Analysis Report (PSAR); 8/1/69.

(2) AEC letter to The Toledo Edison Company transmitting a copy of letter from the Advisory Council on Historic Preservation, dated September 25, 1969; 10/13/69.

(3) Amendment NO. 1 to the application, consisting of revised pages and figures for the PSAR; 12/15/69.

(4) AEC letter to The Toledo Edison Company requesting additional technical data; 2/12/70.

(5) Amendment No. 2 to the application, consisting of revised pages and figures for the PSAR; 2/20/70.

(6) Amendment No. 3 to the application, containing answers to AEC questions and revised pages and figures for the PSAR; 4/16/70.

(7) Amendment No. 4 to the application, consisting of revised pages for the PSAR; 4/29/70.

(8) Amendment No. 5 to the application, consisting of answers to AEC questions, and revised and additional pages and figures for the PSAR; 5/12/70.

(9) AEC letter to The Toledo Edison Company requesting information regarding the maximum water level resulting from probably maximum meteorological event; 6/3/70.

(10) Letter from The Toledo Edison Company requesting an exemption from the provisions of Section 50.10(b) of 10 CFR Part 50 to permit certain construction work prior to the issuance of a construction permit; 6/4/70.

(11) Amendment No. 6 to the application, consisting of revised and additional pages and figures for the PSAR, and revisions of responses to ACE questions; 6/10/70.

(12) AEC letter to The Toledo Edison Company requesting additional information in support of exemptic request; 6/17/70.

(13) Amendment No. 7 to the application, consisting of revised and additional pages and figures for the PSAR; 6/29/70.

(14) Letter from The Toledo Edison Company furnishing information concerning probable maximum water level; 7/24/70.

(15) Letter from The Toledo Edison Company furnishing information in support of the exemption request; 7/24/70.

(16) AEC letter to The Toledo Edison Company forwarding a report from the Fish and Wildlife Service, dated July 14, 1970; 7/27/70.

(17) Amendment No, 8 to the application, consisting of revised pages and figures for the PSAR; 8/7/70.

(18) Letter from The Toledo Edison Company containing additional information in support of exemption request; 8/12/70.

(19) Amendment No. 9 to the application. consisting of revised pages for the PSAR; 8/13/70.

(20) Amendment No. 10 to the application, containing updated financial data and including revised estimated construction cost figures; 8/27/70.

(21) AEC letter to The Toledo Edison Company granting exemption from the provisions of Section 50.10(b) of 10 CFR Part 50 to permit certain construction work prior to issuance of a construction permit; 9/10/70.

(22) Amendment No. 11 to the application, consisting of responses to matters noted by the Advisory Committee on Reactor Safeguards; 9/11/70.

(23) Letter from The Toledo Edison Company responding to the Fish and Wildlife Service comments; 9/14/70.

(24) AEC letter transmitting to The Toledo Edison Company report from the Fish and Wildlife Service dated September 18, 1970; 9/28/70.

MR. ENGELHARDT: Let the record show a formal copy is being given to the Reporter for inclusion in the formal record. It has been marked as Joint Exhibit A and is as described in Mr. Wallig's statement.

CHAIRMAN SKALLERUP: Thank you, Mr. Engelhardt.

We will take a five-minute recess at this time.

(Recess.)

CHAIRMAN SKALLERUP: The hearing will please come to order.

The next item on the agenda is the identification and swearing of Applicant's panel of principal witnesses.

MR. CHARNOFF: Mr. Chairman, consistent with past practice in these hearings, I should like to identify the panel of witnesses and ask the Board to swear in the panel as an entirety if that is permissible with you.

CHAIRMAN SKALLERUP: It is desirable.

MR. CHARNOFF: Thank you.

As I call your name, gentlemen, will you please stand?

Mr. Lowell E. Roe, Chief Mechanical Engineer, Toledo Edison Company.

Mr. Eugene C. Novak, Nuclear Engineer, Toledo Edison Company.

Mr. Howard W. Wahl, Project Engineer for the Davis-Besse project, Bechtel Company.

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Mr. Jagmohan Seoni, Mechanical Nuclear Engineer, Bechtel Company.

Mr. Granville M. Olds, Project Manager for Davis-Besse project, Babcock and Wilcox Company.

Mr. William S. Little, Licensing Supervisor, Babcock and Wilcox Company.

Mr. Chairman, these gentlemen comprise the panel and I would appreciate if you would now swear them in.

XXXX Whereupon,

LOWELL E. ROE, EUGENE C. NOVAK, HOWARD W. WAHL, JAGMOHAN SEONI, GRANVILLE M. OLDS, and WILLIAM S. LITTLE

were called as witnesses on behalf of the Applicant and, having been first duly sworn, were examined and testified as follows:

MR. CHARNOFF: Thank you.

Mr. Chairman, while these gentlemen are standing, I would like to skip over item 13, which is the identification of additional potential witnesses, ad proceed directly with introducing our prepared testimony which is contemplated by item 14, if that is agreeable to the Board.

CHAIRMAN SKALLERUP: It is agreeable to the Board. Mr. Engelhardt?

MR. ENGELHARDT: No objection.

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DIRECT EXAMINATION

MR. CHARNOFF: Gentlemen, and I address this question to the six of you collectively, are you familiar with the document entitled "Summary Description of Application for Licenses under the Atomic Energy Act of 1954 as Amended for Davis-Besse Nuclear Power Station," dated November 6, 1970 and bearing the caption of this proceeding?

I hold this document up in front of me and ask whether you are each familiar with it?

MR. ROE: Yes.

MR. NOVAK: Yes.

MR. WAHL: Yes.

MR. SEONI: Yes.

MR. OLDS: Yes.

MR. LITTLE: Yes.

MR. CHARNOFF: Has this document collectively been prepared by you or under your supervision?

MR. ROE: Yes.

MR. NOVAK: Yes.

MR. WAHL: Yes.

MR. SEONI: Yes.

MR. OLDS: Yes.

MR. LITTLE: Yes.

MR. CHARNOFF: Do you adopt this as your testimony in this proceeding?

MR. LITTLE: Yes.

MR. ROE: Yes.

MR. NOVAK: Yes.

MR. WAHL: Yes.

MR. SEONI: Yes.

MR. OLDS: Yes.

MR. CHARNOFF: Mr. Chairman, I move the document I have just described be introduced into the record of this proceeding as if read.

MR. WALLIG: No objection.

MR. CHARNOFF: I might note, Mr. Chairman, of course that this is the document that we submitted to members of the Board two weeks before the prehearing conference and copies of which have previously been given to the Intervenors in this proceeding and of course to the Regulatory Staff.

CHAIRMAN SKALLERUP: Yes, Mr. Charnoff. It is so ordered.

(Summary Description of Application follows:)

MR. CHARNOFF: Thank you, Mr. Roe.

Mr. Chairman, that concludes the summary oral statement contemplated under item 5 of the agenda.

MR. WALLIG: If the Board please, it will be the purpose of this statement to discuss two matters: First, we will briefly discuss the general procedures followed by the AEC in reviewing applications for power reactor licenses.

Secondly, we would like to identify the evidence that the Regulatory Staff intends to present at this proceeding. First we would like to emphasize that this hearing today is only one of the phases in the Commission review of the safety of the proposed power reactor project.

Generally, the review by the Atomic Energy Commission is divided into three main stages: (a) The construction permit stage; (b) the operating license stage; and (c) the continuing review of the operations which is conducted throughout the entire life of the plant.

We are now at the first stage. At this first stage, the construction permit stage, four separate groups consider the adequacy of the application for this construction permit. When an application is received it is the duty of the Regulatory Staff of the Commission to conduct a thorough comprehensive review of this application and to obtain any additional information which may be required and which is available at that point.

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	)	

SUMMARY DESCRIPTION OF APPLICATION FOR LICENSES UNDER THE ATOMIC ENERGY ACT OF 1954 AS AMENDED FOR DAVIS-BESSE NUCLEAR POWER STATION

NOVEMBER 6, 1970

TABLE OF CONTENTS

APPENDICES

1. INTRODUCTION

This document is a summary of the application (consisting of the initial application, dated August 1, 1969, and amendments 1 through 11 thereto) submitted to the U. S. Atomic Energy Commission (AEC) by The Toledo Edison Company and The Cleveland Electric Illuminating Company (Applicants) for a Class 104(b) construction permit and operating license to construct and operate the Davis-Besse Nuclear Power Station to be located on the shore of Lake Erie in Ottawa County, Ohio. This summary includes information on the site and environment; a description of the Davis-Besse Nuclear Power Station, including the principal design criteria; analyses of the safety aspects of the station, including analyses of postulated accidents; a summary of the testing and quality assurance programs; the research and development programs necessary for the final design; the technical qualifications of the Applicants and principal contractors; and considerations relating to common defense and security of the United States.

This summary also constitutes a portion of the prepared testimony of the Applicants for the public hearing on the application for a construction permit. The testimony will be sponsored by a panel consisting of the following witnesses whose qualifications are attached as Appendix C:

Name	Company	Title
Lowell E. Roe	The Toledo Edison Company	Chief Mechanical Engineer
Eugene C. Novak	The Toledo Edison Company	Nuclear Engineer
Howard W. Wahl	Bechtel Company	Project Engineer
Jagmohan Seoni	Bechtel Company	Mechanical/Nuclear Engineer
James McFarland	The Babcock & Wilcox Company	Project Manager
William S. Little	The Babcock & Wilcox Company	Licensing Supervisor

The Davis-Besse Nuclear Power Station will have a pressurized water nuclear steam supply system furnished by The Babcock & Wilcox Company (B & W). The reactor will operate initially at a core power level of 2633 MWt which will give a net station electrical output of approximately 872 MWe. An ultimate core power level of 2772 MWt is expected with a corresponding net station output of 906 MWe. The containment and engineered safety features and all other structures, systems and components of the facility which bear significantly on the acceptability of the site under the site evaluation factors identified in 10 CFR Part 100 of AEC regulations are designed and evaluated for the expected ultimate power level. This ultimate power level is also used in the analyses of all postulated accidents to establish the suitability of the site under the Part 100 guidelines.

The Applicants' construction permit application, including all amendments thereto, has been reviewed by the staff of the Division of Reactor Licensing of the Atomic Energy Commission, which has prepared and published a safety evaluation of the application. The proposed design of the station has also been reviewed by the Advisory Committee on Reactor Safeguards (ACRS) and its findings have been reported to the Chairman of the Atomic Energy Commission by letter dated August 20, 1970. Both the Division of Reactor Licensing staff and the ACRS have concluded that the Davis-Besse Nuclear Power Station can be constructed with reasonable assurance that it can be operated without undue risk to the health and safety of the public. Both the Staff Analysis and the ACRS report identify certain matters on which they recommend further work by the Applicants during the detailed design and construction stage. Research and development programs are discussed in Section 6 herein. The Applicants have specifically responded to the ACRS report in Amendment No. 11 to the application.

The Preliminary Safety Analysis (PSAR), which is a four-volume document and is a part of the application, specifies the criteria which will govern the station's detail design. The PSAR also describes in detail the site and site-related activities. The engineered safety features, which are being incorporated in the station design, are also described. The design criteria, together with the engineered safety features and other incorporated systems, provide assurance that the Davis-Besse Nuclear Power Station can be constructed and operated at the designated site without undue risk to the health and safety of the public.

The Toledo Edison Company is responsible for the design, construction and operation of the Davis-Besse Station which will be owned by The Toledo Edison Company and The Cleveland Electric Illuminating Company as tenants in common. The architect-engineer and construction manager is Bechtel Company.

2. DESCRIPTION OF SITE AND ENVIRONS

The site and its environment have been studied by the applicants and their consultants. The results of these studies are detailed in Section 2 of the PSAR and are being taken into account in the design of the Station. Based on the information provided by these studies, it is clear that the site meets the applicable criteria for a nuclear generating station as set forth in 10 CFR Part 100, and that the site is suitable for the Davis-Besse Station.

2.1 Location

The Davis-Besse Nuclear Power Station site is located on the south shore of Lake Erie in Ottawa County, Ohio, approximately 9 miles northwest of the City of Port Clinton, the Ottawa County seat. The City of Toledo is 20 miles to the west and the Village of Oak Harbor is 6 miles to the southwest. The location with respect to this area of Northwestern Ohio is shown on Figure 1 of Appendix B of this summary.

2.2 Description of Site and Adjacent Areas

The site encompasses a minimum area of 900 acres of which about half is marshland that will be leased to the U. S. Bureau of Sports Fisheries and Wildlife for management as a National Wildlife Refuge. The configuration of the site and location of the station structures is shown on Figure 2 of Appendix B. There is a minimum distance of 2400 feet from the station to the nearest site boundary.[1]

The site and surrounding area terrain is virtually featureless with marsh areas along the lake shore and farmland further inland. The Toussaint River flows in an easterly direction into Lake Erie a short distance from the southern site boundary. There are two small communities located to the north and northwest of the site which are summer and year-round residences along the beach front of

Lake Erie. There is another area of principally summer cottages located on the Toussaint River to the southwest.[2] An aerial view of the site and immediate area is shown on Figure 3 of Appendix B.

2.3 Population

Within a radius of five miles, there is a permanent resident population of approximately 1700, which increases to a summertime population of approximately 3200. The low population zone with a radius of two miles has a current permanent resident population of approximately 650.[3] The nearest incorporated communities are the Village of Oak Harbor and City of Port Clinton. The nearest cities with a population greater than 25,000 are Toledo and Sandusky, both of which are 20 miles from the station site.[4]

2.4 Land Use

Agriculture is the major source of income for Ottawa County and the area surrounding the site.[5] There are only 8 manufacturing firms that employ over 100 people and these are located in and around Port Clinton.[6]

The area is one of active duck hunting and sport fishing with recreation areas associated with boating and outdoor activities. The marsh areas of the site which comprise about half of the total area will be leased to the U. S. Bureau of Sports Fisheries and Wildlife for management as a National Wildlife Refuge. There are extensive state and national wildlife refuge areas along the shore of Lake Erie in the vicinity of the station site.[7] None of these activities will be affected by the installation and operation of the Davis-Besse Nuclear Power Station.

The station will employ a closed cycle cooling tower system for the condenser cooling water which will require only a limited amount of lake water for makeup.[8] About 98% of the waste heat rejected from the station will be through the cooling tower with about 2% going to the lake from auxiliary systems. There will be no adverse effect on the lake from this limited use of lake water.

When the decision was made to install a closed cycle cooling system, the U. S. Fish and Wildlife Service withdrew the objections it had voiced to the earlier planned use of a once-through condenser cooling water system. The Fish and Wildlife Service stated that the cooling tower will dissipate the heat and thus avoid polutting the lake.

2.5 Meteorology

The meteorology of the station site is generally continental in nature, but is modified by the presence of Lake Erie which moderates the extremes of temperatures. Tornadoes are rather common in the area, but the probability of a tornado striking the station is very low.[9] The station, nevertheless, will be designed so that the critical structure can withstand tornado effects including credible missiles generated by tornadoes.[10]

The prevailing winds are from the west and southwest. Studies of the meteorological characteristics of the site have been made using long-term data from Toledo and Cleveland and, in addition, an on-site meteorological monitoring program was initiated in 1968 with the installation of a 300-foot high instrumented tower.

A study of the site diffusion and dispersion characteristics has been made utilizing the results of the long-term and on-site data. The results of this study together with the elevated release point for all normal and postulated accident conditions, show that any radioactive gaseous releases would be rapidly diluted and dispersed.(11)

2.6 Hydrology

The streams and low-lying areas in the vicinity of the site have their water levels determined by the fluctuating level of Lake Erie. The lake level varies from its mean elevation of 570.5 feet above mean sea level (MSL) in a cyclical fashion on an annual and long-term basis due to variations in rainfall over the Great Lakes basin. The level also varies on a short-term daily basis from the monthly mean, due to wind and weather conditions over Lake Erie. This short-term fluctuation has been investigated for an extreme maximum meteorological event and under these conditions, could be 9.3 above the mean level. This condition occurring at the time of an extreme high monthly mean could result in a water elevation at the site of 583.7 feet above MSL. The station will be protected from this condition by having its grade elevation at 585 feet above MSL and from wave effects by a dike along the north and east edge of the station area.(12)

2.7 Groundwater(13)

The site is underlain by a glaciolacustrine deposit and a till deposit which overlie sedimentary bedrock. The soil deposits, which essentially consist of silty clay, have very low permeability and are considered impervious. Their combined thickness is on the order of 20 feet. The bedrock consists of nearly horizontal beds of argillaceous dolomite with shale, gypsum, and anhydrite, to a depth of at least 200 feet below ground surface. The presence of the impervious soil deposits has produced an artesian groundwater condition in the bedrock, which is the aquifer in the site locality. In the station area, the combined thickness of the soil deposits is approximately 17 feet. The bedrock is quite pervious, mainly in the upper 30 to 50 feet, and contains very small open joints and bedding planes.

In the station area and west of the station area, the ground surface is at approximately elevation 576 feet above MSL. North, east, and south of the station area, there are marshes. Beyond the marshes, north and east of the station area and separated from the marshes by a sand bar, is Lake Erie. South of the station area, beyond the marshes, is the Toussaint River. Water levels in Lake Erie, the Toussaint River, and the marshes are nearly the same.

Investigation of the groundwater conditions has shown that the elevation of the groundwater table follows the fluctuations of the lake level and varies with the wet and dry periods. The groundwater table gradients are small and do not exceed a few feet per mile. They are similar to the gradient of the local rivers and creeks which are approximately two feet per mile.

Water discharge from the station is prevented from reaching the bedrock aquifer by the soil deposits overlying the bedrock. In addition, the gradients in the bedrock aquifer are small and most of the time directed toward the lake. No discharge from the station is expected to reach any wells in the locality which are few in number and which have limited usage due to the poor quality of the water produced.

2.8 Geology[14]

The site is underlain by two distinct types of glacial deposits: a glaciolacustrine deposit, essentially consisting of silty clay, overlying a glacial till deposit essentially consisting of silty sandy clay. The thickness of these glacial deposits at the site was found to be approximately 12 feet to 22 feet in the borings.

The glaciolacustrine deposit generally is in a stiff condition because of desiccation, which is believed to have occurred when the level of Early Lake Erie was lower than the present Lake Erie level. In the borings made at the site, the thickness of the underlying till deposit was found to be approximately 6 feet to 12 feet. The till deposit is in a hard condition.

Beneath the glaciolacustrine is bedrock. The upper bedrock is the Tymochtee formation of the Bass Island group of the upper Silurian epoch. The Tymochtee formation is a soft to hard, thin-bedded to massive, laminated, argillaceous dolomite with occasional carbonaceous shale partings along the bedding planes. It contains verying amounts of gypsum and anhydrite.

Beneath the Tymochtee formation is the Greenfield formation. The lithology of the Greenfield formation is very similar to that of the Tymochtee formation, except for many carbonaceous streaks occurring as stylolites. The contact between the Tymochtee and Greenfield formations is difficult to detect.

Through an extensive investigation program, it is concluded that no faults are known to exist in the site locality and the bedrock is geologically competent to safely support a nuclear power station.

2.9 Seismology (15)

A detailed study of the site and geographic area in which the site is located has been made to determine the seismicity of the site and to determine the seismic design criteria that will be used in the station design.

Historic records indicate that earthquakes have never been felt at the site with an intensity greater than modified Mercalli Scale (MM) V, but based on the above study, it has been concluded that an earthquake of intensity of low MM VI has a small probability of occurring, and that it is improbable, but possible, that an earthquake with an intensity of medium MM VII could be felt at the site.

The structures and equipment important to the safety of the station will be designed to withstand the effects of a ground acceleration of 0.08 g associated with the probable earthquake intensity of low MM VI and will also be designed so that the ability of the station to be safely shut down will not be impaired in the hypothetical event of a ground acceleration of 0.15 g associated with the improbable but possible earthquake with intensity of medium MM VIII.

2.10 Lake Restricted Areas

There are areas of Lake Erie in the vicinity of the station site which are established as restricted areas for use by segments of the armed forces in performing training and testing associated with aircraft, ground weapons, and airborne weapons. These activities have been evaluated with respect to their effect on safety of station operation. This evaluation has shown that these activities have no significant effect on the safety of the station.[16]

Toledo Edison maintains close liaison with the appropriate Department of Defense officials and formal arrangements will be made with the military for informing and discussing with Applicants all relevant activities associated with the use of the restricted areas.

2.11 Environmental Monitoring[17]

A comprehensive environmental monitoring program will be commenced prior to operation to determine the magnitude of the natural radioactivity in the environment surrounding the station and will include environmental sampling of lake and well water, soil, air particulate matter, farm products, lake biota, and bottom sediments. This program will continue after station operation commences to detect and evaluate any change in radioactivity of the environment due to operation of the station. It is expected that any changes in radioactivity levels will be insignificant and will have no effect on the environment. The planning and conduct of this program will be done in cooperation with interested federal and state agencies and will take into account the recommendations of the Fish and Wildlife Service.

Additionally, Applicants have been conducting a study of the local lake area since 1968. One purpose of this study is to determine the type and nature of the lake biota to ascertain the extent that this biota could concentrate radionuclides which might be discharged from the station during operation. Information obtained from this continuing study and from the environmental monitoring program will be used, among other purposes, to assure that the small amount of liquid radioactive releases will not adversely affect marine ecological systems and will not prevent normal utilization of the lake environment.

3. STATION DESCRIPTION

3.1 Principal Design Criteria

The principal design criteria for the Davis-Besse Nuclear Power Station were developed in consideration of, and meet the intent of, AEC's proposed 70 General Design Criteria for Nuclear Power Plant Construction Permits which were published for comment on July 11, 1967. Section 1.4 of the PSAR includes a summary of the Applicants' principal design criteria and a comparative evaluation of the station's design basis with the AEC's proposed 70 General Design Criteria.

3.2 Reactor and Primary Coolant System

The reactor for the Davis-Besse Nuclear Power Station is of the pressurized water type. It has an initial core power level rating of 2633 MWt, corresponding to a net electrical output of 872 MWe.[18] The nominal operating pressure for the reactor is 2185 psig, with an average temperature of 582.5 F; however, the reactor coolant system is designed for 2500 psig pressure and 650 F temperature.[19]

The reactor core is approximately 129 inches in diameter, with an active height of 144 inches.[20] It is made up of 177 fuel assemblies, each consisting of a 15 x 15 array of fuel rods held in place by mechanical spacer grids. The array of fuel rods consists of 208 zircaloy tubes containing uranium dioxide, 16 control rod guide tubes, and a center tube available for an in-core instrumentation assembly.[21] There are approximately 207,486 pounds of uranium dioxide in the core.[19]

The thermal and hydraulic design limits of the core are conservative, and are consistent with those of other pressurized water reactors currently in operation or under construction.[19][22]

Core reactivity is controlled by a combination of 49 movable control rod assemblies, a neutron absorber dissolved in the coolant, and burnable poison rod assemblies. The control rods are an alloy of silver-indium-cadmium encapsulated in stainless steel. The dissolved neutron absorber is boric acid.[23] The burnable poison rods are sintered Al_2O_3-B_4C encapsulated in zircaloy tubing.[24]

Eight part length axial power shaping rod assemblies (APSRA) are provided to thwart any tendency toward axial instability resulting from a redistribution of xenon.[25] Each axial power shaping rod assembly is identical to the control rod assembly except the poison section is in the lower 36 inches of the rods with a zircaloy follower section above the poison section.

The control rods are used for short-term reactivity control associated with the changes in power level and also with changes in fuel and burnable poison burnup between periodic adjustments of dissolved boron concentration.[26] The reactor can be shut down by the movable control rods from any power level at any time.[27] Each movable control rod assembly and axial power shaping rod assembly contains 16 control pins, and is actuated by a separate control rod drive mechanism mounted on the top head of the reactor vessel. Upon trip, only the 49 control rod assemblies fall into the core by gravity. The axial power shaping rod assemblies maintain their set position during a reactor trip.[28]

The control rod drive and axial power shaping rod drive mechanisms are sealed drives of the roller nut type in which a lead screw coupled to the control rod assemblies is axially driven by the rotary motion of a pair of roller nut segment arms. The segment arms which are within the pressure housing are part of the drive rotor and are electrically driven by the motor stator which is external to the pressure housing. The segment arms are held in engagement with the lead screw whenever the drives are electrically energized. The reactor trip signal or loss of power to the control rod drives causes the roller nut segment arms to disengage from the lead screw causing the rod assemblies to fall into the core.[29] The axial power shaping rod drive mechanism is modified so that the roller nut assembly will not disengage from the lead screw on reactor trip or loss of electrical power.[28]

The 16 control rod holes in 72 of the fuel assemblies not equipped with control rod assemblies will be utilized as locations for burnable poison rod assemblies.[23] Each assembly has 16 burnable poison rods, a stainless steel spider, and a coupling mechanism for positive coupling with the fuel assembly holddown latch.

Systems are provided so that the concentration of dissolved neutron absorber in the reactor coolant may be adjusted to maintain the reactor shutdown at room temperature and to provide a safe shutdown margin during refueling.[30] Reduction of the concentration of dissolved absorber and the effect of the burnable poison rods compensate for long-term reactivity changes, burnup of fuel and buildup of fission products over the core cycle.

The core is contained within a cylindrical reactor vessel having internal dimensions of 14 feet 3 inches in diameter and 37 feet 4 inches in height. The nozzle supported vessel has a spherically dished bottom head with a bolted, removable, spherically dished top head.[31] The reactor vessel is constructed of carbon steel with all interior surfaces clad with austenitic stainless steel. The reactor vessel is manufactured under close quality control, and several types of non-destructive tests are performed during fabrication. These tests include radiography of welds, ultrasonic testing, magnetic particle examination, and dye penetrant testing.[32] During operation, specimens of reactor vessel materials will be located in the reactor adjacent to the inside surface of the reactor vessel. These specimens will be subject to irradiation similar to the shell of the reactor vessel. A portion of the specimens can be removed periodically and tested to ascertain the effects of radiation on the reactor vessel material.(33)

Two coolant loops are connected to the reactor vessel by nozzles located near the top of the vessel. Each loop contains one steam generator, two motor-driven coolant pumps and the inter-connecting piping. The reactor coolant piping is carbon steel clad on the inside surface with austenitic stainless steel.(34) Reactor coolant is pumped from the reactor through each steam generator and back to the reactor inlet by two 88,000 gpm centrifugal pumps located near the outlet of each steam generator.(35)

The steam generator is a vertical, straight-tube-and-shell heat exchanger which produces superheated steam at constant pressure over the power range. Reactor coolant flows downward through the tubes and steam is generated on the shell side.(36)

The reactor coolant pumps are vertical, single-stage, shaft-sealed units having bottom suction and horizontal discharge. Each pump has a separate, single-speed, top-mounted motor, which is connected to the pump by a shaft coupling.(35)

The pressurizer, a vertical surge tank approximately half-filled with reactor coolant and half-filled with steam, is connected to the reactor coolant system to control system pressure. The operating pressure of the system is maintained by operating electric immersion heaters to increase pressure or by spraying reactor coolant water into the steam within this pressurizer tank to reduce pressure. Self-actuated safety relief valves connected to the pressurizer prevent over-pressurization of the reactor coolant system.(37)

3.3 Reactor Containment Systems

The reactor containment systems for the Davis-Besse Nuclear Power Station consists of two independent structures, a free-standing steel containment vessel and a reinforced concrete shield building, which completely enclose the primary coolant system.[38] Both structures are founded on competent rock.

The containment vessel, including all its penetrations, is designed to withstand a loss of coolant accident and to confine the release of radioactive material resulting from such a hypothetical and remote accident.[38] The vessel is a cylindrical steel pressure vessel with hemispherical dome and ellipsoidal bottom which completely house the primary coolant system. Attached to the cylindrical shell near the upper tangent line is a crane girder capable of supporting a 180-ton polar crane. A 13' diameter equipment hatch, 3'x6"x6'-8" personnel lock, 2'-6" diameter emergency lock and pipe penetrations are the major appurtenances to the vessel.

The vessel will be constructed in two stages to conform to ASME Boiler and Pressure Vessel Code, Article 14, N-1411.[38] The straight cylinder height of the vessel is 188' giving an overall height of 285'-6" including dome and bottom. The free volume within the vessel is 2,866,000 cubic feet.[39]

The vessel is designed in accordance with the ASME Boiler and Pressure Vessel Code (Section III, Para. B). All conditions of loading which can reasonably be expected to occur during the life of the plant or which could result from the worst postulated accident will be considered in the design.[39]

Utilizing SA299 material of 1-½" thickness, the necessity for field stress relieving is obviated. All containment boundary materials will meet code requirements for a minimum metal service.[40]

The containment vessel will be tested at the conclusion of construction to assure that the design leakage rate associated with the maximum expected pressure under accident conditions does not exceed 0.5 percent of the contained weight of air and vapor in 24 hours.[41]

The shield building is a conventionally reinforced concrete cylindrical structure with shallow dome roof which completely encloses the containment vessel. The shield building will have a height of 279.5 ft. measured from the top of the ring foundation to the top of the dome. The thickness of the wall and the dome are respectively 2.5 ft. and 2.0 ft.[42] The shield building is designed to provide biological shielding from hypothetical accidents, biological shielding during normal operation, and environmental protection for the primary containment vessel from atmospheric conditions and external missiles. The annular space provided between the wall of the containment vessel and the shield building provides a means for collecting and filtering fission products which might leak from the primary containment vessel during a postulated accident.[38]

3.4 Engineered Safety Features

Engineered safety features are provided to fulfill the following functions in the unlikely event of an accident:

a. Protect the fuel cladding;

b. Ensure containment vessel integrity;

c. Reduce the driving force for containment leakage.

The engineered safety features systems can be grouped into the emergency core cooling systems, containment atmosphere cooling systems, and the emergency ventilation system.[43]

The emergency core cooling systems contain both passive flooding systems and pumping systems. The passive flooding system consists of two pressurized core flooding tanks which automatically discharge borated water into the reactor vessel in the event that the reactor system pressure drops below 600 psig. The pumping system consists of two completely independent sub-systems. Each sub-system contains both a high pressure and a low pressure injection pump. Either sub-system, in conjunction with the core flooding tanks, is capable of protecting the core for any size leak up to and including the double-ended rupture of the largest reactor coolant pipe. Either sub-system can supply coolant directly from the borated water storage tank or by recirculation from the containment vessel emergency sump through heat exchangers which cool it before it is returned to cool the core.[44]

The containment vessel cooling system, which is made up of two separate and independent heat removal systems, limits the pressure in the containment vessel following a loss-of-coolant accident. One system contains three air cooling units. The other system contains two spray headers and two spray pumps which spray low temperature borated water into the containment vessel to cool it. Each of these systems without the other or one air cooling unit and one spray pump and header have the heat removal capability to maintain the containment vessel pressure below its design pressure level.[45]

The emergency ventilation system maintains a negative pressure within the Shield Building and Penetration Rooms. Should fission product leakage occur following a loss-of-coolant accident, it will be filtered before being released to the environment.[46]

3.5 Instrumentation and Control

A complete and dependable network of instrumentation and controls will be provided to ensure the safe operation of the Davis-Besse Nuclear Power Station. The protective system is designed to meet the requirements of the "Criteria for Nuclear Power Plant Protection Systems," IEEE-279. The reactor protective system monitors parameters related to safe operation and shuts down the reactor if an operating limit is reached.[47] This will be accomplished by interrupting power to the control rod drive mechanisms and allowing the control rods to drop into the reactor core. Alarms[48] are provided to alert the operator of abnormal operating conditions, and interlocks[49] are provided to prevent operations which could lead to potentially hazardous conditions.

The nuclear instrumentation system monitors reactor power from startup level through 125 percent of full power operation. There are separate overlapping instrumentation channels for the source range, the intermediate range and the power operation range.[50] A control system automatically monitors reactor system conditions and the load requirements on the turbine-generator unit, and adjusts reactor power, steam generator feedwater flow and the turbine throttle for safe, efficient operation.[51]

The actuation system for the engineered safety features monitors plant conditions and automatically initiates operation of the engineered safety features systems, if required.[52] This system provides that emergency core cooling systems will be actuated by high containment vessel pressure in addition to the redundant low pressure signals from pressure transducers in the two primary loops.

Following proven power station design philosophy, all control stations, switches, controllers, and indicators necessary to startup, operate, and shut down the nuclear unit will be placed in the centrally located control room. There will be sufficient information display and alarm monitoring to ensure safe and reliable operation under normal and accident conditions. Special emphasis will be given to maintaining control room integrity during accident conditions.[53]

For the unlikely contingency that occupancy of the control room may be temporarily denied, the capability will be available for taking the station to, and maintaining the station in a safe shutdown condition from other locations in the station.

During the detailed design of the instrumentation systems, immunity to common failure modes has been evaluated.[54] The system is designed to assure that common failure modes will not negate scram action.[54] The instrumentation signals to control and safety circuits from common transmitters are made fully independent by the use of isolation amplifiers. The effectiveness of these isolation amplifiers has been demonstrated by analysis and by actual test of prototype equipment.

3.6 Electrical Systems[55]

The electrical systems for the Davis-Besse Station will be designed to provide reliable power sources for all electrical equipment required for startup, normal operation, safe shutdown, and handling of all emergency situations.

The main generator output is fed through a step-up transformer to the 345 KV switchyard. Three 345 KV transmission lines emanate from the switchyard to electrically connect the switchyard with the Toledo Edison system and the Central Area Power Coordinating Group (CAPCO) system. These transmission lines provide a means to carry the output of the station and also provide a diverse means to supply power to the station from external sources.

During normal operation, an auxiliary power transformer connected to the generator main leads will provide the primary source of electrical power for the station auxiliaries. Two startup transformers, each of the same approximate capacity as the auxiliary power transformer, will be supplied from different 345 KV switchyard bus sections. These transformers will provide power for startup, shutdown, and post-shutdown requirements and will serve as a complete reserve source in the event of failure of the auxiliary transformer supply.

The auxiliary power and two startup transformers supply two auxiliary power busses at 13.8 KV which supply the reactor coolant pump motors and transformers for further transformation to 4.16 KV and 480 volts.

All motor-driven auxiliary equipment required to bring the station to a safe shutdown and all electrical and motor-driven engineered safety features equipment are supplied from two electrically separate 4.16 KV busses. These busses normally are supplied from the auxiliary or startup transformer sources, but each bus can also be supplied from separate diesel generator units which will have the capability of carrying all the connected load on that bus. This provides two completely redundant sources of vital power in the unlikely event of loss of off-site power, coupled with loss of the main generator.

3.7 Auxiliary Systems

Auxiliary systems are provided to supply reactor coolant makeup and pump seal water, to cool the reactor during shutdown, to cool components, to ventilate station spaces, to handle fuel, to cool spent fuel, and to adjust the concentration of various chemicals in the reactor coolant.

Reactor coolant makeup and pump seal water is supplied by the makeup and purification system. This system maintains the proper coolant inventory in the primary system, maintains the pump seal water flow, adjusts the concentration of dissolved neutron absorber in the reactor coolant, and maintains proper water chemistry.[56]

The decay heat removal system cools the reactor when the reactor system is depressurized for maintenance or refueling. This same system serves the engineered safety features function of providing low pressure emergency core coolant and of recirculating borated water to cool the core in the unlikely event of a loss-of-coolant accident.[57]

The cooling water systems maintain appropriate temperatures throughout the equipment and structures of the station.[58] Appropriate normal ventilation systems are provided in the station.[59]

A fuel handling system[60] provides the means for safe, reliable handling of reactor fuel from the time it enters the station as new fuel until it is shipped from the station as spent fuel. Irradiated fuel is handled under water at all times until after it is placed into a sealed shipping cask. The water provides a radiation shield as well as a reliable source of cooling for the irradiated fuel assemblies. A spent fuel pool cooling system maintains the temperature of the spent fuel storage pool water within acceptable limits.[61]

The chemical addition system is designed to add boric acid to the reactor system for reactivity control, lithium hydroxide for pH control and hydrazine for oxygen control.[62]

3.8 Steam and Power Conversion System[63]

The steam and power conversion system is designed to remove the heat energy generated in the reactor core by producing steam in the two steam generators. This heat energy is converted to electrical energy by the turbine-generator. This cycle, including the necessary equipment to achieve safe and reliable operation, is similar in concept and design to turbine-generator cycles in successful use for many years.

3.9 Radioactivity Control Systems[64]

Radioactive gaseous, liquid, and solid wastes will be handled by the radwaste disposal system. This system will be designed to process all liquid and gaseous wastes containing radioactivity so that the radioactivity is reduced to a level which will permit re-use or release to the lake or atmosphere at levels well below applicable safety limits. Solid wastes, including filter media and ion exchange material used to remove radioactivity from gaseous and liquid wastes, will be packaged in approved containers for shipment to off-site disposal areas. All potential effluent will be isolated and sampled prior to release to the environment. Based on analysis of this sample, adequate provisions for safe discharge are made; or if excessive contamination is still present, further processing can be initiated. This batch method of operation, along with the inherent capacity and flexibility of the system, permit the exercise of positive control over releases from the station. This will ensure that all discharges of radioactive material from the site will be maintained as low as practicable and well below the limits of 10 CFR Part 20.

Surveillance of radiation levels in the station will be maintained by a system combining continuous automatic monitoring and periodic sampling. Effluents will be continuously monitored and if their activity exceeds low pre-set values, their release will be stopped. Operating personnel will be protected from exposure to excessive radiation by alarm annunciation and, in some cases, automatic action of protective equipment.

Shielding throughout the station will ensure that radiation doses to the operating personnel during normal operation are kept within the limits of 10 CFR Part 20.

4. SAFETY ANALYSIS

Postulated malfunctions or equipment failure have been analyzed to demonstrate that the Davis-Besse Nuclear Power Station and the site are consistent with the AEC's guidelines in 10 CFR Part 100.[65]

Two categories of malfunctions or equipment failures have been analyzed; those in which the core and coolant boundaries are protected and those in which one of these boundaries is not effective and standby safety features are required. The core and coolant boundary protection analysis shows that, in the event any of the postulated malfunctions were to occur, the normal protection systems operate to maintain the integrity of the core and of the coolant boundary.[66] The standby safety features analysis demonstrates the capability of these safety features to assure protection of the public for postulated malfunctions in which the normal protective systems may not maintain the integrity of the core and coolant boundary.[67] These analyses show that for all credible malfunctions, the radiation exposure to the general public is well below the guideline values prescribed in 10 CFR Part 100.

Of the postulated equipment failures, a loss-of-coolant accident is the most severe. Emergency core cooling systems are provided to minimize release of fission products and to prevent clad and fuel damage that would interfere with continued core cooling for reactor coolant system failures up to and including the complete severance of the largest reactor coolant pipe. As previously discussed in this summary, the core cooling systems ensure that the core will remain in place and intact.[44] The containment vessel spray and air recirculation cooling units limit the pressure in the containment vessel.[68] Emergency electrical power is available on-site to ensure operation of these systems even if all external sources of electric power to the station are assumed to be unavailable at the time of the accident.[69]

Results of the safety analyses show that, even in the event of a loss-of-coolant accident, no core melting will occur.[70] However, in order to demonstrate that the operation of a nuclear power station at the proposed site does not present any undue hazard to the general public, a hypothetical accident has been analyzed involving a release of 100 percent of the noble gases, 50 percent of the halogens and one percent of the solids in the fission product inventory. The analysis evaluated both the direct radiation exposure and the potential total dose to the thyroid from the inhalation of fission products which leak from the containment system. The low leakage rate of the containment vessel and iodine removal by the charcoal filters in the emergency ventilation system reduce the potential radiation dose to the thyroid to a value below the 10 CFR Part 100 guidelines even in the event of such a hypothetical occurrence.[71]

5. TESTS, INSPECTIONS AND QUALITY CONTROL

Pressure containing components of the reactor coolant system will be designed, fabricated, inspected, and tested in accordance with the ASME Boiler and Pressure Vessel Code, Section III, Nuclear Vessels. Piping will be designed, fabricated, inspected and tested to the applicable provisions of Nuclear Power Piping, ANSI B 31.7 - 1968.(72) Nondestructive testing, including radiography, ultrasonic, magnetic particle, or liquid penetrant examinations, will be performed as appropriate during fabrication of the nuclear components.(73)

Auxiliary systems and equipment will be designed, fabricated, and tested to the appropriate provisions of recognized codes and standards of organizations such as the American Society of Mechanical Engineers, American Society for Testing and Materials, American National Standards Institute, and Institute of Electrical and Electronics Engineers.(74)

A comprehensive field testing program will be conducted to assure that equipment and systems are built in accordance with design requirements. The shield building will be designed and constructed to applicable portions of ACI-307-69, Specification for the Design and Construction of Reinforced Concrete Chimneys(75) and checked by the Ultimate Strength Design Method described in ACI-318-63. Load combinations specified in ACI-307-69 provide the design basis of the shield building. Materials and workmanship will be inspected to ensure compliance with appropriate codes, specifications and standards. Materials to be inspected and tested include concrete, reinforcement and embedded structural steel.

The containment vessel will be designed and tested in accordance with the ASME Boiler and Pressure Vessel Code, Section III, Class B.(76) The maximum internal pressure as defined in that code is 40 psig. The vessel will be tested at the conclusion of construction and after all penetrations have been installed to verify that the design leakage rate associated with the maximum internal pressure (40 psig) does not exceed 0.5 percent of the contained weight of air and vapor in 24 hours.

The containment vessel materials will be tested in accordance with the ASME Boiler and Pressure Vessel Code, Section III, N-1211, except that ASTM A37, Type A tests will be performed on impact specimens. Materials entering into fabrication will be tested for nil ductility transition temperatures of $0^{o}F$.(77)

Consideration will be given to the inspectability of the reactor coolant system in the design and arrangement of components. Access for in-service inspection of the reactor coolant system will include access for examination by direct or remote means.(78)

The Toledo Edison Company has the responsibility to assure that Davis-Besse Nuclear Power Station will be fabricated and constructed in accordance with applicable codes and specifications. Accordingly, Toledo Edison has established a comprehensive quality assurance program which began with the initial station design. This program is consistent with the intent of the AEC Quality Assurance Criteria for Nuclear Power Plants set out in Appendix B of 10 CFR Part 50.

Toledo Edison has established an organization to implement the quality assurance program under the direction of a Quality Assurance Engineer who exercises overall quality assurance surveillance for the project. Bechtel is utilized as Toledo Edison's agent in monitoring the quality assurance programs of Babcock & Wilcox, other equipment suppliers, and construction contractors. Those persons responsible for quality assurance in both Toledo Edison and Bechtel organizations are independent of construction responsibility and report independently to their respective management.(79)

A comprehensive field testing program for the Davis-Besse Nuclear Power Station will be carried out to ensure that equipment and systems perform in accordance with design criteria. The testing program will be carried out according to detailed predetermined testing techniques and procedures. The types of tests will include hydrostatic, functional, electrical, and operational.

6. RESEARCH AND DEVELOPMENT PROGRAMS

The nuclear steam supply system for the Davis-Besse Nuclear Power Station is similar in concept to several projects already in operation or under construction. The preliminary design is based on technical data which has been developed in the nuclear industry and on data developed by Babcock & Wilcox which is specifically related to the Davis-Besse nuclear design. Most of the research and development is complete; however, to complete the final detail design of some components, additional information will be obtained.

Most of the work reported in this section consists of proof testing of engineered designs, confirmatory tests to confirm analytically predicted conditions, or analytical studies to evaluate design or accident conditions.

The following summarizes the status of the research and development items listed in the PSAR:[80]

a. Xenon Oscillations

The possibility of the occurrence of xenon oscillations throughout the core life is being evaluated analytically by Babcock & Wilcox.[81] A modal analysis and one, two, and three dimensional calculations have been carried out for a core design similar to Davis-Besse to evaluate axial, azimuthal, and radial oscillations including methods for controlling possible oscillations.[82][83][84] Xenon oscillations are primarily an operational problem, not a critical safety problem, because the oscillations would be slow (25-30 hours) and can be controlled by operator action. Confirmatory analyses will be carried out on the Davis-Besse core design and will be reported to the AEC Staff.

b. Core Thermal and Hydraulic Design

Core thermal performance was evaluated using the W-3 correlation for predicting DNB. This correlation is available in the literature and has been used and found acceptable in establishing thermal design limits for other large pressurized water reactors. With the use of this correlation, only the vessel model flow tests were necessary to substantiate operation of the plant within acceptable thermal limits. These flow tests have been completed and have demonstrated acceptable flow distribution for the rated power level. The test results have been reported to AEC in a B & W Topical Report.(85)

c. Fuel Clad Failure

A Babcock & Wilcox program has been conducted to investigate loss-of-coolant accident fuel clad failure mechanisms in order to ensure that none will interfere with the ability of the emergency core cooling systems to accomplish their objectives. The program involved testing and analytical phases. Parametric tests to investigate possible mechanisms of cladding failure including eutectic formation, cladding embrittlement, and cladding swelling and perforation have been carried out. Results indicate that the ECCS will effectively cool the core, even if substantial fuel rod swelling occurs. This work has been described to AEC in a B & W Topical Report.(85)

d. Control Rod Drive Unit

The design of the control rod drive mechanisms is based on a principle which has been used in operating reactors and which has been extensively tested by Babcock & Wilcox. Test programs have included full scale prototype testing under no-flow conditions, full scale prototype testing at operating conditions, including flow, and components testing. Proof testing of a prototype mechanism was carried out for a full-life cycle of strokes and trips at optimum and 100 percent misalignment conditions, and major design parameters were confirmed. Data from these test programs confirmed design requirements indicating that rod drop time requirements were met, that excessive wear of components did not occur and that corrosion was not significant. These test data have been reported to the AEC in B & W Topical Reports.[(87) (88)]

e. Once-Through Steam Generator

The design of the once-through steam generator is based on experimental work on boiling heat transfer and data obtained by Babcock & Wilcox in full length model tests of the unit. The testing of a prototype unit by Babcock & Wilcox has been completed. It included performance, mechanical, vibration and blowdown tests, and control system development. The results have confirmed the analytical predictions of performance, and sufficient data on the performance and structural design has been obtained from operation of the test models to finalize the design of the steam generators and to confirm the analytical model developed for steam generator depressurization. The results of the tests were reported to the AEC in B & W Topical Reports.[(89) (90)]

f. Self-Powered Neutron Detectors

The testing to demonstrate the performance and longevity of the self-powered detectors in the Babcock & Wilcox Test Reactor and in the Big Rock Point Nuclear Power Plant has been completed. The tests have demonstrated that the detectors perform according to specifications and are capable of measuring neutron flux locally in a PWR environment over a period of several years with a relative accuracy of ± 5%. At the present time, the detectors have accumulated operational experience equivalent to approximately six years of full power operation in the Davis-Besse reactor. The test results were reported to AEC in a B & W Topical Report.(91)

g. Blowdown Forces on Internals and Core

The loads on the reactor and internals following a loss-of-coolant accident and the resultant stresses and deflections in the reactor internals have been analyzed for a skirt supported vessel at another site, and the results have been reported to AEC in two B & W Topical Reports.(91) (92) These analyses will be repeated for the Davis-Besse nozzle supported vessel and site seismic characteristics and reported to the AEC Staff.

7. TECHNICAL QUALIFICATIONS

7.1 The Toledo Edison Company

The Toledo Edison Company will be responsible for the engineering, design, construction, and operation of the Davis-Besse Nuclear Power Station.

Toledo Edison has had over 69 years' experience in the design, construction, and operation of electric generating stations and operates two steam electric generating stations, together with a central steam heating station and four smaller diesel and combustion turbine generating stations. Toledo Edison has a total system capability of 1,256,000 KW including purchase contracts.[94]

Toledo Edison is a member of the Central Area Power Coordination Group (CAPCO) and the Davis-Besse unit will be the fourth pooled unit of this power pooling group. The Davis-Besse Station will be jointly owned by Toledo Edison and The Cleveland Electric Illuminating Company.[94]

Toledo Edison, in addition to having experienced and qualified personnel in the design, construction, and operation of fossil fueled generating stations, has had extensive participation in the Enrico Fermi Fast Breeder project and has key personnel who have had considerable experience in all phases of that project.[95]

In addition to employees with extensive experience in fossil fueled generating stations and the Enrico Fermi project, there are employees who have degrees in nuclear discipline, including advanced degrees, and employees with nuclear operations experience.

An extensive training program has been established for the station operating personnel. This training program includes formal instruction in nuclear theory, technical aspects of the station, observation and operation of operating reactors, simulator training, and extensive on-site training prior to fuel loading. This training program will ensure that a highly competent and fully trained staff will be available for operation of the Davis-Besse Station.(96)

7.2 The Babcock & Wilcox Company

B & W's participation in the development of nuclear power dates from the Manhattan Project. B & W's nuclear activities are broad and include applied research to develop fundamental data, design, and manufacture of nuclear systems components, and design and manufacture of complete nuclear steam generating systems. Through the B & W Company's several divisions, a wide range of equipment for nuclear application is designed and manufactured. The B & W Company's major nuclear contracts, in addition to a substantial percentage of components for the nuclear Navy, have included Indian Point No. 1, NS Savannah, Advanced Test Reactor, Oconee Nuclear Station Units 1, 2, and 3, Three Mile Island Units 1 and 2, three additional units which have received AEC construction permits, and three additional units for which application for licensing has been made.(97)

7.3 Bechtel Company and Bechtel Corporation(98)

Bechtel Company is an affiliate of Bechtel Corporation. Bechtel, established in 1898 by W. A. Bechtel, was initially engaged in heavy construction, but gradually changed its emphasis from construction with engineering overtones to a balanced engineering and construction company. Since the close of World War II, Bechtel has placed strong emphasis on electric power generation projects. Bechtel has installed, or now has under design or construction, about 59 million kilowatts of generating capacity. Of this number, over 18 million kilowatts is capacity generated by nuclear-fueled units.

Bechtel has been actively working on nuclear projects involving power plants, nuclear accelerators, research laboratories, hot cells, experimental reactors and nuclear fuel processing plants for over 15 years and the following is a summary of some of the significant nuclear projects that have been undertaken and are completed:

1. Vallecitos Plant for General Electric Company and Pacific Gas and Electric Company.
2. Dresden Unit No. 1 for Commonwealth Edison Company.
3. Big Rock Point for Consumers Power Company.
4. Humboldt Bay Unit No. 3 for Pacific Gas and Electric Company.
5. San Onofre Unit No. 1 for Southern California Edison Company and San Diego Gas and Electric Company.
6. Tarapur Units No. 1 and No. 2 for the Indian AEC.
7. Robert Emmet Ginna for Rochester Gas and Electric.

Bechtel currently is engaged in the design and construction of over 14 nuclear generating stations located throughout the United States.

The total staff of Bechtel Corporation, exclusive of manual workers, is now in excess of 8,600 employees. Responsibility for engineering design and construction of nuclear power plants is centered in two separate divisions which now employ approximately 2,000 engineers, draftsmen, specialists and key field men qualified in power plant work. These divisions also receive additional necessary support from other components in Bechtel, including technical, legal, estimating and employee relation assistance.

8. COMMON DEFENSE AND SECURITY

There is no indication that construction and operation of the Davis-Besse Nuclear Power Station will in any way be inimical to the common defense and security of the United States.

The Toledo Edison Company and The Cleveland Electric Illuminating Company are Ohio corporations and are engaged as public utilities in the production, transmission, and sale of electricity. All of the directors and principal officers of the Applicants are citizens of the United States and the Applicants are not owned, controlled, or dominated by an alien, a foreign corporation, or foreign government.

The application contains no restricted or other defense information and Applicants have agreed that they will not permit any individual to have access to Restricted Data until The Civil Service Commission shall have made an investigation and report to the Atomic Energy Commission on the character, associations, and loyalty of such individual and the Atomic Energy Commission shall have determined that permitting such persons to have access to Restricted Data will not endanger the common defense and security.

Applicants will as licensees be subject to regulations of the Atomic Energy Commission relating to the transfer of and accountability for special nuclear material in its possession.

9. CONCLUSION

On the basis of the foregoing and the application, the Applicants respectfully submit that:

a. The Applicants have described the proposed design of the Davis-Besse Nuclear Power Station, including, but not limited to, the principal architectural and engineering criteria for the design, and have identified the major features or components incorporated in the station for the protection of the health and safety of the public;

b. Such further technical or design information as may be required to complete the final safety analysis and which can reasonably be left for later consideration will be supplied in the Final Safety Analysis Report;

c. Safety features or components, if any, which require research and development have been described by the Applicants and the Applicants have identified, and there will be conducted, a research and development program reasonably designed to resolve any safety questions associated with such features or components. Such safety questions will be satisfactorily resolved at or before the latest date stated in the application for completion of construction of the proposed facility;

d. Taking into consideration the site criteria contained in 10 CFR Part 100, the proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public;

e. The Applicants are technically qualified to design and construct the proposed facility;

f. The issuance of a construction permit for the Davis-Besse Nuclear Power Station will not be inimical to the common defense and security or to the health and safety of the public; and

g. Sufficient information has been provided to support the findings proposed to be made and the construction permit proposed to be issued by the Director of Regulation.

APPENDIX A

LIST OF REFERENCES

(1) PSAR, Volume 1, Section 2.2.1
PSAR, Volume 1, Section 2.2.2

(2) PSAR, Volume 1, Section 2.2.5

(3) PSAR, Volume 1, Section 2.2.5
PSAR, Volume 1, Table 2-2

(4) PSAR, Volume 1, Table 2-1

(5) PSAR, Volume 1, Section 2.2.6.1

(6) PSAR, Volume 1, Section 2.2.6.2

(7) PSAR, Volume 1, Section 2.2.6.3

(8) PSAR, Volume 3, Section 9.3.2.1

(9) PSAR, Volume 1, Section 2.3

(10) PSAR, Volume 2, Section 5.2.2.3.5
PSAR, Volume 2, Section 5.9.1.2

(11) PSAR, Volume 2, Appendix 2-B

(12) PSAR, Volume 1, Section 2.4.1.2

(13) PSAR, Volume 1, Section 2.4.5

(14) PSAR, Volume 1, Section 2.5
PSAR, Volume 1, Appendix 2-C

(15) PSAR, Volume 1, Section 2.6
PSAR, Volume 1, Appendix 2-C

(16) PSAR, Volume 1, Section 2.2.6.4
PSAR, Volume 1, Appendix 2-A

(17) PSAR, Volume 1, Section 2.8
PSAR, Volume 1, Appendix 2-D

(18) PSAR, Volume 1, Section 1.1

(19) PSAR, Volume 1, Table 1-2

(20) PSAR, Volume 1, Table 3-2

(21) PSAR, Volume 1, Table 3-1, Section 3.2.4.2

(22) PSAR, Volume 1, Section 3.2.3

(23) PSAR, Volume 1, Section 3.2.2.1.2
PSAR, Volume 2, Section 7.3.2.1

(24) PSAR, Volume 1, Section 3.2.4.3.7

(25) PSAR, Volume 1, Sections 3.2.4.3.6 and 3.2.2.2.3

(26) PSAR, Volume 1, Section 3.2.2.1.2

(27) PSAR, Volume 1, Section 3.2.2.1.3

(28) PSAR, Volume 1, Section 3.2.4.3.2

(29) PSAR, Volume 1, Section 3.2.4.3.3

(30) PSAR, Volume 3, Section 9.2

(31) PSAR, Volume 2, Section 4.2.2.1
PSAR, Volume 2, Table 4-3

(32) PSAR, Volume 2, Section 4.5

(33) PSAR, Volume 2, Section 4.4.3
PSAR, Volume 4, Answer 4.9

(34) PSAR, Volume 2, Section 4.2.5

(35) PSAR, Volume 2, Section 4.2.2.4

(36) PSAR, Volume 2, Section 4.2.2.3

(37) PSAR, Volume 2, Section 4.2.2.2

(38) PSAR, Volume 1, Section 1.2.4
PSAR, Volume 2, Section 5.1.1

(39) PSAR, Volume 2, Section 5.2.1.1

(40) PSAR, Volume 2, Section 5.2.1.4.4

(41) PSAR, Volume 2, Section 5.8.1.1.1

(42) PSAR, Volume 2, Section 5.2.2.1

(43) PSAR, Volume 2, Section 6

(44) PSAR, Volume 2, Section 6.1

(45) PSAR, Volume 2, Section 6.2

(46) PSAR, Volume 2, Section 6.3

(47) PSAR, Volume 2, Section 7.1.1

(48) PSAR, Volume 2, Section 7.6.3

(49) PSAR, Volume 2, Section 7.3.3.2

(50) PSAR, Volume 2, Section 7.4.1

(51) PSAR, Volume 2, Section 7.3.2.2

(52) PSAR, Volume 2, Section 7.2

(53) PSAR, Volume 2, Section 7.6.5

(54) BAW-10019, "Systematic Failure Studies of Reactor Protective Systems"

(55) PSAR, Volume 3, Section 8

(56) PSAR, Volume 3, Section 9.1

(57) PSAR, Volume 3, Section 9.5

(58) PSAR, Volume 3, Section 9.3

(59) PSAR, Volume 3, Section 9.8

(60) PSAR, Volume 3, Section 9.6

(61) PSAR, Volume 3, Section 9.4

(62) PSAR, Volume 3, Section 9.2

(63) PSAR, Volume 3, Section 10

(64) PSAR, Volume 3, Section 11

(65) PSAR, Volume 3, Section 14

(66) PSAR, Volume 3, Section 14.1

(67) PSAR, Volume 3, Section 14.2

(68) PSAR, Volume 2, Section 6.2

(69) PSAR, Volume 3, Section 8.2

(70) PSAR, Volume 3, Section 14.2.2.3

(71) PSAR, Volume 3, Section 14.2.2.4

(72) PSAR, Volume 2, Section 4.1.5
PSAR, Volume 2, Table 4-10

(73) PSAR, Volume 2, Section 4.5.1.2

(74) PSAR, Volume 3, Section 9

(75) PSAR, Volume 2, Section 5.2.2.4.1

(76) PSAR, Volume 2, Section 5.2.1.4.1

(77) PSAR, Volume 2, Section 5.2.1.4.4

(78) PSAR, Volume 4, DRL Question 4.6

(79) PSAR, Volume 1, Appendix 1B

(80) PSAR, Volume 1, Section 1.5
PSAR, Volume 4, Answer 1.2

(81) PSAR, Volume 1, Section 1.5.1 and Section 3.2.2.2.3

(82) BAW-10010, Part 1, "Stability Margin for Xenon Oscillations - Modal Analysis"

(83) BAW-10010, Part 2, "Stability Margin for Xenon Oscillations - One Dimensional Digital Analysis"

(84) BAW-10010, Part 3, "Stability Margin for Xenon Oscillations - Two and Three-Dimensional Digital Analysis"

(85) BAW-10012, "Reactor Vessel Model Flow Tests" (PROPRIETARY)

(86) BAW-10009, "Effect of Fuel Rod Failure on Emergency Core Cooling" (PROPRIETARY)

(87) BAW-10007, "Control Rod Drive System Test Program"

(88) BAW-10007, Supplement 1, "Control Rod Drive System Test Program"

(89) BAW-10002, "Once-Through Steam Generator Research and Development Report" (PROPRIETARY)

(90) BAW-10002, Supplement 1, "Once-Through Steam Generator Research and Development Report" (PROPRIETARY)

(91) BAW-10001, "Incore Instrumentation Program"

(92) BAW-10008, Part 1, Rev. 1, "Reactor Internals Stress and Deflection Due to LOCA and Maximum Hypothetical Earthquake"

(93) BAW-10008, Part 2, Rev. 1, "Fuel Assembly Stress and Deflection Analysis Due to LOCA and Seismic Excitation" (PROPRIETARY)

(94) PSAR, Volume 1, Appendix 1A, Section 1.1

(95) PSAR, Volume 1, Section 1.7

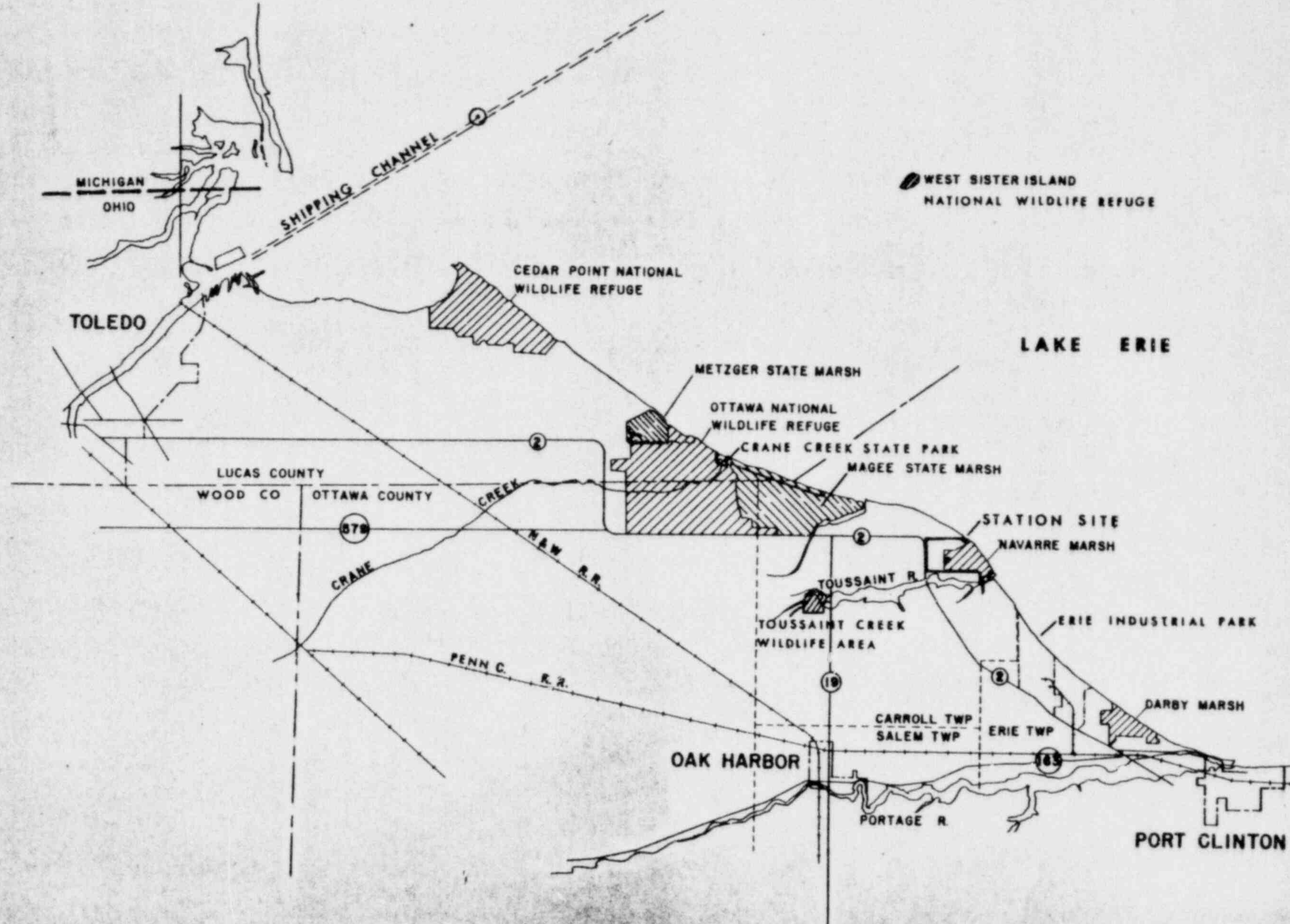
(96) PSAR, Volume 3, Section 12.3

(97) PSAR, Volume 1, Appendix 1A, Section 2

(98) PSAR, Volume 1, Appendix 1A, Section 3

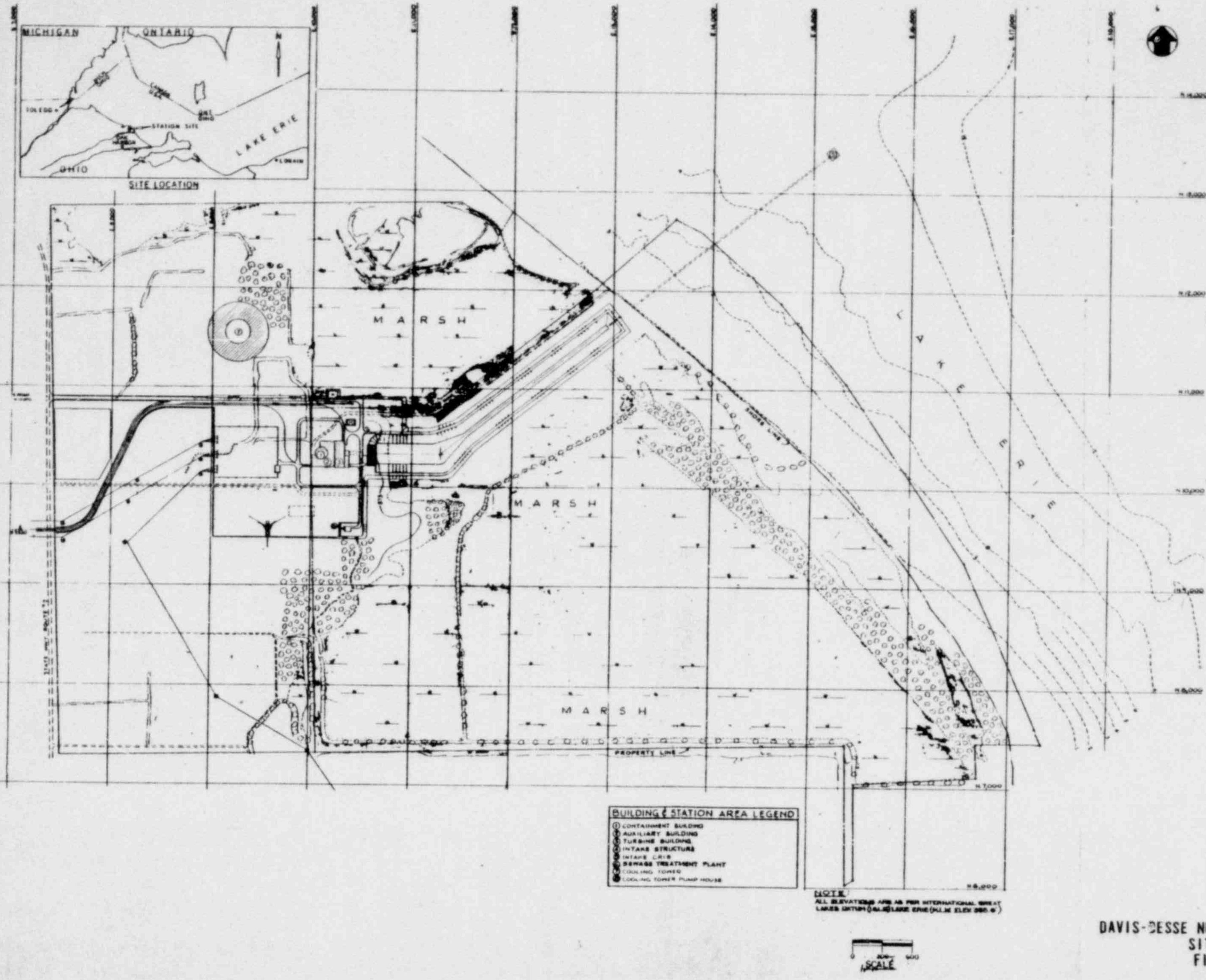
APPENDIX B

FIGURES



DAVIS-BESSE NUCLEAR POWER STATION
SITE LOCATION PLAN
FIGURE 1

DAVIS-BESSE NUCLEAR POWER STATION
STATION LOCATION &
SITE BOUNDARIES
FIGURE 2



DAVIS-BESSE NUCLEAR POWER STATION
SITE PLAN
FIGURE 3

APPENDIX C

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS OF WITNESSES

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS
LOWELL E. ROE
CHIEF MECHANICAL ENGINEER
THE TOLEDO EDISON COMPANY

1. My name is Lowell E. Roe. My residence is 3119 Glenn Street, Toledo, Ohio. I am employed by The Toledo Edison Company, Toledo, Ohio, as Chief Mechanical Engineer.

2. I served in the U.S. Navy from 1943 to 1946 completing the Naval Reserve Officers Training Program at Harvard University in 1945 with the rank of Ensign.

3. I graduated from The Ohio State University in 1948 with a Bachelor of Mechanical Engineering degree. Upon graduation, I commenced employment with The Toledo Edison Company in the Mechanical Engineering Division.

4. In 1951, I was recalled to active duty in the U.S. Navy and released to inactive duty in 1953. I presently hold the rank of Lt. Commander in the U.S. Naval Reserve (Retired).

5. In 1953, I re-commenced employment with The Toledo Edison Company in the Mechanical Engineering Division.

6. In 1956, I was appointed Special Project Engineer and was assigned to the Atomic Power Development Associates in Detroit, Michigan, to work on the Enrico-Fermi Breeder Reactor Project. During this period, I worked on all phases of component test facility design, construction of the reactor system and was head of Test Operations Section for the early non-nuclear testing, including sodium filling and operations.

7. In 1961, I returned to The Toledo Edison Company work in the Mechanical Engineering Division as a Senior Engineer working on the engineering for a major unit addition.

8. In 1962, I was appointed Chief Mechanical Engineer where I am responsible for the mechanical engineering activities relating to the selection, design, and arrangement of power plant equipment. I have also been appointed as Project Engineer for all design activities associated with the Davis-Besse Nuclear Power Station project.

9. I am a member of the American Society of Mechanical Engineers, American Nuclear Society, National Society of Professional Engineers, and am a Registered Professional Engineer in the State of Ohio.

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS
EUGENE C. NOVAK
NUCLEAR ENGINEER
THE TOLEDO EDISON COMPANY

1. My name is Eugene C. Novak. I reside at 4559 Overland Parkway, Toledo, Ohio. I am employed by The Toledo Edison Company, Toledo, Ohio, as Nuclear Engineer in the Mechanical Engineering Division.
2. I graduated from The University of Toledo in 1959 with a Bachelor of Science in Mechanical Engineering degree. In 1964, I attained a Master of Science in Industrial Engineering degree from The University of Toledo, and in 1969, a Master of Science in Engineering (Nuclear) from The University of Michigan.
3. After working part time at Toledo Edison from 1957 as a student engineer, I held full-time employment from 1959 through 1968 in the Power Production Division in various engineering positions up to Results Engineer at Bay Shore Station. During this period, my duties involved equipment, cycle and station performance reporting and analysis; overseeing station instrumentation and control equipment with respect to safety and optimum performance; conducting operator and maintenance personnel training on instrumentation, controls, and power plant equipment and cycles; and supervising the checkout and calibration of instrumentation and controls for the start-up of a major power generation unit.
4. In 1970, after returning from The University of Michigan, I joined the Mechanical Engineering Division as Nuclear Engineer. Here, my duties have been concerned with the design and technical aspects of the Davis-Besse Nuclear Power Station nuclear and non-nuclear process, instrumentation, and control systems.

5. I am a member of the American Society of Mechanical Engineers and the American Nuclear Society, and am a Registered Professional Engineer in the State of Ohio.

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS
HOWARD W. WAHL
PROJECT ENGINEER
BECHTEL COMPANY

1. My name is Howard W. Wahl. My residence is 11706 Coldstream Drive, Potomac, Maryland. I am employed by Bechtel Company, Gaithersburg, Maryland. As Project Engineer for the Davis-Besse Nuclear Power Station, I am responsible for overall coordination and supervision of the engineering work for the project.

2. I graduated from the University of Washington in 1956 with a Bachelor of Science degree in Civil Engineering. Upon graduation, I joined the Power and Industrial Division of Bechtel Corporation.

3. My experience includes civil and structural design on the Dresden, Humboldt Bay and Peach Bottom nuclear power plants as well as fossil fueled plants. Upon completion of the design phase of the Humboldt Bay plant, I served as the jobsite civil field engineer for a period of nearly two years.

4. Other responsibilities have included:

   a. Contributing to the AEC Reactor Containment Handbook ORNL-NSIC-5.

   b. Structural design on the FARET Project and the Savannah River Power Conversion Study.

   c. Civil and structural portion of numerous commercial nuclear power plant proposals and studies for both U. S. and foreign power companies.

5. I was the Project Engineer of the Containment Design Group, Power and Industrial Division. This Design Group was responsible for the formulation of design criteria, the structural analysis and design, and the

material specifications for the post-tensioned concrete containment structures for the Palisades Plant, Turkey Point Units #3 and #4, and Point Beach Units #1 and #2. The group also served as technical consultant on the above items for Arkansas Nuclear One, Oconee Units #1, #2, and #3, and the Rancho Seco Plant.

6. In 1969, I was appointed Project Engineer, responsible for Engineering for the Davis-Besse Nuclear Power Station project.

7. I am a member of the American Society of Civil Engineers and a Registered Professional Civil Engineer in the States of California and Ohio.

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS
JAGMOHAN SEONI
MECHANICAL/NUCLEAR ENGINEER
BECHTEL COMPANY

1. My name is Jagmohan Seoni. I am employed in the Power and Industrial Division of Bechtel Company, 190 Shady Grove Road, Gaithersburg, Maryland. I am the Nuclear Engineer on Davis-Besse Nuclear Power Station. In this position, I am responsible, under the overall supervision of the Mechanical Group Supervisor, for project coordination with the Nuclear Steam System Supplier (B & W) and supervising the design of the auxiliary and engineered safeguards systems, radioactive waste handling, fuel handling and the radiation shielding.
2. I graduated from the Panjab University (India) with a Bachelor's Degree in Physics and Mathematics in 1957 and a Bachelor's Degree in Mechanical Engineering with a minor in Nuclear Engineering from Howard University in 1963. In addition, I have completed nine credits of master's level courses in Nuclear Engineering from the Catholic University of America. From 1963 to 1966, I worked for the Bureau of Water Supply, the City of Baltimore.
3. In 1966, I gained employment with Bechtel's Power and Industrial Division in Gaithersburg, Maryland. Here, prior to the Davis-Besse Project, I was assigned for over two years to the Turkey Point Nuclear Units 3 and 4 where I was also responsible for various auxiliary and engineered safeguards systems, fuel handling system and analytical studies in heat transfer and hydraulics. Briefly, I was also assigned to Farley Nuclear Plant, Unit No. 1, for the preparation of the PSAR.

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS
JAMES McFARLAND
PROJECT MANAGER, NUCLEAR POWER GENERATION DEPARTMENT
POWER GENERATION DIVISION
THE BABCOCK & WILCOX COMPANY

1. My name is James McFarland. My residence address is 2105 Burnt Bridge Road, Lynchburg, Virginia 24503. I am employed by The Babcock & Wilcox Company, Power Generation Division, Nuclear Power Generation Department, as a Project Manager.
2. I served in the U. S. Navy Reserve from February 1943 through February 1946, Ensign rank - honorable discharge.
3. I was graduated from Carnegie Institute of Technology in 1948 with a Degree in Mechanical Engineering.
4. In 1948, I began working for The Babcock & Wilcox Company as a Student Engineer. A year later, I was assigned to the Field Engineering Section of the Boiler Division as a Service Engineer in the Pittsburgh district.
5. In 1956, I transferred to B & W's Boiler Division headquarters at Barberton, Ohio, working as a Contract Supervisor.
6. In 1967, I transferred to the Nuclear Power Generation Department as an Assistant Project Manager and later that year was assigned to the Russellville Nuclear Unit as a Project Manager for B & W. In 1968, I was also assigned to the Davis-Besse Nuclear Station as Project Manager for B & W.
7. I am a registered Professional Engineer in the States of Ohio and Pennsylvania.

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS
WILLIAM S. LITTLE
LICENSING SUPERVISOR, NUCLEAR POWER GENERATION DEPARTMENT
POWER GENERATION DIVISION
THE BABCOCK & WILCOX COMPANY

1. My name is William S. Little. I reside at 1309 Edley Place, Lynchburg, Virginia. I am employed by The Babcock & Wilcox Company, Power Generation Division, Nuclear Power Generation Department, as a Licensing Supervisor.

2. I was graduated from Georgia Institute of Technology in 1953 with a Bachelor of Chemical Engineering Degree. During 1959-1966, I did graduate work in Nuclear Engineering at the University of Idaho.

3. I joined the Atomic Energy Division of Phillips Petroleum, Idaho Falls, Idaho, in 1956 as a Project Engineer for liquid metal cooled and fueled experiments in the MTR and ETR at the National Reactor Testing Stations (NRTS).

4. In 1959, I became a Plant Engineer with Phillips working in the areas of reactor core heat transfer and hydraulics, fuel assembly and control rod development and testing and reactor safety analysis.

5. In 1956, I became Heat Transfer Hydraulics and Radiography Section Supervisor in the Plant Engineering Branch with Phillips. I was responsible for providing engineering support in the general areas of heat transfer and hydraulics for the Test Reactors Area (TRA) at the NRTS, and providing radiography, magnetic particle, and dye Penetrant testing services for all NRTS contractors. I was a member of the TRA Safeguard Committee.

6. In 1966, I became Supervisor of the Emergency Core Cooling Test Section in the Plant Applications and Engineering Test Branch with Phillips. I was responsible for originating and administering the Full Length Emergency Cooling Heat Transfer (FLECHT) test program and for carrying out the Scoping Emergency Cooling Heat Transfer (SECHT) test program in support of emergency core cooling systems for commercial power reactors.

7. In May of 1968, I joined The Babcock & Wilcox Company as a Senior Engineer in Design Engineering. In September of 1968, I transferred to the Licensing Section of Contract Engineering where as a Licensing Supervisor, I have been responsible for licensing activities on the Three-Mile Island Unit 2, Crystal River Nuclear Unit, and the Davis-Besse Nuclear Power Station.

November 2, 1970

SAFETY EVALUATION

BY THE

DIVISION OF REACTOR LICENSING

U.S. ATOMIC ENERGY COMMISSION

IN THE MATTER OF

THE TOLEDO EDISON COMPANY

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

DAVIS-BESSE NUCLEAR POWER STATION

DOCKET NO. 50-346

TABLE OF CONTENTS

1.0 INTRODUCTION

On August 1, 1969, the applicants, The Toledo Edison Company (TEC) and The Cleveland Electric Illuminating Company (CEIC), applied to the Atomic Energy Commission (Commission) for licenses to construct and operate the Davis-Besse Nuclear Power Station located on the southwestern shore of Lake Erie in Ottawa County, Ohio, approximately 21 miles east of Toledo, Ohio.

These two companies will own the plant as tenants in common and will share in the expenditures for the construction and operation of the plant and in the energy produced. The Toledo Edison Company will be responsible for the design and construction of the proposed facility.

The plant will utilize a two-loop pressurized water reactor nuclear steam supply system supplied by Babcock and Wilcox (B&W). General Electric Company (GE) will supply the turbine generator. The Bechtel Corporation will be the architect-engineer for plant design and will act as construction manager during construction of the plant.

Although the proposed reactor is designed to operate at an initial power level of 2633 thermal megawatts (MWt), the design of the engineered safety features, including the containment structure and emergency core cooling systems, and calculations of consequences of certain postulated accidents have been analyzed by the applicants and evaluated by us at the ultimate power level of 2772 MWt. The evaluation of thermal, hydraulic, and nuclear core characteristics was performed for a power level of 2633 MWt. Before operation at any power level above 2633 MWt would be authorized, the applicants must provide supporting analyses and data for our evaluation to assure that the core can be operated safely at the higher power level.

The safety review of the preliminary design of the proposed facility was accomplished by the Division of Reactor Licensing with assistance from the Division of Reactor Standards and various AEC consultants. Our safety review has been based on the applicants' Preliminary Safety Analysis Report (PSAR) and eleven subsequent amendments, all of which are part of the application.

In the course of our review of the application, we have held numerous meetings with representatives of the applicants to discuss and clarify the technical material submitted. A chronology of the principal actions relating to the processing of the application is attached as Appendix A to this evaluation. In addition to our review, the Commission's Advisory Committee on Reactor Safeguards (ACRS) met with both the applicants and the staff to discuss the facility as part of its independent review of the application. A copy of the

ACRS report to the commission on the Davis-Besse Nuclear Power Station is attached as Appendix B.

On June 4, 1970, the applicants requested that the Commission grant an exemption, pursuant to 10 CFR 50.12 of the Commission's regulations, from provisions of 10 CFR 50.10(b) in order to permit certain construction of the shield and auxiliary buildings, foundations, floors and walls up to the site grade level elevation prior to the issuance of a construction permit. The exemption request was granted on September 10, 1970.

Our review of the application included (a) an evaluation of site-related features, (b) identification and comparison all of the design and safety features for similarity to those previously reviewed, (c) determination that the design features and the treatment of safety matters were consistent with current regulatory criteria and policy and (d) identification and evaluation of those design features and safety matters which were new or unique.

The review and evaluation of the proposed design of the facility for a construction permit is only the first stage of a continuing review by the Atomic Energy Commission's regulatory staff covering the design, construction, and operating features of the Davis-Besse Nuclear Power Station. Prior to issuance of an operating license, we will review the final design to determine that all of the Commission's safety requirements have been met. The facility would then be required to operate in accordance with the terms of the operating license and the Commission's regulations, under the continued surveillance of the Commission's regulatory staff.

The issues to be considered, and on which the findings must be made by an Atomic Safety and Licensing Board before the requested construction permit may be issued, are set forth in the Notice of Hearing issued by the Commission in this proceeding and published in the Federal Register.

2.0 FACILITY DESCRIPTION

The reactor, steam generators, primary coolant system, and the pressurizer are housed inside the primary containment structure, a steel vessel which will be constructed by the Chicago Bridge and Iron Company. Surrounding the primary containment will be a reinforced-concrete shield building.

A reinforced-concrete building houses the waste treatment facilities, control room, components of the engineered safety features, fuel handling facilities, and other related auxiliary systems. The turbine building houses the power conversion equipment.

The Davis-Besse station will use a pressurized water reactor. The reactor will be fueled with slightly enriched uranium dioxide in the form of ceramic pellets contained in Zircaloy clad fuel rods. Water serves as both the moderator and the coolant. Boric acid dissolved in the coolant is used as a neutron absorber to provide long-term reactivity control. Reactivity control and shutdown capability is provided by top-entry control elements which are moved vertically within the core by control rod drives. Two reactor coolant pumps in each of the two main loops circulate the coolant water through the reactor vessel and core. The heated water then flows through two steam generators, where heat is transferred to the secondary (steam) system, and back to the pumps. The steam produced in the steam generators is used to drive the turbine generator.

A reactor protection system i provided which automatically initiates appropriate action whenever a plant condition monitored by the system reaches pre-established limits.

Redundant and independent standby cooling systems are provided to maintain reactor cooling, and to provide containment cooling in the unlikely event of a loss-of-coolant accident.

3.0 SITE AND ENVIRONMENT

3.1 Site Description

The Davis-Besse site is located on the southwestern shore of Lake Erie in Ottawa County, Ohio, approximately 21 miles east of Toledo, Ohio. The site consists of approximately 900 acres and is virtually flat with no natural promontories. A large portion of the site consists of unused marsh land which will be leased to the Bureau of Sport Fisheries and Wildlife of the Department of the Interior, United States Government, for use as a National Wildlife Refuge.

The minimum distance to the boundary of the exclusion area will be 2400 feet, within which there are no residences. The low population zone (LPZ) distance is two miles. The 1969 population within the LPZ was 1,564 summer and 637 permanent residents. The projected population within the LPZ by the year 2000 is 2529 summer and 1022 permanent residents. The nearest population centers with a current population greater than 25,000 are Toledo, Ohio and Sandusky, Ohio, each of which is approximately 21 miles from the site.

On the basis of our evaluation of the potential radiological consequences of postulated design basis accidents for the Davis-Besse facility we conclude that the calculated offsite doses which are presented in Section 9.0 of this Safety Evaluation are well within the guidelines of 10 CFR Part 100 for the exclusion area and the low population zone distances selected.

3.2 Meteorology

The applicants have conducted a meteorological monitoring program at the site since October 1968 using a 300-foot instrumented tower. Since the facility stack is only about 10 feet higher than the shield building, and because of the building down wash effect, the release of stack effluents should be treated as a ground level release in evaluating the consequences of postulated accidents. The meteorological data appropriate to ground level release consist of wind speed and direction measurements taken at the 20-foot elevation for a six-month period and temperature measurements as a function of elevation. These data indicate that diffusion conditions less favorable than Pasquill Type F with a wind speed of 1.5 m/sec occurred more than 5% of the time. The six-month period of measurement did not include summer when, according to Environmental Science Services Administration (ESSA) data, the wind speeds at nearby Toledo, Ohio are lowest. In our calculations of doses that might result from postulated accidents we choose the worst meteorological conditions which occur 5% or more of the time. On this basis, we and our consultant, ESSA, conclude that Pasquill Type F and 1 m/sec are the appropriate meteorological assumptions for use in our accident analysis. The report of ESSA on the meteorological data is attached as Appendix C.

We conclude that the meteorological aspects of the site have been determined adequately to establish a conservative meteorological model for accident evaluations and for establishing routine effluent limits.

3.3 Geology and Seismology

A geological study of the proposed site provided by the applicants shows that bedrock exists below 14 to 30 feet of glacial till and locustrine clays. The bedrock consists of slightly dipping

Paleozoic sedimentary rocks which have varying amounts of soluble anhydrite and soluble gypsum. Indications of solution cavities were found in the bedrock at a test excavation 400 feet south of the proposed plant location. In response to our questions about the potential of large cavities underlying the plant site, the applicants initiated a program of foundation bedrock inspection, exploration, and, where necessary, grouting under important structures. The applicants have identified a grouting procedure which is acceptable to us. We and our consultants from the U.S. Geological Survey (USGS) have reviewed the applicants' program for cavity exploration and conclude that it should be adequate to discover any significant solution cavities or fissures which might occur in the site bedrock. A copy of the report from the USGS is attached as Appendix D.

The intensities of the earthquakes that have been experienced within 50 miles of the site have not exceeded Modified Mercalli (MM) V intensity. There are no known faults within the site boundary. The applicants have considered earthquakes with MM VI and VII intensities at the site for design of the facility. A maximum horizontal ground acceleration of 0.15g will be assumed for the design basis earthquake and a horizontal ground acceleration of 0.08g will be assumed for the operating basis earthquake. We and our consultants, the U.S. Coast and Geodetic Survey (USC&GS), conclude that the proposed design acceleration values are acceptable. A copy of the report from the USC&GS is attached as Appendix E.

A strong motion accelerograph and three peak recording accelerometers will be installed in the facility to provide information on the seismic accelerations experienced in the event of an earthquake.

3.4 Hydrology

The Davis-Besse plant will be located about 3000 feet from the shore of Lake Erie. To assure the availability of shutdown cooling water in the event that the water level should drop below the bottom of the intake canal, the applicants have designed an intake forebay that will contain 7.7 million gallons of stored water. The applicants have determined, and we agree, that the 7.7 million gallons of water would provide shutdown cooling water for more than 60 days.

We have also reviewed the effects of flooding resulting from increased water levels in Lake Erie. The effects of wind setup surge, seiche and wave runup resulting from meteorological conditions were used to establish the flood protection requirements. The vital components and structures of the plant essential for safe shutdown will be protected from flooding up to the 591 foot (above mean sea level) elevation. We and our consultant, the Coastal Engineering Research Center, conclude that this analysis and the design basis for flood protection are acceptable.

3.5 Environmental Monitoring

The applicants will initiate an environmental monitoring program at least 18 months prior to plant operation. This program will establish the type, number, frequency, and methods of analyzing samples. The samples will consist of lake and well water, soil, air particulates, farm products (including milk), lake biota, fish and bottom sediments.

The applicants initiated a limnology study in 1968 to evaluate the past, present, and projected future use of Lake Erie. Included in this study will be a field investigation to determine physical, chemical and biological characteristics of the offshore lake regime which could be affected by the station effluents. The studies and programs are being conducted and developed with the cooperation of appropriate state and federal agencies.

Copies of comments of the Fish and Wildlife Service, U.S. Department of Interior, were forwarded to the applicants. The Service's comments are attached as Appendices F and F-1. The first letter (Appendix F) recommended that the applicants provide another heat rejection system instead of using Lake Erie as the primary heat sink for the facility's thermal discharge. To eliminate the possible effects of the plant's thermal discharge on Lake Erie, the applicants have proposed to use a natural-convection, hyperbolic closed-cycle cooling tower which will use the atmosphere as the primary heat sink. This proposed change has been reviewed by the Fish & Wildlife Service which has indicated in a subsequent letter (Appendix F-1) that this system is acceptable. The applicants have indicated that the recommendations contained in the Fish and Wildlife Service letter (Appendix F) will be incorporated in the development of the environmental monitoring program.

We conclude that the proposed environmental monitoring program is acceptable and will consider the details of the program at the operating license stage of our review.

3.6 Activities in Areas Adjacent to the Station Site

To the east of the station site are Erie Industrial Park and Camp Perry, an Ohio National Guard installation. Projecting out over Lake Erie from these two facilities are two restricted areas used for weapons testing. These restricted areas (designated as Areas I and II in Figure 2A-4 of the application) are limited to use as target areas for small arms, artillery and antiaircraft artillery fired from Camp Perry and from the test firing range at Erie Industrial Park which is operated by Thompson-Ramo-Woolridge, Inc. and Cadillac Gage Company. The closest boundary of these two restricted areas is 1.5 miles from the station site.

Another weapons testing area, also a restricted area (designated as Area III in Figure 2A-4 of the application) is located north of the station site on Lake Erie. Its closest boundary to the station site is 10.4 miles. This area is used by aircraft as a target area for bombing, rocket firing and aerial automatic weapons using inert type ordnance only.

Through contacts with the Detroit District of the Corps of Engineers, the authorities at Camp Perry, the Naval Air Station, Thompson-Ramo-Woolridge and Cadillac Gage, and 4410th Combat Crew Training Wing, we have verified that the present and estimated future activities to be conducted within the restricted areas are as stated by the applicants.

Physical means, including azimuth-limiting stakes on gun housings and self-destroying fuses on explosive projectiles, supplement the enforcing agencies' control procedures to assure that no ordnance will be fired outside of the boundaries of restricted Areas I and II. The Adjutant General's Office, State of Ohio, indicates that there is no record that any projectile fired into Areas I and II has ever landed outside the boundaries of the two areas.

A study of ordnance effects on concrete structures shows that the types currently fired from Areas I and II would not penetrate the reinforced concrete plant structures enclosing systems vital to the safety of the plant.

For Area III, the Air Force and Navy have indicated that training flight paths will keep aircraft 10 miles or more from the station site. As recommended in the ACRS letter, the applicants will establish prior to operation of the plant a formal procedure to assure prior notification of changes in the training flight paths that might result in closer approach of aircraft to the plant. Considering the distance from the site, the type of aircraft, and frequency of usage, the applicants concluded, and we agree, that no additional protection for the facility is required with regard to aircraft impact.

All changes to the size of the three restricted areas and to the general types of activity conducted within these Areas are controlled by the Corps of Engineers. Public Notices afford the public and the applicants ample opportunity to question the consequences of proposed actions on the plant. The applicants and the staff will be kept informed of any changes in the future usage of these restricted areas.

As recommended in the ACRS letter, the applicants will also establish formal procedures with the appropriate authorities that will assure the applicants prior knowledge of planned ordnance activity that may affect the operation of the Davis-Besse Nuclear Power Stations.

We conclude that there is reasonable assurance that the activities conducted in these restricted areas are subject to sufficient controls and the design of the proposed plant is adequate to prevent the significant release of radioactivity as a result of these activities.

MR. CHARNOFF: Gentlemen, I have before me a document beaing the caption in this proceeding "Applicants' Response to Questions Asked by the Atomic Safety and Licensing Board at the Prehearing Conference." The document is dated December 4, 1970.

I hold this document up in front of you and ask whether you are all familiar with it.

MR. ROE: Yes.

MR. NOVAK: Yes.

MR. WAHL: Yes.

MR. SEONI: Yes.

MR. OLDS: Yes.

MR. LITTLE: Yes.

MR. CHARNOFF: Is this a document that was prepared by you collectively and prepared directly under your supervision?

MR. ROE: Yes.

MR. NOVAK: Yes.

MR. WAHL: Yes.

MR. SEONI: Yes.

MR. OLDS: Yes.

MR. LITTLE: Yes.

MR. CHARNOFF: Mr. Chairman, I move this document be included in the record of this proceeding as if read. Again this was a document which has previously been furnished to the members of the Board, the Regulatory Staff and counsel for the

Intervenors.

CHAIRMAN SKALLERUP: It is so ordered.

(Applicants' Response to Questions follows:)

UNITED STATES OF AME

ATOMIC ENERGY COMMIS

In the Matter of

THE TOLEDO EDISON COMPANY

and

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

Davis-Besse Nuclear Power Station

APPLICANTS' RESPONSE TO

ASKED BY THE

ATOMIC SAFETY AND LICENS

AT THE PREHEARING CONF

DECEMBER 4, 1970

Question by Dr. Jordan

"What would be the concentration of the trit
the effluent and how does that compare with
in the lake?"

Response

Normally, tritium will be released from the
large buildup in the reactor coolant system.
of 6.0 uc/ml at coolant operating temperatur
corresponds to 8.742 uc/ml at 120 F and will
tion, prior to mixing with the dilution flow
Once this maximum level has been reached, ba
tritium leaking to the coolant, about 208 ft
every five days to maintain it. This assume
confined to the primary system. Based on a
mixing factor of 80% and a discharge spread
concentration at the discharge point into Lak
7.87×10^{-5} uc/ml. This represents about 2.
releases to unrestricted areas. Using the di
Volume 4 of the PSAR, AEC Question 2.4, this
tritium concentration at the nearest public
serving Camp Perry, the Erie Industrial Park
less than 8.0×10^{-7} uc/ml. The total releas
year is about 3000 Ci.

The estimate of tritium released is very cons
available data indicates that the 30% leakage
fuel cladding is high.

During station operation, a sampling network will be set up to monitor local tritium background levels. At this time, however, no record of Lake Erie background determination has been located. The information that is available was obtained from the tritium surface water network run by HEW for various locations throughout the county. The data from the sampling stations nearest the site are as follows:

Sampling Station	Average Surface Water Tritium Concentration from January to June (uc/ml)	
	1968	1969
Poughkeepsie, N. Y. Hudson River	1.1×10^{-6}	4.0×10^{-7}
Wheeling, W. Va. Ohio River	8.0×10^{-7}	3.0×10^{-7}

The most striking feature of these figures is their large annual variance. It should also be noted that they are the same order of magnitude as the concentrations at the nearest potable water intake caused by station discharge.

The basis for the decontamination factors (D.F.) used in evaluating the radwaste system are covered in Volume 4 of the PSAR, AEC Questions 2.4 and 11.6.

Question No. 2

Question by Dr. Jordan — TR page 54

Asked for the identification of critical exposure routes including consideration of reconcentration in the environment.

Response

The applicant has investigated potential exposure routes to determine the most critical path. Included among the most significant routes were direct consumption of water from Lake Erie; consumption of fish caught in the plant vicinity; and ingestion of milk from cows watering from Lake Erie.

For the projected discharges from the station as listed in Table 2.4-1, the critical exposure route is direct consumption of water. That is, an individual taking both water and fish from the same location in Lake Erie would receive a dose about 50 times greater from the water (at 2200 cc per day intake in accordance with ICRP) than from ingestion of fish at a rate of 40 pounds per year (the average for U. S. commercial fishermen). The dose in both cases is predominantly from tritium: in water, this radionuclide delivers essentially all of the ingestion dose; in fish, tritium is responsible for about 80% of the dose, the bulk of the remainder deriving from isotopes of cesium. Consumption of 1 quart of milk per day from cows using Lake Erie for water would deliver about half of the dose from direct water consumption.

Question No. 3

Question by Dr. Jordan

TR page 56

How and when are the Engineered Safety Features and the Reactor Protection System tested?

Response

Prior to initial fuel loading, the Engineered Safety Features and the Reactor Protection System will be subjected to hydrostatic, functional, electrical and operational tests, where appropriate, in order to verify that the safety systems will perform in accordance with design criteria.

Operational tests will involve actual operation of the system and equipment under design conditions, or simulated design conditions. Functional tests will verify that the system or equipment is capable of performing the function for which it is designed.

Typically, signals simulating the outputs of calibrated sensors will be used to initiate protective system action, while verification of proper performance and conformance to design is made by direct observation and by analysis of test and operational instrumentation.

After initial criticality, safety system testing frequency and procedures will be conducted in compliance with the Station Technical Specifications as outlined in PSAR Section 15.4 (Surveillance Standards) so as to ensure the availability and operability of these systems.

Detailed test procedures and their frequencies will be developed as system design details and equipment selection are finalized. Selection of procedures and test intervals will be based upon factors such as component reliability, system redundancy, test duration, and potential consequence of system unavailability.

Typical test procedures will entail introduction of a test signal at the first active element of a protection system channel so as to initiate protective action short of actual initiation of the protective function. In accordance with Technical Specifications, tests not feasible during normal operation (such as control rod trip insertion timing) will be conducted during refueling outages.

Question No. 4

Question by Dr. Winters TR page 56

Figure 5.5 of the PSAR shows the containment vessel hot pipe penetrations. How and what portions of these penetrations are periodically tested? If leaks are discovered in the penetration how are they conveniently fixed?

Response

Hot penetrations (main steam and main feedwater) will be tested for leakage during refueling operations. During refueling the reactor is shut down and there is adequate access and time to implement leak tests and possible repairs and there is no danger of escaping radioactive material.

Flexible metal bellows will be used with these penetrations. They will be of two-ply construction with an air gap and test connection and they can be pressurized and tested without pressurizing the whole containment vessel. The bellows will be tested initially and at the time of each major refueling operation.

The additional portions of the penetrations will be tested initially and three (3) times each subsequent ten (10) years as a part of the containment boundary.

Question No. 5

Question by Dr. C. E. Winters — TR page 56

Adequacy of multiple-component piping with respect to single failure criteria. Reference figures 9-6, 9-7, 9-13, 1.3-6, and 1.3-7.

Response

The service water and component cooling water system design as shown in the PSAR figures 9-5, 9-6, 1.3-6, and 1.3-7 does meet the AEC single failure criterion 41. However, in order to provide additional operational and maintenance flexibility during normal station operation, double valves in the cross-over lines in these systems have since been added.

The Spent Fuel Pool Cooling system (Figure 9-7) is not an engineered safety features system and is not designed to seismic Class I requirements except for the portion between the spent fuel pool and decay heat removal system connections, therefore, double valving is not provided. The Decay Heat Removal system serves as a seismic Class I backup for the spent fuel pool cooling.

Double valves on the cross-over lines in the Auxiliary Feedwater System (Figure 9-13) are not provided for the following reasons:

1. It is an equipment shutdown system only. Public safety is not affected due to a valve failure.
2. This system is not required for a long term operation similar to some of safety features system, therefore, a single failure of a passive component in this system is not a design criterion.

To provide for proper isolation of either auxiliary feedwater line, a valve is required in the cross-over line shown ahead of the flow meters. This valve has since been added.

Question No. 6

Question by Dr. Winters   TR pages 57 and 58

In regard to the atmospheric dump valve referenced in Section 10.2.3 of the PSAR, where does the steam go, what are the quantities and what may be the radioactivity involved in this system?

Response

The atmospheric dump valves will discharge directly to the atmosphere. Only under the very unusual conditions of loss of electric power or sudden and large load rejection would these valves discharge any steam as outlined in Section 10.2.3 of the PSAR.

The potential release of radioactivity and the resulting site boundary dose resulting from operation of these valves has been analyzed in Section 14.1.2.8 of the PSAR. The integrated thyroid dose at the site boundary for the most extreme condition has been calculated to be 0.004 rem.

Question No. 7

Question by Dr. Winters

TR page 58

The emergency diesels are cooled from the service water system. The service water system in turn requires power from the diesel system. In the event of an outage, the diesel can be started, and again, if all goes well and you can get the pumps started then you can cool the diesel. It is not obvious that there is any contingency there for second tries.

Response

The single failure mode criterion is applied in the design of the two independent diesel generator units and the two independent component cooling water lines which provides the cooling water for the diesel engines. Each diesel generator is connected to a separate 4160 volt emergency bus and each generator is capable of providing the power to satisfy engineered safety features loads. Therefore, the diesel generator that starts will automatically energize the component cooling pump which supplies the cooling water to that diesel. Additionally, the diesel generators are designed to start and come up to full load without component cooling water.

MR. CHARNOFF: The first document that was introduced into the record as if read, Mr. Chairman, was distributed to all of you and to the Regulatory Staff and it contained the educational and professional qualifications of the gentlemen who were sworn in and who sponsored this testimony.

It did not include the educational and professional qualifications of Mr. Granville M. Olds, who is the Project Manager for this project for the Babcock and Wilcox Company. I did, however, send a copy of this document to you, to the Regulatory Staff and handed copies to counsel for the Intervenors.

I should like to ask Mr. Olds if he is familiar with the document entitled "Educational and Professional Qualifications, Granville M. Olds, Project Manager, Nuclear Power Generation Division, Babcock and Wilcox Company.

MR. OLDS: I am.

MR. CHARNOFF: Is this a statement of your educational and professional qualifications?

MR. OLDS: It is.

MR. CHARNOFF: I move this document be included in the transcript as if read.

MR. WALLIG: No objection.

CHAIRMAN SKALLERUP: It is so ordered.

(Educational and Professional Qualifications of Granville M. Olds follow:)

MR. CHARNOFF: I might simply note that it might be more appropriate for the record tha the document that had been circulated that contained the qualifications of Mr. James McFarland, who had previously been the Project Manager for the Babcock and Wilcox Company for this project and Mr. Olds has succeeded to Mr. McFarland's position, I would propose that even though Mr. McFarland's qualifications are attached to this document that at this time those qualifications not be included with the document into the transcript.

I assume that should not be any difficulty.

MR. WALLIG: The Staff has no objection.

CHAIRMAN SKALLERUP: The Board has no objection.

MR. CHARNOFF: Before proceeding with introducing the Applicant's testimony with regard to the financial qualifications of the owners of the plant, Mr. Chairman, I should now like to formally make note of the fact I mentioned earlier, that we should like to reserve the right to, at the opening of the hearing on January 5, to introduce additional direct technical testimony relating to the specific contentions that have been admitted as appropriate for this particular

End #30 hearing.

CHAIRMAN SKALLERUP: It is the Board's understanding that you have reserved that position and I would also point out to the audience at this time that there will be no cross-examination by the Intervenors, but the Intervenors, on the other hand, have preserved that right, too, to cross-examine on this testimony on or after the 5th of January.

MR. CHARNOFF: Thank you.

Mr. Chairman, I have previously distributed to the members of the Board, the Regulatory Staff and to the Intervenors two documents, one bearing the caption of this proceeding, and entitled "Final Qualifications of the Cleveland Electric Illuminating Company, Testimony of Richard A. Miller" who is the Vice President - Finance of the Cleveland Electric Illuminating Company, and that document is dated November 27, 1970.

And the copy I circulated to the members of the Board and other parties in this proceeding had attached at the end of it an affidavit by Mr. Miller. I should now like to introduce this testimony on behalf of Mr. Miller and the affidavit into the record as if read.

This document attests to the financial qualifications of Cleveland Electric Illuminating Company.

Secondly, I also circulated a document again bearing the caption of the proceeding, entitled, "Financial Qualifications of Toledo Edison Company, Testimony of Donald G.

1n2 Nicholson," dated November 6, 1970.

Mr. Nicholson is secretary and treasurer of the Toledo Edison Company.

I am going to ask Mr. Churchill to hand to the Stenographer an affidavit by Mr. Nicholson attesting to the facts and statements in that document and in accordance with the discussion that we had at the prehearing conference, I would propose that both of these documents be incorporated into the record as if read.

CHAIRMAN SKALLERUP: It is so ordered in accordance with our prior understanding.

(The Financial Qualifications of the Cleveland Electric Illuminating Company, Testimony of Richard A. Miller and Affidavit; and the Financial Qualifications of the Toledo Edison Company, Testimony of Donald G. Nicholson and Affidavit follow:)

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

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

FINANCIAL QUALIFICATIONS

OF

THE TOLEDO EDISON COMPANY

TESTIMONY OF

DONALD G. NICHOLSON

November 6, 1970

FINANCIAL QUALIFICATIONS

OF

THE TOLEDO EDISON COMPANY

1. QUALIFICATIONS OF WITNESS

My Name is Donald G. Nicholson. I am Secretary and Treasurer of The Toledo Edison Company.

Upon graduation from Bowling Green State University (Bowling Green, Ohio) with a Bachelor of Science in Business Administration degree in June, 1950, I joined Toledo Edison and have remained employed by the Company since that time. I received an M.B.A. degree from the University of Toledo in 1962.

In 1958, I was elected to the position of Assistant Secretary; in 1962, elected to the position of Assistant Secretary and Assistant Treasurer, and in 1965, elected to the position of Secretary and Treasurer. In 1968, I was assigned additional duties as Secretary and Treasurer and was designated the chief financial officer.

I am a member of The Financial Analysts Society of Toledo, Inc. and the American Society of Corporate Secretaries, Inc. Within the utility industry, I am serving on the Investor Relations Committee of the Edison Electric Institute.

2. DESCRIPTION OF THE TOLEDO EDISON COMPANY

The Toledo Edison Company was incorporated under the laws of the State of Ohio on July 1, 1901. The Company is a public utility engaged primarily in the generation, transmission, distribution and sale of electric energy in Toledo and Northwestern Ohio, covering an area of approximately 2,500 square miles, with an estimated population of about 718,000. The Company also provides a relatively small amount of natural gas and steam heating service.

The Company serves about 225,000 electric customers. Retail power is supplied within the corporation limits of 47 municipalities in the service area including the City of Toledo and wholesale power is supplied to 15 municipally-owned systems. Toledo has a total system capability of more than 1.2 million kilowatts.

In 1969, the Company's operating revenues were $88,075,000 of which 97% was derived from the sale of electricity. Total electric operating revenues in 1969 were derived 32% from residential sales, 17% from commercial sales, 36% from industrial sales, 5% from other utilities for resale, and 10% from all others.

Energy sales in the Company's service area have increased at an average rate of 9.3% annually over the five-year period from 1965 to 1969.

The Toledo Edison Company's financial position is reflected in the 1968 and 1969 Annual Reports filed with Amendment No. 10 to the Application for Licenses, dated August 27, 1970.

3. DESCRIPTION OF THE CENTRAL AREA POWER COORDINATION GROUP (CAPCO)

In September 1967, The Toledo Edison Company, The Cleveland Electric Illuminating Company, Duquesne Light Company, Ohio Edison Company and its subsidiary, Pennsylvania Power Company (the CAPCO group) entered into a Memorandum of Understanding to create a power pool in the interests of reliability and economy, with future additional generating requirements of the members to be provided by sharing in the largest units feasible for pool purposes, mutual support of power requirements and provision of bulk power transmission required for such purposes. Definitive agreements are in the process of preparation.

The initial phase of the arrangement includes the construction of four generating units, the last of which is the Davis-Besse Nuclear Power Station. Two other units, scheduled for completion in 1971 and 1972, are coal-fired units, each having an expected net capability of 650,000 kilowatts, located on the systems of Ohio Edison and Cleveland respectively. In addition, a nuclear unit is scheduled for completion in 1973 having an expected initial net capability of 847,000 kilowatts and an ultimate net capability of 882,000 kilowatts, to be located on the system of Duquesne. Each of the units will be owned by two or more of the CAPCO companies as tenants-in-common.

In 1969 the CAPCO companies provided for the construction of two coal-fired generating units of the 800,000 kilowatt class, to be located on the system of Pennsylvania Power, and scheduled for operation in 1975 and 1976. No allocation of interests in these units has yet been made, but it is expected that such allocation among the CAPCO companies will be made generally on the basis of their respective forecast electric load requirements for periods following the respective dates of commercial operation of the units.

The initial phase of the CAPCO arrangement also provides for the construction of approximately 155 miles of 345 KV transmission lines through 1974. It is contemplated that additional transmission facilities will be installed as needed to accomplish pool operations.

4. RELATIONSHIP BETWEEN THE TOLEDO EDISON COMPANY AND THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

The Toledo Edison Company and The Cleveland Electric Illuminating Company will share ownership as tenants-in-common of the utilization facility, to be known as the Davis-Besse Nuclear Power Station, and its site. The Toledo Edison Company's share of ownership will be 52.5% and The Cleveland Electric Illuminating Company will own 47.5%. The Toledo Edison Company has complete responsibility for the design and installation of the Davis-Besse Station and for the prosecution of all related licensing activities and proceedings before the Atomic Energy Commission. The Toledo Edison Company will also have complete responsibility for the operation and maintenance of the Davis-Besse Station. The Toledo Edison Company and The Cleveland Electric

Illuminating Company are not acting as the agents or representatives of any other persons in filing the Application for Licenses.

5. CONSTRUCTION EXPENDITURES

The Toledo Edison Company construction expenditures for 1969 amounted to $18,549,000. Current estimates for construction expenditures through the year 1975 are as follows:

	Construction Forecast	Portion of Construction Forecast Attributable to Davis-Besse Project*
1970	$35,000,000	$10,844,000
1971	53,000,000	30,748,000
1972	69,000,000	50,499,000
1973	81,000,000	55,744,000
1974	49,000,000	15,949,000
1975	43,000,000	1,208,000

*The Toledo Edison Company's 52.5% share of the Nuclear Power Station and the initial nuclear fuel core, plus the cost of associated wholly-owned transmission facilities, is estimated at $166,371,000, of which $1,379,000 was expended prior to 1970.

The total estimated cost of the Davis-Besse project, including associated transmission line facilities to be wholly-owned by The Toledo Edison Company, is $305,742,000, as indicated in Amendment No. 10 to the Application for Licenses, dated August 27, 1970.

6. FINANCING

The Toledo Edison Company has engaged in a continuing construction program for the expansion of its facilities, financed by short term loans, long term debt securities, equity financing through the issuance of preferred and common stock, and internal sources.

During the period from 1950 to 1969 inclusive, $299,560,000 was spent on the construction program. These funds were provided by the sale of debt securities in the amount of $86,500,000, issuance of additional capital stock in the amount of $31,885,600, and the remainder from internal sources.

Mortgage Bond issues in recent years have been rated double A by both Moody's Investors Service and by Standard and Poor's Corporation.

It is expected that the Company's total construction requirements for the period 1970-1975 will be provided from internal sources, from the sale of debt securities and from the issue of capital stock in such a manner as to maintain a sound and conservative capital structure.

7. CONCLUSION

The Toledo Edison Company is financially qualified to undertake its share of the design and construction of the Davis-Besse Nuclear Power Station.

AFFIDAVIT

STATE OF OHIO)
) SS.
COUNTY OF LUCAS)

DONALD G. NICHOLSON, being first duly sworn, says that he is Secretary and Treasurer of The Toledo Edison Company; that he has prepared the attached statement entitled "Financial Qualifications of The Toledo Edison Company"; that he has knowledge of all of the facts set forth therein, and that all of said facts and statements therein contained are true.

Donald G. Nicholson

Sworn to before me and subscribed in my presence, this 4 day of December, 1970.

Notary Public

GENEVA I. LEAKE
Notary Public, Lucas County, Ohio
My Commission Expires Sept. 2, 1974

[SEAL]

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

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

FINANCIAL QUALIFICATIONS

OF

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

TESTIMONY OF

RICHARD A. MILLER

November 27, 1970

FINANCIAL QUALIFICATIONS

OF

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

1. QUALIFICATIONS OF WITNESS

My name is Richard A. Miller. I am Vice President-Finance of The Cleveland Electric Illuminating Company.

I took my undergraduate work with a major in Business Administration at Western Reserve University in Cleveland, Ohio, graduating in 1950.

I graduated from Harvard Law School with a degree of Bachelor of Laws in 1953. Immediately after my graduation from Harvard Law School, I joined the Legal Department of the Chesapeake & Ohio Railway Company where I did general corporate legal work, gradually developing in the specialization of tax work.

On October 30, 1960, I left the Chesapeake & Ohio Railway Company and took a position with The Cleveland Electric Illuminating Company as a Senior Tax Accountant and became principal tax consultant on December 1, 1961.

On February 1, 1962, I became Controller of The Cleveland Electric Illuminating Company. On April 23, 1969, I became Vice President-Finance, which position I hold today.

I am Chairman of the Advisory Committee of the Accounting Division of the Edison Electric Institute, a member of the Cleveland Chapter of the Financial Executives Institute serving as Secretary in 1966-1967 and Chairman of the Membership Committee in 1968-1969, a member of the Tax Executives Institute and Director of the Lake County National Bank of Painesville.

I am also active in several civic organizations.

2. DESCRIPTION OF THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

The principal offices of the Company are located in The Illuminating Building, P. O. Box 5000, 55 Public Square, Cleveland, Chio 44101. The Company was incorporated under the laws of Ohio in 1892 and is a public utility engaged primarily in the production, transmission, distribution and sale of electric energy for lighting, heating, cooling and power purposes within Ohio in an area approximately 1,700 square miles which extends about 100 miles along the south shore of Lake Erie. The Company is also engaged in the production, distribution and sale of steam for heating and other purposes in the downtown area of Cleveland. Approximately 98% of the Company's operating revenues during the twelve month period ended December 31, 1969, was derived from the sale of electric energy.

The Company serves approximately 655,000 customers. Total operating revenues during the calendar year 1969 were $218,497,611.

Energy Sales have shown an increase of 7.5% per year compounded during the five year period, 1965 through 1969.

The Company's financial position is reflected in the 1968 and 1969 Annual Reports filed with Amendment No. 10 to the Application for Licenses, dated August 27, 1970.

3. DESCRIPTION OF THE CENTRAL AREA POWER COORDINATION GROUP (CAPCO)

In September 1967 The Toledo Edison Company, The Cleveland Electric Illuminating Company, Duquesne Light Company, Ohio Edison Company and its subsidiary, Pennsylvania Power Company (the CAPCO group) entered into a Memorandum of Understanding to create a power pool in the interests of reliability and economy, with future additional generating requirements of the members to be provided by sharing in the largest units feasible for pool purposes, mutual support of power requirements and provision of bulk power transmission required for such purposes. Definitive agreements are in the process of preparation.

The initial phase of the arrangement includes the construction of four generating units, the last of which is the Davis-Besse Nuclear Power Station. Two other units, scheduled for completion in 1971 and 1972, are coal-fired units, each having an expected net capability of 650,000 kilowatts, located on the systems of Ohio Edison and Cleveland respectively. In addition, a nuclear unit is scheduled for completion in 1973 having an expected initial net capability of 847,000 kilowatts and an ultimate net capability of 882,000 kilowatts, to be located on the system of Duquesne. Each of the units will be owned by two or more of the CAPCO companies as tenants-in-common.

In 1969 the CAPCO companies provided for the construction of two coal-fired generating units of the 800,000 kilowatt class, to be located on the system of Pennsylvania Power, and scheduled for operation in 1975 and 1976. No allocation of interests in these units has yet been made, but it is expected that such allocation among the CAPCO companies will be made generally on the basis of their respective forecast electric load requirements for periods following the respective dates of commercial operation of the units.

The initial phase of the CAPCO arrangements also provides for the construction of approximately 155 miles of 345 KV transmission lines through 1974. It is contemplated that additional transmission facilities will be installed as needed to accomplish pool operations.

4. RELATIONSHIP BETWEEN THE TOLEDO EDISON COMPANY AND THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

The Toledo Edison Company and The Cleveland Electric Illuminating Company will share ownership as tenants-in-common of the utilization facility, to be known as the Davis-Besse Nuclear Power Station, and its site. Toledo Edison Company's share of ownership will be 52.5% and Cleveland Electric Illuminating Company will own 47.5%. Toledo Edison Company has complete responsibility for the design and installation of the Davis-Besse Station and for the prosecution of all related licensing activities and proceedings before the Atomic Energy Commission. Toledo Edison Company will also have complete responsibility for the operation and maintenance of the Davis-Besse Station. Toledo Edison Company and Cleveland Electric Illuminating Company are not acting as the agents or representatives of any other persons in filing the Application for Licenses.

5. CONSTRUCTION EXPENDITURES

The Cleveland Electric Illuminating Company construction expenditures for 1969 amounted to $100,446,00. Current estimates for construction expenditures over the next six years are as follows:

	Total Construction Budget	Portion of Budget Attributable to the Davis-Besse Plant
1970	$107,000,000	$ 8,200,000
1971	140,000,000	28,000,000
1972	143,000,000	41,630,000
1973	140,000,000	47,030,000
1974	128,000,000	11,935,000
1975	139,000,000	1,090,000

The Cleveland Electric Illuminating Company's 47.5% share of the Nuclear Power Station and the initial nuclear fuel core is estimated at $139,371,000, of which $1,486,000 was expended prior to 1970.

The total estimated cost of the Davis-Besse project, including associated transmission line facilities to be wholly-owned by The Toledo Edison Company, is $305,742,000, as indicated in Amendment No. 10 to the Application for Licenses, dated August 27, 1970.

6. FINANCING

The Cleveland Electric Illuminating Company has engaged in a continuing construction program for the expansion of its facilities, financed by long-term debt securities, short-term loans, equity financing through the issuance of common stock, and internal sources. All construction is financed on a basis of total requirements. No separate financing is undertaken for specific projects. During the period from 1949 to 1969 inclusive, approximately $804,542,000 was spent on construction, $220,000,000 having been raised by the sale of debt securities.

Mortgage Bond issues in recent years have been rated AAA.

It is expected that the total construction requirements for the period 1970 through 1975 will be provided by internal sources, the sale of capital stock and from the sale of debt securities in such a manner as to maintain a sound and conservative capital structure.

7. CONCLUSION

The Cleveland Electric Illuminating Company is financially qualified to undertake its share of the design and construction of the Davis-Besse Nuclear Power Station.

Respectfully Submitted,

Richard A. Miller
Vice President-Finance
The Cleveland Electric Illuminating Company

STATE OF OHIO)
) SS
COUNTY OF CUYAHOGA)

On this 27th day of November, 1970, before me personally appeared Richard A. Miller, known to me to be the person who executed the foregoing "Financial Qualifications of The Cleveland Electric Illuminating Company - Testimony of Richard A. Miller" and made oath that he is the Vice President-Finance of The Cleveland Electric Illuminating Company, that he has read the foregoing "Financial Qualifications of The Cleveland Electric Illuminating Company - Testimony of Richard A. Miller" by him subscribed, and that the same is true of his knowledge, except as to matters therein stated to be upon information and belief, and as to those matters, he believes them to be true.

Judith A. Coll, Notary Public

JUDITH A. COLL
Notary Public For Cuyahoga County
My Commission Expires Feb. 13, 1974

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DR. JORDAN: The Staff has, of course, looked at these, has it, has evaluated and will report on their evaluation. Is that correct?

MR. WALLIG: That is correct.

MR. CHARNOFF: Mr. Chairman, I believe that concludes at the time being the presentation of our direct testimony; along with the application included in Joint Exhibit A, we believe supports the issuance of a construction permit in this proceeding.

Thank you.

CHAIRMAN SKALLERUP: At this time in accordance with the agenda we have been following we would normally hear the presentation of the Intervenors' testimony and exhibits.

In accordance with the understanding we reached with the Intervenors today, they have been given until January 5th to present their case

MR. CHARNOFF: Mr. Chairman, we did skip from Item 12 to 14. Item 13 isn't an agenda provision for swearing of additional or potential witnesses for the Applicant.

I would submit that while we have a number of potential witnesses here in the audience, the more expeditious way of identifying and swearing in those witnesses would be to do so at the time any question is asked pertinent to their particular areas of interest.

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MR. ENGELHARDT: Mr. Chairman, customarily at this stage of the proceeding, with the Applicant's case being presented, the parties to the proceeding may begin their cross-examination of the Applicant's witnesses.

You have discussed the reservation of the rights of the Intervenors to defer on that cross-examination. The Staff has no cross-examination questions to raise of the Applicant.

I wish to reemphasize the statement that Mr. Wallig made in his opening comments, that the Staff has had some 15 months of review and examination of the application and the Applicant's personnel including all of the gentlemen who have been offered as sponsors of this testimony.

We have had extensive examination of the witnesses for the Applicant. However, as additional testimony may be presented in this proceeding by the Applicant and its witnesses, we very well may have additional cross-examination at that time, depending on the content of the newly offered or introduced evidence presented by the Applicant.

CHAIRMAN SKALLERUP: Thank you.

The next item on the agenda is the identification, qualifications and swearing of AEC Regulatory Staff witnesses.

MR. WALLIG: As I call your names, will you rise.

Robert L. Tedesco, Raymond Powell, William Haddican.

Mr. Chairman, these will be the witnesses for the

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Regulatory Staff.

Whereupon,

ROBERT L. TEDESCO

RAYMOND POWELL

WILLIAM E. HADDICAN

were called as witnesses on behalf of the Regulatory Staff and, having been first duly sworn, were examined and testified as follows:

DIRECT EXAMINATION

MR. WALLIG: Mr. Tedesco, did you prepare a statement of your professional qualifications entitled, "Robert L. Tedesco, Professional Qualifications, Boiling Water Reactor Branch No. 2, Division of Reactor Licensing"?

MR. TEDESCO: I did.

MR. WALLIG: Is it true and correct to the best of your knowledge?

MR. TEDESCO: It is.

MR. WALLIG: Do you adopt this document as your testimony in regard to your professional qualifications?

MR. TEDESCO: I do.

MR. WALLIG: If the Board please, I move at this time the document entitled "Robert L. Tedesco, Professional Qualifications, Boiling Water Reactor Branch No. 2, Division of Reactor Licensing," a copy of which was given to the Board, the Intervenors and the Applicant, be incorporated into the

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record as if read.

CHAIRMAN SKALLERUP: It is so ordered.

(The Professional Qualifications of Mr. Robert L. Tedesco follow:)

I am the Branch Chief of Boiling Water Reactor Branch No. 2 in the Division of Reactor Licensing, U. S. Atomic Energy Commission. In this position I am responsible for coordinating and supervising the safety evaluations for reactor plants under review for either construction permits or operating licenses assigned to the branch.

I accepted an appointment with the technical staff of the AEC Regulatory Organization in 1964 and presently have or have had the primary responsibility for safety reviews of various pressurized and boiling water reactor plants.

My formal education was obtained at the University of Connecticut where I received the B.A. degree in Mathematics and related Sciences in 1951. Subsequently, I attended Trinity College and received the M.S. degree in Physics in 1959.

From 1957 to 1960 I was employed at Combustion Engineering, Naval Reactors Division, located in Windsor, Connecticut. My responsibilities included various studies on reactor and plant dynamics and the safety evaluation of the SIC prototype submarine propulsion reactor.

At the completion of this work, I participated

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in the actual startup and confirmatory test programs of the SIC plant. From 1960 to 1964 I was employed at the CANEL office of Pratt and Whitney Aircraft Company which was located in Middletown, Connecticut. I participated in the preparation of the operational program for a proposed high temperature liquid metal cooled reactor for potential aircraft and space applications. My responsibilities included the preparation of the safety evaluation for the proposed reactor plant and the development of experimental techniques for determining reactor stability during the confirmatory test programs.

I am a member of the American Nuclear Society.

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MR. WALLIG: Mr. Powell, did you prepare a statement of your professional qualifications entitled, "Raymond R. Powell, Professional Qualifications, Boiling Water Reactor Branch No. 2, Division of Reactor Licensing"?

MR. POWELL: I did.

MR. WALLIG: Is it true and correct to the best of your knowledge?

MR. POWELL: It is.

MR. WALLIG: Do you adopt this document as your testimony in regard to your professional qualifications?

MR. POWELL: Yes.

MR. WALLIG: If the Board please, I mvoe the document entitled "Raymond R. Powell, Professional Qualifications, Boiling Water Reactor Branch No. 2, Division of Reactor Licensing," a copy of which has been given to the Board, Intervenors and the Applicant, be incorporated into the record as if read.

CHAIRMAN SKALLERUP: It is so ordered.

(The Professional Qualifications of Raymond R. Powell follow:)

I am a Project Leader on the staff of the Boiling Water Reactor Branch No. 2 of the Division of Reactor Licensing, U. S. Atomic Energy Commission. My responsibilities include analyzing and evaluating the nuclear safety aspects of power reactors, leading and coordinating the review of applications for construction and operation of power and test reactors. I accepted this appointment in 1967. In this position I had the primary responsibility for the safety review of the Three Mile Island Nuclear Power Station Unit 2 pressurized light water reactor. I presently have the primary responsibility for the safety review of the Davis- Besse Nuclear Power Station and the Peach Bottom Nuclear Power Station Units 2 and 3.

I graduated from Montana State College with a Bachelor of Science Degree in Engineering Physics in 1952, after which I accepted employment with E. I. DuPont de Nemours Company. In this employment I was sent to Argonne National Laboratory for a one year training program after which I was transferred to the Savannah River Project in Aiken, South Carolina. At the Savannah River Project I joined a Works Technical Group which had the responsibilities for initial start-up of the reactors, preparation of written operating procedures, and providing technical support for reactor operations.

In July 1956, I resigned my position with DuPont and accepted a position with AMF Atomics, a division of American Machine and Foundry Company at Greenwich, Connecticut. My responsibilities included core physics analysis, safety evaluation, performance of critical experiments, and technical assistance during initial start-up of swimming pool reactors

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pressurized light water and heavy water test reactors. The principal reactors for which I performed the above duties were swimming pool reactors ranging from 1 MW to 5 MW power capability, Surfside, JRR-2 a 10 MW Heavy Water Reactor, Ames Lab. 10 MW Heavy Water Test Reactor, a flux trap critical for an advanced material test reactor concept for the Italian GNEN, and Pulstar.

I am a member of the American Nuclear Society.

MR. WALLIG: Mr. Haddican, did you prepare a document entitled, "William E. Haddican, Professional Qualifications, Site, Environmental & Radiation Safety Group, Division of Reactor Licensing"?

MR. HADDICAN: I did.

MR. WALLIG: Is this document true and correct to the best of your knowledge?

MR. HADDICAN: It is.

MR. WALLIG: Do you adopt this document as your testimony in regard to your professional qualifications?

MR. HADDICAN: I do.

MR. WALLIG: If the Board please, I move at this time the document entitled, "William E. Haddican, Professional Qualifications, Site, Environmental & Radiation Safety Group, Division of Reactor Licensing," copies of which have been given to the Board, the Intervenors and the Applicant, be incorporated into the record as if read.

CHAIRMAN SKALLERUP: It is so ordered.

(The Professional Qualifications of William E. Haddican follow:)

I am a health physicist on the staff of the Site, Environmental and Radiation Safety Group, Division of Reactor Licensing. My duties include evaluation of the environmental safety of nuclear power plants.

I was born in New Orleans, Lousiana, and I attended Lousiana State University in Baton Rouge, where I received a Bachelor of Science degree in Mechanical Engineering in 1960. After six months of active duty as a U. S. Army Officer, I attended the University of Washington in Seattle where I received a Master of Science degree in Radiological Science in 1962. My thesis was titled, "A Computer Program for Evaluating Radiological Hazards Resulting from the Atmospheric Release of Radionuclides from a Reactor."

Since 1962 I have been a member of the AEC Regulatory Staff. Initially, I worked as an engineer and a health physicist for the development of Atomic Energy Commission's rules and regulations, Title 10, Code of Federal Regulations.

Subsequently, I reviewed the radiation safety aspects of the use of radioactive materials by universities, hospitals, industries, doctors and other organizations and individuals. Since 1967, I have reviewed the environmental

1n5 safety aspects of nuclear power plants. I have also reviewed the safety aspects of plans for the nuclear ship Savannah to berth in ports both within and outside the United States.

I am a member of the Health Physics Society, including its Baltimore-Washington Chapter.

MR. WALLIG: Mr. Tedesco, I direct your attention to the document entitled "Safety Evaluation by Division of Reactor Licensing, U. S. Atomic Energy Commission, in the matter of Toledo Edison Company, Cleveland Electric Illuminating Company, Davis-Besse Nuclear Power Station, Docket No. 50-346" of 87 pages, plus nine appendices attached thereto of 45 pages, for a total of 132 pages, dated November 2, 1970.

Did you supervise the preparation of this document?

MR. TEDESCO: I did.

MR. WALLIG: Does the Staff have any corrections to make at this time?

MR. TEDESCO: Yes, we do. I will ask Mr. Powell to read them into the record.

MR. POWELL: The following are corrections, mainly typographical, which should be made in our safety evaluation dated November 2.

On page 3, the 11th line, change "comparison all of" to "comparison of all."

MR. CHARNOFF: Mr. Chairman, may I ask Mr. Powell to repeat the page and correction, please? I am sorry, I

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missed it.

MR. POWELL: On page 3, the 11th line, change "comparison all of" to read "comparison of all."

On page 7, the last line, change the spelling of -- it is spelled now "l-o-c-u-s-t-r-i-n-e," and it should be "l-a-c-u-s-t-r-i-n-e."

On page 25, 15th line, change "75 percent" to read "85 percent."

On page 26, Lines 8 and 9, following "system" delete "of spring-connected, lump masses coupled to the subgrade by springs which represent soil properties" and add "in accordance to Section 3, page 124 of Appendix G."

MR. CHARNOFF: Could you repeat that.

In accordance to Section 3?

MR. POWELL: I will read it all over. Following "system" --

MR. CHARNOFF: I have the deletion. I need the insertion.

MR. POWELL: "In accordance to Section 3, page 124 of Appendix G."

CHAIRMAN SKALLERUP: Would you please repeat the entire sentence as amended.

MR. POWELL: Yes. "In performing design calculations, the containment structure will be treated as a system in accordance to Section 3, page 124 of Appendix G."

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On page 28, in Table 5.2, change Annulus Free Volume under Davis-Besse from 478,000 cubic feet to 678,000 cubic feet.

On page 32, the first line, under 5.7 "Intake Structures" add "and" between pumps, fire water and on second line delete "and circulating water pumps."

CHAIRMAN SKALLERUP: Will you read the sentence as amended.

MR. POWELL: Yes.

"The Intake Structures house the surface water pumps and fire water pumps."

On page 33, the 9th line, under 5.8, "Pipe Whip Protection" add "and feedwater" between steam and lines.

The sentence reads as follows, "These criteria require that the containment building be protected against failure that might be caused by the pipe whip effects resulting from the failures of the main steam and feedwater lines and that the steam lines be protected against failure resulting from the rupture of the primary system line."

The last correction is on page 76, the 10th line, change "will be" to "has been" and delete "later this year."

The sentence should read "Three-dimensional digital analysis results has been submitted for our review."

end 31

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CHAIRMAN SKALLERUP: Is the verb there "has" or "have?"

MR. POWELL: It should be "have."

MR. WALLIG: As now corrected, Mr. Tedesco, are the statements in the safety evaluation true and correct to the best of your belief and knowledge?

MR. TEDESCO: Yes, it is.

MR. WALLIG: Do you adopt this safety evaluation as your testimony?

MR. TEDESCO: Yes, I do.

MR. WALLIG: Mr. Powell, to the extent of your participation of the safety evaluation, are the statements true and correct to the best of your knowledge and belief?

MR. POWELL: Yes.

MR. WALLIG: Do you adopt this safety evaluation as your testimony?

MR. POWELL: I do.

MR. WALLIG: If the Board please, in connection with Section 16 of the safety evaluation, entitled "Financial Qualifications," Appendix A to the safety evaluation is entitled "Evaluation of Financial Qualifications," and the document entitled "Charles A. Lovejoy, Office of the Controller, United States Atomic Energy Commission, Professional Qualifications," as agreed at the prehearing conference will be offered and the affidavit of Charles A. Lovejoy relating to his professional qualifications and his preparation of the financial qualification.

I don't believe the Board has copies of the professional qualifications, so I will give copies now to Mr. Engelhardt to distribute to the Board. Do the Applicants have copies of the two documents?

MR. CHARNOFF: We will in a moment. Thank you.

MR. WILLIG: In accordance with the stipulation made at the prehearing conference, I move that the affidavit of Charles A. Lovejoy and the document entitled, "Charles A. Lovejoy, Office of the Controller, United States Atomic Energy Commission, Professional Qualifications," be incorporated into the record as if read.

CHAIRMAN SKALLERUP: It is so ordered.

(Affidavit follows:)

(Professional Qualifications follows:)

UNITED STATES OF A

ATOMIC ENERGY COMM

In the Matter of	)
	)
THE TOLEDO EDISON COMPANY &	)
THE CLEVELAND ELECTRIC	)
ILLUMINATING COMPANY	)
	)
(Davis-Besse Nuclear Power	)
Station)	)

AFFIDAVIT OF CHARLES A

I, Charles A. Lovejoy, being duly sw that I am a staff accountant in the Offic U. S. Atomic Energy Commission; that I pr documents:

1. Section 15 of the Safety Evaluat "FINANCIAL QUALIFICATIONS"

2. Appendix H of the Safety Evaluat "EVALUATION OF THE FINANCIAL QUA

3. "PROFESSIONAL QUALIFICATIONS" of Office of the Controller, Atomic

that the contents of the foregoing docume to the best of my knowledge; and that if proceeding, I would adopt as my testimony including all conclusions set forth there

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Subscribed and sworn to before me this 25t at Germantown, Maryland.

Battaille S. Powers

Notary Public

My Com

CHARLES A. LOVEJOY

OFFICE OF THE CONTROLLER

UNITED STATES ATOMIC ENERGY COMMISSION

PROFESSIONAL QUALIFICATIONS

I am employed as a staff accountant in the Office of the Controller, United States Atomic Energy Commission, Washington, D. C.

I am a graduate of Benjamin Franklin University with BCS and MCS degrees in Accounting.

Between 1933 and 1941, I held a variety of positions in the fields of accounting and auditing for the Government of the United States. For two years, before entering the military service in 1943, I was Controller for the United Services Life Insurance Company. Following discharge from the Army, I served in various staff and supervisory positions in the audit and accounting divisions of the Reconstruction Finance Corporation for seven years, during which period my duties included financial analysis and review of the operations of borrowing institutions.

Since 1953, I have been a staff accountant in the Office of the Controller of the Atomic Energy Commission. In this capacity, my duties include preparation of financial analyses of firms applying for facility licenses and construction permits. Over the past years I have been the financial witness for the AEC staff in hearings on applications for Class 104 licenses.

MR. WALLIG: If the Board please, I now move the safety evaluation be incorporated into the transcript as if read.

CHAIRMAN SKALLERUP: It is so ordered.

(Safety Evaluation follows:)

4.0 NUCLEAR STEAM SUPPLY SYSTEM

4.1 Design Changes

The mechanical, nuclear, thermal and hydraulic design of the Davis-Besse reactor is the same as those we have reviewed previously and approved for B&W nuclear steam supply systems, such as Three Mile Island Nuclear Power Station Units 1 & 2, except for the following changes: (a) the design power level has been increased from 2452 MWt to 2633 MWt, (b) the internal core barrel vent valves have been eliminated, and (c) the pressure vessel will be supported by its recirculation line nozzles.

The Davis-Besse nuclear steam supply system is designed for a rated power level of 2633 MWt. This power level is approximately 7.4% higher than those approved previously for B&W systems. In Section 3 of the PSAR, the applicants present information and changes in the core design to support this increase in the rated power level.

Three principal design changes have been made in connection with the increase in the rated power level for the core: (1) the installation of burnable poison rods to assure that the moderator temperature coefficient of reactivity will be negative throughout the core life, (2) a modification of the Mark II canless-type fuel assembly that reduces the ratio of the flux peak in the hottest fuel pin to that of the average fuel pin, and (3) the removal of the internal vent valves that results in an increase of about 4.6% in the coolant flow through the core. (In the design using vent valves, one vent valve is assumed to fail to seat properly and this results in 4.6% of the flow bypassing the core.)

We have reviewed these design changes and conclude that they are adequate to justify the increase in the rated power level without reducing the previously approved margins of safety for the core performance.

The Davis-Besse nuclear steam system is the first B&W design that will not have internal vent valves because of the change in elevation of the steam generators relative to the pressure vessel. In previous B&W plants, valves were installed inside the reactor pressure vessel to permit pressure equalization between the inlet and outlet plenums. These valves were unidirectional vent valves similar in design to check valves. These valves served to eliminate the possibility of creating a back pressure that could prevent core flooding in the event of a cold leg pipe rupture in the recirculation loop.

We have reviewed the proposed design elevations and conclude that they are adequate to eliminate the need for the internal vent valves.

4.2 Reactor Internals & Pressure Vessel Supports

The reactor internals will be designed to withstand normal design loads of mechanical, hydraulic and thermal origin, including those resulting from the operating basis earthquake and from anticipated transients, within the stress intensity criteria of Section III of the ASME Boiler and Pressure Vessel Code.

All internal components will be designed to withstand loads resulting from a combined design basis earthquake and loss-of-coolant accident. Strain limits for the internals under this combined load will be limited to less than 20% of the uniform ultimate strain for this material corresponding to an elastic stress limit (calculated) of not greater than 2/3 of the ultimate tensile strength. Allowable deflection limits will generally be within 50% of loss-of-function deformation limits. We consider these design limits to be acceptable.

The applicants have referenced a Babcock & Wilcox topical report, BAW 10008, Parts 1 and 2, as outlining the methods of analysis to be employed for the internals and fuel assemblies under loss-of-coolant and design basis earthquake loadings. The report was previously submitted as applicable to the components in skirt-supported reactor vessels. Because the reactor vessel for this plant is supported by the nozzles, a different dynamic model should be used to determine the seismic response. In addition, changes in plant arrangement and the elimination of internal vent valves will result in loadings resulting from the loss-of-coolant accident that are different from those given in the topical report (BAW 10008).

The proposed nozzle-supported vessel design is similar to previously acceptable designs. The applicants will submit a topical report covering the detailed design and analysis which we and our consultants will review during construction of the plant.

4.3 Vibration Testing

The major core and core support components have been evaluated to provide assurance that allowable limits for displacement and frequency on vibratory excitation are not exceeded under either steady state or transient conditions. These analyses have considered inlet flow impingement, turbulent flow, and the calculated natural frequencies of components, to establish that the excitation frequencies are well separated from possible natural resonant frequencies.

The applicants will include provisions for confirmatory vibration testing in the design of this plant. This testing will include the installation of vibration instrumentation for preoperational tests and detailed inspection of reactor internals after cold and hot functional tests. The testing requirements will be established during the operating review stage. The nuclear steam system supplier, Babcock & Wilcox, has stated that the lead plant of this design (as yet unspecified) will be instrumented for vibration tests, and tests on that plant will be completed prior to the completion of construction of Davis-Besse and will identify potential problem areas, if any, for this plant. In Amendments No. 6 and No. 11 the applicants have indicated that the design of the core components will not preclude their removal for inspection or vibration testing following preoperational testing and that B&W has initiated a scoping program to develop instrumentation for detection of excessive vibration or detection of loose parts in the primary system, as recommended by the ACRS. We conclude that this commitment for confirmatory vibration testing is satisfactory for this stage of our review.

4.4 Reactor Coolant System

The reactor coolant system will be designed to withstand normal operating loads of mechanical, hydraulic, and thermal origin (including all design transients) plus operating basis earthquake loads within appropriate code allowable stress limits.

The applicants state that the earthquake loads have been determined by dynamic analyses. We and our seismic design consultant (John Blume and Associates) have reviewed the analytical techniques used to establish earthquake loads and conclude they are adequate. Our seismic design consultant's report is attached as Appendix G.

In Amendment No. 6 to the application the applicants described the seismic design organization, responsibilities, documentation, and auditing to assure the adequacy of the seismic design. We have reviewed the applicants' response and find that it is acceptable.

4.5 Mechanical Equipment

All welding procedures and welders involved with the fabrication of the nuclear steam supply system pumps and valves will be qualified in accordance with Section IX of the ASME Boiler and Pressure Vessel Code.

The proposed inspection program for pumps and valves requires independent review of the physical and chemical test data for pressure boundary materials as well as independent review of nondestructive examinations of valve bodies, valve bonnets, and pump casings. We find these requirements acceptable.

All equipment for the engineered safety features will be designed to withstand the design basis earthquake without loss of function. The seismic design requirements for this equipment will be based on and checked against, the outcome of the structural dynamic analysis and will include, where necessary, consideration of the dynamic feedback of flexible equipment. We find this approach acceptable.

4.6 Reactor Vessel

The Davis-Besse reactor vessel will be designed and fabricated in accordance with the 1968 edition of the ASME Boiler and Pressure Vessel Code, Section III, Class A, plus the Summer 1968 Addendum and Code Case 1332-4. The vessel design is substantially the same as that of vessels for Arkansas One-Unit 1 (Russellville), Crystal River Units 3 and 4, Three Mile Island Unit 1, Rancho Seco Unit 1, Midland, and Oconee Unit 1.

Based on our review, we have concluded that the proposed design and fabrication specifications and procedures are acceptable.

4.7 Reactor Vessel Material Surveillance Program

The estimated end-of-life neutron fluence for the reactor vessel is 2.4×10^{19} nvt, based on a 40-year service lifetime and a load factor of 0.80; however, for design, Babcock & Wilcox has selected a conservative value of 3.0×10^{19} nvt. B&W has verified its calculational model through three separate nuclear experiments. These experiments are outlined and referenced in Section 4 of the PSAR. On the basis of our reviews of fluence calculations for other PWR plants and of the experimental verification performed by B&W, we find the proposed neutron fluence values acceptable for the Davis-Besse Station. The reactor vessel material surveillance program utilizes six capsules placed adjacent to the pressure vessel inner wall at about the mid-core elevation and is consistent with programs that have been accepted on previous PWR plants with respect to total number of capsules, archive material provisions, and material chemistry documentation. We will evaluate the quantity and types of specimens in the capsules and the withdrawal schedule during the operating license review. We find the proposed surveillance program for the reactor vessel material is adequate to establish the reactor vessel material nil-ductility temperature throughout the 40 year service lifetime and is acceptable.

4.8 Leak Detection

The reactor coolant pressure boundary leak detection systems for Davis-Besse are similar to those provided at other PWR plants. These systems, which include air particulate monitoring, radiogas monitoring, humidity detection, and containment sump level monitoring provide an array of instrumentation that is redundant, diverse, and provides timely alarms. Although the applicants have not yet stated the sensitivities of the leak detection systems, the applicants indicate that the sensitivities will be adequate to provide early detection of small leaks before they could propagate into large breaks. We conclude that the proposed leak detection systems are acceptable.

4.9 Missile Protection

The applicants calculated that the largest missile that could be generated by failure of the turbine could not penetrate the containment, the control room, or the roof of the fuel pool building. We have reviewed the calculational methods and conclude that they represent a conservative approach. The applicants stated that the facility design is such that a turbine missile will not cause a loss-of-coolant accident or prevent safe shutdown of the reactor. The auxiliary building, which contains engineered safety features, is to be designed with a minimum roof thickness of 18 inches of reinforced concrete to provide protection against turbine missiles and missiles that might be generated by tornadoes or as a result of ordnance testing activities in the nearby restricted areas. We find that the applicants' design provides acceptable protection against these missiles.

In answer to Question 4.8 in Amendment No. 3, Toledo Edison has presented the results of an extensive study of protection against the effects of missiles that might be generated as a result of failures within the containment.

We conclude that the results of the study are reasonable and that the applicants' design criteria, if properly implemented, will result in acceptable protection of the primary system, other vital systems, and the containment liner from missile hazards.

The primary pump-motor flywheels proposed for Davis-Besse will be manufactured by Westinghouse and will be similar to those used in many other PWR plants. The flywheels are fabricated of A533B steel plate and subjected to extensive quality controls. On the basis of our previous evaluations, we conclude that the probability of a failure of these flywheels that might produce missiles is reduced by the use of high-grade material, extensive quality control measures, special manufacturing procedures and by the proposed preservice and inservice surveillance requirements.

4.10 Inservice Inspection

The applicants are applying Section XI of the ASME Code Rules for Inservice Inspection of Nuclear Reactor Coolant Systems, as the basis for determining the areas and components of the primary system requiring access for future inservice inspections. The applicants will include inservice inspection requirements for the primary pump-motor flywheels in their program.

In answer to Question 4.7 in Amendment No. 5 of the PSAR regarding inservice inspection of vital systems other than the reactor coolant pressure boundary, the applicants indicated that access provisions will be included in the design arrangements to facilitate inservice inspection of areas and components of the primary coolant system and systems required to assure safe shutdown of the plant.

We conclude that the applicants' plans for development of programs for inservice inspection are acceptable. The final program will be reviewed at the operating license stage.

5.0 CONTAINMENT AND CLASS I STRUCTURES

5.1 General Structural Considerations

The applicant has designated as "Class I" those structures, systems, and components, including instruments and controls, whose failure might cause or increase the severity of a loss-of-coolant accident, or result in an uncontrolled release of significant amounts of radioactivity, and those structures and components necessary for safe shutdown of the reactor. Structures and equipment which may be essential to the operation of the station, but which are not essential to a safe shutdown and isolation of the reactor and whose failure could not result in the release of substantial amounts of radioactivity are designated as Class II. We have reviewed the applicants' list of Class I items (Appendix 5A-2 of the PSAR) and have determined that the structures, systems, and components have been properly classified.

We and our consultants, J. Blume and Associates, have reviewed the applicants' structural design bases for Class I items and conclude that they are acceptable. Our consultant's report is included in Appendix G.

The following Class I structures will be founded on rock or on compacted fill down to rock: the reactor containment structure, shield building, and auxiliary building. The service building and turbine building will be supported either on spread footings or on reinforced concrete mats, depending on the founding level and depth to rock of each section of the building. The main steam and feed-water isolation valve housing and safeguard areas abutting the reactor containments will be supported on reinforced concrete mats founded on solid rock. The service water reservoir and pump house will be founded on rock.

The applicants have indicated that seismic instrumentation will be installed at the site. A description of the instrumentation and proposed plans for its utilization will be furnished in the Final Safety Analysis Report (FSAR). This approach is acceptable.

Those Class I structures that are essential for safe shutdown of the reactor and that can be subjected to tornado loadings will be designed to withstand loads resulting from a tornado having tangential and translational velocities of 300 mph and 60 mph, respectively, and a differential pressure of 3.0 psi in 3 seconds acting outward; and to withstand the effects from tornado-borne missiles. Allowable stresses will not exceed: (1) 90% of the guaranteed minimum yield strength of structural steels, (2) the American Concrete Institute (ACI) 318 capacity reduction factor times the minimum guaranteed yield strength of reinforcing steels, and (3) 75% of the ultimate strength of concrete. We find the applicants' tornado design criteria for these Class I structures to be acceptable.

5.2 Seismic Design

The applicants have proposed seismic response spectra for Class I structures founded on rock and for those founded on soil. In each case, the spectra were developed by enveloping the response spectra, for various degrees of damping, of the E-W component of the Helena (1935) earthquake. For Class I structures founded on soil, the spectra were normalized to ground accelerations of 0.15 g for the design basis earthquake (DBE) and 0.08 g for the operating basis earthquake (OBE) taking into account the calculated amplification of seismic loads through the overburden. Class I structures that are founded on rock use the spectra corresponding to 0.15 g for the DBE and to 0.08 g for the OBE.

In performing design calculations, the containment structure will be treated as a system of spring-connected, lumped masses coupled to the subgrade by springs which represent soil properties. Horizontal and vertical motions will be treated separately, but the resultant loads will be applied simultaneously. The total response at any mass point will be calculated by taking the square root of the sum of the squares of the coordinate response for each mass for all significant modes.

The applicants will use a dynamic method of analysis for the seismic design of piping and equipment. This is acceptable to us and our consultant, John A. Blume and Associates.

5.3 Containment Design

The Davis-Besse primary containment houses the reactor primary coolant system, core flooding tanks, let-down coolers and steam generators.

A cylindrical reinforced-concrete shield building with a hemispherical roof surrounding the containment vessel provides secondary containment of fission products that might leak from the containment vessel during the design basis accident, provides biological shielding during normal operations and under design basis accident conditions, and protects the primary containment vessel from the effects of adverse atmospheric conditions and external missiles.

The primary containment vessel and the shield building will be supported on a concrete slab founded on competent bedrock. Above this foundation, there will be no structural connections between the primary containment structure and the shield building to restrict differential movement.

Table 5.2 compares the principal design parameters for the containment structures for Davis-Besse with those of Prairie Island Station which uses the same type containment and was previously reviewed and approved.

Penetrations common to both the primary and secondary containments are attached to the steel primary containment structure and pass through the shield building with sufficient clearance to accommodate lateral and radial differential movement of the two structures. Hot process lines in the annulus are enclosed within guard pipes vented back to the primary containment so that a rupture of the hot process line will not affect the annulus pressure. The penetration design is consistent with practices used in other recently approved plants and is acceptable for Davis-Besse. The applicants have indicated

TABLE 5.2

COMPARISON OF CONTAINMENT DESIGN PARAMETERS

Parameter	Davis-Besse	Prairie Island
Primary Containment		
Net Free Volume	2,866,000 ft^3	1,320,000 ft^3
Inside Diameter	130 ft	105 ft
*Design Internal Pressure	36 psig @ 264°F	42 psig @ 268°F
*Maximum Internal Pressure	40 psig @ 264°F	46 psig @ 268°F
Maximum Shell Thickness	1-1/2 inches	1-1/2 inches
Design Leak Rate (% of internal free volume in 24 hours)	max. 0.5% @ 40 psig 264°F	Max. 0.5% @ 46 psig 268°F
Test Pressure	45 psig	52 psig
Design External Pressure	0.50 psig	0.80 psig
Shield Building (Secondary Containment)		
Annulus Free Volume	478,000 ft^3	400,000 ft^3
Thickness of wall	2.5 ft	2.5 ft
Thickness of dome	2.0 ft	2.0 ft
Design Leak Rate	approx. 1% of annulus volume @ 1/4 inch of H_2O in 24 hours	10% of annulus volume @ 1/4 inch of H_2O in 24 hours

* In accordance with ASME Boiler and Pressure Vessel Code, Section III, Class B.

that the design of the hot process line penetrations will be reviewed independently by Bechtel and by the supplier of the penetrations, as recommended by the ACRS.

The primary containment structure is protected from missiles as generated inside the structure, including pipe whip, by concrete shield walls, the concrete operating floor, and the control rod drive mechanism shield. The applicants indicate that the detailed analysis of the pipe whip protection will be made during the detailed design of the station.

5.4 Design Pressure

The applicants have calculated the pressure response of the primary containment to a loss-of-coolant accident (LOCA) for various sizes and locations of postulated breaks in the primary system piping. The largest internal pressure calculated by the applicants was 35.5 psig, as the result of a 3.0 ft^2 double-ended pipe break, assuming that two of two core flooding tanks operate, that one of two diesel generators is available to operate either the containment vessel sprays or air coolers and that one of two high pressure injection systems and one of two low pressure injection systems operate (defined as "minimum engineered safety features"). The ACRS recommended that the staff review the adequacy of the margin between calculated maximum containment accident pressure and the containment design pressure. The results of our independent calculation indicates that the maximum containment pressure for a LOCA is 35.3 psig for a 3.0 ft^2 double-ended pipe break. Since the design pressure is 40 psig and the peak pressure calculated for the 3.0 ft^2 break is 35.3 psig, the applicants have provided a 13% pressure margin in the containment design.

We conclude that the primary containment design pressure is acceptable.

5.5 Leak Rate

The containment vessel will be tested at the conclusion of construction, and after all penetrations have been installed, to verify that the leak rate associated with the design pressure of 40 psig and accident temperature and air conditions does not exceed 0.5% of the containment vessel internal free volume in 24 hours. The acceptance leak rate for the initial leak test of the containment at 40 psig will be 0.25%/day.

Following a successful overpressure test at 45 psig, a leakage test will be performed on the primary containment at 40 psig using the "reference system method" to determine the leak rate. The tests will be similar to those conducted on previously-approved plants, and are acceptable for Davis-Besse.

5.6 <u>Emergency Ventilation System</u>

In the event of an accident, the primary containment will be isolated, and any leakage from the primary containment will be collected in the secondary containment structure (shield building) and filtered by the emergency ventilation system before being discharged to the atmosphere at an elevation of about 240 feet.

Leakage from the shield building and penetration rooms, estimated at 1% of the free volume per day at a partial pressure of 1/4-inch of water, will be measured using a test fan, damper and calibrated duct orifice. This leak rate is lower than the secondary containment emergency ventilation capacity so that all leakage of the secondary containment barrier will be leakage into the space between the primary and secondary containment barriers which, in turn, will be filtered prior to release at about 240 feet elevation. In addition, the secondary containment will be tested at anticipated positive pressures to measure outward leakage at a partial pressure of +6 inches of water.

Primary containment leakage is filtered through roughing filters, high efficiency particulate (HEPA) filters and two charcoal filters in series prior to discharging through the station vent at an elevation of about 240 feet.

The applicants have calculated that with offsite power available, the ventilation system would be in operation as early as 12 seconds after the containment isolation signal; in the event of a loss of offsite power, the maximum time for the vent system to reach full capacity operation is estimated to be 46 seconds. The applicants will test the ventilation system periodically for operability and performance.

We conclude from our evaluation of the secondary containment ventilation system, including filter performance, that it is acceptable and the doses resulting from any postulated accident situations will be well below the 10 CFR Part 100 guideline values.

5.7 Intake Structure

The intake structure houses the service water pumps, fire water pumps, and circulating water pumps. The enclosures for the service water pumps are designed to withstand the seismic load requirements for Class I structures and provide tornado missile protection.

Approximately 700 feet of the intake canal directly in front of the intake structure will be designed and constructed as a Class I (seismic) structure. The design will provide a 7.7 million gallon storage water reservoir to maintain a means of decay heat removal assuming isolation of the plant from Lake Erie through failure of the canal structure beyond the Class I section. This emergency cooling water reserve is sufficient to provide necessary heat removal for approximately 60 days under either normal shutdown or accident conditions.

We conclude that the structural provisions for the intake structure, canal, and emergency cooling water reservoir are acceptable.

5.8 Pipe Whip Protection

The applicants have specified, in response to Question 4.11 of Amendment 9 to the application, the design criteria proposed to provide protection of systems and components necessary to assure operability of the engineered safety features against damage that might result from the motion of ruptured piping (pipe whip). These criteria require that the containment building be protected against failure that might be caused by the pipe whip effects resulting from failures of the main steam and feedwater lines and that the steam lines be protected against failure resulting from the rupture of a primary system line.

Based on our review of the proposed pipe whip criteria, we conclude the proposed criteria are acceptable.

5.9 Pressure Vessel Cavity

The applicants have indicated that the largest possible size of a pipe break within the reactor pressure vessel cavity is 3.0 ft^2. The calculated cavity pressure resulting from this break is about 55 psig. The applicants have indicated that the pressure vessel cavity will be designed to withstand the pressure transient of about 200 psig which would result from a 14.1 ft^2 double-ended pipe rupture within the cavity. We have reviewed the design criteria and conclude they are acceptable.

5.10 Post-Accident Hydrogen Control

In Amendment 3 to the application, the applicants submitted a response to our question (12.6.9) concerning post-accident-hydrogen evolution and control. Following a loss-of-coolant accident, hydrogen gas might accumulate within the containment as a result of metal-water reaction involving the zirconium cladding and the reactor coolant, radiolytic decomposition of the post-accident emergency cooling solutions and corrosion of metals by solutions used for emergency cooling or containment spray. The applicants have made a preliminary evaluation of the hydrogen concentration in the containment following a LOCA and have acknowledged that a potential might exist for the hydrogen concentration in the containment to reach the flammability limit of 4.1 v/o. The applicants have indicated that they are currently undertaking three tasks regarding means for the control of hydrogen concentrations within the containment building. These three tasks are: (1) review of the containment air circulation capability to assure local high concentrations of hydrogen will not occur, (2) analysis and development of methods for controlled purging to the atmosphere, and (3) study of the use of recombiners for controlling hydrogen concentration.

The applicants have indicated they are continuing to study the hydrogen evolution and control problem and will provide the necessary means to meet requirements which may be established for an acceptable means of controlling the hydrogen within the containment building.

The applicants have indicated the containment design will have sufficient spare penetrations to permit installation of a hydrogen recombiner system, and that such a system will be installed if the completed analysis indicates that the hydrogen concentration in the containment following a LOCA could reach the lower flammability limit.

Purging as a method of hydrogen control within the containment will be used only as a backup system, as recommended by the ACRS. We conclude that the applicants' program to cope with hydrogen evolution and control within the containment is acceptable.

6.0 ENGINEERED SAFETY FEATURES

6.1 Emergency Core Cooling System (ECCS)

The ECCS design for this plant is similar to the systems proposed for previously reviewed and approved nuclear facilities which utilize the B&W designed nuclear steam supply system. Since the emergency high pressure injection system will not be used to provide primary coolant makeup during normal operation, the system will use only two high pressure injection pumps instead of three pumps as in previously reviewed B&W designs. The major equipment making up the ECCS consists of (a) two high pressure injection pumps (up to 500 gpm per pump), (b) two low pressure injection pumps (up to 3000 gpm per pump), and (c) two core flooding tanks (940 ft^3/tank). The minimum ECCS consists of two core flooding tanks, one high pressure injection pump, and one low pressure injection pump. The capacity of the ECCS is selected to provide adequate core cooling for primary system ruptures of sizes from about 0.05 ft^2 up to a double-ended hot leg pipe rupture (14.1 ft^2) without exceeding a maximum fuel clad temperature of 2300°F. The ultimate core power level of 2772 MWt was used to establish the ECCS performance requirements.

The ECCS will be actuated in the event of (a) an abnormally low reactor coolant system pressure of 1500 psig or (b) a containment pressure of 4 psig. Either of these two signals will automatically increase the high pressure injection flow to the reactor coolant system. Termination of the high pressure injection requires operator action. The core flooding tanks are designed to start discharging into the reactor pressure vessel when the primary coolant system pressure reaches 600 psig. The gas overpressure in the core flooding tanks and the sizing of the piping is sufficient to assure reflooding of the core within 25 seconds after the largest pipe rupture (14.1 ft^2). The low pressure injection system also functions as the normal decay heat removal system. This low pressure injection system (3000 gpm per pump) is actuated by either (a) a primary coolant system pressure of 200 psig or (b) a 4 psig containment pressure.

The initial source of coolant for the ECCS system is the borated water storage tank which has a capacity of 360,000 gallons of borated water with a concentration of 1800 ppm boron. When the level of the borated water storage tank reaches a pre-set low level, the valves controlling suction to the ECCS pumps will automatically switch to a recirculation mode taking suction from the containment sump.

The piping and pumps for the ECCS are sized and located to assure the net positive suction head (NPSH) requirement is met even if the containment pressure were to drop 0.5 psi below atmospheric pressure.

The heat transfer capability of the three fan coolers at the saturation temperature corresponding to containment accident pressure is in excess of the core heat generation rate at the time the suction for low pressure injection is switched from the borated water storage tank to the recirculation mode of operation.

We have reviewed the Davis-Besse ECCS and find that the motor-driven valves used to isolate the core flooding tanks during depressurization below 600 psig could experience an active failure and degrade the ECCS below an acceptable level. We require these motor-driven isolation valves either to be protected against active failures or to be redundant. The applicants, in Amendment 8, Question IQ.17, indicate that the power supply to these valves will be disconnected and locked out to assure inadvertent closure of these valves cannot occur. We conclude this procedure is acceptable.

The emergency core cooling system (ECCS) for Davis-Besse has been analyzed using a modified version of the FLASH-1 code. This code describes the reactor coolant system by the use of two control volumes for the primary loops and one for the pressurizer. The system is grouped into the two control volumes on the basis of temperature distribution. Resistances to flow are calculated by dividing the reactor coolant system into 24 regions and calculating the volume-weighted flow resistance for a given rupture location based on normal flow resistances. The model incorporates a variable velocity steam bubble rise model.

Recent results obtained by Westinghouse using a multi-node computer code (SATAN) for evaluation of the ECCS performance for the Indian Point 2 plants, and by Idaho Nuclear Corporation using another multi-node code (RELAP) have raised questions concerning the reliability of predictions of the thermal-hydraulic response of a reactor core during blowdown following a large cold-leg rupture using present analytical methods. In view of these concerns, we are requiring the applicants to provide additional evidence, obtained with the use of suitable multi-node analytical techniques, to verify that the ECCS system is capable of limiting core temperatures to acceptable levels. The applicants have indicated B&W is reevaluating the ECCS cooling capability using a multi-node code (FLASH 2.5), and that these multi-node analyses will be completed in time to make any necessary changes in the emergency core cooling system design to assure the calculated maximum clad temperature will not exceed 2300°F.

We conclude that the applicants' commitment to perform the additional multi-node analysis and to modify the ECCS if necessary to limit the maximum clad temperature to less than 2300°F is acceptable.

6.2 Containment Spray System

A containment spray system has been provided to remove heat from the containment atmosphere in the event of a loss-of-coolant accident and thereby assure that the peak containment pressure will not exceed 40 psig. The containment spray system is sized to furnish sufficient containment cooling with the containment air circulation fan coolers inoperative. The spray system consists of two half-capacity pumps (1300 gpm per pump), two half-capacity spray headers and necessary valves and piping.

The spray system is actuated by a high-high containment pressure (20 psig) signal coincident with an emergency injection-actuation signal.

The two half-capacity spray systems with a total of 150×10^6 Btu/hr heat removal capacity and with minimum ECCS heat removal capacity will reduce the containment pressure after the pressure peak for all primary pipe ruptures to less than 20 psig within 20 minutes after the occurrence of the rupture.

The two half-capacity spray pumps are located in separated compartments at the lowest elevation to assure that the NPSH requirement for the pumps is met during and following the LOCA. Following an accident the rooms containing these pumps will be ventilated using the shield building emergency ventilation system to assure that any airborne activity is filtered prior to release to the environment.

The borated water supplied to the containment spray system will not contain any iodine removal additive such as sodium hydroxide or sodium thiosulfate.

On the basis of our review of the proposed design and design criteria, we conclude that the containment spray system design is acceptable and that operation of the system would limit the peak containment pressure in the event of a loss-of-coolant accident to less than 90% of the containment design pressure of 40 psig.

6.3 Containment Fan Coolers

In addition to the containment spray system, the containment will have three half-capacity fan cooler systems. Any two of the three fan coolers have a heat removal capacity equivalent to that of the containment spray system. The containment minimum heat removal requirements are met by the following systems: 50% spray capacity plus one fan cooler, two sprays, or two fan coolers. Each fan cooler consists of a finned-tube cooling coil and a direct-drive fan. Cooling water for the fan cooler is supplied by one of three service water pumps which are located at the intake pump house. The service cooling water is a once-through system. During normal operation, the discharge line of each fan cooler has a modulating control valve in parallel with a stop valve. The modulating control valve provides automatic control of the containment temperature during normal operation. In the event of a LOCA, the emergency injection actuation signal will open the stop valve and permit full water flow through the fan coolers.

Excessive leakage of the unborated fan cooler water is annunciated in the control room by high water level in the fan cooler condensate sump and isolation valves can be actuated from the control room.
The cooling coils are similar to the design used in the Haddam Neck and Palisades plants.

Based on our review of the design and design criteria, we conclude that the fan cooler system design is acceptable.

6.4 Containment Isolation System

The containment isolation system will isolate all piping and penetrations through the containment that are not required for operation of the engineered safety features systems. The design criteria for isolation capability provide that the leakage through all penetrations not serving accident-consequence-limiting systems be reduced by using a double barrier concept. These double barriers take the form of closed piping systems inside and outside the containment in combination with various types of isolation valves.

The isolation of the containment is actuated by a Containment Isolation Signal (CIS) which is initiated by three logic systems: (1) the high pressure emergency injection signal closes isolation valves in noncritical systems, (2) critical isolation valves for component cooling water systems are closed after a delay of sufficient time to meet functional requirements by the signal that initiates the containment spray system, and (3) the containment purge system is isolated by either the high pressure emergency injection signal or a nigh radiation signal. The high radiation signals are provided from a gas and particulate sensor located in the normal ventilation stack or from the same-type sensor located in the containment.

Containment isolation valves will have the capability to be tested individually by manual actuation. The instrumentation and control circuits are such that no single failure will prevent containment isolation and each isolation valve is designed to close on loss of electric power or of air supply.

All valves and equipment which are intended to be isolation barriers are protected against the effects of potential missiles and jet forces both inside and outside the containment.

Based upon our review of the Davis-Besse containment isolation system and of similar systems for previously-approved plants, we conclude that the containment isolation system is acceptable.

6.5 Emergency Ventilation System

The emergency ventilation system will consist of two independent, full-capacity, fan-filter systems. The containment isolation signal (CIS) will start both emergency fan-filter systems following a LOCA. The emergency ventilation systems will reduce the air pressure within the shield building annulus to a negative pressure of 1/2 to 1-1/2 inches of water in less than one minute. After the pressure in the shield building annulus is reduced to a negative pressure of 1/2 inch of water, the volume of air discharged to the stack is limited to only that required to compensate for the in-leakage. The remaining air flow through the fans is returned to the shield building annulus.

Areas that could contain iodine activity due to leakage from systems in direct communication with the containment atmosphere are vented through the emergency ventilation system. The charcoal filter system used in the emergency ventilation system will reduce the iodine dose at the exclusion distance and low population zone boundary, for the design basis accidents, to well below the 10 CFR Part 100 guideline values.

In response to Question 5.7 in Amendment 6 to the application the applicants have indicated all areas that will be ventilated by the emergency ventilation system. The emergency ventilation system will provide iodine removal for possible leakage from the containment building. In addition, the emergency ventilation filter system will be used to ventilate the fuel storage pool area and provide iodine filtration capability.

On the basis of our review we conclude that the emergency ventilation system is acceptable.

7.0 INSTRUMENTATION, CONTROL, AND POWER SYSTEMS

7.1 General

Our review encompassed the auxiliary electric power system and the plant protection system instrumentation. The Commission's proposed General Design Criteria, as published in the Federal Register on July 11, 1967, and the proposed IEEE Criteria for Nuclear Power Plant Protection Systems (IEEE 279) dated August 1968, served, where applicable, as the bases for evaluating the adequacy of the designs.

The reactor protection instrumentation and control systems, as well as the instrumentation that initiates and controls the engineered safety features, (ESF) are substantially the same as those found acceptable for the Three Mile Island Nuclear Power Station Unit 2. The following discussion concerns only those features of the design which differ from those of Three Mile Island and for which new or additional information has been received.

7.2 Instrumentation and Control

In the Three Mile Island #2 design, three instrument channels are provided to monitor each variable required to initiate ESF. These instruments are arranged in a two-out-of-three coincidence logic for initiation of the protective action. The Davis-Besse design uses four instrument channels arranged in a two-out-of-four coincidence logic in initiating a protective action. We have concluded that this modification provides added redundancy and is acceptable. The applicants have stated that the systems will satisfy the requirements of IEEE 279.

7.2.1 Diverse ECCS Initiation Signals

In the Davis-Besse design, emergency coolant injection is initiated by either low reactor coolant pressure or by high containment pressure; however, reactor trip is only initiated by low reactor coolant pressure. Since the analyses of the effectiveness of ECCS assume that a reactor trip occurs, we informed the applicants that the high containment pressure signal or another diverse signal other than low primary system pressure should also initiate reactor trip. The applicants have agreed to provide such diversity to assure reactor trip on initiation of ECCS. The applicants have been advised that the instrumentation selected must be qualified to perform satisfactorily in the environment to which it will be subjected in the event of an accident.

This matter will receive additional review during final design. We conclude that the applicants' commitment is satisfactory for the construction permit stage of review.

7.2.2 Operation With Reactor Coolant Pumps Out of Service

The applicants have stated that operation of the reactor with less than the full complement of four reactor coolant pumps does not require adjustment of reactor protection trip settings to more conservative values. The applicants have stated that the reactor would be scrammed on loss of a second coolant pump.

The applicants also state that capability to operate the reactor on two reactor coolant pumps will be included in the design criteria for the reactor protection system. After reactor shutdown, manual adjustment of trip setpoints would be made in accordance with Technical Specification requirements to permit operation at reduced power. The permissible power level and trip setpoints will be established during the detailed design of the system. We will review, at the operating license stage, the written operating procedures and the hydraulic and thermal analyses for both one and two loop operation.

We conclude that these commitments are satisfactory for the construction permit stage of review.

7.2.3 Control Rod Assembly Interlocks

In the Davis-Besse design several interlocks have been provided to restrict the amount and/or the rate of reactivity addition by the control rods. We have informed the applicants that those interlocks whose failure might lead to fuel damage in the event of a rod withdrawal accident must be designed to the requirements of IEEE 279. The applicants have stated that fuel failure will not result from exceeding an operating limit normally protected by a single control rod assembly interlock.

We conclude that this criterion is satisfactory.

7.3 Electric Power

7.3.1 Offsite Power

Power for the Davis-Besse Nuclear Power Station will be supplied from a single 345 kV switchyard which is connected to the CAPCO grid by three 345 kV transmission lines. Two of the three lines are installed on the same right-of-way for seven miles of their length. The lines are supported on independent structures set far enough apart to avoid the possibility of a structural collapse of one line causing an outage of both lines. The third transmission line is routed independently along a separate right-of-way.

Initially the switchyard will be arranged in a five breaker ring-bus configuration, with two full capacity main buses. The applicants plan to modify this design to a full breaker-and-one-half arrangement during the detailed design phase. Either arrangement meets the single failure criterion. Two redundant 125 volt d-c protective relaying systems are provided, with each system being composed of a separate battery, charger, and cables. In the event of a single failure, a loss of control power will not be experienced.

The CAPCO grid stability has been analyzed and the applicants have reported that the loss of this unit or the loss of the largest single generating unit on the interconnection will not result in the loss of offsite power to the plant.

During normal operation, power is supplied by the station auxiliary transformer which is connected to the main generator 25 kV isolated phase bus. Each of the secondary windings of the auxiliary transformer is connected to the two 13.8 kV main buses. In the event that power is lost on either 13.8 kV bus, the system will initiate fast automatic transfer to reserve sources (startup transformers). Each of the two startup transformers is supplied from different 345 kV bus sections and is the reserve source for only one redundant emergency bus. If either startup transformer fails, the other startup transformer can supply minimum engineered safety features power requirements without further switching. However, with manual switching the remaining transformer is capable of supplying power to all the engineered safety features.

We conclude that the offsite power system is acceptable.

7.3.2 Onsite Power

The design of the onsite power system utilizes the split-bus concept. The equipment trains for redundant engineered safety features are divided between two 4.16 kV buses such that either one will supply minimum power requirements for safety. One diesel-generator is connected to each bus. A third 4.16 kV bus with additional ESF loads may be connected to one of the two emergency buses. The equipment connected to this third bus is not needed to meet redundancy requirements, but is utilized for replacement of redundant counterpart equipment removed from service. Its connection to either bus is effected by operator action from the control room. Redundant interlocks which m[illegible] single failure criterion are provided to preclude the poss[illegible]ity of inadvertently paralleling the emergency generators.

The two redundant diesel-generators will be located in separately ventilated rooms of a seismic Class I structure. Auxiliary systems for these machines are redundant and independent; the fuel oil supply is adequate for the operation of minimum engineered safety features for at least ten days. The applicants have stated the continuous rating of the diesel generators will be selected such that the connected loads will not exceed the continuous 8000-hour rating.

The d-c battery system for the station includes two redundant 250/125 volt bus systems. Three chargers are provided for each system, two of which are normally connected (one each to the ± 125 volt d-c buses) and a spare charger has been provided for back up. Redundant feeders from each 125 volt d-c bus are connected to four 125 volt d-c distribution panels. Normally the preferred feeder breaker at each panel will be closed while the alternate breaker is left open. Single failures in the battery systems would not prevent supplying power required for minimum engineered safety features.

The batteries are mounted on racks and housed in separate rooms which are designed to satisfy seismic Class I standards. Additionally, each of these rooms will be provided with independent ventilation systems. The 125 V d-c distribution panels provide power to the ESF and reactor protection system instrumentation utilizing the split-bus concept.

We have concluded that the design of the onsite power system is acceptable.

7.4 Seismic, Radiation, and Environmental Testing

7.4.1 Seismic Testing

The reactor protective system, emergency electric power system and instrumentation and controls for the engineered safety features and shutdown cooling systems are designed as seismic Class I systems. The systems are designed to function before, during, and after the maximum peak seismic acceleration. Specifications for components of these systems will contain the requirements for the submission of test data, appropriate operating experience or calculations which will substantiate that the components will not suffer loss of function under the design basis seismic loadings.

7.4.2 Radiation Testing

The applicants have stated that the design criterion for all electrical cable is that it shall not fail when subjected to the accident radiation doses after the normal long term operating conditions. In addition, the specifications for all material and equipment associated with safety related systems will require that the equipment be capable of performing its functions after exposure to the irradiation resulting from operation for 40 years and from any design basis accident. Tests will be performed or existing test data will be used to show that these items are satisfactory for use in the specified environment.

7.4.3 Environmental Testing

The applicants have identified instrumentation and equipment including cables, located within containment, which are required to operate during and subsequent to an accident. The applicants have stated that "type tests" have been or will be required to show satisfactory operation in an equivalent environment of pressure, temperature, and humidity for the time period required.

We agree with the applicants' criteria with respect to the testing program and conclude that the tests proposed for these components are satisfactory.

7.5 Cable Design, Selection, Routing, and Identification

We have reviewed the applicants' criteria for the design, selection, and routing of cables, and we conclude that with adherence to the criteria, the probability of loss of redundant channels of protection from a single cause (such as fire) will be acceptably low. The criteria for physical identification of safety-related circuits and components to assure appropriate treatment, particularly during maintenance and testing, are acceptable.

7.6 Turbine Overspeed Protection

The turbine-generator will be designed by General Electric and will use a 1800 rpm tandem compound, four-flow exhaust, indoor turbine unit. This unit will use an electrohydraulic control system with a 110% overspeed trip. The emergency trip system is an independent, redundant control system providing protection against turbine overspeed, loss of condenser vacuum, thrust bearing wear and generator electrical faults. A mechanical centrifugal device plus the emergency trip system provide a 111% overspeed trip.

We conclude this overspeed protection proposed is acceptable.

7.7 Common Mode Failure

As discussed in Amendment No. 11, to the application Babcock and Wilcox will submit a topical report (BAW-10019) concerning studies of means of preventing common mode failures in their reactor protection system design from negating scram action and information relating to the consequences of such failures. The ACRS noted this matter in its report on the Davis-Besse facility and also indicated that studies should be accelerated to establish any need for design features to make tolerable the consequences of failure to scram when required during anticipated transients. We have discussed this matter with Babcock and Wilcox to describe the assumptions and transients which should be included in the study. Additional meetings and discussions will be held with Babcock and Wilcox during construction regarding the status and results of the studies. Our evaluation of the probability and consequences of these types of events will provide the basis for further review of the proposed design of the systems regarding their ability to terminate or limit the consequences of such events. The applicants will be required to make such changes in the final design as are found necessary as a result of this further review.

7.8 Prompt Detection of Fuel Failures and Use of Core Exit Thermocouples

The applicants stated that B&W has initiated a program to develop instrumentation to provide the capability for prompt detection of the gross failure of a fuel element. This prompt detection instrumentation would be in addition to the fission product detection instrumentation provided in primary coolant letdown system.

In Amendment No. 11 the applicants indicated that thermocouples will be provided to measure core exit coolant temperatures in each of the 57 incore instrument positions. These core exit thermocouples will provide an additional method to detect potential anomalies during operation.

We conclude that proposed utilization of core thermocouples and the program for development of failed fuel detection instrumentation are satisfactory.

8.0 AUXILIARY SYSTEMS

8.1 General

The following systems are the same as those we have reviewed for B&W PWR facilities and as in the previous cases we find them to be acceptable: Chemical and Volume Control, Residual Heat Removal, Service Water, Spent Fuel Cooling, Sampling, Vent and Drain and Ventilation. The locations of these systems are within the Class I auxiliary building which provides protection against tornado missiles. All leakage or spillage from these systems will be confined to the auxiliary building and collected in sumps.

Our evaluations of the other auxiliary systems (the Radwaste System, Spent Fuel Storage, Intake Canal, Auxiliary Feedwater System, Cooling Tower, and Boric Acid Injection System) are summarized in the following sections.

8.2 Radwaste System

8.2.1 Liquid Radwaste

The major sources of radioactive liquid waste result from the primary coolant which is removed and stored during reactor startup operations and from the collection of leakage from the primary coolant system during operation of the facility. The liquid radwaste treatment system includes a degasifier, primary demineralizers, evaporators, mixed bed demineralizers and filters. This system is designed to reduce the concentrations of all radionuclides except tritium in the water. The PSAR (p.2.4-2) lists the decontamination factors as follows:

Kr and Xe......................................6.86×10^4

Cs, Mo and Y...................................6.86×10^7

Cr, Mn, Co, and Fe (insoluble corrosion products)..6.86×10^5

All others.....................................6.86×10^9

The liquid radwaste system for the Davis-Besse facility will have the capability of treatment and reuse of the major portion of the liquid waste generated from normal plant operation without discharging radioactivity into Lake Erie. The applicants have indicated that if storage of liquid waste becomes inadequate or when the cleanup demineralizer requires recharging, liquid waste may be discharged by a batch-type process. The activity level of this batch-type discharge of liquid waste will be well below 10 CFR Part 20 limits at the point of discharge from the site.

The batch discharging of liquid wastes will be interlocked with the plant discharge pumps to assure a positive dilution flow of the discharge water to Lake Erie. The applicants have indicated in Amendment 11 to the application that the design will provide a means of rapid dispersion in the lake, as recommended by the ACRS. We will follow the applicants' program in this regard during plant construction.

Other low level radioactive liquid wastes generated in the plant which contain oil or detergents are collected in a separate storage tank monitored and either released into the plant discharge flow or cycled through an evaporator to reduce activity levels before being discharged to Lake Erie.

The borated water tank and the primary water tank may contain significant quantities of tritium. The tanks are above ground, outside, and adjacent to the facility and they are not protected against tornadoes. The primary water storage tank is not protected against earthquakes. The applicants determined the maximum offsite doses that could result from tank ruptures, that might result from earthquakes, floods, or tornadoes. The applicants provided an analysis (pgs.2.4-4 and 11.4-1 of the PSAR) which concludes that a dose to the whole body less than 0.02 Rem would result from the abrupt release of tank water to Lake Erie. The highest dose would occur at Camp Perry (2.8 miles away) where the nearest potable water intake is located. We determined that an offsite dose of 0.05 Rem to the whole body could result from an incident using the following assumptions: (a) the larger tank (360,000 gallons) was full of water with the highest tritium concentration assumed by the applicant (9 μCi/cc), (b) 10% of the water in the tank became dispersed in the air, (c) atmospheric diffusion resulted from Type F meteorological conditions, with a 1 m/sec wind speed, taking into account a building wake effect, and (d) the breathing rate of an individual at the site boundary was $3.47 \times 10^{-4} m^3$/sec.

Based on these analyses, we conclude that the design of these storage tanks is acceptable.

8.2.2 Gaseous Waste System

Gaseous waste is collected from the liquid waste by a degasifying process and from the cover gas of liquid waste storage tanks. The gaseous waste is collected and compressed for storage in three decay tanks for 30-60 days to permit decay of the radioactivity prior to discharging to the atmosphere through a high efficiency particulate air filter. The gaseous waste is monitored continuously during a discharge to the atmosphere with automatic shutoff of discharge when activity levels exceed preset values to assure that 10 CFR Part 20 limits are not exceeded.

8.2.3 Radwaste Systems Monitoring and Structures

Samples of radwaste gases and liquids can be collected at points within and at the end of the radwaste systems. Instruments will be provided to monitor and record the radiation from the waste being discharged, and to activate alarms and control valves if the radiation levels exceed preset values.

The radwaste system is in the auxiliary building which is a Class I structure. Surge and gas decay tanks are designed to Class I standards. All other radwaste system equipment and piping is Class II. Liquids released by the rupture of Class II radwaste tanks will be contained within the Class I auxiliary building.

8.2.4 Conclusion

On the basis of our review of the information presented in the PSAR, and the design and design criteria established for the liquid, gaseous, and solid radioactive waste systems and associated instrumentation, we conclude that these systems will provide adequate protection against accidental releases sufficient to meet the 10 CFR Part 20 requirements and that the decontamination factor capability provided can be used to reduce the radioactivity released to the environs to levels considered as low as practicable.

8.3 Spent Fuel Storage

The spent fuel storage pool is also located in the Class I auxiliary building. The reinforced concrete wall and roof of the auxiliary building will have a minimum thickness of 18 inches. The fuel cask loading pool is separated from the fuel storage area to prevent dropping of the cask in the fuel storage area. The applicants have indicated in Table 2 on page 12.3.7-3 of the PSAR that the fuel storage pool will be protected against fuel element damage or loss of water that might be produced by a turbine-generator missile.

The emergency ventilation filter system can provide iodine filtration capability for the fuel pool storage area.

We have reviewed the proposed design and conclude that it is acceptable.

8.4 Intake Canal

The lowest water level for Lake Erie was calculated by the applicants to be 555.85 feet above mean sea level. The intake canal will be dredged to a depth of 554 feet above mean sea level (MSL) on shore and to 557.6 feet MSL offshore.

The intake canal will be designed as a Class II structure except for approximately a 700-foot length of the intake canal connected to the intake pump structure, which will be designed to Class I seismic requirements. The intake canal is approximately 7000 feet long, 200 feet wide at bottom, and has a bank slope of 1:3. Normal flow through the canal will be approximately 30,000 gpm. This flow is required to provide makeup and blowdown water for the closed cooling tower loop and also once-through service water.

The Class I portion of the intake canal provides 7.7 million gallons of cooling water between the water level of 560 feet MSL and the bottom of the service water pump suction inlet. This 7.7 million gallons of cooling water plus 250,000 gallons of condensate storage water is sufficient to cool the plant from power operation to cold shutdown and to remove the decay heat for more than 60 days for either normal or accident conditions.

The intake canal will have screens to prevent debris from entering the plant cooling systems and will have deicing capability.

The applicants have indicated, and we agree, that adequate cooling water for removal of decay heat could be re-established within about 14 days in the event normal lake supply were cut off in the intake canal. Each of the three Class I (seismic) service water pumps and two Class I piping systems can provide the cooling requirement for removing decay heat.

We have reviewed the intake canal design criteria, and we conclude the event Lake Erie cannot be used to supply cooling water due to either a seismic event or extremely low lake water level.

8.5 Auxiliary Feedwater System

The auxiliary feedwater system will consist of two redundant steam-turbine-driven feedwater pumps. Each pump is sized to meet the steam generator feedwater requirement to remove the decay heat 40 seconds after a reactor trip from the ultimate power level of 2772 MWt. Backup to the auxiliary feedwater system supply (two 250,000 gal condensate storage tanks) is provided by the fire protection system and the service water system. All active components of the system are accessible for inspection during plant operation. The system will be tested periodically during operation.

We have reviewed the auxiliary feedwater system and conclude that it is acceptable.

8.6 Cooling Tower

The Davis-Besse facility will use a single hyperbolic natural draft cooling tower to dissipate heat loads from the condenser to the atmosphere. The water in this closed loop system is circulated from the main condenser, where it is heated by the turbine-generator steam discharge, to the cooling tower where the heat is released to the atmosphere by evaporation. Two redundant systems take water from the intake canal discharge into the cooling tower closed loop to replace water lost by evaporation, entrainment, and blowdown.

The cooling tower is of similar design to those previously reviewed and approved for the Three Mile Island Nuclear Power Station Units 1 and 2. The cooling tower will be approximately 450 feet high and 485 feet in diameter at the base. The exterior shell will be steel-reinforced concrete. The tower will be located more than 450 feet from the reactor building so that failure of the tower structure would not affect the safety of the plant.

The blowdown from the closed cooling loop will be mixed with other once-through cooling water and discharged into Lake Erie. This discharge water will also provide dilution for liquid radioactive waste discharged from the plant.

We conclude the proposed cooling tower closed loop system design is acceptable.

9.0 Accident Analyses

9.1 General

In order to assess the safety margins of the plant design, the following plant operating transients were considered by the applicants: rod withdrawal during startup and from power, moderator dilution, loss-of-coolant flow, loss of electrical load, and loss of AC power. The applicants' criterion for detailed design of the reactor control and protection system, is that the system take corrective action automatically to prevent fuel damage for any of these transients.

Based on our evaluation of the information submitted by the applicants and our evaluations of other PWR designs at the operating license stage, we conclude that the Davis-Besse protection and control system design is such that these transients can be terminated without the core and reactor coolant boundary being damaged, and with no off-site radiological consequences.

The applicants and we have evaluated the consequences of potential accidents such as would result from rupture of the gas decay tank, a steam line break, and steam generator tube rupture. For each of these accidents, the applicants' calculated radiological doses are less than the 10 CFR Part 100 guideline values.

On the basis of our experience with the evaluation of the steam line break and steam generator tube rupture accidents for PWR's of similar design we have concluded that the consequences of these accidents can be reduced by limiting the permissible primary and secondary coolant system radioactivity concentrations. At the operating license stage we will require Technical Specifications on the primary and secondary system radioactivity concentrations such that the potential 2-hour doses at the exclusion radius that we calculate for these accidents will be well within Part 100 guidelines. Recently approved Technical Specifications for operating PWR's include limitations necessary to reduce the calculated consequences of these accidents to this level.

The calculated radiological consequences of the fuel handling accident, the control rod ejection accident, and the loss-of-coolant accident are discussed in the following sections.

We have also considered the accidents with lesser consequences than the fuel handling, the control rod ejection accident and the loss-of-coolant accidents in evaluating the capability of the engineered safety features, including containment, to protect the public from potential though improbable accidental release of fission products. Our review has considered the same design basis accidents as those evaluated for other PWR's which have been granted construction permits recently.

9.2 Loss-of-Coolant Accident

The design basis loss-of-coolant accident for the Davis-Besse Station is similar to that postulated for other PWR's. A double-ended break in the largest pipe (14.1 ft^2) in the reactor coolant system was assumed. The emergency core cooling system discussed in Section 6.1 is designed to limit fuel cladding temperature to well below the melting point in the event of such an accident and to limit fission product release from the fuel. Nevertheless, we require that the containment and its associated engineered safety features be capable of limiting calculated offsite doses to within the 10 CFR Part 100 guideline values, assuming significant releases of fission products from the fuel.

In calculating potential offsite doses, we used meteorological assumptions which are conservative. These assumptions are: wind speed of 1 meter per second, Pasquill Type "F" meteorology, and a ground release giving credit for some building wake effect.

We conservatively assume that 100% of the noble gases and 50% of the halogens in the core fission product inventory are released from the fuel and 50% of the iodine fission products released from the fuel is available for leakage from the containment. The radioactive iodine is assumed to consist of 10% in the form of organic iodides, 5% as particulates, and 85% as inorganic iodine. The containment is assumed to have a leak rate of 0.5%/day for the first 24 hours following the accident and 0.25%/day for the remaining course of the accident.

The calculated two-hour thyroid dose at the closest site boundary (2400 feet) is 140 Rem. The calculated offsite doses resulting from this design basis loss-of-coolant accident are well below the 10 CFR Part 100 guideline values.

9.3 Refueling Accident

Fuel assemblies are handled and stored under water after removal from the reactor. During refueling operations the spent fuel storage pool area will be ventilated by the normal ventilation system. In the event radiation is detected in the fuel storage pool area the ventilation is automatically switched to the emergency ventilation system which has charcoal filters to remove radioactive iodine prior to release to the environment at approximately the 240 foot elevation.

For the postulated fuel handling accident, we assumed that a fuel assembly is dropped during the handling operation resulting in damage to 208 fuel pins (all fuel pins in one fuel assembly) and subsequent release of the gaseous fission products contained in the annulus between the UO_2 fuel pellet and the zircaloy cladding. In our evaluation of this accident, we assume the fuel assembly had been dropped 72 hours after shutdown of the core in which it had been operated and that the fuel assembly had generated 1.8 times the average fuel assembly power during the time it was in the reactor.

We assume that 10% of the iodine fission products in the damaged fuel pins are released into the storage pool water and that 10% of the iodine released into the pool water escapes into the building atmosphere. We also assume that 20% of the noble gas in the damaged fuel pins escapes directly to the building atmosphere with no retention in the storage pool water. The fission product gases which escape to the building atmosphere are exhausted through the emergency ventilation system which has two activated charcoal filters for removal of radioactive iodine prior to release to the environment at an elevation of about 240 feet. The emergency ventilation system charcoal filters consist of two charcoal filters in series. We assume these iodine filters can reduce the iodine concentration by a factor of 0.05 and the meteorological conditions are the same as assumed in the loss-of-coolant accident analysis.

We calculate that the two-hour doses at the site boundary are 65 Rem to the thyroid and 2 Rem to the whole body which are well below the 10 CFR Part 100 guideline values.

9.4 Rod Ejection Accident

Our evaluation of the rod ejection accident assumes the ejection of a single control rod from the reactor core. The reactivity added to the core for this accident is based upon the maximum single control rod worth and the resulting power level transient effects on the fuel rod clad temperature. For a rod ejection accident occurring with the reactor operating at the ultimate power level of 2772 MWt the analysis predicts a peak fuel enthalpy of about 170 calories per gram, a peak thermal power of 126% of full power and that 4.1% of the core fuel rods will experience departure from nucleate boiling (DNB). In analyzing the release of fission products from the fuel rods we conservatively assume that any fuel rod which experiences DNB will undergo failure of the fuel rod cladding.

Using these assumptions we calculate that the two-hour doses at the site boundary (2400 feet) would be 70 Rem to the thyroid and less than 5 Rem to the whole body, which are well below the 10 CFR Part 100 guideline values.

10.0 CONDUCT OF OPERATION

10.1 Technical Qualifications

The Davis-Besse Power Station will be co-owned by the Toledo Edison Company and the Cleveland Electric Illuminating Company. The Toledo Edison Company will have the responsibility for the overall design, construction and operation of the Davis-Besse plant. The Bechtel Company (Gaithersburg, Maryland) will perform the architect-engineering services and the Bechtel Corporation will provide construction management services. (In subsequent discussions both Bechtel Company and Bechtel Corporation are referred to as Bechtel.) Babcock and Wilcox will supply the nuclear steam supply system. The turbine generator will be supplied by the General Electric Company.

The applicants have experience in the design, construction, and operation of fossil-fueled electric power stations and have participated as members of the Atomic Power Development Associates (APDA) in the design, development and operation of the fast breeder reactor, the Enrico Fermi Atomic Power Plant.

The Toledo Edison Company's Engineering staff consists of 90 employees holding engineering degrees of various disciplines.

Bechtel has been actively engaged in design and construction of nuclear plants and is currently engaged in the design and construction of 23 BWR and PWR nuclear power plants.

Babcock and Wilcox is currently engaged in the design, construction, and installation of 10 pressurized water nuclear steam supply systems.

On the basis of the above considerations and our contact with project personnel during our review, we have concluded that the applicants and their contractors, collectively, are technically qualified to design and construct the proposed Davis-Besse Nuclear Power Plant.

10.2 Operating Organization

The operating organization for the Davis-Besse Plant will consist of 57 full-time employees of The Toledo Edison Company. Functional responsibilities are divided into four groups, each headed by a supervisor reporting to the Plant Superintendent. The Operations Group consists of 25 men who will conduct operations. The three remaining groups consist of Maintenance (13 men), Technical (9 men), and Chemical and Health Physics (5 men). The applicant proposes a normal shift of five operations personnel, who will also receive training in chemistry and health physics. The five-man shift will consist of one shift supervisor (senior operator's license), one plant control operator (licensed operator), one reactor operator (licensed operator), one major equipment operator, one auxiliary equipment operator. In addition, six other members of the operating organization will have senior operators' licenses. We have concluded that the proposed shift size and composition are acceptable.

10.3 Training

Toledo Edison has submitted in the application the scope and schedule of each phase of a plant operations training program which is acceptable. Most of the men selected for training will come from existing positions within the company and will have experience in fossil-fired plants. The training program consists of six phases. Phase one consists of nuclear theory that will be taught at Toledo Edison. Phase two, PWR observation, will consist of three months at an operating PWR. The Plant Superintendent, Operations Engineer, Maintenance Engineer, all technical staff engineers, technical leader, and all shift supervisors will take part in this phase. Phase three, PWR Technology, will be presented by Babcock and Wilcox at their Lynchburg facility. Phase three will require a period of six weeks for all personnel who received phase two training. The plant control operators and the reactor operators will receive this course prior to reporting for on-site training. Phase four, PWR operations, will be conducted at the Lynchburg facility. This course consists of six weeks of classroom and operational training on the B&W plant simulator, two weeks of training on the Lynchburg Pool Reactor and four weeks of shift operation on the simulator. The course will be completed by the Plant Superintendent, Operations Engineer, Technical Engineer, Results Engineer, one general engineer, technical leader, and all shift supervisors. Phase five, On-the-Job-Training, will be at Davis-Besse and will last for approximately eight months. Phase site. As recommended in the ACRS letter, the applicants will establish prior to operation of the plant a formal procedure to assure prior notification of changes in the training flight paths that might result in closer approach of aircraft to the plant. Considering the distance from the site, the type of aircraft, and frequency of usage, the applicants concluded, and we agree, that no additional protection for the facility is required with regard to aircraft impact.

All changes to the size of the three restricted areas and to the general types of activity conducted within these Areas are controlled by the Corps of Engineers. Public Notices afford the public and the applicants ample opportunity to question the consequences of proposed actions on the plant. The applicants and the staff will be kept informed of any changes in the future usage of these restricted areas.

As recommended in the ACRS letter, the applicants will also establish formal procedures with the appropriate authorities that will assure the applicants prior knowledge of planned ordnance activity that may affect the operation of the Davis-Besse Nuclear Power Stations.

We conclude that there is reasonable assurance that the activities conducted in these restricted areas are subject to sufficient controls and the design of the proposed plant is adequate to prevent the significant release of radioactivity as a result of these activities.

4.0 NUCLEAR STEAM SUPPLY SYSTEM

4.1 Design Changes

The mechanical, nuclear, thermal and hydraulic design of the Davis-Besse reactor is the same as those we have reviewed previously and approved for B&W nuclear steam supply systems, such as Three Mile Island Nuclear Power Station Units 1 & 2, except for the following changes: (a) the design power level has been increased from 2452 MWt to 2633 MWt, (b) the internal core barrel vent valves have been eliminated, and (c) the pressure vessel will be supported by its recirculation line nozzles.

The Davis-Besse nuclear steam supply system is designed for a rated power level of 2633 MWt. This power level is approximately 7.4% higher than those approved previously for B&W systems. In Section 3 of the PSAR, the applicants present information and changes in the core design to support this increase in the rated power level.

Three principal design changes have been made in connection with the increase in the rated power level for the core: (1) the installation of burnable poison rods to assure that the moderator temperature coefficient of reactivity will be negative throughout the core life, (2) a modification of the Mark II canless-type fuel assembly that reduces the ratio of the flux peak in the hottest fuel pin to that of the average fuel pin, and (3) the removal of the internal vent valves that results in an increase of about 4.6% in the coolant flow through the core. (In the design using vent valves, one vent valve is assumed to fail to seat properly and this results in 4.6% of the flow bypassing the core.)

We have reviewed these design changes and conclude that they are adequate to justify the increase in the rated power level without reducing the previously approved margins of safety for the core performance.

The Davis-Besse nuclear steam system is the first B&W design that will not have internal vent valves because of the change in elevation of the steam generators relative to the pressure vessel. In previous B&W plants, valves were installed inside the reactor pressure vessel to permit pressure equalization between the inlet and outlet plenums. These valves were unidirectional vent valves similar in design to check valves. These valves served to eliminate the possibility of creating a back pressure that could prevent core flooding in the event of a cold leg pipe rupture in the recirculation loop.

We have reviewed the proposed design elevations and conclude that they are adequate to eliminate the need for the internal vent valves.

4.2 Reactor Internals & Pressure Vessel Supports

The reactor internals will be designed to withstand normal design loads of mechanical, hydraulic and thermal origin, including those resulting from the operating basis earthquake and from anticipated six, Specialist Schools and Training, will include courses in nuclear engineering, fuel management, instrumentation, radiation protection, radiochemistry and maintenance of major equipment. Based on the foregoing, we have concluded that the training program proposed by the applicants is satisfactory.

10.4 Emergency Plan

The applicants have provided an outline of a plan to handle a radiological emergency at Davis-Besse. The plan delineates organization and contacts, communications and alarms, classification of emergencies and offsite assistance, including medical assistance. Detailed procedures, which provide all personnel with a preplanned course of action for a variety of postulated accidents will be prepared by the applicants. We have concluded that the plan outline provides an acceptable framework for further development of the plan into comprehensive, overall emergency preparedness procedures.

10.5 Initial Tests and Operations

Davis-Besse operational personnel will conduct all testing. Technical direction and assistance will be provided by Babcock and Wilcox Company. We will review the testing program in more detail at the operating license stage of review.

Conclusions

On the basis of our review of the information submitted by the applicants, we conclude that the applicants have the requir qualifications to design and construct the proposed plant. The applicants proposed training program and emergency plan outline are acceptable.

11.0 QUALITY ASSURANCE (QA)

We have reviewed the quality assurance program presented by the applicants for the design, construction and operation of the Davis-Besse Nuclear Power Station with regard to the applicants' stated objective of meeting the intent of the AEC "Nuclear Power Plant Quality Assurance Criteria," Appendix B of 10 CFR 50. The Davis-Besse Quality Assurance Program is described in the PSAR Volume I, Appendix 1B, Amendment No. 2.

The Toledo Edison Company (TEC) will have the ultimate responsibility for the QA program. Bechtel, acting as agent for TEC, will be responsible for the day-to-day implementation of the QA program. Babcock and Wilcox Nuclear Power Generation Department (NPGD) will have the day-to-day responsibility for the nuclear steam supply system.

The TEC organization has an experienced Quality Assurance Engineer (QAE) reporting directly to the Vice President in charge of the Power Group, who has the ultimate responsibility for the Davis-Besse plant. The QAE has prepared a Toledo Edison Quality Assurance Manual which complies with the AEC criteria and provides written procedures for TEC's implementation of the QA program. The manual incorporates by reference the QA manuals of the principal contractors. A description of the duties of the Toledo Edison QAE and Engineering Staff are addressed in the PSAR. The QAE will have the authority to stop work in the event of nonconformance with drawings, specifications and/or procedures established for major critical structures, substructures, systems and subsystems.

Bechtel as the architect-engineer and construction manager has prepared six manuals to provide instructions, guidelines, procedures, check lists, and appropriate documentation forms to assure implementation of the QA program. All design drawings and calculations originating within the Bechtel organization will receive at least one internal independent review and check prior to releasing to TEC where it receives an additional review and approval before issuance for procurement.

TEC and the Bechtel Quality Assurance Coordinator will audit the Bechtel QA program to assure that it is being implemented.

Babcock & Wilcox as supplier of the nuclear steam supply system (NSSS) has established a Quality Assurance Program to cover the areas of NSSS design, manufacturing, procedures, specifications and erection. The B&W Nuclear Power Generation Division Quality Assurance group administers the QA program and reports directly to the Vice President in charge of the NPGD. B&W implements the B&W QA program by use of standards and written procedures. Auditing of the B&W QA/QC to assure the QA program is being implemented will be performed periodically by TEC assisted by Bechtel when requested by TEC.

The Toledo Edison Company, assisted by the two prime contractors, Bechtel and B&W, will provide specifications, procedures, and auditing necessary to assure that the subcontractors responsible for construction and manufacturing of critical structures and components will meet the requirements and intent of the "Nuclear Power Plant Quality Assurance Criteria," Appendix B of 10 CFR 50 throughout the design, construction, and operation of this plant.

The Division of Compliance has made an initial inspection of the applicants' quality assurance program and has verified that the program is being implemented in the following areas:

a. The applicants have developed a manual for guidance of their staff in performance of QA functions. The manual incorporates by reference the QA manuals of the principal contractors.
b. The applicants intend to rely on their contractors for day-to-day implementation of the requisite QA and QC activities.
c. The applicants plan to perform a limited design review with their own staff. They have developed an audit program to provide assurance that their contractors are implementing the QA activities described in their internal manuals.

d. The applicants have developed a schedule and procedures for audit which are acceptable.

e. At the present time the applicants' QA staff consists of a single individual. The applicants have indicated that the QA staff will be increased as construction progresses.

Based on our discussions with the applicants, Bechtel, and B&W and the information contained in Appendix 1B of the PSAR, we conclude that the overall Quality Assurance Program for the Davis-Besse Nuclear Power Station is acceptable.

12.0 RESEARCH AND DEVELOPMENT

A number of areas have been identified for which further analytical, experimental, design development, or testing efforts will be performed to substantiate the adequacy of the pressurized water reactor design. Specific areas requiring attention prior to completion of the design are summarized below.

12.1 Core Stability and Power Distribution Monitoring

This program is required to establish the stability characteristics of the core and demonstrate that the partial length control rod system can control any core instability to assure the desired operation of the plant. The B&W program on xenon oscillations consists of the following analyses:

1. Modal analysis
2. One and two dimensional digital analysis
3. Three dimensional analysis

The results of the modal analysis, performed by B&W have been submitted as Topical Report BAW-10010, "Stability Margin for Xenon Oscillations - Modal Analysis." A one-dimensional digital analysis will be used to determine the validity of the modal analysis approach. The results of the one-and two-dimensional digital analyses will be submitted as a topical report shortly. The three-dimensional digital analysis results will be submitted for our review later this year. The entire program is scheduled for completion well before the scheduled startup of the Davis-Besse facility.

Information is needed to demonstrate that sufficient information can be derived from external detectors alone to determine the power distribution after the reactor has been operated. The flux distribution will be perturbed because the axial burnup is not uniform, and because of the effects of fuel or control rod replacement or errors in fuel element position or enrichment. In addition, little experience exists with operation of large power reactors to ascertain how frequently out-of-core detectors should be recalibrated. If the planned R&D program does not produce convincing evidence that the out-of-core detection system is sufficient, we will require that a minimum number of in-core detectors, properly positioned throughout the core, be operable at all times when the reactor is operating at power.

12.2 Fuel Rod Clad Failure

B&W has initiated a study of fuel clad failure mechanisms associated with a loss-of-coolant accident that includes an evaluation of existing data and scoping tests on potential failure mechanisms. These tests consist of the following:

1. Eutectic formation - test data indicate that a liquid eutectic forms at temperatures above 1700°F at the point of contact between the stainless steel spacer grid and the zircaloy clad. The applicants report that no interference with emergency core cooling would result from this eutectic formation. The work in this area is complete and the results will be submitted for our review.

2. Brittle failure - clad specimens heated to 2300°F and quenched in room temperature water did not experience brittle failure. A reduction in ductility occurred but strength was not reduced. The applicants have reported that work in this area is complete. We are awaiting a report on the experiments.

3. Clad swelling - single rod tests have been run to investigate the effects of clad swelling, the heatup rate, internal pressure,

hydriding of zircaloy, and preoxidation of the cladding. The applicants have reported that results to date indicate that: (a) the low pressure tests produced a larger increase in diameter due to greater ductility at higher temperatures, (b) the lower heat rates produce greater swelling, (c) the hydrogen content plays no major role in the event of diametral swelling, (d) the preoxidation generally resulted in less swelling (On this basis, it was decided to delete the systematic study of preoxidation effects on swelling), (e) the perforations were randomly located on the cladding, (f) the failure time is extremely short, (g) the first point of swelling was not necessarily the one which ruptured or swelled the greatest. Multirod experiments are planned using oven heating. A 4x4 rod bundle will be heated in an oven with the four central rods pressurized.

The analytical study of fuel clad failure is in the planning stage. This program will consist of evaluation of the axial and radial temperature distributions throughout the core. The changes in flow channel resistance to flow were calculated and incorporated into the channel analysis. The program is designed on the basis that the major unknown is the amount and location of flow blockage that could result from clad deformation in a loss-of-coolant accident.

The multi-pin tests will provide data to determine the possible interaction between pins undergoing a temperature excursion. These data, coupled with the data resulting from completion of the FLECHT

Program (Full Length Emergency Cooling Heat Transfer Test) scheduled for completion this year, will provide further information on the capability of the emergency core cooling system to function as designed.

12.3 Once-Through Steam Generator

B&W has conducted tests on 7-tube, 19-tube and 37-tube mockups of the once-through steam generator in the following areas: heat transfer and heat capacity, control and dynamic response, structural integrity under normal and accident conditions, vibration, feedwater heating by spray nozzles, tube leakage propagation, and simulated steamline failure tests. This program is complete and is reported in BAW-10002. We are reviewing this report at the present time and have identified areas where further justification will be required before we can accept the B&W conclusion that the tests substantiate the design. Our discussions with B&W are being conducted in the course of our review of the Oconee reactor.

12.4 Control Rod Drive Test

The B&W control rod drive test program to develop the roller-nut type drive has been completed and is reported in Topical Report BAW-10007, "Control Rod Drive System Test Program." We are reviewing this report. Several areas have been identified to B&W where more details of the tests results should be addressed. Review of the areas is continuing in the course of our review of the Oconee plant and should be completed before the end of 1970.

12.5 Self-Powered Detector Tests

The B&W research and development program for self-powered detectors is completed (longevity testing is continuing) and is reported in BAW-10001, "Incore Instrumentation Test Program." The testing of the self-powered detectors has indicated that this system is capable of measuring neutron flux in a PWR environment with a relative accuracy of ±5 percent over a three year time span. This device has an inherently large time constant and is not used in any direct safety actions. As indicated in Section 12.1 of this Safety Evaluation, if out-of-core detectors are not capable of detecting core instability, at the operating license review stage we will establish the minimum number of incore instruments that must be operable when the reactor is operated at rated power.

12.6 Core Thermal & Hydraulic Design

B&W is conducting a research and development program for heat transfer and fluid flow investigations. The requirements of the experimental programs are developed from the thermal and hydraulic core design limits set forth in Section 3 of the PSAR. A topical report, BAW-10012, "Reactor Vessel Model Flow Test" is currently being reviewed. We will continue to review these matters to assure that sufficient safety margin is available to prevent events which could cause departure from nucleate boiling and subsequent fuel failures.

In addition, analyses described in Section 6.1 of the PSAR are necessary to assure that the ECCS will provide sufficient cooling to limit the calculated maximum clad temperature to below 2300°F. B&W is currently reanalyzing the LOCA and ECCS capability using a more sophisticated code (Flash 2.5). The applicants indicated this analysis using the Flash 2.5 code will be completed in early 1971.

12.7 Blowdown Forces on Core Internals

The stresses and deflection of the reactor internals are being analyzed by B&W for the nozzle supported pressure vessel. This analysis for the skirt supported vessel is reported in topical report BAW 10008, "Reactor Internals Stress and Deflection Due to a Loss-of-Coolant Accident (LOCA) and Maximum Hypothetical Earthquake." The results reported in this topical report are currently being reviewed. B&W will submit a topical report for the nozzle supported pressure vessel and include those additional matters of concern developed during our review.

12.8 Conclusion

Based on our review of the research and development programs proposed, we conclude that these programs are timely, are reasonably designed to accomplish their respective development objectives, will provide adequate information on which to base analyses of the design and performance, and should lead to acceptable designs for the systems involved.

13.0 REPORT OF ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

The ACRS completed its review of the application for a construction permit for the Davis-Besse Nuclear Power Station at a meeting held on August 13-15, 1970. A copy of the ACRS letter, dated August 20, 1970, is attached as Appendix B. The letter contains several recommendations and notes several items to be resolved by the applicants and the staff during construction.

These matters have been considered in our evaluation in the sections indicated: suitable arrangements should be made to be informed of any changes in the restricted area activities (section 3.7); formal arrangements should be made to maintain continuing awareness of the operational patterns of military aircraft using Area III (section 3.7); preoperational vibration testing should be employed for the primary system and instrumentation for inservice monitoring for excessive vibration or detection of loose parts in the primary system should be developed (section 4.5); the containment design pressure should be reviewed to assure that an adequate margin of conservatism exists (section 5.3); hot process pipe penetrations should have an independent review of the actual design (section 5.2); primary protection for controlling hydrogen concentration within the containment following a loss-of-coolant accident should utilize a hydrogen control method with purging utilized only as a backup method (section 5.9); additional evidence should be provided using improved multi-node analytical techniques to assure the emergency core cooling system is capable of limiting core temperatures to acceptably conservative values (section 6.1); the study of means to prevent common failure modes from negating scram action, and of design features to make tolerable the consequences of failure to scram during anticipated transients should be accelerated (section 7.7); instrumentation should be provided for prompt detection of the gross failure of a fuel element and core exit thermocouples should be used as aid to reliable operation and as an additional method of detecting behavior anomalies (section 7.8); plans for operation of waste treatment equipment should minimize the quantities of radioactivity discharged, and provisions should be made to achieve rapid dispersion in the lake (section 8.2).

The ACRS concluded in its letter that these items "can be resolved during construction and that, if due consideration is given to these items, the Davis-Besse Nuclear Power Station can be constructed with reasonable assurance that it can be operated without undue risk to the health and safety of the public."

14.0 COMMON DEFENSE AND SECURITY

The application reflects that the activities to be conducted at the Davis-Besse Nuclear Power Station would be within the jurisdiction of the United States and all the directors and principal officers of the applicants' organization are citizens of the United States.

The applicants are not owned, dominated or controlled by an alien, a foreign corporation or a foreign government. The activities to be conducted do not involve any restricted data, but the applicants have agreed to safeguard any such data which might become involved in accordance with the requirements of 10 CFR Part 50. The applicants will rely upon obtaining fuel as it is needed from sources of supply available for civilian purposes, so that no diversion of special nuclear material for military purposes is involved. For these reasons and in the absence of any information to the contrary, we have found that the activities to be performed will not be inimical to the common defense and security.

15.0 FINANCIAL QUALIFICATIONS

Based upon the evaluation of the financial information presented in the application and Amendment No. 10 thereto, it is the staff's opinion that The Toledo Edison Company and The Cleveland Electric Illuminating Company are financially qualified, as their interests may appear, to design and construct the nuclear generating station to be known as the Davis-Besse Nuclear Power Station.

The estimated cost to construct the facility, including the first core fuel, is $305,742,000 of which $266,102,000 is for the nuclear production plant, $14,030,000 is for the associated transmission and general plant and $25,610,000 is for the nuclear fuel inventory for the first core. Although the estimated costs of plant construction are slightly higher than previous similar plants, it is our opinion that the estimate should be amply sufficient to cover all applicable costs and the fuel requirements for the first core.

The Davis-Besse Station will be owned and financed by the applicants as tenants in common without right of partition in the following percentages: Toledo Edison, 52.5% and Cleveland Electric, 47.5%. Each applicant will provide its own share of the funds required as part of its normal construction program (e.g., retained earnings, depreciation accruals, sale of debt and equity securities).

An analysis of the applicants' financial statements over the past several years indicates, for each company, a strong financial position, sound financing, adequate resources and a high level of earnings. This analysis, together with the reasonable assumption that such earnings will continue and each applicant's high credit and bond ratings, supports the conclusion that each applicant will be able to obtain the funds from the sources normally used in the past for financing its normal construction program. A detailed evaluation is contained in Appendix H.

16.0 CONCLUSIONS

Based on the proposed design of the Davis-Besse Nuclear Power Station, on the criteria, principles and design arrangements for systems and components thus far described which include all of the important safety items, on the calculated potential consequences of routine and postulated accidental releases of radioactive materials to the environs, on the scope of the development program which will be conducted, and on the technical competence of the applicants and the principal contractors, we have concluded that:

1. In accordance with the provisions of paragraph 50.35(a), 10 CFR Part 50 and paragraph 2.104(b) 10 CFR 2:

   a. The applicants have described the proposed design of the facility including, but not limited to, the principal architectural and engineering criteria for the design, and have identified the major features or components incorporated therein for the protection of the health and safety of the public;

   b. Such further technical or design information as may be required to complete the safety analysis and which can reasonably be left for later consideration, will be supplied in the final safety analysis report;

   c. Safety features or components, if any, which require research and development have been described by the applicants and the applicants have identified, and there will be conducted, a research and development program reasonably designed to resolve any safety questions associated with such features or components; and

   d. On the basis of the foregoing, there is reasonable assurance that (i) such safety questions will be satisfactorily resolved at or before the latest date stated in the application for completion of construction of the proposed facility, and (ii) taking into consideration the site criteria contained in 10 CFR Part 100, the proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public.

2. The applicants are technically qualified to design and construct the proposed facility;
3. The applicants are financially qualified to design and construct the proposed facility; and
4. The issuance of a permit for the construction of the facility will not be inimical to the common defense and security or to the health and safety of the public.

APPENDIX A

CHRONOLOGY OF

REGULATORY REVIEW OF DAVIS-BESSE CONSTRUCTION PERMIT APPLICATION

Application for Construction Permit filed	August 1, 1969
Initial meeting with Toledo Edison Company and Bechtel	September 10, 1969
Technical meeting to review site-related matters	November 7, 1969
Technical meeting to review faciltiy design	December 17, 1969
Applicants filed Amendment No. 1 correcting errors in PSAR, changes in building foundations, and methods of treating solution cavities.	December 17, 1969
Meeting with Toledo Edison Company, Bechtel, and Babcock & Wilcox to discuss Davis-Besse Quality Assurance Program.	January 28, 1970
Request for additional information submitted to applicants.	February 12, 1970
Amendment No. 2 containing description of Davis-Besse Quality Assurance Program and changes in seismic design for increasing the operating basis earthquake horizontal acceleration from 0.06g to 0.08g.	March 2, 1970
Meeting with applicants to review structural and critical components, seismic and tornado design bases and methods of analysis.	March 13, 1970
Meeting with applicants to discuss seismic response spectra and time-history accelerogram to be used for seismic design of Class I structures and components.	April 2, 1970
Amendment No. 3 containing applicants' response to February 12, 1970 request for additional information.	April 22, 1970
Amendment No. 4 containing documentation of matters agreed upon at the April 2, 1970 meeting.	April 30, 1970

Amendment No. 5 containing applicants' response to February 12, 1970 request for information and additional information on site geology and environmental program.	May 15, 1970
Technical meeting to discuss seismic response spectrum and time-history accelerogram.	May 19, 1970
Technical meeting to discuss site-related matters and applicants' Amendments Nos. 3 and 5.	May 20, 1970
Site visit by staff and ACRS Subcommittee	May 26, 1970
Request for exemption from provisions of Section 50.10(b) of 10 CFR Part 50 to permit certain construction work prior to issuance of a construction permit.	June 4, 1970
Amendment No. 6 containing seimsic design and clarification of matters discussed at May 20, 1970 technical meeting.	June 12, 1970
Amendment No. 7 describing exploration and verification procedures for possible solution cavities and fissures in site bedrock.	July 1, 1970
Technical meeting to discuss the flood protection level required for safe shutdown of the facility.	July 17, 1970
Amendment No. 8 describing flood protection and change to cooling tower as primary heat sink.	August 7. 1970
Amendment No. 9 establishing pipe whip criteria	August 13, 1970
ACRS Committee review with staff and applicants.	August 14, 1970
Amendment No. 10, updating of the applicants financial qualifications.	August 27, 1970
Exemption request granted for construction of foundations, walls and floors of the shield building and auxiliary building up to grade level (583 feet 6-inch elevation).	September 10, 1970
Amendment No. 11, applicants response to matters discussed in the Davis-Besse ACRS letter.	September 14, 1970

APPENDIX B

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

August 20, 1970

Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subject: REPORT ON DAVIS-BESSE NUCLEAR POWER STATION

Dear Dr. Seaborg:

At its 124th meeting, August 13-15, 1970, the Advisory Committee on Reactor Safeguards completed its review of the application by the Toledo Edison Company and The Cleveland Electric Illuminating Company for a permit to construct the Davis-Besse Nuclear Power Station. A Subcommittee met to review the project on May 26, 1970, at the site and in Toledo, Ohio, and on August 4, 1970, in Washington, D. C. During its review, the Committee had the benefit of discussions with representatives and consultants of the applicants, the Babcock and Wilcox Company, the Bechtel Corporation, and the AEC Regulatory Staff. The Committee also had the benefit of the documents listed.

The plant will be located on the southwestern shore of Lake Erie approximately 21 miles east of Toledo, Ohio. The nearest population centers are Toledo and Sandusky, Ohio, each about 20 miles from the site, with populations in 1960 of 379,000 and 32,000, respectively. The city of Fremont, Ohio, with a 1960 population of about 18,000, is located 17 miles from the site. The minimum exclusion distance is 2400 feet and the low population zone distance is two miles. Approximately 3200 people live within five miles of the site.

Camp Perry, an Ohio National Guard facility, is located on Lake Erie about five miles east of the site. This installation is used during a short period each year for target practice with small arms and with 40-mm. anti-aircraft shells armed only with a small destruct charge. At the Erie Industrial Park, about three to four mil[illegible] [illegible]t of the site, Cadillac Gage Company is engaged in testing ordnance equipment firing 120-[illegible]. mortar shells with a maximum range of about two miles. All fi[illegible]g from both locations is directed into restricted areas in Lake Erie. The applicants have provided studies which demonstrate that none of the projectiles now being fired from these installations could penetrate the heavy reinforced concrete structures provided to protect the essential portions of the plant. The Committee recommends, however, that the applicants and the Regulatory Staff make suitable arrangements to be informed of any changes in these activities so that their possible effect on the safety of the plant may be evaluated.

An area in Lake Erie about ten miles north of the site is used by aircraft from the Selfridge Air Force Base in Michigan as an Anti-Submarine Warfare practice area and by the Lockbourne Air Force Base at Columbus, Ohio, as an impact area for automatic weapon firing from aircraft. The applicants have been given assurance by officials of the Department of Defense that military aircraft enroute to or from this area will not be routed closer than ten miles from the site. The Committee believes that this arrangement reduces, to acceptably low levels, the probability of an aircraft striking the plant, but recommends that formal arrangements be made to enable the applicants and the Regulatory Staff to maintain continuing awareness of the operational patterns of military aircraft in this area.

The Davis-Besse plant will include a two-loop pressurized water reactor similar to those for the Midland units except that the internal vent valves have been eliminated by changes in the elevations of the steam generators to obviate their need. Since the proposed arrangement eliminates the possibility of coolant flow bypass through an open vent valve, the Davis-Besse reactor is designed for an initial core power level of 2633 MWt as compared to 2452 MWt for the Midland units.

The applicants stated that it will be possible to anneal the pressure vessel if this should become necessary at some time after operation is begun.

A suitable preoperational vibration testing program should be employed for the primary system. Also, attention should be given to the development and utilization of instrumentation for in-service monitoring for excessive vibration or loose parts in the primary system.

The containment consists of a steel vessel surrounded by a reinforced concrete shield building, with the annular space maintained at a slightly negative pressure and the air from this space exhausted through filters. This design is similar to that for the Prairie Island, Kewaunee, and Hutchinson Island plants, except that the free volume of the steel containment is much greater, nearly three million cubic feet. The Regulatory Staff should review the containment design pressure to assure that an adequate margin of conservatism exists.

Detailed criteria remain to be formulated by the applicants for the design of the penetrations for the hot process pipes which traverse the annulus between the two containment barriers. In view of the importance of these penetrations, criteria should be reviewed by the Regulatory Staff to assure adequate conservatism, and the applicants should arrange for an independent review of the actual design.

The Committee has commented in previous reports on the development of systems to control the buildup of hydrogen in the containment which might follow in the unlikely event of a loss-of-coolant accident. The applicants are studying various methods of coping with this problem, including purging and the use of catalytic recombiners. The Committee recommends that the primary protection in this regard should utilize a hydrogen control method which keeps the hydrogen concentration within safe limits by means other than purging. The capability for purging should also be provided. The hydrogen control system and provisions for containment atmosphere mixing and sampling should have redundancy and instrumentation suitable for an engineered safety feature. The Committee wishes to be kept informed of the resolution of this matter.

The applicants have stated that they will provide additional evidence obtained by improved multi-node analytical techniques to assure that the emergency core cooling system is capable of limiting core temperatures to acceptably conservative values. They will also make appropriate plant changes if further analysis demonstrates that such changes are required. This matter should be resolved during construction in a manner satisfactory to the Regulatory Staff. The Committee wishes to be kept informed.

The Committee recommends that the applicants accelerate the study of means to prevent common failure modes from negating scram action, and of design features to make tolerable the consequences of failure to scram during anticipated transients. The applicants stated that the engineering design would maintain flexibility with regard to relief capacity of the primary system and to a diverse means of reducing reactivity. This matter should be resolved in a manner satisfactory to the Regulatory Staff during construction. The Committee wishes to be kept informed.

The Committee believes that consideration should be given to the utilization of instrumentation for prompt detection of gross failure of a fuel element. Consideration should be given also to the use of core exit thermocouples as an aid to reliable operation and as an additional method of detecting behavior anomalies.

The applicants propose batch discharge of liquid wastes following treatment. Concentrations of radionuclides in the discharge will be kept well below 10 CFR 20 limits with positive dilution being provided from several equipment cooling water streams. Plans for operation of waste treatment equipment should be such as to minimize the quantities of radioactivity discharged, and provisions should be made to achieve rapid dispersion in the lake.

Other problems related to large water reactors have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports. The Committee believes that resolution of these items should apply equally to the Davis-Besse plant.

The Committee believes that the above items can be resolved during construction and that, if due consideration is given to these items, the Davis-Besse Nuclear Power Station can be constructed with reasonable assurance that it can be operated without undue risk to the health and safety of the public.

Sincerely yours,

Joseph M. Hendrie

Joseph M. Hendrie
Chairman

References:

1. Letter from Toledo Edison Company, dated August 1, 1969; License Application, Volumes 1, 2 and 3 of the Preliminary Safety Analysis Report (PSAR)

2. Volume 4 of the PSAR, dated April 16, 1970

3. Amendments 1 through 9 to License Application

APPENDIX C

Comments on

Davis-Besse Nuclear Power Station
Toledo Edison Company
Preliminary Safety Analysis Report
Amendment No. 3 dated April 16, 1970

Prepared by

Air Resources Environmental Laboratory
Environmental Science Services Administration
May 18, 1970

The emission of radioactive effluents to the free atmosphere is described as a controlled release through a vent on the reactor building roof 246 feet above the ground. A study by Martin /1/ showed that in such roof-top emissions, downwash of the plume immediately past the building complex was a prevalent condition. The photographs in figures 18, 19, and 28 of the report clearly show this condition. Consequently, it is our view that, as far as the site boundary and beyond is concerned, the emission should be treated as a ground source with an additional dilution factor because of building wake effect. We feel that the 20-ft wind level is the more appropriate data to use in this case, as opposed to the use of the 100-ft wind data by the applicant.

From the joint frequency distributions at the 20-ft level given on pages 2.1-4 to 2.1-21 covering $6\frac{1}{2}$ months of valid data (excludes entirely June through September), the frequency of moderately stable conditions, onshore winds (excludes only W and WSW winds), and wind speeds at or below 3 mph occurs 5 percent of the time. It is quite probable that the addition of the summer and early fall data would increase this percentage since for the Toledo Municipal Airport Data /2/ these months have the lowest monthly wind speeds of the year. Consequently, for the 2-hour release period we have assumed Type F diffusion, a 1.0 m/sec wind speed, and a cA factor of 1300 m^2 for the building wake effect.

Since the inversion persistence data in table 2B-23 is not jointly correlated with wind speed and direction, and the direction persistence in table 2B-24 is not correlated with diffusion category, we are unable to make a quantitative assessment of the 24-hour average concentration from the data presented.

On a seasonal basis the 20-ft wind data show that the maximum frequency of a wind in a particular direction was 19 percent of the time. Thus, for the 30-day release we have assumed that the "worst" month could have a 25 percent frequency in a particular direction equally divided among diffusion Types B, D, and F at 3, 3, and 2 m/sec, respectively, and averaged over the sector.

In summary, a comparison of the relative concentrations at the site boundary (730 m) as computed by ESSA and by the applicant as listed in table 2B-26 is as follows:

	ESSA	Table 2B-26
2-hour period	4.6×10^{-4} sec/m^3	2.2×10^{-4} sec/m^3
30-day period	1.4×10^{-5} "	1.5×10^{-6} "

Reference

/1/ Martin, J. E., "The correlation of Wind Tunnel and Field Measurements of Gas Diffusion Using Krypton-85 as a Tracer". U. of Michigan, Michigan Memorial Phoenix Project (MMPP 272), June 1965.

/2/ U. S. Dept. of Commerce, "Local Climatological Data, Annual Summary with Comparative Data, 1964, Toledo, Ohio.

APPENDIX D

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON, D.C. 20242

AUG - 4 1970

Mr. Harold Price
Director of Regulation
U.S. Atomic Energy Commission
7920 Norfolk Avenue
Bethesda, Maryland 20545

Dear Mr. Price:

Transmitted herewith in response to a request by Mr. Roger S. Boyd, is a review of the geologic and hydrologic aspects of the Davis-Besse Nuclear Power Station - AEC Docket No. 50-346 - proposed by the Toledo Edison Company and the Cleveland Electric Illuminating Company.

This review was prepared by H. H. Waldron and P. J. Carpenter and has been discussed with members of your staff. We have no objections to your making this review a part of the public record.

Sincerely yours,

W. A. Radlinski

Acting Director

Enclosure

cc: Walter G. Belter, AEC

The Toledo Edison Company and the Cleveland Electric Illuminating Company
Davis-Besse Nuclear Power Station

AEC Docket No. 50-346

The planned location of the Davis-Besse Nuclear Power Station is on the southwestern shore of Lake Erie, Ottawa County, Ohio. It is approximately 6 miles northeast of Oak Harbor, 9 miles northwest of Port Clinton and 21 miles east of Toledo. The ultimate output of the pressurized-water reactor is given as 2,772 megawatts thermal or 906 megawatts electrical. Water for once-through condenser cooling will be taken from and discharged to Lake Erie via canals approximately 7,000 feet in length.

Based on a review of the "Preliminary Safety Analysis Report" and "Amendments" and an independent check of available data and literature, it appears that the analyses of those hydrologic conditions noted below, and the geologic and foundation conditions pertinent to the site safety evaluation are adequate. Geologic conditions at the site were inspected on May 26, 1970.

Geology

The site is located in the Great Lakes section of the Central Lowland physiographic province. In the station area about 12 to 30 feet of Pleistocene and Holocene deposits, chiefly till and glaciolacustrine silty clay, overlie more than 2,500 feet of nearly flat-lying Paleozoic sedimentary rocks which, in turn, overlie a Precambrian crystalline basement complex.

Bedrock strata immediately underlying the site are reported to be part of the Bass Islands Group of Late Silurian age--about 80 feet of the Tymochtee Formation and more than 150 feet of the underlying Greenfield Formation. Both formations consist of thin-bedded to massive dolomite interbedded with some shale and limestone. The dolomitic strata commonly are hard, contain varying amounts of gypsum and anhydrite, and locally tend to be vuggy and cavernous. Salt beds have not been reported in any of the Upper Silurian evaporite formations in this part of Ohio.

Tectonically the site is situated on the east flank of the Findlay Arch, an ancient, broad, regional, northeast-trending anticlinal structure that separates two deep basins, the Michigan Basin on the northwest and the Appalachian Basin on the southeast. The trace of the axis of the Findlay Arch is inferred to be about 15 miles west of the site. With the exception of this arch, there are no other major geologic structures or faults known in the area that could be expected to localize seismicity in the immediate vicinity of the site. Despite the apparent geologic antiquity of the Findlay Arch, epicenters of several historic earthquakes appear to be associated with the Arch farther south. Consequently, it is assumed that earthquakes with similar intensities also could occur at any point along this major structure, including the vicinity of the site.

The applicant proposes to found the major plant facilities on the Tymochtee Formation. Normally this dense, hard dolomite should provide a competent foundation for the proposed facilities. However, because solution cavities occur in the formation in the site area, the applicant has proposed to undertake an extensive program of rock exploration, inspection, and remedial treatment in the foundations underlying the major plant structures. The proposed program of exploration and the criteria for remedial treatment should be adequate to assure that no solution cavities of a detrimental size would underlie any of the major plant structures.

Hydrology

Based on studies of the long-term and annual water-level variations of the lake, wind tide, transverse seiche, and wind waves, the flood-protection level of the plant will be established above the plant grade of 584 feet above mean sea level (International Great Lakes Datum, 1955). The analyses of extreme high- and low-water levels of Lake Erie were not reviewed. Extreme flooding on the Toussaint River (drainage area about 143 square miles), which flows easterly past the southern plant boundary, should not exceed the plant grade. At near normal lake levels the flood waters would spread over extensive areas of low-lying marshlands surrounding the plant before topping the several-mile-long beach ridge separating the lake from the marshlands. The maximum elevation of this ridge is less than 580 feet above mean sea level. When lake levels are extremely high, flood waters of the Toussaint River would flow into the marshland areas which would have been inundated by backwater from the lake. It should be noted that during periods of extreme flooding on the Toussaint River or when lake levels are very high, the plant would be surrounded by water, thereby denying land access to the site.

In the site vicinity all known wells supplying potable water are drilled into the Paleozoic sedimentary rocks underlying the 12 to 30 feet of glacial till and glaciolacustrine deposits. The nearest municipal supply is at Genoa, 16 miles southwest of the site. There are no large ground-water supplies available in Ottawa County; large surface-water supplies are taken from Lake Erie (Youngquist, 1949). Based on data obtained from extensive field explorations, the applicant has determined that (1) the water table in the glacial deposits is approximately 1 to 2 feet above the lake level, the hydraulic gradient is about 2 feet per mile toward the lake, and the water table fluctuates with the lake level; (2) the ground water in the underlying sedimentary rocks is under artesian pressure and the piezometric surface at the site corresponds to the lake level and has a gradient of about 2 to 3 feet per mile toward the lake; (3) the coefficient of permeability of the sedimentary rocks, as determined from pumping tests, ranged from 2×10^{-2} to 6×10^{-2} centimeters per second (coefficient of transmissibility, 1×10^{4} to 2×10^{4} gallons per day per foot). The coefficient of permeability of the glacial deposits has been estimated to be less than 10^{-6} centimeters per second. In view of the impervious nature of the glacial deposits and the flat slopes of the water table and piezometric surface, both of which are toward the lake, the applicant concludes that the risk of contamination of the ground-water supplies from the accidental spillage of radioactive liquids on the land surface or by infiltration to the ground is small. Unless the gradient of the piezometric surface were to be reversed as a result of large future ground-water withdrawals from the artesian aquifer, this conclusion appears to be reasonable.

The nearest potable water-supply intakes in Lake Erie are at Camp Perry and the Erie Industrial Park 3 miles east of the site. Port Clinton, 8 miles east, and Toledo and Oregon, 13 miles west, also utilize Lake Erie water for municipal supplies. The applicant states that radioactive liquid wastes will be released operationally with the circulating-water discharge in concentrations much less than the maximum permissible concentrations specified in 10 CFR 20. The applicant has made an analysis of the concentration of radioactivity which may be expected at the nearest water-supply intakes resulting from the rupture of the primary water storage tank with ensuing direct runoff to the lake, assuming no circulating-water discharge. Based on a theoretical mathematical model of a continuous point-source release, supported by Rhodamine B dye-dilution studies and observations of lake currents, the resulting short-term concentration of tritium at the intakes would be approximately 6.5 times as great as the average yearly maximum permissible concentrations specified in 10 CFR 20.

Because of the uncertainties regarding the photochemical decay of Rhodamine B dye and the absence of the warm-water discharge plume in the dye dilution tests and the model study, the results of the dilution study would not be directly applicable to operating conditions with a circulating-water discharge. Any estimates of dilution for such operating conditions should consider varying lake currents and the actual warm-water discharge of the plant.

Reference

Youngquist, C. V., 1949, Water in Ohio, summary and prospects 1949; Ohio Dept. Public Works, Water Resources Board Bull. 20.

DOCKET NO. 50-346

APPENDIX E

U.S. DEPARTMENT OF COMMERCE
Environmental Science Services Administration
COAST AND GEODETIC SURVEY
Rockville, Md. 20852

July 15, 1970

Reply to
Attn of: C23

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

Dear Mr. Price:

In accordance with your request, we are forwarding 10 copies of our report on the seismicity of Ottawa County, Ohio. The Coast and Geodetic Survey has reviewed and evaluated the information on the seismic activity of the area as presented by the Toledo Edison Company in the "Preliminary Safety Analysis Report," for use in the evaluation of the site of the proposed Davis-Besse Nuclear Power Station; and we hereby submit our conclusions concerning the seismicity factors.

If we may be of further assistance to you, please contact us.

Sincerely,

Don A. Jones
Don A. Jones
Rear Admiral, USESSA
Director, Coast and Geodetic Survey

10 Enclosures

IMAGE EVALUATION
TEST TARGET (MT-3)

6"

MICROCOPY RESOLUTION TEST CHART

IMAGE EVALUATION
TEST TARGET (MT-3)

6″

MICROCOPY RESOLUTION TEST CHART

REPORT ON THE SITE SEISMICITY
FOR THE
DAVIS-BESSE NUCLEAR POWER STATION

At the request of the Division of Reactor Licensing of the Atomic Energy Commission, the Seismology Division of the Coast and Geodetic Survey has evaluated the seismicity of the area around the proposed Davis-Besse Nuclear Power Station near Locust Point, Ottawa County, Ohio. The Survey has also reviewed a similar evaluation represented by the Toledo Edison Company in their "Preliminary Safety Analysis Report."

The seismic history of the area indicates that few earthquakes have occurred within 50 miles of the plant site but there have been considerably more, over 50 events, in the 50 to 100 mile range.

The areas of major consideration include the concentration of earthquakes near Anna, Ohio with intensities as high as VII - VIII and the occurrence of intensities IV - VI throughout the Great Lakes region of the Central Lowlands physiographic province. Major distant earthquakes such as the New Madrid, Mo. and the St. Lawrence Valley events, are also considered in the seismic evaluation of this site.

The report of the U. S. Geological Survey states that "Tectonically the site is situated on the east flank of the Findlay Arch, an ancient, broad, regional, northeast-trending anticlinal structure that separates two deep basins, the Michigan Basin on the northwest and the Appalachian Basin on the southeast. The trace of the axis of the Findlay Arch is inferred to be about 15 miles west of the site. With the exception of this arch, there are no other major geologic structures or faults known in the area that could be expected to localize seismicity in the immediate vicinity of the site. Despite the apparent geologic antiquity of the Findlay Arch, epicenters of several historic earthquakes appear to be associated with the arch farther south. Consequently, it is assumed that earthquakes with similar intensities also could occur at any point along this major structure, including in the vicinity of the site."

The seismic activity near Anna, Ohio consists of a series of some 23 observed moderate earthquakes with intensities ranging from III to VII - VIII. In addition, several small to moderate events have been reported as having occurred to the north and east of the Anna area. Because of the possible relationship of these events with the Findlay Arch, as described in the Geological Survey report, it is assumed that similar events could occur anywhere along the Arch and therefore in the general vicinity of the plant site.

Since the major distant earthquakes, such as the New Madrid, Mo. and the St. Lawrence Valley events, have occurred at distances greater than 400 miles, these events do not have a significant effect on the seismic evaluation of this site.

As a result of this review of the seismological and geological characteristics of the area around this proposed plant site, the Coast and Geodetic Survey agrees with the applicant that an acceleration of 0.08 g would be adequate for representing seismic disturbances likely to occur within the lifetime of the facility. Also, the Survey recommends that an acceleration of 0.15 g, resulting from a strong VII (MM) earthquake, would be adequate for representing the ground motion from the maximum earthquake likely to affect the site. It is believed that these values would provide an adequate basis for designing protection against the loss of function of components important to safety.

U. S. Coast and Geodetic Survey
Rockville, Maryland 20852

July 13, 1970

APPENDIX F

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
WASHINGTON, D. C. 20240

IN REPLY REFER TO:

JUL 14 1970

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

Dear Mr. Price:

This is in reply to Mr. Boyd's letters of August 20 and December 29, 1969, and March 10, April 24, and June 3, 1970, requesting our comments on the application and amendments Nos. 1, 2, 3, and 4 by the Toledo Edison Company and the Cleveland Electric Illuminating Company for a construction permit for the proposed Davis-Besse Nuclear Power Station, Ottawa County, Ohio, AEC Docket No. 50-346.

The project would be constructed on a 900-acre tract of land on the southwest shore of Lake Erie about 65 miles west of Cleveland, and would use a pressurized water reactor designed for an ultimate output of 2,772 MWT(906 MWE). Condenser cooling water would be pumped through an intake structure from Lake Erie, passed over the condensers, and discharged back into the lake. We understand that the design criteria for the condenser cooling water system have not yet been developed and that the applicants are preparing a report on alternative methods of dissipating waste heat. Radioactive wastes would be disposed of through a system designed to provide controlled handling of liquid, gaseous, and solid radioactive wastes resulting from plant operations.

The western Lake Erie marshes are a pivotal point for migrating waterfowl and the project area accommodates most of the waterfowl species common to the Lake Erie region. The lake adjacent to the plant site supports a variety of game and foodfish species and has been an active sport fishing area.

The preservation and enhancement of the quality of our environment is a primary concern of the Fish and Wildlife Service. A proper concern for the environment requires that particular attention be given to fish and wildlife resources during the construction and operational phases of a nuclear power facility. This is expressed in the National Environmental Policy Act of 1969.

The applicants indicate that the release of radioactive wastes would not exceed maximum permissible concentrations prescribed in title 10, part 20, of the Code of Federal Regulations, which are considered adequate to safeguard man from undue radiation exposure. However, the

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radiosensitivity of fish and wildlife organisms is poorly understood and acceptable radiation dose rates and body burdens for fish and wildlife have not been established. Pending such establishment, the applicant should conduct a radiological monitoring program to detect possible radiation buildup in the environment.

We are concerned that the discharge of heated, chemically treated water into Lake Erie may place undue biological stress on the local environment. The cooling water system also poses a potential hazard to the fish resources of the lake. A substantial number of organisms may be attracted to or drawn into the intake structure with the water and destroyed. (Remedies for these situations are discussed in an appendix to this report.)

Therefore, we oppose the issuance of a construction permit for this project until the applicants provide the Commission with assurance satisfactory to the Secretary of the Interior that the project will be constructed and operated in a manner which will neither reduce the water quality of Lake Erie nor create adverse effects on fish and wildlife resources. This assurance should describe specific measures such as cooling towers or cooling ponds which the applicants plan to include in the plant structure to prevent harmful effects on fish and wildlife from the discharge of heated water into the lake. It should also describe specific measures, such as a traveling screen, which will be installed in the plant to protect aquatic organisms of the lake from destruction by being drawn into the plant with the cooling water. We understand that such measures can be installed during plant construction at a substantially lower cost than after the plant has been completed.

Sincerely yours,

Charles H. Meacham

Commissioner

Attachment

APPENDIX TO FISH AND WILDLIFE SERVICE REPORT ON THE APPLICATION FOR A CONSTRUCTION PERMIT FOR THE DAVIS-BESSE NUCLEAR POWER STATION, AEC DOCKET NO. 50-346

Lake Erie adjacent to the plant site supports a variety of game and foodfish species including freshwater drum, white bass, yellow perch, channel catfish, carp, gizzard shad, alewife, goldfish, and walleye.

The western Lake Erie marshes are a pivotal point for migrating waterfowl. Segments of the Mississippi and Atlantic flyway populations separate in the vicinity of the marshes on their southward fall migrations and rejoin in their northward spring flights. The project area accommodates most species of waterfowl common to the Lake Erie region. Several thousand Canada Geese and coots use the marshes and open water. Mergansers and whistling swans use the adjacent lake and shoreline ponds. In addition, approximately 250 species of birds have been observed, including the endangered bald eagle. Resident mammals include cottontail rabbit, muskrat, squirrel, woodchuck, raccoon, weasel, fox, and occasionally white-tailed deer.

The region in the vicinity of the project site has been an active hunting, trapping, and sport fishing area. Construction and operation of the nuclear powerplant facility will curtail these activities.

About one-half of the 900-acre project site is marshland acquired by the applicants from the Bureau of Sport Fisheries and Wildlife. Under an agreement between the two parties the unused marsh areas will be leased back to the Bureau for management under the Ottawa National Wildlife Refuge program. The upland area is now farmland and will continue to be farmed after the station is built. There will be no domestic residence and no activities other than leased farming and management of the marshlands when the facility becomes operational.

While the project has the potential of having a significant adverse impact on area ecology, we believe that by careful design of the condenser cooling water system major difficulties can be avoided. The use of large volumes of lake water for cooling purposes may have a significant effect on local fish populations as fish eggs and larvae, and fish food organisms may become entrained in the cooling water and destroyed. It may be appropriate to consider the installation of a horizontal traveling screen at the cooling water intake structure similar in design to the one the Fish and Wildlife Service proposes for the Leaburg hydroelectric powerplant intake canal at Eugene, Oregon. This plant has been licensed by the Federal Power Commission. A report describing this screen is included at the end of this appendix.

The discharge of large volumes of chemically treated, heated water into the lake may have significant adverse effects on fish and wildlife resources. The walleye population has been low during recent years in the western basin of Lake Erie. It is important that existing high quality spawning areas some ten miles offshore from the project site be preserved. Though prevailing west to east currents usually carry the heated water eastward along the shore away from the spawning reefs, it is possible that one or more instantaneous 4 to 5° F. temperature fluctuations across the reefs might be exerted upon fish during the critical April-May period of egg development, spawning, and hatching.

Measures must be taken to avoid this situation.

Extensive algae blooms occurred in the western basin of Lake Erie during August and September 1969. Heavy growths of a least two types, Microcystis and Aphanozomanon, were apparent. Although blooms have occurred for decades, they were never as extensive as those observed in 1969. We are concerned that the plant's heated effluent may aggravate the algal problem in the vicinity of the project site.

In addition, increased lake temperatures in the late fall and winter may result in attracting and holding a substantial number of waterfowl in the project area, which otherwise would have migrated southward, thereby endangering the lives of these birds when the weather becomes severe and the food supply is diminished. To protect the fish and wildlife resources of the area, it may be necessary to install some form of cooling facility to reduce the temperature of the plant's thermal effluent. The results of pre-operational and post-operational environmental monitoring should be used in determining the need for further project modification.

We understand that the applicants plan to conduct a comprehensive environmental survey of the lake beginning 15 months before reactor operation and that limnological research is being conducted by the University of Michigan's Great Lakes Research Division which includes studies of radionuclide concentrations at various trophic levels in the aquatic environment. We further understand that currently fish populations, plankton, and benthic organisms are being sampled and studied under Ohio's Federal Aid to Fisheries Project F-41-R, "Environmental Evaluation of a Nuclear Power Plant."

In addition to the above-mentioned studies, we believe that plant operations present a unique opportunity to study mineral ecology in a marsh environment and the effects of radionuclides and temperature on marsh physiology. Intensive studies of marsh radioecology would greatly increase our knowledge of the distribution of nuclear powerplant radioactive wastes enabling the Service to better insure the safety of fish and wildlife resources. We propose that the applicants engage in a joint effort with the Ohio State University, the USPHS Radiological Training Center, and the Service in a study and analysis of marsh radioecology.

The applicants have stated that they will cooperate fully with the Fish and Wildlife Service, the State, and local authorities in developing and carrying out a program for the protection and preservation fish and wildlife resources, the natural terrestrial and aquatic environment, and associated recreational pursuit.

Nevertheless, we recommend that the Toledo Edison Company and the Cleveland Electric Illuminating Company:

1. Continue to cooperate with the Fish and Wildlife Service, the Federal Water Quality Administration, and other interested State and Federal agencies in the development of planned radiological and ecological monitoring programs.

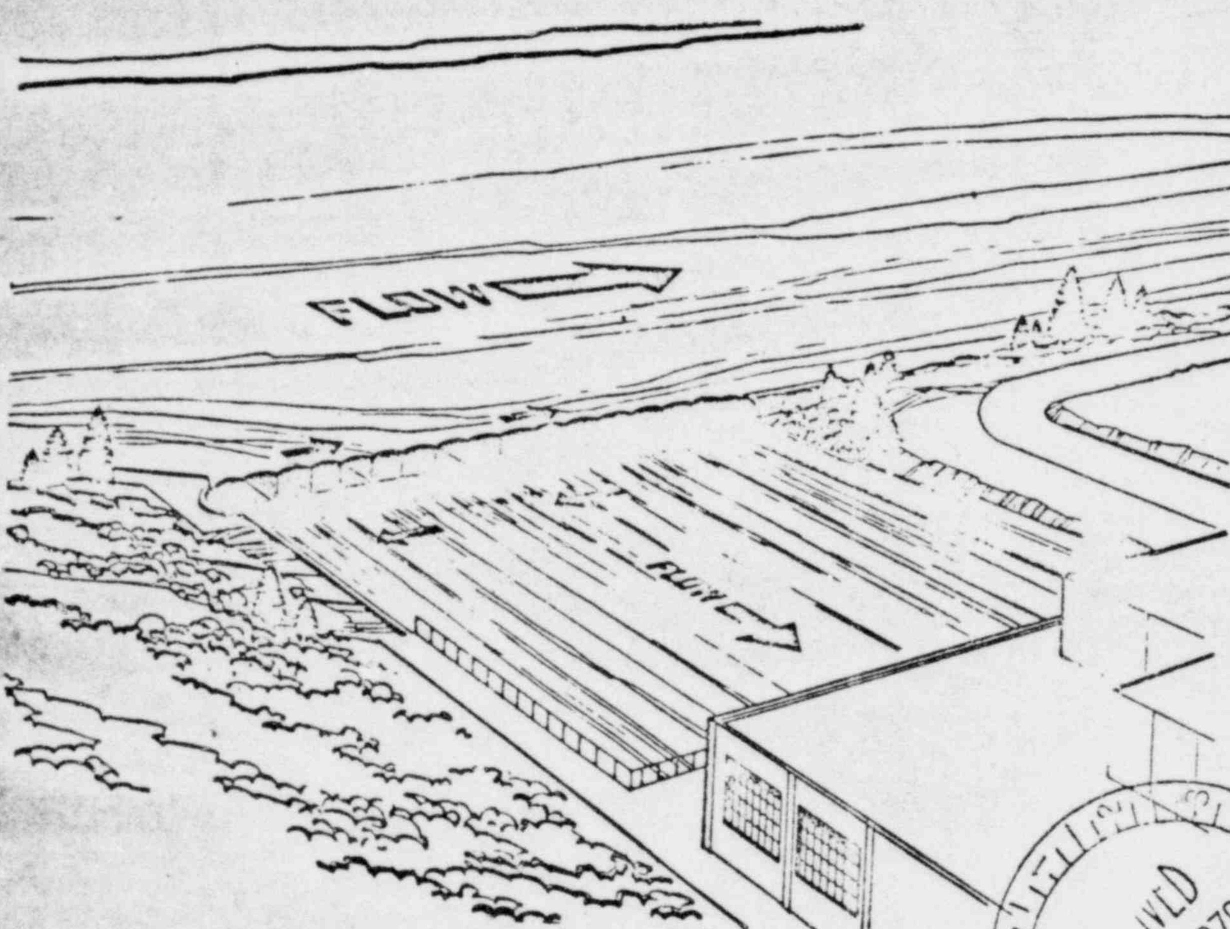
2. Conduct pre-operational radiological and ecological surveys developed in cooperation with the above-named agencies. Prepare a report of these surveys, and provide six copies of each to the Secretary of the Interior for evaluation prior to project operation.

3. Meet with the above-named agencies at frequent intervals to discuss any new or modified plans and the progress of the ecological and radiological surveys.

4. Conduct post-operational radiological and ecological surveys in accordance with plans developed under recommendation 1 and as may be modified under 3 above. Prepare reports annually or until it has been conclusively demonstrated that no significant adverse conditions exist, and submit six copies of these reports to the Secretary of the Interior for evaluation.

5. Make such modifications in project structures and operations, including facilities for cooling discharge waters and protective screening devices, as may be necessary to protect the fish and wildlife resources of the area.

Diversion and Collection of Juvenile Fish with Traveling Screens



UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

Fishery Leaflet 633

2908

UNITED STATES DEPARTMENT OF THE INTERIOR
Walter J. Hickel, *Secretary*
Leslie L. Glasgow, *Assistant Secretary for Fish and Wildlife, Parks, and Marine Resources*
Charles H. Meacham, *Commissioner*, U.S. FISH AND WILDLIFE SERVICE
Philip M. Roedel, *Director*, BUREAU OF COMMERCIAL FISHERIES

Diversion and Collection of Juvenile Fish with Traveling Screens

By

DANIEL W. BATES

Fishery Leaflet 633

Washington, D.C.
March 1970

Diversion and Collection of Juvenile Fish with Traveling Screens

By

DANIEL W. BATES, Fishery Biologist

Bureau of Commercial Fisheries
Biological Laboratory
Seattle, Wash. 98102

ABSTRACT

A horizontal traveling screen, suitable for screening fish or debris from powerplant water intakes or irrigation diversions, was designed and operated by the Bureau of Commercial Fisheries during 1965-69. The structure consisted of a vertically hung, endless belt of wire-cloth screen panels, flush with the face of the water intake structure or at an angle to the direction of flow.

Field tests in different water approach velocities, with the screen traveling at various rates, proved that such a facility can be operated efficiently. The horizontal traveling screen, as described here, should contribute materially to the development of an efficient, relatively low-cost diversion facility for fish and debris.

BACKGROUND ON PROBLEMS IN SCREENING FISH

For many years biologists and engineers have been trying to develop an efficient method to safeguard juvenile fish exposed to hydroelectric or irrigation developments in rivers. They studied the possibility of deflecting migrants from their normal paths, causing them to take alternate routes. Numerous methods of deflecting fish have been examined, such as bands of rising bubbles, curtains of hanging chains, electrical stimuli, lights, louvers, sound, and water jets (fig. 1). These methods functioned satisfactorily under certain conditions, but were never completely reliable.

Notwithstanding the extensive and imaginative research, all fish-guiding or deflection devices in use today are burdened with one or more of the following disadvantages: (1) high cost, (2) insufficient guiding efficiency, (3) mechanical limitations where water depth is great or volume of flow large, (4) excessive head loss, (5) limited capacity for safely guiding or collecting fry and eggs of striped bass, shad, and smelt, (6) need for frequent adjustments to compensate for changes in flow volume, (7) and excessive maintenance.

In 1965 a new approach was conceived which promises to overcome these disadvantages. Development of the horizontal traveling screen (fig. 2) provided many practical solutions to problems of fish diversion. Among its advantages are the following:

1. Reduction of cost appears probable, due to simplicity of design.

2. Maintenance costs are low because all major operating parts are out of the water.

3. Previous problems of impingement of fish on screens are far less serious. Formerly many fish carried onto vertically traveling screens (such as the drum screen, fig. 3) were either carried over the screen and lost or sustained injuries in their efforts to free themselves. This latter problem also applies to

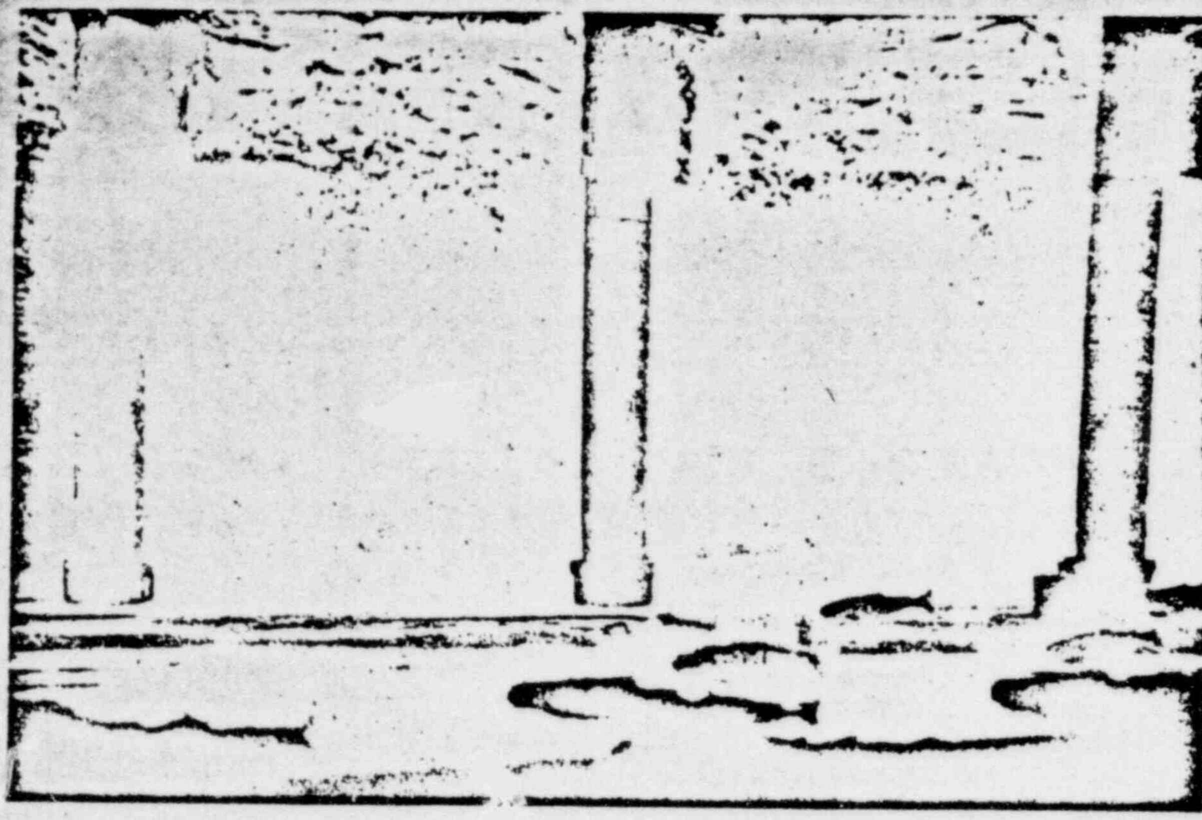


Figure 1.–Water deflection array in operation. Fish in foreground are avoiding jet streams emerging from right side of pipes.

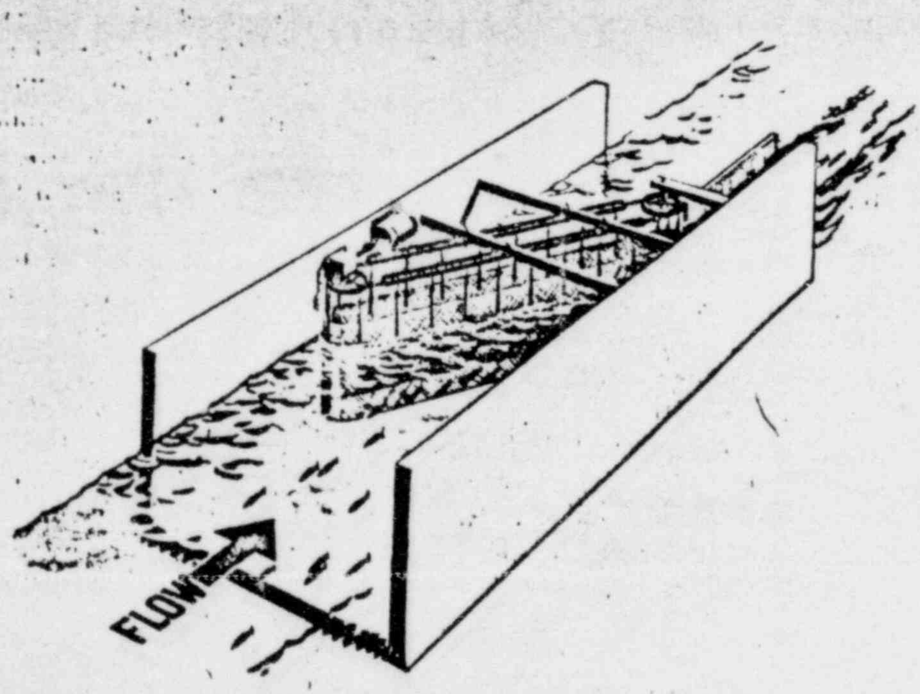


Figure 2.–Artist's view from upstream of traveling screen (model 1), 17 feet long and 4 feet high. This screen represents the first of six experimental models.

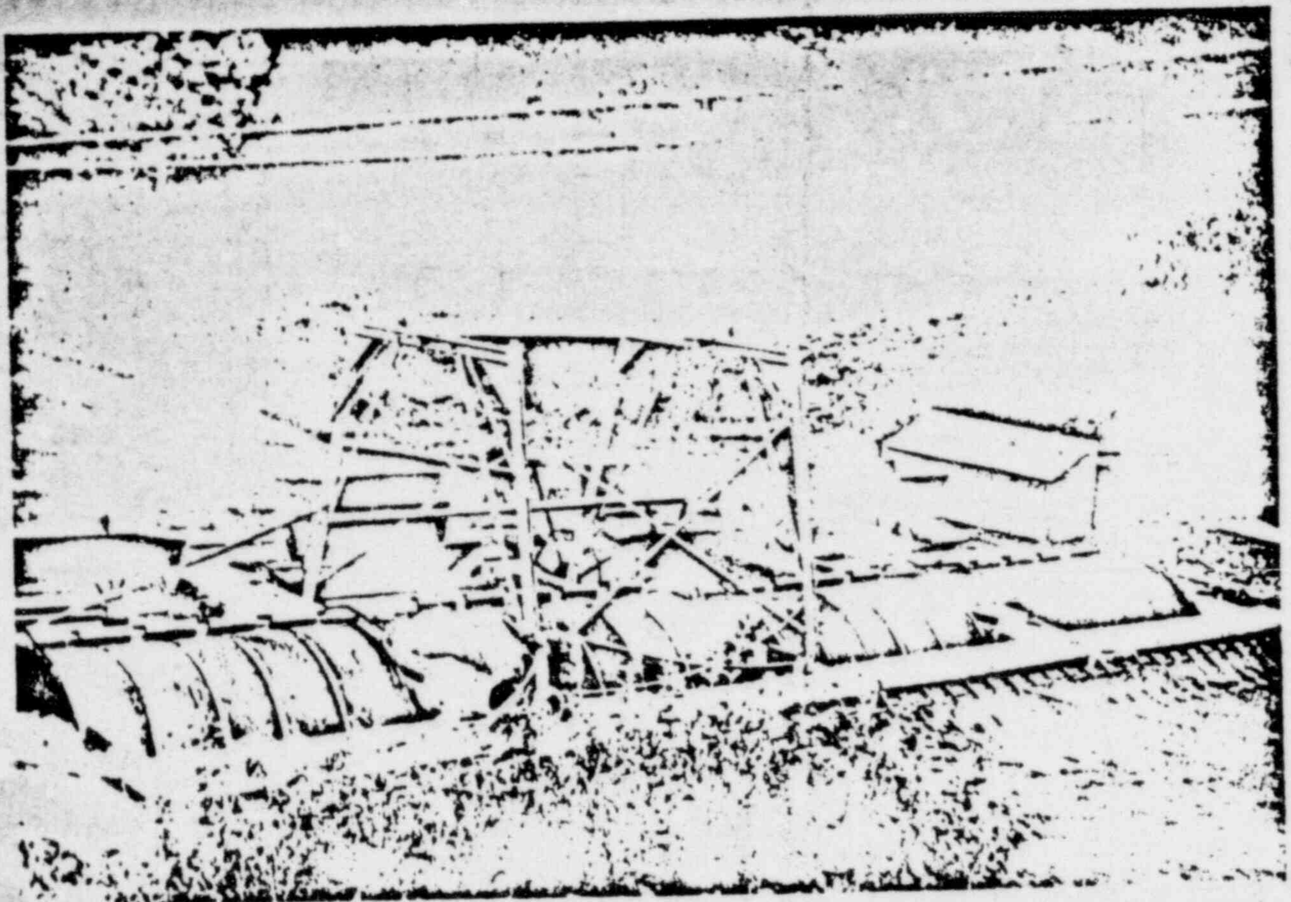


Figure 3.–View from upstream of series of rotary drum screens placed 90° to direction of flow.

the industrial water screen. Conversely, if fish are carried onto the horizontal traveling screen their impingement is gentle since travel of the screen can be matched to the velocity of the water; the fish remain in the water as they are carried into the bypass. Because of the gentle impingement, higher approach velocities and reduced canal widths can be considered.

4. Nonswimming forms, such as eggs of striped bass and shad, can be collected on the screen and safely carried for release into the bypass.

5. To provide for inspection or maintenance, the interlocking screen panels can be readily lifted out and returned to their original positions.

6. Screens can be easily changed if a different mesh size is required.

7. High efficiency in fish deflection can be anticipated on the basis of successful tests during 1967 in the 500 second-foot Stanfield Irrigation Canal, a diversion of the Umatilla River, Oreg. When model V (fig. 4) was tested with a natural run of juvenile steelhead trout and coho salmon, efficiencies ranged between 97 and 100 percent. Even greater efficiency can be expected from the newer designs.

8. Efficiency of operation remains high irrespective of fluctuations in water surface elevation.

9. As a safety measure, a pressure-release mechanism allows the panels to swing open if the water pressure becomes excessive.

10. The total velocity of bypass flow is minimal compared to total canal flow since fewer bypasses are required for the traveling screen. With other systems the number of bypasses must be considerably greater to avoid the possibility of fish becoming tired and impinging on the screens.

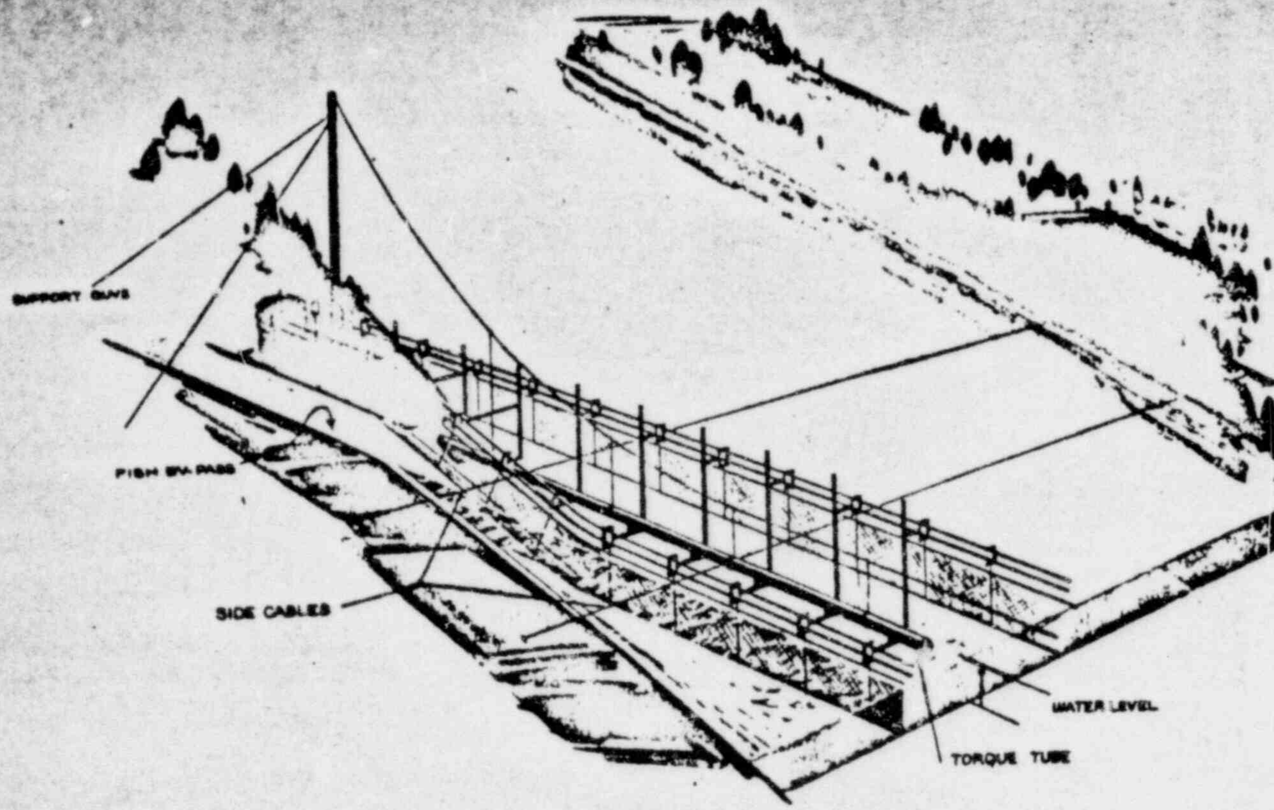


Figure 4.–Sectional view of model V, installed and tested during 1967 in the Stanfield Irrigation Canal, a diversion of the Umatilla River near Echo, Oreg.

CONTINUING IMPROVEMENTS IN DESIGN

Since its conception, the plan has undergone extensive development. The latest prototype (model VI, 85 feet long) screens over 1,000 second-feet of water at a 6-foot depth at velocities up to 3 feet per second. It is now being operated in the Bureau of Commercial Fisheries' test flume on the Grande Ronde River near Troy, Oreg. A bypass installed at the downstream end of the traveling screen serves as an exit for fish deflected by the screen.

FUTURE APPLICATION

Wherever a problem of fish screening exists, the horizontal traveling screen could be the answer. The State of California, collaborating with the U.S. Bureau of Reclamation, is studying its application in the Central Valley of California to divert fish eggs and juvenile fish. The State estimates annual diversion at over 250 million small striped bass one-eighth to several inches long. This project would require the screening of about 30,000 second-feet of water (13.5 million gallons per minute). The Bureau of Reclamation regards this new concept as the most promising development to date in high-efficiency fish screening.

An ideal application of the horizontal traveling screen would be its placement in front of a powerplant intake. The figure on the cover illustrates one possible method of installation. This layout allows river flows to circulate freely past the screen face and eliminates the need for a bypass.

PROPOSAL TO INDUSTRY

The Bureau of Commercial Fisheries is now proposing the design of a larger and improved model (fig. 5) for the 2,500 second-foot Leaburg powerplant intake canal at Eugene, Oreg. The canal is 17 feet deep and 70 feet wide; maximum water velocity is 3.6 feet per second (fig. 6). The City of Eugene (through its powerplant division, the Eugene Water and Electric Board) has approved use of the canal for installation of a traveling screen and has provided $7,500 to cover preliminary engineering design costs.

Thus far, each model has been somewhat larger than the previous one, and each design has been considerably modified and improved. The Bureau of Reclamation is planning a study of the traveling screen at its Denver hydraulic laboratory. A test stand will be constructed, consisting of a section of straight track, one complete end-turn, and two panels with carriages. This stand will serve as a check of operation and fabrication problems.

Although the Bureau of Commercial Fisheries has independently developed the design of horizontal traveling screens since 1965, a cooperative effort by the government and private industry is an appropriate means of pursuing final design, construction, and testing of a prototype (model VII) structure. Sufficient adaptability to meet a wide variety of screening requirements is anticipated.

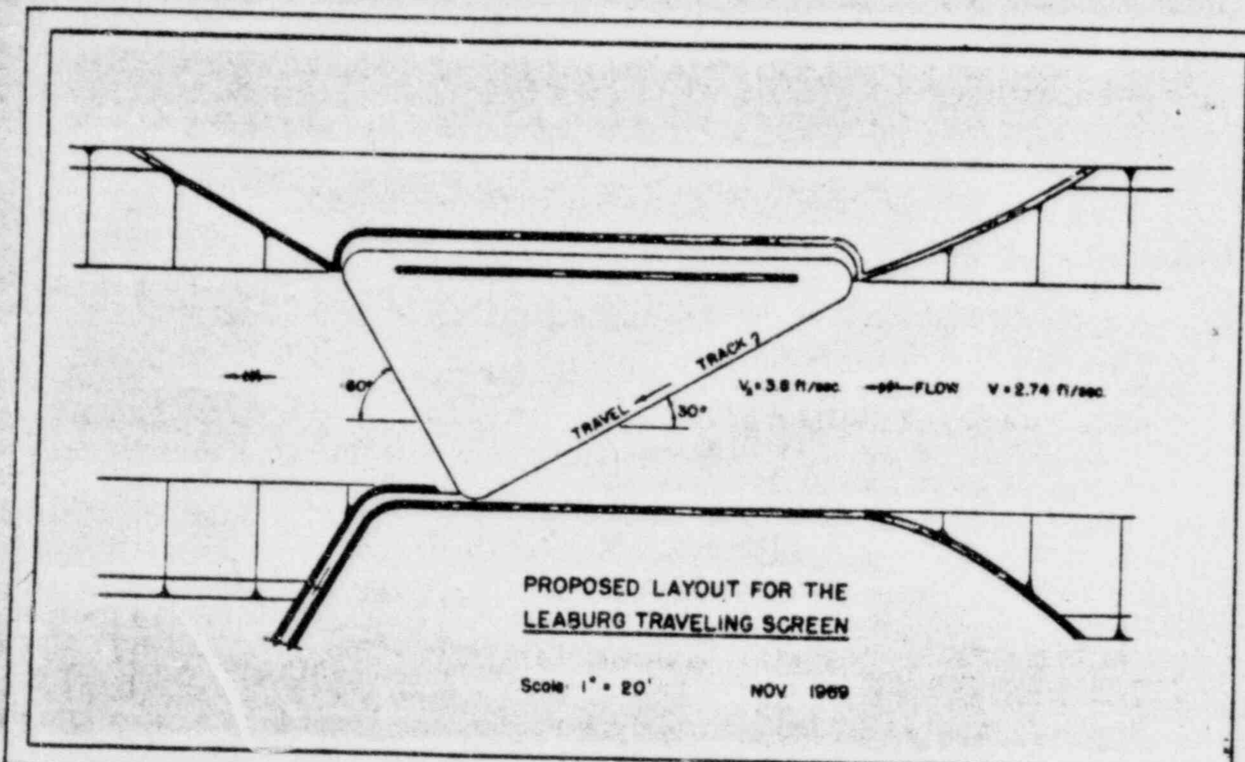


Figure 5.—Artist's concept of model VII, as it might appear within a canal or river.

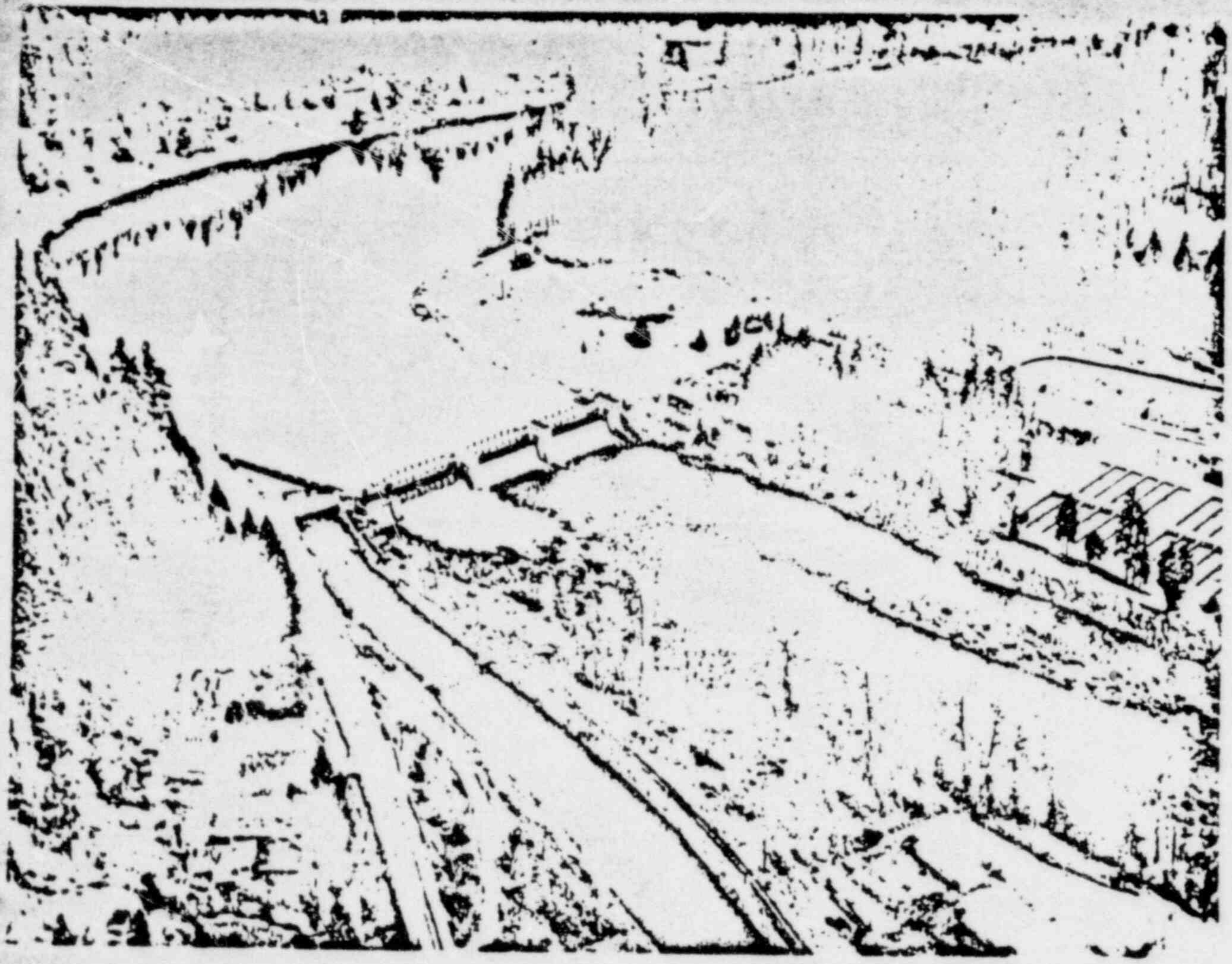


Figure 6.–Upstream view of the McKenzie River, showing the Leaburg diversion dam and canal.

MS. #1966
GPC 996-684

APPENDIX F-1

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
WASHINGTON, D. C. 20240

IN REPLY REFER TO:

SEP 18 1970

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

Dear Mr. Price:

This is in reply to Mr. Boyd's letter of August 11 requesting our comments on Amendment No. 8 to the application by the Toledo Edison Company and the Cleveland Electric Illuminating Company for a construction permit for the proposed Davis-Besse Nuclear Power Station, Ottawa County, Ohio, AEC Docket No. 50-346.

Amendment No. 8 firms up the design criteria for the reactor cooling system by adding a closed cycle water cooling system, incorporating a natural draft cooling tower and related facilities. Construction of the discharge channel formerly considered will not now be required, since no heated water will be discharged to the lake from the reactor cooling system. Makeup water would be pumped from Lake Erie to replace water lost by evaporation, drift, and blowdown. The intake structure would be located about 2,500 feet offshore in about 10 feet of water.

Although no heated condenser cooling water would be discharged to the lake, waste water from blowdown and from other facilities in the station may be discharged. Any effluent should conform to the water quality standards established by the State of Ohio and approved by the Secretary of the Interior.

We are concerned that the cooling water system may pose a potential hazard to the fish resources of the lake. A substantial number of organisms may be attracted and drawn into the intake structure with the makeup water and destroyed. It may be necessary to install a suitable screening facility to prevent the loss of a significant number of aquatic organisms into the intake structure, and the construction permit should be conditioned accordingly.

2995

2995

Since the cooling tower will dissipate waste heat from the reactor and thus avoid polluting the lake, and construction and operation of this project as now planned should not present any unresolvable biological and radiological environmental problems, we hereby withdraw our opposition to issuance of the construction permit for this project as expressed in our letter of July 14.

Sincerely yours,

Charles H. Meacham

Commissioner

APPENDIX G

JOHN A. BLUME & ASSOCIATES, ENGINEERS
612 HOWARD STREET · SAN FRANCISCO, CALIFORNIA 94105 · (415) 397-2525

July 17, 1970

Mr. Edson G. Case, Director
Division of Reactor Standards
U.S. Atomic Energy Commission
Washington D.C. 20343

Contract No: AT(49-5)-3011
Blume Project No: 2085513
Subject: Davis-Besse Nuclear Power Station
Toledo Edison Company
Docket No. 50-346

Dear Mr. Case:

In accordance with your request, we have performed a general review of the PSAR Volumes 1-4 and Amendments 1-7 for the Davis-Besse Plant. Our review was also based on data gained during several meetings with members of the staffs of DRS and DRL, and during a meeting with the members of the staffs and the applicant on May 19, 1970.

We are enclosing herewith five copies of our report, "Review of the Seismic Design Criteria for the Davis-Besse Nuclear Power Station." We have revised our May 15, 1970 preliminary report based on discussions with the applicant and members of the DRS and DRL staffs at a meeting on May 19, 1970, and on Amendments No. 5-7 to the PSAR.

As requested by your staff we have deleted any reference to the problems of solution activity in the foundation material. We submitted questions to the AEC on April 24, 1970, and understand that this item is to be covered in a separate report.

Very truly yours,

JOHN A. BLUME & ASSOCIATES, ENGINEERS

Garrison Kost
for Roland L. Sharpe
Executive Vice President

EGK:aa

Enclosures 5

REVIEW OF THE SEISMIC DESIGN CRITERIA

FOR THE

DAVIS-BESSE NUCLEAR POWER STATION

(Docket No. 50-346)

July 17, 1970

JOHN A. BLUME & ASSOCIATES, ENGINEERS

San Francisco, California

REVIEW OF THE SEISMIC DESIGN CRITERIA

FOR THE

DAVIS-BESSE NUCLEAR POWER STATION

(Docket No. 50-346)

INTRODUCTION

This report summarizes our review of the engineering factors pertinent to the seismic design criteria of the Davis-Besse Nuclear Power Station. The power station will be located on the south western shore of Lake Erie in Ottawa County, Ohio, approximately 21 miles east of Toledo and 9 miles northwest of Port Clinton, Ohio. The design and construction of the plant will be performed by Bechtel Corporation under the direction of the applicant, The Toledo Edison Company. The nuclear steam supply system will be manufactured by Babcock & Wilcox Company. Application for a construction permit has been made to the U.S. Atomic Energy Commission (AEC Docket No. 50-346) by The Toledo Edison Company. A Safety Analysis Report has been submitted in support of the application to show that the plant will be designed and constructed in a manner which will provide for safe and reliable operation. Our review is based on the information presented in the Safety Analysis Report and is directed specifically towards an evaluation of the seismic design criteria for Class 1 structures, systems, and components. The list of reference documents upon which this review has been based is given at the end of this report.

DESCRIPTION OF FACILITY

The Davis-Besse Nuclear Power Station site region is characterized by flat plains having poor drainage and consists primarily of marshland with the western area rising to 4-6 feet above Lake Erie. The major streams in the region are the Maumee River and the Toussaint River (or Creek) which have very low flow velocities. All the streams generally flow toward the northeast into Lake Erie. Site soil is composed of a surficial deposit of stiff, desiccated lacustrine clays ranging from 6 to 9 feet in thickness and underlain by 4 to 20 feet of till. Immediately below is bedrock composed of argillaceous dolomite with shale partings and varying amounts of gypsum and anhydrite. No faults are known to exist in the site locally.

The containment system consists of a cylindrical steel pressure vessel with hemispherical dome and ellipsoidal bottom enclosed by a reinforced concrete shield building having a cylindrical shape with a shallow dome roof. An annular space of about 4'-6" is provided between the containment vessel and shield building along with space between the domes. Both structures are joined at the base and supported on competent rock at finished grade. The height of the shield building from top of foundation ring to top of dome is 274'-6". The wall and dome thicknesses will be about 2'-6" and 2'-0" respectively. A shell thickness of 1-1/2 inches will be used in the design of the containment vessel to enclose the 130-foot diameter interior space. Reinforced concrete construction will be used for the Auxiliary Building including the spent fuel and control room areas. The Turbine Building will consist primarily of steel frame construction with concrete slabs and a massive concrete turbine support structure.

STRUCTURAL DESIGN CRITERIA AND LOADS

All structures, equipment, systems, and piping are classified according to function or consequence of failure as either Class I or Class II as defined in Appendix 5A of the Safety Analysis Report. Class I structures, systems, and equipment are those whose failure could cause uncontrolled release of radioactivity or are those essential for immediate and long-term operation following a design basis accident. They are designed to withstand the appropriate seismic loads simultaneously with other applicable loads without loss of function. Structures and equipment under Class II designation are those whose failure would not result in the in the release of significant radioactivity and would not prevent reactor shutdown. A listing of Class I structures, equipment, and systems is given in Appendix 5A.

The design loads for the Davis-Besse Station shield building are based on ultimate strength design criteria as presented in ACI 318-63 and as modified in Appendices 5B and 5D. Structure design loads are increased by load factors based on the probability and conservatism of the predicted design loads. Yield capacity reduction factors are applied to the stresses allowed by the applicable building codes.

The containment structure will be designed in accordance with the ASME Boiler and Pressure Vessel Code, Section III, Class B. A "design internal pressure" of 36.0 psig along with a coincident design temperature of 264° will be used. All structures are designed for 40 psf roof load.

Wind loads will be determined from ASCE Paper 3269 including gust factors and variation of wind velocity with height. The criteria of the fastest wind for a 100-year recurrence results in 90-mph basic wind at 30 feet above grade. The structure will be designed for tornado loading which corresponds to a design tornado with a total tangential and forward velocity of 360-mph and an atmospheric pressure drop of 3 psi in 3 seconds. Tornado-generated missiles considered in the design will be a 12 foot long, 8 inch diameter wooden pole traveling at 250 mph and a 4000 lb automobile at 50-mph up to 25 feet above ground.

ADEQUACY OF THE SEISMIC DESIGN CRITERIA

We have reviewed the Preliminary Safety Analysis Report and Amendments No. 1 through 7. In addition, we have discussed the various aspects of the seismic design of the plant with members of the staffs of the Divisions of Reactor Standards and Reactor Licensing at several meetings and with the members of the staffs and the applicant at a meeting on May 19, 1970. We have the following comments regarding the adequacy of the seismic design criteria:

1. The applicant has selected a peak ground acceleration of 0.08g for the "Maximum Probable Earthquake" and 0.15g for the "Maximum Possible

Earthquake." We concur with the selection of these ground accelerations. In addition, the site response spectra for the Maximum Probable Earthquake and the Maximum Possible Earthquake as shown on pages 2C-47 and 2C-48, respectively, are satisfactory.

2. The applicant has stated that the procedures for the design of the reactor internals are discussed in Topical Resports BAW-10008. We have reviewed these documents for the Oconee plant and have similar concerns for the Davis-Besse plant. We understand that these reports have been revised and will be submitted for the Davis-Besse application. Review and approval of these reports should be completed before implementation of the results of the reports in the final design, but the review need not be completed prior to issuance of the construction permit.

3. The applicant has stated that he will use the response spectrum method of dynamic analysis for Class 1 structures, piping, and equipment. The structures will be analyzed for response in both the horizontal and vertical directions. Time-history analyses of Class 1 structures will be performed to develop response spectra in vertical and horizontal directions at the points of support of piping and equipment.

   The applicant has stated that he will perform comparative analyses of the containment structure to confirm the assumption of a rigid base mathematical model. In these comparisons, a range of foundation material moduli will be used in the analyses to account for variations in these moduli. Should the results of the analyses of the rigid base and flexible base models differ significantly, the most conservative values will be used in design.

   We concur in general with the proposed approach to the seismic design of Class I structures, piping and equipment. The analytical techniques proposed by the applicant are satisfactory and if properly implemented will result in a conservative design.

CONCLUSIONS

On the basis of the information presented by the applicant in the Preliminary Safety Analysis Report and Amendments, it is our opinion that the seismic design criteria and approach to seismic design as outlined in the PSAR and Amendments 1 through 7, if properly implemented by the applicant, will result in a design that is adequate to resist the earthquake conditions postulated for the site.

JOHN A. BLUME & ASSOCIATES, ENGINEERS

for Roland L. Sharpe

Garrison Kost

Garrison Kost

REFERENCE DOCUMENTS

DAVIS-BESSE NUCLEAR POWER PLANT

Preliminary Safety Analysis Report, Volumes 1-4

Amendments Number 1-7

AEC Conference Notes No. 34 (March 13, 1970)

APPENDIX H

EVALUATION OF THE FINANCIAL QUALIFICATIONS

We have reviewed the financial information in the application and Amendment No. 10 thereto, including the Annual Reports, of the Toledo Edison Company and the Cleveland Electric Illuminating Company for a permit to construct a nuclear reactor with an initial thermal power level of 2,633 Mwt (872 Mwe net) to be known as the Davis-Besse Nuclear Power Station and to be located on the shores of Lake Erie about 21 miles east of Toledo, Ohio. Based on this information we have concluded that the applicants are financially qualified to carry out their commitments under the arrangements as stated in the application to design and construct the proposed nuclear facility.

This conclusion is based upon the following facts and considerations:

1. The applicants, in Amendment No. 10, estimate the costs of construction of the Davis-Besse Nuclear Power Station, including nuclear fuel inventory cost of the first core, to be $305,742,000 made up as follows:

Total nuclear production plant costs	$266,102,000
Transmission, distribution and general plant costs	14,030,000
Total plant construction costs	$280,132,000
Inventory costs of initial core	25,610,000
Total	$305,742,000

The above estimates include interest during construction and escalation.

The details of these estimates as they pertain to the capital costs of the nuclear plant have been reviewed by the Division of Reactor Licensing. The Division deems the estimates to be high but considers them reasonable in that they should be ample to cover all costs to design and construct the plant.

The Division of Reactor Development and Technology has reviewed the fuel requirements, specified by the applicant as 207,486 lbs. UO_2, for the first core of the Davis-Besse reactor and finds them reasonable for a reactor of this type and power level.

2. As stated in the application, Davis-Besse will be owned by the applicants as tenants in common without right of partition in the following proportions: Toledo Edison - 52.5% and Cleveland Electric - 47.5%. The two companies will share in the costs of construction and operation and in the energy production on the same basis. Accordingly, each company's share of the total estimated costs are:

Toledo Edison	$160,515,000
Cleveland Electric	145,227,000
Total	$305,742,000

3. Construction of the Davis-Besse plant will be financed as an integral part of the total construction programs of the applicants in the same general manner as other additions to their generating facilities are financed, e.g., from depreciation and other accruals, undistributed earnings and from sale of new debt and equity securities and short-term borrowing.

Based on each applicant's record of earnings and provisions for depreciation and other accruals over the past three years, on the reasonable assumption of the continuation of the level of earnings over the next several years, and in view of each applicant's resources, the strength of its financial position, its sound financing and the high regard held for its bond issues, it is our opinion that each company will also be able to finance its commitments for the design and construction of Davis-Besse.

4. Each applicant is soundly financed and has adequate resources at its command, with a solid record of earnings over past years of operations. Capitalization ratios are sound and neither company is overcapitalized on a book value basis. Each company has an AaA1 credit rating and Moody's Investors Service (August 1970) rates the mortgage bonds of Toledo Edison as "high" (Aa) and those of Cleveland Electric as "gilt-edge" (Aaa). The pertinent financial ratios for CY 1969 for each company indicate a continuing

sound financial position and are well in line with those of the electric utilities as a whole. A copy of the financial analysis of each company, reflecting these ratios and other pertinent data, is attached.

TOLEDO EDISON COMPANY
DOCKET NO. 50-346
FINANCIAL ANALYSIS

	(dollars in millions) For the year ended Dec. 31		
	1969	1968	1967
Long-term debt	$ 120.8	$ 121.1	$ 121.6
Utility plant (net)	257.2	248.6	227.8
Ratio - debt to fixed plant	.47	.49	.53
Utility plant (net)	257.2	248.6	227.8
Capitalization	238.5	234.1	230.2
Ratio - net plant to capitalization	1.08	1.06	.99
Stockholders' equity	117.7	113.0	108.6
Total assets	283.0	272.5	261.4
Proprietary ratio	.42	.41	.42
Earnings available to common	13.1	12.1	11.8
Common equity	86.7	82.0	77.6
Rate of return on common equity	15.1%	14.8%	15.2%
Net income	14.5	13.5	13.1
Stockholders' equity	117.7	113.0	108.6
Rate of return on stockholders' equity	12.3%	11.9%	12.1%
Net income before interest	19.0	17.0	15.5
Liabilities and capital	283.0	272.5	261.4
Rate of return on total investment	6.7%	6.2%	5.9%
Net income before interest	19.0	17.0	15.5
Interest on long-term debt	4.9	5.0	3.6
Times interest charges earned	3.9	3.4	4.3
Net income	14.5	13.5	13.1
Total revenues	88.3	80.5	70.9
Net income ratio	.164	.168	.185
Operating expenses	69.0	63.0	54.8
Operating revenues	88.1	80.1	70.3
Operating ratio	.78	.79	.78
Retained earnings	50.8	46.1	41.7
Earnings per share of Common	$2.54	$2.35	$2.28

Capitalization:	1969 Amount	1969 % of Total	1968 Amount	1968 % of Total
Long-term debt	$120.8	50.6%	$121.1	51.7%
Preferred stock	31.0	13.0	31.0	13.3
Common stock	86.7	36.4	82.0	35.0
Total	$238.5	100.0%	$234.1	100.0%

ody's Bond Ratings:
First Mortgage — Aa

Dun and Bradstreet Credit Rating — AaA1

CLEVELAND ELECTRIC ILLUMINATING COMPANY
DOCKET NO. 50-346
FINANCIAL ANALYSIS

	1969	1968	1967
	(dollars in millions) For the year ended Dec. 31		
Long-term debt	$ 292.8	$ 208.7	$ 198.4
Utility plant (net)	672.5	553.8	462.5
Ratio - debt to fixed plant	.44	.38	.43
Utility plant (net)	672.5	553.8	462.5
Capitalization	566.6	468.9	447.4
Ratio - net plant to capitalization	1.19	1.18	1.03
Stockholders' equity	273.8	260.2	249.0
Total assets	741.1	618.4	545.5
Proprietary ratio	.37	.42	.46
Earnings available to common (net income)	39.2	37.3	35.8
Common equity	273.8	260.2	249.0
Rate of return on common equity	14.3%	14.3%	14.4%
Net income before interest	46.4	40.9	41.0
Liabilities and capital	741.1	618.4	545.5
Rate of return on total investment	6.3%	6.6%	7.5%
Net income before interest	46.4	40.9	41.0
Interest on long-term debt	11.0	6.5	6.5
Times interest charges earned	4.2	6.3	6.3
Net income	39.2	37.3	35.8
Total revenues	218.9	204.1	189.9
Net income ratio	.179	.183	.189
Operating expenses	172.2	163.1	148.7
Operating revenues	218.5	203.8	189.0
Operating ratio	.79	.80	.79
Retained earnings	91.2	79.5	69.1
Earnings per share of Common	$2.92	$2.78	$2.66

	1969		1968	
Capitalization:	Amount	% of Total	Amount	% of Total
Long-term debt	$292.8	51.7%	$208.7	44.5%
Common stock	273.8	48.3%	260.2	55.5
Total	$566.6	100.0%	$468.9	100.0%

Moody's Bond Ratings:	
First Mortgage	Aaa
Dun and Bradstreet Credit Rating	AaA1

MR. WALLIG: Mr. Tedesco, are you familiar with a document entitled, "Detailed Statement of the Environmental Considerations by the Division of Reactor Licensing, United States Atomic Energy Commission Relating to the Proposed Construction of the Davis-Besse Nuclear Power Station by the Toledo Edison Company and the Cleveland Electric Illuminating Company," of 20 pages plus Appendix A, the Applicant's environmental report of 122 pages, and Appendices B through O of 71 pages?

MR. TEDESCO: Yes, I am.

CHAIRMAN SKALLERUP: The Board would appreciate an opportunity to consult with counsel.

(Bench Conference.)

MR. WALLIG: Mr. Tedesco, Did you, as the designee of the director of regulation supervise the preparation of the body of this document?

MR. TEDESCO: Yes, I did.

MR. WALLIG: If the Board please, I now offer to be marked as Staff Exhibit No. 1, the document entitled, "Detailed Statements on the Environmental Considerations by Division of Reactor Licensing, United States Atomic Energy Commission Related to the Proposed Construction of the Davis-Besse Nuclear Power Station by Toledo Edison Company and Cleveland Electric Illuminating Company," for the limited purpose of showing compliance with Appendix D to 10 CFR Part 50.

MR. JORDAN: Is this Staff Exhibit 1?

MR. WALLIG: That is Appendix A to Staff Exhibit 1.

MR. JORDAN: So the Staff takes as their Exhibit the Applicant's environmental report?

MR. WALLIG: As an Appendix to that exhibit, yes, and as part of the exhibit. It is marked solely for identification.

MR. CHARNOFF: Mr. Chairman, before you rule on that do I understand that Mr. Wallig said it is for the limited purpose of showing compliance with Appendix D and it is not offered as evidence in this proceeding?

MR. WALLIG: That is correct.

MR. CHARNOFF: Thank you.

MR. JORDAN: Would you explain why this comes in for thelimited purposes and not as evidence in this matter?

MR. WALLIG: Under the Commission's rules and under the statement of policy in Appendix D to 10 CFR, Part 50, the Commission has provided that the Regulatory Staff shall prepare a detailed statement of the environmental considerations.

This statement is prepared after copies of the Applicant's environmental statement is sent to the various Federal agencies and to State and Local officials for comment. The Appendix D provides that this detailed statement shall accompany the record through the Commission's review process. That is the reason why we offer it as an exhibit now, to accompany the record through the review process.

XXXXXXXXXX

(Whereupon, the document referred to was marked Staff Exhibit No. 1 for identification.)

MR. ENGELHARDT: Mr. Chairman, I think it should be clarified here that this is not offered for the truth of the statements contained therein --

MR. JORDAN: Or the adequacy?

MR. ENGELHARDT: That is correct. We are merely offering this to show that we have complied with the requirements of the Commission's regulations and to have this document accompany the review process from here on, accompany the record of this proceeding from here on and to provide a handy means of identifying the document as it is accompanying the review as it progresses.

So we are offering it for identification purposes only.

MR. JORDAN: Very well. I understand.

MR. CLINK: Yes. Can this be used for official testifying, the basis for official testimony or not? Later on after January 5th?

MR. WALLIG: This is not testimony.

CHAIRMAN SKALLERUP: It is not being offered as testimony.

MR. CLINK: I realize that. Who prepared it?

MR. WALLIG: As we stated and as Mr. Tedesco has testified, it was prepared under his supervision as a designee of the director of regulations.

MR. JORDAN: I don't think we need to raise any more questions about it now. This will be on the record. I dare say that Intervenors might want to question this point. It would be up to them entirely, would you say?

MR. WALLIG: Mr. Tedesco, did the Regulatory Staff prepare answers to questions asked by the Board at the pre-hearing conference?

MR. TEDESCO: Yes, we have.

MR. WALLIG: Will you please give the answers?

MR. TEDESCO: Mr. Chairman, and members of the Board: At this time we are going to provide answers to the questions raised by the Board at the prehearing conference. In order to assure orderliness in the presentation, I would like to follow the Applicant's submittal of their replies to the Board's questions.

In total there were about ten questions asked of the Board, seven of which were answered by the Applicant in their reply.

MR. TEDESCO: So on that basis we would like to follow the response by the Applicant which has been admitted earlier entitled, "Applicant's Response to Questions Asked by the Atomic Safety and Licensing Board at the Prehearing Conference," dated December 4, 1970.

With regard to question number one raised by Dr. Jordan and identified in the prehearing transcript on page 54, the nature of the question related to tritium in the lake.

With regard to the Applicant's response, we are in general agreement with the statement. However, we do have some supplemental comments to make.

I would like to have Mr. Haddican offer these comments now.

MR. HADDICAN: Mr. Chairman, a member of the U. S. Department of Health, Education and Welfare has informally reported to us at that time results of their recent measurements of tritium concentration in Lake Erie at Swan Creek, which is about one mile north of the site. These concentrations range from a maximum concentration of ten to the minus 6 microcuries per cc to below 6 times 10 to the minus 7 microcuries per cc, which is the minimum sensitivity of the detection instrument that they had available.

MR. TEDESCO: In regard to question number 2 raised by Dr. Jordan, found on page 54 of the prehearing transcript, in relation to the consideration of reconcentration in the environment, we would have no further comment to make on this question.

On questic number 3 raised by Dr. Jordan and identified in the prehearing transcript on page 56, as it relates to engineered saf y features and the reactor protection system, we have not further comments to make.

As to question number 4, which was raised by Dr. Winters on page 56 of the prehearing transcript, the nature of the concern relates to the containment vessel penetration. On this matter we have no further comments to make.

Question 5 raised by Dr. Winters, identified on page 56 of the prehearing transcript, the nature of the question relates to multiple-component piping with respect to single failure criteria. With regard to this question we again have no further comments to make.

Question number 6, also raised by Dr. Winters, as stated on pages 57 and 58 of the prehearing transcript, relating to atmospheric release of steam, on this concern we have no further comments to make.

Question number 7 raised by Dr. Winters and identified on page 58 of the prehearing transcript, the nature of the question concerns the emergency diesel generators and on this matter we have no further comment to make.

CHAIRMAN SKALLERUP: I would appreciate it if either counsel for the Staff or counsel for the Applicant would use question number 5 as an example for the audience to demonstrate how this process we are engaged in at the hearing works.

MR. CHARNOFF: Mr. Chairman, I believe that we had made available in the back of the room, and I am not sure whether they still remain here, additional copies of the document entitled, "Applicant's Response to Questions Asked by the Atomic Safety Analyzing Board at the Prehearing Conference."

If we were to use question number 5, which you suggest, Mr. Chairman, as an illustration, what we did in the document was in effect restate the sense of the question identified on this page that the question was asked by the panel member in this case, Dr. Winters, identified the source of the question, transcript page 56, and that is a reference to page 56 of the prehearing conference transcript and then we provided a response which I might hold up and show, which was responsive to the questions asked by Dr. Winters in this case.

There were a few additional questions that were asked specifically of the staff and we did not attempt of course to answer those questions. I take it from a remark made by Mr. Tedesco as he introduced this subject that he did have plans to add supplemental answers to this material.

I understand Mr. Tedesco's remarks to mean that the staff has reviewed this document with the seven answers that we have given and only with respect to question one did they supplement it and with regard to all of the others, they found our answers satisfactory and are in effect adopting the sense of those answers as their answers to the same questions. Is that correct?

MR. ENGELHARDT: Mr. Chairman, that is correct, Mr. Charnoff. We are prepared now to respond to the Board's questions directed specifically to the Staff that have not been dealt with in the answers prepared by the Applicant.

Our answers, however, will be presented orally by Mr. Tedesco or Mr. Powell and not in a prepared written form such as that presented by the Applicant.

DR. JORDAN: I had a little further question that required a little further clarification. Are you prepared to undertake that today?

MR. CHARNOFF: If the appropriate people are here, Dr. Jordan, the answer is yes. If they are not, we would appreciate hearing the question from you and we could provide the additional information on January 5th.

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DR. JORDAN: All right. I was quite pleased with the response for the critical exposure paths excepting in one case I was surprised a bit with the result that you answered in the last sentence, question number two, that the consumption of one quart of milk per day from cows using Lake Erie for water would deliver about half the dose of direct water consumption. I guess I thought the problem was likely to be with cows who eat grass and the grass possibly has some radioiodine in it.

Was that taken into consideration and is that does less?

MR. CHARNOFF: Let me ask the Board to swear in Dr. Morton I. Goldman who assisted in the preparation of this answer. And I would then invite Dr. Jordan to "simply ask any questions he wishes in this area with regard to this particular question of Dr. Goldman and I am sure Dr. Goldman would be glad to reply to them.

Thereupon,

DR. MORTON I. GOLDMAN

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

DIRECT EXAMINATION

xxxxxxx

MR. CHARNOFF: Dr. Goldman, I hold here a document entitled "Educational and Professional Qualifications, Morton I. Goldman, Vice President and General Manager,

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Environmental Safeguards Division, NUS Corporation," which is 3 pages long and contains 11 paragraphs. If you were to read it, it would probably take about, judging from some previous cases, about 15 minutes.

So I would like to ask you whether this is a statement of your educational and professional qualifications and whether you adopt these as your qualifications for this proceeding?

DR. GOLDMAN: Yes.

MR. CHARNOFF: Mr. Chairman, I move that this document -- and I will ask Mr. Churchill to hand it to the members of the Board and Mr. Engelhardt and to the secretary -- that this document be incorporated into the record as if read.

CHAIRMAN SKALLERUP: It is so ordered.

(The educational and professional qualifications of Dr. Goldman follow:)

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS
MORTON I. GOLDMAN
VICE PRESIDENT AND GENERAL MANAGER
ENVIRONMENTAL SAFEGUARDS DIVISION
NUS CORPORATION

1. My name is Morton I. Goldman. My address is 2351 Research Boulevard, Rockville, Maryland 20850. I am Vice President and General Manager of the Environmental Safeguards Division of NUS Corporation and have served in this capacity since January 1966.

2. I was graduated from the New York University in 1948 with the degree of Bachelor of Science in Civil Engineering. In 1950, I received a Master of Science degree in Sanitary Engineering; in 1958, a Master of Science degree in Nuclear Engineering; and in 1960, a Doctor of Science degree, all from the Massachusetts Institute of Technology.

3. From 1948 to 1949, I was a Research and Teaching Assistant at the Sanitary Engineering Research Laboratory, New York University, conducting research on water coagulation and assisting in teaching sanitary chemistry and sanitary biology laboratory courses.

4. From 1949 to 1950, I was a Research Assistant at the Radioactivity Research Laboratory, Sanitary Engineering Department at MIT conducting original research on removal of radionuclides from water by standard water treatment techniques.

5. From 1950 to 1961, I was a Commissioned Officer with the United States Public Health Service, Division of Radiological Health. I was first assigned to the Radiological Health Training Section from 1950 to 1954 as the engineer staff member lecturing on appropriate aspects of radiological safety and waste disposal.

6. From 1954 to 1956, I was on loan to the Oak Ridge National Laboratory as Chief of Soils and Engineering Section, Waste Disposal Research Activities. In this position, I conducted and supervised research on disposal of radioactive wastes at Oak Ridge National Laboratory.

7. From 1956 to 1959, I was assigned to MIT as Project Leader for the Radioactive Waste Disposal Project of the Sanitary Engineering Department and in training in the Nuclear Engineering Department. In the former capacity, I initiated and supervised research on novel methods of disposal of high activity fission product waste materials. In addition, I served on the MIT Reactor Safeguards Committee as its secretary.

8. From 1959 to 1961, I was designated as Nuclear Installation Consultant with the Division of Radiological Health in Washington, D.C. In this capacity, I provided technical consultation and assistance to State Health Agencies and other Federal Agencies on health and safety problems associated with nuclear installations. As part of my responsibility, I served as the evaluator responsible for the following nuclear plants: Yankee, Elk River, Indian Point, Carolina-Virginia, Hallam, Pathfinder, Peachbottom, and Humboldt Bay.

9. Since 1961, I have been with NUS Corporation and active in all of the environmental safety activities described below:

I am responsible for all site evaluations, safety analyses, waste management system design, and environmental program development conducted by this Division. This has included the evaluation of site and environmental safety factors for a number of nuclear and fossil fueled plants in this country and abroad including the following nuclear plants: Trino Vercellese (ENEL, Italy), San Onofre (SCE), Malibu (LADWP), H. B. Robinson and Brunswick (CP&L), Point Beach (Wisconsin-Michigan Power Company), Surry and

North Anna (VEPCo), Three Mile Island (Metropolitan Edison), Crystal River (Florida Power Corporation), Pathfinder, Monticello and Prairie Island (NSP), Burlington, Salem and Newbold Island (PSE&G), Dresden, Quad Cities and Zion (Commonwealth Edison), Kewaunee (WPSCo), Calvert Cliffs (BG&E), Diablo Canyon (PG&E), Beaver Valley (Duquesne Light Company), Rancho Seco (SMUD), Davis-Besse (Toledo Edison Co.), and Trojan (PGE).

10. I am the author and co-author of a number of papers on radiation and public health, nuclear safety and radioactive waste management.

11. I am a member of the American Society Society of Civil Engineers, the American Association for the Advancement of Science, the American Nuclear Society and the Air Pollution Control Association. I am also a Licensed Professional Engineer in the State of New York and the District of Columbia and Diplomate of the American Academy of Environmental Engineering in Radiation Hygiene and Hazard Control. I am also a member of Committee N18, "Nuclear Design Criteria," of the USA Standards Institute. In 1968, I served as the U.S. representative to, and chairman of, an expert panel on waste management practice at nuclear power plants at the International Atomic Energy Agency in Vienna.

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MR. CHARNOFF: Dr. Goldman, did you hear and understand the question asked by Dr. Jordan?

DR. GOLDMAN: Yes.

MR. CHARNOFF: I wonder if you might come up here where there is a microphone and reply to it.

DR. GOLDMAN: Dr. Jordan, the basis for not considering the ingestion or incorporation of iodine in milk from cows grazing as a result of emissions from Davis Besse results from the fact that iodine is not emitted from Davis-Besse in gaseious wastes.

DR. JORDAN: I see. The levels for iodine then hold up in the tanks, and it is so very low you feel that can not possibly be an exposure?

DR. GOLDMAN: There has not been to the best of my knowledge any iodine 131 ever measured in the discharge from a pressurized water reactor.

DR. JORDAN: That is very good. Thank you.

MR. CHARNOFF: Do you have any further questions, Dr. Jordan?

DR. JORDAN: No, I do not have now. Thank you.

MR. ENGLEHARDT: Mr. Chairman, the staff is prepared to respond to those questions that were directed to the staff at the pre-hearing conference at this time.

CHAIRMAN SKALLERUP: Just a moment please. The Board has another question.

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DR. WINTERS: Regarding question number 4, in your paraphrasing of the remarks I do not find the answer to the second sentence.

MR. CHARNOFF: Mr. Wahl will reply to that question, Dr. Winters.

MR. WAHL: I do believe you are correct. I am trying to take a moment here to review the answer to be sure I am not missing it.

DR. WINTERS: If there is some problem, you can bring forth the answer at the next session of the hearing.

MR. WAHL: No, I do believe I can address myself to it at this time.

The design of the penetration will provide for any repair work which would have to be done on the bellows seals. We feel that the bellows seals are the only portion of the penetration subject to repair. The balance of the penetration consists of fairly heavy walled steel pipe completely welded and not subject to requiring repair.

In any case, any repair required, whether it be in the welded steel pipe or in the bellows, could be accomplished, not necessarily conveniently in some cases, but certainly could be accomplished.

DR. WINTERS: Such as a cracked bellows? You can ta[illegible] a bellows out and put another one in?

MR. WAHL: Yes, sir.

DB-5

DR. WINTERS: Well, I guess so. It looks like a major task, which I suppose really is not -- I guess that has to be interpreted as a remark and not a question.

In question number 6, concerning the atmospheric dump, in the very last line, last two lines, you say "The integrated thyroid dose at the site boundary for the most extreme condition has been calculated to be .004 rem." Is this per dump or per episode?

MR. CHARNOFF: Mr. Roe?

MR. ROE: That is correct, this is per occurrence.

DR. WINTERS: Do you have any estimates on the number of episodes per year?

MR. ROE: I do not have any such estimate right at this point. I believe within the material in the PSAR, under the design conditions, we could determine how many occurrences, or make an estimate of how many occurrences a year there would possibly be.

DR. WINTERS: I suspect this is right. There is in the design of the pressure vessel a long statement of predicted conditions.

MR. ROE: Yes, sir.

DR. WINTERS: Would you please prepare such an estimate?

MR. ROE: Yes, we will.

DR. WINTERS: Thank you. The next question is still along that same subject and it really depends of course on what your answer -- or to some extent at least -- on what your answer comes out to be. The question that is running through my mind is isn't there a better place to dump this steam? Such as the turbine condensor?

And a subsidiary question to this -- well, if you wish, you may answer that at this point first.

MR. ROE: Yes, sir. There is a better place to dump this steam and this is into the condensor and this would normally be done. This information is not presented in the answer. However, it is presented in other sections of the PSAR and this is the normal route for steam being released for any of these occurrences, and it is only back-up and under very unusual conditions such as large load rejections or complete and quick loss of electric power where there would be any discharge into the atmosphere. It would normally, in all normal situations, go to the condensor, so there would be no direct release to the atmosphere.

DR. WINTERS: I interpret your statement to say the normal dump is to the turbine condensors?

MR. ROE: Yes, sir.

DR. WINTERS: It is only under extraordinary circumstances that it dumps to the atmosphere?

MR. ROE: That is correct.

DR. WINTERS: I now address a question to the staff.

DB-7

Does this meet the AEC criteria for minimum discharge?

MR. TEDESCO: Dr. Winters, the atmosphere dump system would be used as a heat sink in the event that the main condenser is not available as a heat sink. Considering the amount of steam released and the activity limits in the primary and secondary system, the resulting radiological doses to the public would be very small and well below the guideline doses given in 10 C'R 100.

DR. WINTERS: You would have to do something?

MR. TEDESCO: You would have to dump into the atmosphere. That is the way the system is designed. In the event you do have a loss of off-site power and you did have to blow down, the resulting radiolgocial consequences we calculate are so very very much less than part 100 that we find them acceptable.

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MR. ROE: May I make a comment here?

DR. WINTERS: Yes, sir.

MR. ROE: The reason the answer did not address the normal dump to the condenser is because the question referred only to the atmospheric dump. We could have possibly expanded it for clarity. However, the analysis of the dose there is also on the assumption that there is 1 percent effective fuel in the reactor at equilibrium condition. It has been operated there.

And there is also steam generator leaks allowing primary water to leak into the secondary system.

Both of these situations are not likely, either by themselves or more unlikely together, so therefore this is by far the most extreme condition.

DR. WINTERS: I think I understand this. I think I will reserve further comments, if any, on this after I receive your submission with respect to the estimation of the total annual, maximum total annual discharge from this source.

I don't have the transcript reference here, I haven't looked it up, I should say, but it seems to me I asked a question concerning flywheels.

Did I miss actually asking that question?

Let us proceed and I will find the question.

MR. TEDESCO: Mr. Chairman, Members of the Board:

With regard to those remaining questions that are addressed to the Staff, Mr. Powell and I will try to respond to them. One has to do with the common mode failure, another has to do with the quality assurance program, and the last has to do with review procedures.

I will ask Mr. Powall to respond to the first two items.

MR. POWELL: At the prehearing Dr. Jordan's question regarding the common mode failures was referenced on page 55, lines 2 through 12 the studies of the common mode failures, failures to scram during anticipated transients are subjects that the Staff believes deserves additional studies beyond that available in the present application.

The first of these studies of common mode failures involves a systematic investigation of the common elements within the reactor protection system whose failure could cause the reactor protection system to become inoperative.

The second study, failure to scram during anticipated transients, relates to an evaluation of the consequences of a transient, assuming that a scram does not occur and the reliability of the scram system should the design of the plant be such that failure to scram for an anticipated transient produces unacceptable consequences, for example, greater than 10 CFR Part 100.

These studies are currently under evaluation by the various reactor manufacturers and the Commission. Because the results of these studies from all of the manufacturers are not yet available, it is premature to predict what additional design requirements might be imposed.

The topical report, BAW, 10,019 was submitted on September 4, 1970 and our review of this report is still in progress. As noted, we will get the results of similar studies by other manufacturers to completely evaluate the matter. Such evaluation will also include appropriate discussions with the ACRS.

DR. JORDAN: I conclude from this that you still have the matter under consideration, but you do not feel that the BAW report is necessarily the final answer.

MR. POWELL: That is correct.

DR. JORDAN: Are you expecting more from the Applicant in this case on these common mode failures?

MR. POWELL: I think it would be premature to say whether it will be available to this Applicant, but certainly we would require something like that.

DR. JORDAN: I see. If it turns out your study shows further work is required, you will request the Applicant to provide further material.

MR. POWELL: Yes.

DR. JORDAN: Very well.

MR. POWELL: On page 55 of the prehearing transcript Dr. Jordan requested or indicated a concern regarding the quality assurance program. The Applicants have established a quality assurance program based on meeting the guidelines set forth in Appendix B to 10 CFR Part 50.

Applicant's program contains sufficient program to enable us to determine that an appropriate basis has been established to assure that the program meets the requirements of Appendix B. We have approved this program on the basis of the information provided.

The detailed program and its implementation will be under the surveillance of the Division of Compliance. Deficiencies noted are brought to the attention of DRL for resolution. Thus, the program and quality assurance guidelines provide the means of organization and documentation that can be readily audited by the Division of Compliance throughout the construction of the station.

DR. JORDAN: Nevertheless, so you say of course it continues all during construction and the operational stages, which I understand. But at the moment you are satisfied with the proposed quality assurance program as proposed by the Applicant?

MR. POWELL: Yes.

DR. JORDAN: Very well.

MR. TEDESCO: The last question we have to respond to, one also raised by Dr. Jordan on page 55, lines 19 through 25, and page 56, lines 1 and 2 of the prehearing transcript. It concerns the regulatory staff evaluation of the Davis-Besse project.

On August 1, 1969, Toledo Edison Company and Cleveland Electric Illuminating Company applied to AEC for construction permits and facility license for the proposed Davis-Besse Nuclear Power Plant. Upon receipt of the application, the project was assigned to reactor project branch number 2, which was one of the branches in the Division of Reactor Licensing.

At this time the Division of Reactor Licensing consisted of several main groups, that is, reactor projects, reactor technology, and reactor operations.

On February 27, 1970, the Division of Reactor Licensing reorganized into several specialty groups, that is, pressurized water reactors, boiling water reactors, reactor operations and a site and environmental radiation branch. The reactor technology aspects of the Division of Reactor Licensing was assigned to the Division of Reactor Standards.

The reorganization did not affect the distribution of man power on the Davis-Besse project. The review of the Davis-Besse application was not interrupted although the group initially and currently assigned to the project underwent a name change.

Specifically, the project personnel assigned to the case were not changed. Mr. Raymond Powell, who has been assigned project responsibility for the Davis-Besse Plants remained as project leader. I also remained as a branch chief for the case.

The review was effected by the project team by coordinating the review of the specialty groups in the Division of Reactor Licensing and Reactor Standards as well as the consultants assigned to the Davis-Besse project. The total review period, including that of the ACRS, extended over a period of about sixteen months.

It is estimated that about thirteen engineers were involved in the major phase of the review together with an appropriate supervisory personnel.

DR. JORDAN: How many engineers was that?

MR. TELESCO: Thirteen. The staff review of the safety of this proposed plant included a technical evaluation using standards criteria developed by the Commission. Some aspects of the review were undertaken by specialists in such fields as instrumentation and control, site and structural design.

In addition, we received advice from consultants on site-related subjects and on structural design from John A. Blume & Associates. The reports of all consultants are appended to our safety evaluation.

The estimated man days of effort involved in the

Davis-Besse review was on the order of 625, which is about the same effort expended on current cases.

DR. JORDAN: Thank you very much. I appreciate particularly your answering so completely the question, Mr. Tedesco. Mr. Powell, I take it you then were assigned to the Davis-Besse project quite early?

MR. POWELL: Yes.

DR. JORDAN: And you have had other projects, however, running concurrently?

MR. POWELL: No.

DR. JORDAN: You have been mainly on Davis-Besse?

MR. POWELL: It has been primarily Davis-Besse up until the last three or four months.

DR. JORDAN: Yes, of course. Very good. Thank you very much.

MR. WALLIG: Mr. Chairman, that complese our answers to the Board's questions. That also concludes our presentation of our case in chief.

CHAIRMAN SKALLERUP: We have another question from another Board member.

MR. WALLIG: Oh, certainly.

DR. WINTERS: This Board member wishes to apologize to the Applicants. I have a question here that I had intended to ask at the prehearing conference; the pages must have stuck together or something and I cannot find it in the record, so I will proceed to ask it at this time. This concerns the question of pump flywheels. On page 4.12-1, the PSAR describes the QA process for assuring the quality of the flywheel. I can't find anywhere in the PSAR a description of this flywheel in terms of let us say its diameter, mass, thickness, stresses and so forth.

Is this information available?

MR. ROE: It is not readily available to me right now; I don't believe any other of our personnel have it. We will attempt to have this for January 5.

DR. W[illegible]: Thank you, sir.

MR. WALLIG: We have no further comments on the questions at this time. That completes our case except that as we stated earlier we reserve the right to offer redirect or rebuttal testimony.

Thank you.

CHAIRMAN SKALLERUP: There being no redirect, there wouldn't be any rebuttal at this time.

The next item being supplemental responses to limited appearances, the understanding is that these responses will be made in January and it is our hope that the individuals in Port Clinton will be given notice of the time when these responses will be made.

DR. JORDAN: Does this complete the case?

MR. WALLIG: At this time, I believe that is as far as we can go.

CHAIRMAN SKALLERUP: This gentleman back here raised his hand. Yes, sir?

MR. TRENCHARD: Mr. Chairman, I am George Trenchard. I am a farmer. I live downwind of the plant less than a mile perhaps.

CHAIRMAN SKALLERUP: Would you please spell your name for us and give your address?

MR. TRENCHARD: George T-r-e-n-c-h-a-r-d.

I live downwind, which is usually north or northwest prevailing winds, less than a mile perhaps; it looks like about that from the plant. And I have read quite a bit about radiation and the hazards involved.

I was wondering if these learned gentlemen can give me any assurance, not that they are going to make surveillance of the equipment to see whether it works right, but how much danger would I and people in my position be in. I have a family, grandchildren, a good sized farm, and I am very concerned. I may be out of order but --

DR. JORDAN: Sir, you are not out of order at all and your concern is quite understandable. And I guess you realize that the day is getting on at this time, but we will include your question in those that we will specifically address to the applicants and ask them to particularly answer, do the best they can to assure you, give you the information that you would like to have.

MR. TRENCHARD: Should the Applicant be the one or should it be perhaps these specialists, these gentlemen from the Atomic Energy Commission?

DR. JORDAN: Both of them should have specialists and I will say let them bring up the best man to answer it, no matter which it is.

MR. TRENCHARD: What should I do? Wait until January 5th?

DR. JORDAN: Yes, sir. I think you would get a better answer than an off-the-cuff answer here.

MR. ENGELHARDT: If I may inject, Dr. Jordan, initially it might be useful for this gentleman to review at least the safety evaluation, which we can make a copy available to him. That is written very technically, I admit, it is not written exclusively for a layman who is unfamiliar with some of the terms that we use in this particular industry. However, it is a useful document. It does give you some idea of the extent of the review and what the review consisted of and the conclusions that were reached as a result of that review.

We would be happy to make a copy of this document available for you to review between now and the January 5th date. Then possibly you could come back and raise some specif questions that could be directly answered after you read this document which describes this plant and what its safety featu are and how it is designed to protect you and the people in this community and throughout this area from any hazards from radioactivity.

MR. TRENCHARD: Shall I give you my name and address?

MR. ENGELHARDT: After the hearing recess, if you just come up here we can just give you the documents.

MR. TRENCHARD: Thank you very much.

CHAIRMAN SKALLERUP: Thank you for coming.

MR. CHARNOFF: Mr. Chairman, while it certainly is my view we ought to proceed as planned, namely, to provide answers to all of the limited appearances at one time at the end of the hearing. I should like to offer to the Board if it wishes to call upon Dr. Goldman to give a reply to this particular questionto this particular gentleman at this hour.

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I think it could be done rather briefly. We are not offering it as testimony, but I do think Dr. Goldman has the qualifications and background to provide a very direct response to the question asked by this gentleman at this time.

CHAIRMAN SKALLERUP: We would be very grateful.

MR. CHARNOFF: Fine. Dr. Goldmand, would you please come up to the microphone.

MR. GOLDMAN: I would like to apologize in advance, this is going to be just as much off the cuff to you as you were off the cuff to the Board in regard to the question.

I think, though, that there is a great deal of misunderstanding about the radiation exposures that are around these nuclear plants.

We think we know a fair amount about it because there are a lot of these plants that are operating now, both in this country and around the world. And we know what these plants are putting out and what the radiation is in the environment around them.

One of the things I think that is frequently misunderstood is the fact that before there was any Atomic Energy Commission, or any nuclear plant, there was radiation.

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It has been on the world since there was a world. And as a result all of the human race and all of the animals and everything else that is in it have grown up with radiation every since there was life on earth.

So it is not strange in that sense. And the kinds of radiation that comes from nuclear plants has no different effect on people than radiation that we have been receiving ever since there was life on earth.

The same thing can be said for the x-rays that we get when we go to the doctor for a chest x-ray or to a dentist with an aching tooth.

So it is not something new and strange, it wasn't just discovered a couple of years ago like DDT. It has been around for a while and we know what it does and what ti does not do and how much comes out from these nuclear plants.

Now, because radiation is natural to a very large extent, we live in it and have grown up and evolved in it, it changes from place to place and even in the same place from time to time.

The natural radioactive materials that make up the earth are in the things that we were, in the buildings we live in. This building with its brick wall probably delivers a lot more radiation to the people who are here than if this thing were made entirely out of wood, for example, because wood does not have too much natural radioactivity in it, brick and stone

ln3

do. In the same way if you are a farmer, you probably spread fertilizer on the field with a fair amount of potash, potassium contains a fair amount of a form of an element that is naturally radioactive, made that way by God.

If you spread a couple of hundred pounds per acre of potash on that field you are getting about twice as much radiation when you work in that field as you would when you work in a field that didn't have that kind of fertilizer.

So radiation is around us. We change it by the way we live, by the kinds of buildings we live in. You, as a farmer, would get quite a bit more radiation in the course of your occupation from natural sources than a fisherman who goes out on the lake every day, because the man out on the lake is not being exposed to the natural radioactive materials that are in the soil.

The difference between what he gets on his boat and what you get in your field with this fertilizer on it is about 100 times as much as you would get if you lived next to the nuclear plant for a year.

Now, that kind of radiation difference, I am sure, hasn't made you any more tired than working in the sun has or the fisherman on the boat.

That difference in radiation just isn't that important to us. And that is the kind of thing we are talking about.

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MR. TRENCHARD: I am not worried about the normal radiation from the sun and chemical elements like potassium and phosphorous. What happens if something goes wrong with the plant? And that has happened. How can that be controlled?

And there are mechanical devices and anything that is mechanical can certainly go wrong as I have found out with tractors and combines that are supposed not to break down.

MR. GOLDMAN: I don't know whether I am the right guy to answer this, but let me take a crack at it and if I go wrong, I am sure somebody will get to me.

Anything that is made by people has a possibility of going wrong. I think, and this is my own feeling, and I think it has been borne out by a fair amount of experience, that there isn't any other kind of thing that I know of that is made by man that has so many things piled on top of it to keep it from going wrong and hurting anybody that you sometimes wonder whether it will work at all.

There are, I think, as Mr. Roe talked about earlier safety factors piled on safety factors piled on safety factors. It is like you needed seven keys to start your tractor going and you had to have all of them and if you didn't have all of them, you couldn't get that thing going at all.

The odds of anything happening to this thing that

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would be dangerous to people in the way of releasing large amounts of radioactivity that could really affect somebody I think are about on the same par as one of the big jet planes flying into the football stadium when the Cleveland Browns are playing.

You can't say that it won't happen. But I don't know of anybody that stops the planes from flying over the stadium, or putting a steel roof over the stadium to keep the people from getting hurt just in case that big plane should fall in there.

Now, what they have done here in this kind of plant is they have put the equivalent of that big steel roof over that football stadium, so even if the plane wants to come down on it, there isn't going to be anything happen to the people on the inside.

That is the best comparison I can give you. It is an even-if kind of thing; nothing will happen.

MR. TRENCHARD: If there weren't so many physicists that disagreed with you, I would feel great.

MR. GOLDMAN: I don't think you ever get two scientists to agree with each other all of the way.

CHAIRMAN SKALLERUP: Having reached really the high point of the hearing --

MR. CHARNOFF: Is that because it is the end or we were talking about the Cleveland Browns.

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CHAIRMAN SKALLERUP: I was talking about the colloquy. We have reached the conclusion of this part of the hearing and we will stand adjourned until January 5, ten o'clock, here in the Armory, 1971.

(Whereupon, at 4:55 p.m., the hearing was recessed, to reconvene at 10:00 a.m., Tuesday, 5 January 1970.)

end