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NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

PUGET SOUND POWER & LIGHT COMPANY
ET AL.

Skagit Nuclear power Project
Units 1 and 2)

Docket Nos. 50-522/50-23

Place Seattle, Washington

Date Wednesday 25 1979

Pages 13228-13458

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the matter of:		
PUGET SOUND POWER & LIGHT COMPANY, et al.	:	Docket Nos. 50-522 50-523
(Skagit Nuclear Power Project Units 1 and 2)	:	

New Federal Building
Courtroom 3086
915 Second Avenue
Seattle, Washington

Wednesday 25 July 1979

The hearing in the above entitled matter was reconvened, pursuant to adjournment, at 9:20 a.m.

BEFORE:

VALENTINE B. DEALE, Esq., Chairman
Atomic Safety and Licensing Board

GUSTAVE A. LINENBERGER, Member

DR. FRANK F. HOOPER, Member

APPEARANCES:

On behalf of the Applicants:

F. THEODORE THOMSEN, Esq., DOUGLAS S. LITTLE, Esq., Perkins, Coie, Stone, Olsen & Williams, Seattle, Washington, and MICHAEL BAUSER, Esq., Lowenstein, Newman, Reis, Axelrad & Toll, Washington, D.C.

On behalf of the Regulatory Staff:

RICHARD L. BLACK, Esq., and DANIEL T. SWANSON, Esq., Nuclear Regulatory Commission, Washington, D.C.

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APPEARANCES: (Continued)

On behalf of the Skagitonians Concerned About Nuclear Plants, Intervenors:

ROGER M. LEED, Esq., 411 Fourth Avenue, Seattle, Washington with Mr. Gendler and Mr. Carstens

On behalf of Forelaws on Board and the Coalition for Safe Power:

ERIC STACHON, Portland, Oregon

On behalf of Skagit County:

THOMAS MOSER, Esq., Deputy Prosecuting Attorney for Skagit County

* * *

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Testimony of:	Direct	Cross	Redirect	Recross	Board	Cross on Board
(Resumed)						
E. STULL P. LEECH A. DVORAK H. LEFEVRE T. WINTERS		13,231	13,234		13,287	13,335
T. WINTERS	13,357	13,362				

* * *

Exhibits:	Identified	Received
Intervenor SCANP		
No. 192 (Memo from Hulman to Regan Re: Skagit Nuclear Plant Alternative Site Study, 3/8/79)	13,231	13,233
No. 193 (Staff Memo, "Floodplain Management Act Criteria," undated)	13,264	

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P R O C E E D I N G S

CHAIRMAN DEALE: Let's come to order.

The item that we have on our agenda is the opportunity for the Applicant to cross-examine the panel.

Whereupon,

E. STULL

P. LEECH

H. LEFEVRE

T. WINTERS

and

A. DVORAK

resumed the stand as witnesses on behalf of the Regulatory Staff, and having been previously duly sworn were further examined and testified as follows:

MR. LEED: Mr. Chairman, before we do that I have an exhibit I would like to have introduced by this panel.

CHAIRMAN DEALE: Exhibit in relation to --

MR.LEED: This is the document that has been produced.

(Counsel distributing document to Board and reporter)

This would be exhibit 192.

(The document referred to was marked Intervenor SCANP Exhibit No. 192 for identification)

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CROSS-EXAMINATION (Continued)

BY MR. LEED:

Q Mr. Leech, I am having marked as Exhibit 192, the memorandum dated March 8, 1979 from L.G. Hulman to William H. Regan Re: Skagit Nuclear Power Alternative Site Study.

Do you recall that document?

A (Witness Leech) Yes.

Q Is that the memorandum which you identified earlier for me that was prepared in connection with the preparation of the Supplemental Testimony on Alternative Sites by the Staff, and which is not listed as a reference?

A That's correct.

MR. LEED: We would like to offer this.

CHAIRMAN DEALE: You would like to have this introduced tinto evidence?

MR. LEED: Yes.

CHAIRMAN DEALE: rARe there any objections?

MR. THOMSEN: I haven't seen it, Mr. Chairman. Could we take a look at it?

(Dr. Hooper handing document to Mr. Thomsen)

MR. THOMSEN: No objection.

(Mr. Thomsen handing document to Mr. Black)

MR. THOMSEN: Do you have copies, Mr. Leed?

MR. LEED: I've got one copy here, but I will be depriving someone else if I give it to you.

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(Counsel Lead handing document to Counsel Thomsen)

MR. THOMSEN: Well, I can share it until we get to a Xerox.

MR. BLACK: I have no objection.

CHAIRMAN DEALE: All right.

There being no objection, the matter will be accepted into evidence.

(The document heretofore marked Intervenor SCANP Exhibit 192 for identification, was received in evidence.)

CHAIRMAN DEALE: And now we return to you, Mr.Thomsen.

As we understand it, the cross-examination of the Staff's panel by SCANP and FOB have been concluded, and the turn that comes up now is yours.

MR. THOMSEN: I had thought I had served my turn, Mr.Chairman. I did at the beginning spend an hour or so with Dr. Winters, and considered that my turn.

But, I probably could look over my notes here --

CHAIRMAN DEALE: Fine. We are glad that your turn is finished.

(Laughter.)

Mr. Black, would you care to engage in any redirect testimony?

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MR. BLACK: Yes. I have a couple of things I would like to cover.

REDIRECT EXAMINATION

BY MR. BLACK:

Q Mr. Leech, do you recall one of the questions propounded by SCANP had to do with the assumption of a three-year delay in relocating the Skagit units to the Hanford area?

And, do you recall that a witness -- an answer by the Staff panel indicated that it would be from two to three years, I believe, from when the application was docketed to either an LWA issuance?

Do you recall that line of questioning?

A (Witness Leech) Yes, I do.

Q Do you agree with that statement?

A The two to three years?

Q Yes.

MR. LEED: Just a minute.

Is counsel inquiring whether the Staff is going to impeach an answer it gave?

MR. BLACK: Oh, no. No.

MR. LEED: That's the way I understood the question.

MR. BLACK: We are just clarifying remarks here.

I don't thinkthere is going to be an impeachment

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statement at all.

MR. LEED: Just a minute. A party is not entitled to impeach its own witness.

MR. BLACK: I don't think it is an impeachment statement at all.

BY MR. BLACK:

Q Is that correct?

MR. LEED: Just a minute.

Was this an answer given by Mr. Leech?

MR. BLACK: I believe it was an answer given by Dr. Winters. And we are asking for clarification.

MR. LEED: You cannot have Mr. Leech impeach Dr. Winters. That's not proper.

MR. BLACK: Let me rephrase the question.

BY MR. BLACK:

Q Mr. Leech, do you recall the answer by Dr. Winters which indicated that it would take two and a half to three years from application docketing to LWA or CP?

Do you recall that answer?

A (Witness Leech) I'm not sure of the exact answer, but it sounds like what I heard.

Q Is there anything -- is there any other time involved if -- let's say, is there any other time involved if the Skagit units would have to be relocated to Hanford?

A Other than from the docketing to CP?

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Q That's correct.

A Yes, there would be some additional time involved.

The Applicants would certainly have to make arrangements for a site. Presumably, if you take Hanford for example, for a site at Hanford, just what's involved in that I'm not entirel sure.

I believe that the present plans at Hanford are on a lease basis from the federal government in some manner and so a location would have to be selected on the reservation and negotiations made with the federal government.

And assuming that the same participants would be involved, I guess there would be no particular agonies over changing those contracts.

But, I suppose it is always possible that they may not end up with the same participants. I don't know that.

So I believe there would be some rathe. indefinite period of time for that. I have, just for the sake of an estimate, estimated three months. That may be a rather meager amount of time for it, I'm not certain.

In addition, after you have picked the location at Hanford, although we do know a great deal from previous investigations of the other plants that are being constructed there, this does not relieve an Applicant of doing specific geologic investigatin work at the site. They have to do some boring, whatever analysis goes with the assessment for

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foundations, et cetera.

We have estimated -- well, under normal circumstances, that geologic work might take on the order of 14 months.

But at Hanford, where a fair amount is already known about the region, I have the impression from Mr. Lefevre that you could reduce this to perhaps 10 months. So that you could cut that down somewhat.

Now, while this kind of work is going on, presumably since this would now be a new applications process, the Environmental Report and the Chapter 2 of the PSAR could be in preparation. But you couldn't complete these documents until you had the results of the geologic investigation.

So, I have indicated here approximately two months for that.

And then when you have all this together, the Environmental Report and the PSAR Chapter 2, you file an application which then has to be looked at for acceptance.

Now an acceptance review could be rather quick in this case. Ordinarily one doesn't know until the acceptance review is completed, whether you can then proceed, because we have t make that decision on adequacy of the information.

But here I think we should assume that it would be adequate. And the usual docketing time on a case like that would be about 30 days or one month.

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Now those are the additional items for -- there would be in addition to the period from docketing to the CP.

I do have an overall estimate of the total time if you wish that?

Q Well, couldyou break down the time period then from, let's say docketing, to any type of decision issuance.

Could you indicate to the Board and the Parties what type of timeframe the Staff is contemplating in this type of situation?

A Well, if we take the time from the filing of the application --

MR. LEED: Just one moment.

We did ask Mr. Leech to provide certain information regarding actual experience at Hanford, did we not?

Is it intended to elicit this from him while he is offering those other incidental information?

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MR. BLACK: We'll get into that;if you would like to get it on recross, fine.

MR. LEED: Well, I asked Mr. Leech to get that information, have it available on Monday, and I never did hear back.

MR. BLACK: I think we can get into that, yes.

MR. LEED: I'm going to object to the line of --

CHAIRMAN DEALE: Go ahead, Mr. Black. Proceed with this.

MR. BLACK: We;ll put it in.

BY MR. BLACK:

Q Go ahead, Mr. Leech.

A You asked me how -- what the time would be required for thereview, did you not?

Q Yes. First to contemplate Mr. Leech's request -- Mr. Leel's request; first of all, to the staff assumptions, how long it would take, let's say, from docketing of the applicant's application to decision for issuance and then for the question posed by Mr. Leed earlier as to what is the actual experience for the WPPSS plants over there.

If you could give those answers as well and then give the staff's estimate and then give the actual experience.

A To develop a draft environmental statement, ordinarily takes on the order of nine months these days,

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but we fael we could expedite that and so I have assumed now a rnage between six and nine months for that. The minimum would be perhaps six months.

Then that has to go out for comment, and so forth, and development of a final environmental statement and we would ordinarily expect that might take as long as eight months.

But on an expedited basis, we might make it in four months. So four to eight months is the range for that. After the FES is out, the hearing schedule of course depends on how much intervention there is and the timing of people's availability. But I have put down as a minimum five months and a maximum of 10 months.

Now if you add all these things up together, starting with the time of decision that an applicant would decide to go to another site, the three months of geologic work, et cetera, if you then add all this up to a rnage of a minimum of 30 months to a maximum of 46 months; I can recite that if anybody wants it in clear order, but that's what it adds up to.

Q So you have a rnage of from 30 months to 48 months?

A 46.

Q 30 to 46 months.

Now, can you recite what the actual experience with WPPS plants has been?

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A I do not have precisely comparable information because I don't have the information before docketing, the exploratory information, development of the ER and all that; so I can only give you from the date of docketing, which assumes that we have accepted the filing. I don't know whether the filing has been rejected earlier or resubmitted or what, but let's just take fromthe date of docketing WPPSS number two, which is the earliest of these, it turns out.

That was on August 19, 1971. There was now LWA issued. The construction permit was issued on March 19, 1973; that period was around 19 months.

Now, WPPSS one and four, it was docketed on August 20, 1973, and LWA was issued on August 1, 1975. Construction permits were issued on December 23, 1975 and February 21, 1978.

So what I have here is the span between docketing and LWA is slightly over 23 months to the CP of unit one; 27 months to the CP of unit four, which is somewhat beside the point -- is 53 months for WPPSS for WPPSS three and five, which of course is not at Hanford, but at Satsop -- the docketing date was September 30, 1974.

The LWA issuance, which I guess is for unit three only -- I'm not sure -- was April 8, 1977. The construction permit was April 11, 1978. So the months to LWA were 30 plus, to CP, 42.

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Now, I was also asked about, I guess, the state processing; do you wish me to go into that?

Q What exactly was the question as far as state processing?

A Well, I'll try to rephrase Mr. Leed's interest in that.

I think the question revolves around how long it took for some of these in the state process. FSEC Chairman Lewis confirmed that it was 20 months in their process for a WPPSS number two; and the most recent one, WPPSS three and five, which took 38 months.

I think for our purpose, however, it's logical to assume that unless there is some problem with simultaneous processing of these applications in the state and in the NRC proceeding, that they could occur -- that the state consideration could occur during the time that our process was being accomplished.

There's only one thing, of course, that we would have need for from the state for sure, and that's the 401 certification before we could issue an LWA.

So it would have to be completed before we could issue that.

Q So based on all this information, is it your opinion that the staff's estimate of two and a half to three years is a very reasonable estimate of time to relocate the

david5

Skagit units to the Hanford vicinity?

MR. LEED: I object to that question; it's not up to this witness to decide what's reasonable. I would also object to it insofar as it purports to be based on any data on any sites other than Hanford sites.

BY MR. BLACK:

Q Based upon the data for the Hanford sites, is it your opinion that the staff's estimate of two and a half to three years to relocate the Skagit units to the Hanford vicinity is a reasonable estimate?

MR. LEED: I have the same objection.

MR. BLACK: I don't understand what the objection is.

MR. LEED: This witness is not to opine on an ultimate fact to be found by the board in this proceeding. He's not here to tell us anything. He's here to give us facts. He's not here to make the up the board's mind.

MR. BLACK: Then I don't know what the staff's panel is up there for if it's not to convince the board of their position. I'm only asking for his position and the staff's position.

MR. LEED: You're asking him if he's right.

MR. BLACK: I'm asking him if he thinks the staff estimate is a reasonable one.

MR. LEED: That's a decision for the board. That's

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not a proper question to direct to this witness.

(Board conferring.)

CHAIRMAN DEALE: The board is prepared to make up its own mind about the reasonableness of the staff's supposition, whether it's two and a half or three years.

And presumably, this is an inquiry about -- from a man who knows in general the processes that the staff must go through. He elucidated those processes, the time that was involved with respect to WPPSS and Hanford, and your question is limited to the witness's experience with WPPSS and Hanford.

And we really don't see -- we have no objections to the question. We don't know, whether he says it's reasonable or not reasonable; I think that we are in a position to make up our own mind about the reasonableness of the two and a half to three year limit.

So go ahead. He can answer it.

BY MR. BLACK:

Q Do you have the question in mind, Mr. Leech?

A Whether two and a half to three years is a reasonable estimate.

Q Yes.

A I think the two and a half is a minimal estimate; three years is closer to the mark. It might take slightly longer.

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Q Thank you.

Mr. Lefevre, do you recall that reference was made yesterday to the Woodward and Clyde siting document, that those consultants did for the WPPSS people?

A (Witness Lefevre) Yes, I recall that.

Q Do you recall that the intervenor, counsel for SCANP, stated that in the document, the Woodward and Clyde siting study, he indicated that the Skagit site in that document was eliminated because of seismicity reasons; do you recall that statement?

MR. LEED: Objection to that question. He wasn't testifying --

MR. BLACK: He made that statement; I believe it was made subject to check.

MR. LEED: I don't believe I testified, counsel, and I'm a little concerned that the witness -- this record doesn't have this document before it. The witness didn't have the document with him.

So I'm rather mystified as to what you're seeking to develop about a document not in evidence that is not in the witness's possession.

MR. BLACK: Well, counsel, you made a statement that -- that I believe you said: "Isn't it a fact that the Skagit site was eliminated from that siting study because of seismicity reasons." I believe you made that

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statement.

DR. HOOPER: Mr. Black, I have the distinct impression this is exactly what Mr. Leed said. As a matter of fact, I was arguing with the board about it; I heard the statement yesterday. You're absolutely right. This impression was left with the board by Mr. Leed.

MR. LEED: The problem is that this witness does not have the document before him. Is that the point? Is that true?

MR. BLACK: This witness can set the record straight based upon his consultation with the WPPSS people.

MR. LEED: That's what I thought, yes. That's why I'm objecting, Mr. Black. We don't have the WPPSS people here. We don't have the report here, and I don't think the witness ought to be making a statement based on pure hearsay in relation to what a study shows without his inspecting the study.

Now, he would be able to inspect it, I imagine. staff could produce it, could they not?

MR. BLACK: Well, we certainly don't have it here at this time. But certainly if you're going to object to this because we do not have this document in evidence, then I would ask for your comments of yesterday to be stricken from the record.

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(Board conferring.)

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MR. BLACK: That's the only point.

CHAIRMAN DEALE: Mr. Black, would you be good enough to repeat the question?

MR. BLACK: I haven't asked the question yet, other than was he familiar with that statement made by counsel for SCANP yesterday and he indicated he was.

CHAIRMAN DEALE: When in the document in question --

MR. BLACK: We don't have the document here, but it's a Woodward and Clyde siting study done for WPPSS. I do not have the dates of that study. It's a fairly recent document.

WITNESS LEFEVRE: I think it's 1975.

MR. BLACK: And it consists of what, two volumes? Two volumes and an executive summary?

WITNESS LEFEVRE: I believe so, yes.

MR. THOMSEN: It's a reference in Dr. Cheney's prefiled testimony on alternative sites, among other things I noticed.

MR. BLACK: And my question was going to be simply whether the intervenor's statement as to the elimination of the Skagit site because of seismicity reasons, whether that was a correct statement based on the Woodward and Clyde study.

MR. LEED: I still have to object to the witness responding to the question. If he hasn't reviewed the study --

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MR. BLACK: I certainly can lay that foundation.

MR. LEED: If counsel wants to ask the witness whether any answer he gave at any time is subject to verification by looking at the study, that's fine. But he cannot testify as to what the study shows unless he has seen the study.

MR. BLACK: I believe he indicated yesterday that he has seen the study; he was not sure of the remark that counsel for SCRAP made.

We have checked it. We have checked it through the WPPSS people. Obviously, we cannot draw reference from the Woodward and Clyde study since we do not have it here. That leaves us at a disadvantage, obviously.

If the board will not allow this type of continuation of examination because of inadequate foundation or not having that record -- the siting study in evidence, I would merely ask that Mr. Leed's previous statement in regard to this be stricken, since certainly --

MR. THOMSEN: Mr. Chairman, we can make the study available to Mr. Lefevre over the noon recess, so maybe this could go on subject to his checking it out at that time at our office.

MR. BLACK: But also I think I'm going to ask Mr. Lefevre how he checked out this reference, and he -- he did make some phone calls and check with the WPPSS people, and

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obiously now, the way Mr. Leed is pursuing it, he's going to object to that because of hearsay, and obviously, as you well know, hearsay is allowed in these proceedings, as long as it can be proven reliable.

So I don't see that we really need to lay a proper foundation with the Woodward and Clyde study insofar a response to this question.

MR. LEED: The problem is not just that the witness has called other people up, but rather he's offering interpretation of a document which he does not have and which we do not have.

And as to the interpretation of which no examinationcan be propounded because that document isn't available.

MR. THOMSEN: You spent 25 minutes on the document the other day. What are you talking about?

CHAIRMAN DEALE: The question -- the general question that is based on that study of -- that Skagit was eliminated from consideration because of seismicity --

MR. BLACK: THat's what SCANP is contending.

CHAIRMAN DEALE: Yes.

MR. BLACK: We are going to clarify that if we are allowed to pursue this line of questioning.

CHAIRMAN DEALE: Now, SCANP has made that position -- that is, that Skagit was eliminated from

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consideration because of seismicity reasons, and this conclusion is reflected in this particular study, and you're asking Mr. Leech about SCRP's conclusion.

MR. BLACK: That's correct.

CHAIRMAN DEALE: Mr. Lefevre.

MR. BLACK: Lefevre. I think that really what is was is that Mr. Leed made a statement yesterday to one of the witness's and the witness's unfamiliarity with the Woodward and Clyde study indicated he couldn't respond to that question, whether it was true or false.

Now we have talked to the WPPSS people and we understand what is in that Woodward and Clyde study. And we're merely offering it at this time; I believe that this hearsay witness -- hearsay testimony is reliable. We can tell you who we talked to and what position he holds in the WPPSS organization.

And I think it's a fair interpretation of the Woodward and Clyde study.

CHAIRMAN DEALE: It's verfiable from the study itself that Skagit was eliminated from consideration because of seismicity.

MR. BLACK: That's correct.

MR. LEED: This is completely improper, Mr. Chairman. Mr. Black insists on mischaracterizing the situation: what is being attempted here is to have a document represented

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into the record, and that is not the way in which these proceedings have been or should be conducted.

If the staff wants to put the document before the board and before the parties, it will speak for itself.

Mr. Lefevre should not be purporting to state what it says or why, based on a telephone call. And the document itself is the evidence. But the document --

CHAIRMAN DEALE: Mr. Lead, who was it among your witnesses that made the reference that Skagit was eliminated because of this study in view of siesmicity matters?

MR. LEAD: No witness of mine made that representation.

CHAIRMAN DEALE: I see.

MR. BLACK: But Mr. Lead made that representation.

MR. THOMSEN: That's right.

CHAIRMAN DEALE: Mr. Lead makes a lot of representations, which are not in evidence.

(Laughter.)

MR BLACK: As long as the board won't rely on all those gratuitous statements, I guess we don't have any problems.

CHAIRMAN DEALE: We do not rely on, you know, the statements of counsel. We would like to pin our decision on matters that are in evidence.

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MR. BLACK: Well, I have some problems with that because I don't want these remarks by Mr. Lead to go unresponded to because he was the one that certainly talked about the Woodward and Clyde study at great length yesterday. As you recall, it was a siting study that was differently than the Bechtel study, and we went into that at length.

He was the one that made the statement that the Skagit site was eliminated for seismicity reasons. It seems to me, if you will not allow questioning based on the argument he made reference to at length, then something is amiss in these proceedings, particularly if there is a confusion surrounding the testimony he elicited yesterday.

I think that when we have every opportunity to clear up the confusion that was brought forth yesterday -- I still don't understand the basis for his objection.

MR. LEED: Just to clarify matters, Mr. Chairman, I invite questioning based on the document, as long as the document is here.

I welcome questions based on the document as long as the document is here in the record. I have no problems with that. That's what I'm encouraging, in fact.

MR. BLACK: Well, of course, he would encourage that only because we do not have the document here. And it's not possible for us to enter it into the record. But maybe we can clear this all up. If the board would like to pursue

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this, they can ask the question.

DR. HOOPER: Right.

CHAIRMAN DEALE: Yes.

MR. BLACK: And I will just skip by it.

CHAIRMAN DEALE: Well, it might be helpful -- did you say, Mr. Thomsen, that you were able to -- you have the document and you could make it available at, say, the noon recess?

MR. THOMSEN: Yes, sir, I can. I have only one copy, and it's -- it's, as I recall, two thick volumes. But I certainly can make it available. It doesn't belong to me or -- anyway, I can make it available.

CHAIRMAN DEALE: All right.

MR. THOMSEN: I don't want to grab for the record here --

CHAIRMAN DEALE: I think it would be helpful if you made it available; just the fact that the document is here might solve some of the problems.

MR. THOMSEN: Right.

CHAIRMAN DEALE: Well, Mr. Black, could you proceed. And we -- you understood that Mr. Leed made the statement that Skagit was eliminated from consideration by this study because of seismicity considerations, and that's a statement that you understood that Mr. Leed had made.

Mr. Leed points out that no witness has made that.

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MR. BLACK: That's correct.

CHAIRMAN DENNIS: I -- it would appear -- and your position is that that -- that that is so or not so?

MR. BLACK: That is not so.

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And I realize many times Mr. Leed is his own best witness and I have certainly listened to him many times when he offers statements and he's been useful to us many times in this proceeding in this past.

BY MR. BLACK:

Q Mr. Leech, I believe you indicated you were familiar with Exhibit -- I believe it's 192, which indicates Skagit Nuclear Plant Alternative Sites Study: A Memo for William H. Regan from L. G. Hulman, chief Hydrology-Meteorology Branch, dated March 3rd, 1979.

Are you familiar with that document?

CHAIRMAN DEALE: Is this Exhibit 192?

MR. BLACK: Exhibit 192.

WITNESS LEECH: Well, I certainly read it at one time.

BY MR. BLACK:

Q Does that exhibit indicate on page 3 that these sites have been evaluated insofar as the flood plain management act or the floodplain management --

MR. LEED: Objection.

This goes beyond the witness's direct testimony. This is not redirect.

MR. BLACK: This is a matter that was brought up on cross-examination by an exhibit brought through cross-examination by Mr. Leed. It certainly is proper for redirect.

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MR. LEED: Oh, no it's not, Mr. Chairman, not if we're not going to get an opportunity to inquire. If he gets to develop a new subject and we're out off on the opportunity to inquire on it, if we're going to open a new subject then we have to have the opportunity to inquire.

CHAIRMAN DEALE: The opportunity to inquire about what?

MR. LEED: Mr. Black just started to ask the witness about floodplain studies. He didn't ask about any floodplain studies nor is there any testimony in the prefiled testimony, direct testimony, regarding floodplain studies.

And I might say just to preface this that Mr. Black is well aware of the fact that I have advised him that we want to seriously cross-examine with respect to any floodplain studies that have been conducted. So I'm merely trying to preserve our opportunity to exercise our right to inquire about any such studies.

And I'm sure counsel is not trying to frustrate that, but I had in mind the Board's view that we are not entitled to any kind of recross, and therefore we have to be cautious that any new subjects are not opened.

MR. BLACK: Well, I realize that perhaps Mr. Leed anticipated me a little bit here, and I will let the Board know where I am going. I don't know if the Board is familiar with the floodplain management -- I don't believe it's called

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an act, it's an Executive Order 11988, which was passed I believe sometime this spring, which indicates that all construction projects must be evaluated as far as their floodplain management criteria set forth in that executive order.

This exhibit merely indicates that all sites have been evaluated for the floodplain management, and I was merely going to ask Mr. Leech if the Skagit site has been evaluated pursuant to those criteria as well. And that was basically as far as I was going to get to.

Now if --

CHAIRMAN DEALE: Well, this is a subject that has been introduced by SCANP, that is this exhibit. And your inquiry relates to the exhibit.

And we're going to let the question go.

MR. LEED: Mr. Chairman, do I have the opportunity to inquire about any subject, any question that's asked about something that was not raised by us on our cross?

CHAIRMAN DEALE: Well, this is a matter which you had just raised, as we understand it. You had asked to put this into evidence, and Mr. Black has picked this up and has gone through the matter, and he has a question as to whether or not Skagit has been looked at from the standpoint of floodplain management.

I don't know where he might have had a point of

mpb4

departure if this hadn't been introduced. And we're talking about a matter that has been introduced, which is a Scaff memorandum.

MR. LEED: This was introduced after we were instructed we could ask no more questions. Does the Chairman recall that?

CHAIRMAN DEALE: I certainly recall that we said to you that your cross-examination should be finished of the panel by yesterday.

MR. LEED: So we never had an opportunity to inquire, I want the record to show that. And that is why I'm making the point now.

We have not had the opportunity.

CHAIRMAN DEALE: You have not had the opportunity to inquire about what?

MR. LEED: It was not a matter of waiving the opportunity. We have never had an opportunity to inquire about this document that counsel is now seeking to get into.

MR. BLACK: Well, I think that --

CHAIRMAN DEALE: This still is a reference which you introduced into evidence.

MR. LEED: That's true.

MR. BLACK: I don't have any problems with Mr. Leed pursuing a limited amount of examination on anything I bring out on redirect. I think that's proper. If we are going

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to bring out anything, I think he should have a reasonable opportunity.

CHAIRMAN DIXLE: Well he's talking about, then, a recross. And from our standpoint we simply said that the cross-examination must be concluded by the time of the end of yesterday.

I suppose you could say that we have not addressed ourselves to the question of recross.

Now if Mr. Leed has the opportunity of recrossing on material that Mr. Black brings up, that should eliminate much of Mr. Leed's objections.

MR. LEED: Well, that would address my concern, yes, sir.

CHAIRMAN DIXLE: Yes, all right.

MR. LEED: I wonder if Mr. Black could give us a reference in the record to any statement regarding seismicity in connection with the Woodward-Clyde study. Do you have something in mind?

MR. BLACK: I have not gone through the record. I don't have a transcript cite. But I can certainly check that out for you.

MR. LEED: Well, I'm very concerned, if you could point out to me where I made any representation such as you spent quite a bit of time this morning describing.

MR. BLACK: I will check that out.

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MR. LEED: All right.

And I'd like to reserve some time before we begin after the recess at noon to have Mr. Black point us to the record where there was such a representation.

BY MR. BLACK:

Q In any event, Mr. Leech, referring to Exhibit 197, where they indicate that -- this exhibit indicates that the Hydrology-Meteorology Branch has evaluated alternative sites insofar as the floodplain management act is concerned, is that true?

A (Witness Leech) I really can't say that they have fully evaluated the alternative sites with regard to floodplain management. They have primarily called our attention to a necessity for doing so for any site that is a proposed site, and they have as a matter of information presented some preliminary information about some of those 20 some sites in regard to that wherever they felt it might be necessary that we pay attention to it.

Q And did this branch also evaluate the Skagit site insofar as the -- Did they evaluate the Skagit site in its review of these alternative sites?

A Yes, they have.

Q And what were their conclusions with regard to the Skagit site insofar as the floodplain management criteria?

A Let's see.

mpb7

Q What are the floodplain management criteria anyway? Can you give us a brief synopsis of that?

A I'm sorry to say I don't have that here. But as I understand it, when something is going to be located in the floodplain, in the case of nuclear plants it's likely that an intake and a discharge would be in the floodplain. And in some cases facilities, you know, major facilities might be in the floodplain.

Such a thing must be evaluated for its impact on I guess downstream flooding that might result from the presence of those structures. That I think is basically the intent of a floodplain --

Q Does it have to be evaluated insofar as any terrestrial impacts as well?

A Well, we have done so. I'm not certain whether it calls for that, but I guess it does or it wouldn't be here.

Q And what has the Staff concluded insofar as the Skagit Plant with regard to the floodplain management criteria?

MR. LEED: Well, on that I believe there are documents, is that correct?

MR. BLACK: That is correct.

MR. LEED: And I've advised Mr. Black that I wanted to cross-exam[illegible] the persons who prepared those documents. And I am prepared to object to this question unless Mr. Leech is in a position to respond to such cross-examination.

mpb8

MR. MOSER: Mr. Chairman, Skagit County also has an interest in the floodplain management and I've asked our staff to also prepare something I think might be useful to this Board along these lines. And maybe we could do that in the future, if we could have an indication of when you'll be accepting this testimony.

CHAIRMAN DEALE: Yes, that's what I was going to say.

MR. MOSER: All right.

CHAIRMAN DEALE: I just want to make sure that we understand this, Mr. Moser.

You have direct testimony that you would like to introduce?

MR. MOSER: At this point I believe we will. I've asked our staff in Skagit County who have an expertise in floodplain management because that's part of our function also, to be prepared to be of assistance to this Board if called upon or if there is a need.

CHAIRMAN DEALE: And when would this testimony be ready and available so we could have a witness?

MR. MOSER: I could do that probably within the next few days, if that's something the Board feels is appropriate. I haven't got them prepared right now, but I warned them last week. Mr. Black was kind enough to give me a copy of the document he has now, and I forwarded that to

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them and asked them for their comments and further evaluation.

So if I have an indication of when, I'd be glad to put on some testimony.

CHAIRMAN DEALE: Well, we'll take this matter -- I'm glad to have your comment.

MR. BLACK: I guess there's no sense in pursuing this since we seem to have a lot of opposition to it.

But let me just hand out now the Staff's evaluation. I have handed it out to the parties previously. I think that I handed it out to the Board -- Oh, you have a copy? Okay. So everybody has a copy of the Staff's evaluation of that.

MR. STACHON: You're referring to this one page? (Indicating.)

MR. BLACK: I'm referring to that one page.

CHAIRMAN DEALE: Mr. Black, I'd like to just see it.

(Handing document to the Board.)

MR. LINENBERGER: You did hand it out, but....

MR. BLACK: I guess, as long as we might be getting into this subject later, at this time I'd at least like to have it marked as Exhibit 193, and we can dispose of it at some future time.

This is a memo that was prepared by the Staff pursuant to answering this question of the floodplain

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Management Director Oria.

(Whereupon, the document referred to was marked as Exhibit No. 193 for identification.)

BY MR. BLACK:

Q Mr. Leech, do you have a copy of Exhibit 193 in front of you?

A (Witness Leech) Yes, I have it.

Q Was this prepared under your -- or pursuant to requests by you to the Hydrology-Meteorology Branch?

A Yes, and to the environmental specialists as well.

Q So this was a multi-discipline endeavor, at least as far as the conclusions that are derived here?

A Yes.

Q And would this be something that would normally come under your purview as far as the environmental project manager in any case?

A Yes, it would.

MR. BLACK: I would like to have this offered into evidence at this time. And I certainly realize that other people would like to have the chance to respond to that, so I don't particularly want to get into the detail now, particularly if we're going to cover it at another session.

Skagit County certainly should have the opportunity

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to evaluate this, so I guess I would not pursue it at this time.

CHAIRMAN DEALE: Not pursue what, Mr. Black?

MR. BLACK: Well, the facts that are indicated in here, and I think that SCANP should be given a reasonable opportunity to respond to it as well.

So at this time I would just like to offer it and give everybody a reasonable opportunity to respond to it. And we will not pursue it any further.

MR. THOMSEN: Is it possible we might do it this session, but next week, or take more time than that? I was hoping we could maybe clean up an item like this.

Do you have witness availability problems?

MR. BLACK: Well, I haven't really checked this out. But I know that we could handle it if there are people that would want to respond, I guess we could handle it either next week or at the August session.

But I think that perhaps the August session might be a better shake at least for Skagit County to respond to it.

CHAIRMAN DEALE: So you're introducing this into evidence --

MR. BLACK: At this time, yes.

CHAIRMAN DEALE: -- at this time?

MR. LEED: We have an objection, Mr. Chairman,

mpb12

unless we can be assurred that Mr. Leech is able to answer questions regarding the manner in which any investigations which underlie Exhibit 193 were conducted and describe the data gathering process and all the evaluations that were performed.

That is what we want. We want the opportunity to cross-examine regarding that.

BY MR. BLACK:

Q Well, Mr. Leech, do you know how this evaluation was made and what data was considered in the evaluation?

A (Witness Leech) No, I don't.

Q Didn't you provide the Hydrology-meteorology branch with the data with which to make this assessment?

A I believe the branch already had information from various sources such as the Environmental Report and the FES.

I didn't particularly provide anything else.

CHAIRMAN DEALE: Mr. Leech, are you in a position to explain the process which the Staff went through to justify this report? I think this is what Mr. Leed is referring to.

He'd like to know how they got to these conclusions and the extent of their study, the method of their study, what they studied and so forth. And this is what Mr. Leed is asking.

mpb13

WITNESS LEECH: Well, I can at least give a fair try at it, yes.

MR. LEED: Well, for example, this document contains the conclusion that:

"...the physical structures involved will not measurably diminish the floodplain's capacity to convey water, nor significantly alter the water levels during flood..."

Can Mr. Leech respond to any questions at all regarding the basis for those statements?

WITNESS LEECH: I don't have the detailed information to respond to that.

But I can tell you that the hydrologists had what they regarded as sufficient information about the floodplain to make the judgment.

MR. LEED: And their judgment was reasonable in your opinion, I assume -- Don't answer that, Mr. Leech. I withdraw the question.

Anyway, I just tried to bring out the concern that I voiced to Mr. Black, which was that we beli it's important to find out the basis for these conclusions.

CHAIRMAN DEALE: Mr. Black?

MR. BLACK: Well, I think that's a reasonable request. I think that as long as Skagit County as well as SCANP desires to respond to this, I think that they should

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respond to it by the August session. And obviously I would say again that we certainly would like to see these responses before we come into the hearing process again and not get inundated with prefiled testimony -- I shouldn't even say "prefiled testimony" -- testimony when we get here.

We would like to see what their concerns are and have the opportunity to respond to them.

MR. LEED: Well, let me just tell the Board, Mr. Black and the other parties here that for us to identify our -- quote, unquote -- "concerns" -- which is a term I've heard counsel repeat here a number of times -- we need to have some more information.

Here is less than a full page which purports to report conclusions about floodplain analysis without any information about who considered -- who did the analysis, what they considered, how it was done. So as a practical matter without the opportunity to inquire, we're not in a position to know whether or not there should be a response made to this document.

And if Mr. Black is suggesting that this should be received into evidence and we should merely be given the opportunity to speculate that there may have been some errors, I think that's rather premature. We have to know how it was done before we can ask an expert to evaluate the process and the method and the data.

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CHAIRMAN DEALE: Mr. Black, just some orientation.

Is this a general subject of hydrology and terrestrial ecology, a matter which comes under the general umbrella of alternative sites? That's the subject matter that we're talking about.

MR. BLACK: Yes and no.

All candidate sites have to be evaluated with regard to the flood plain management criteria, and that is what Exhibit 192 indicates.

At the end of the Staff's analysis of all alternative sites we do go into these criteria, and that is reflected in 192.

CHAIRMAN DEALE: Insofar as Skagit is concerned?

MR. BLACK: Insofar as Skagit is concerned, the paper that I handed out which is marked for identification as 193 is the Staff's review of that.

Now this is similar to -- this Executive Order 11988, the floodplain management, is similar to let's say a 401 certificate. We have to do that evaluation, or that evaluation has to be completed before a CP is issued. And we have to note that the Staff has evaluated these criteria, floodplain management criteria. And this is basically what this document indicates, that we have done that analysis and we see nothing that would violate the criteria set forth in

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the floodplain management.

CHAIRMAN DEALE: In the content of the alternative sites subject, has the Staff made a study of the hydrology and terrestrial ecology of the other sites?

MR. BLACK: I believe that has been indicated, yes, that we have done a limited study of both of those things insofar as the candidate sites are concerned, and this is reflected in previous testimony.

That's about the best I can say about it now.

CHAIRMAN DEALE: Well, then --

MR. BLACK: Well, I think insofar as what we should do with Exhibit 193, obviously I'm hearing that Mr. Leed has problems insofar as its introduction into evidence.

He has indicated also that he wishes to respond to it. I believe that there's enough in this document that he can respond to. He certainly knows the problems with the Ranney Collectors and the diffuser and its relationship to any floodplain. And I don't believe that the Staff has to set forth any further basis than what is depicted here.

MR. THOMSEN: Mr. Chairman, I'm troubled that the Intervenor is attempting to sieze on this to once again expand this proceeding and cause further delay.

I confess I don't know what the executive order provides, but I am concerned that Mr. Black maybe is offering too much opportunity to Mr. Leed here to go into this document.

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Could it be that this is something that the Staff is independently obligated to do and file with the Board, and it's not really subject to examination in an evidentiary hearing, for example. Certainly SCRAP has no contention that would go to this piece of paper. The only paragraph that adds anything at all is the second paragraph. It states a conclusion and an observation.

The first paragraph and the third paragraph are well supported by the existing record, and of course the conclusions are supported too in my view by the existing record.

I am puzzled. I am sorry I'm not familiar with the legal status of this obligation of the Staff, but I am quite concerned that we could arrive here the last week in August and have this be the vehicle for four or five days on project discharge, Ranney Collectors, barge slip and so on again, which I don't think would be appropriate.

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MR. BLACK: That is also my problem. I am not so sure as to -- I think this is the first proceeding in NRC where we have had to deal with this problem after the FES has been issued.

Usually what we do now is indicate the FES, whether the flood plain management criteria are acceptable or not; whether those things can be addressed by the Staff.

And so therefore we usually don't get into them by this type testimony.

I also believe that we could probably satisfy the requirements of this Executive Order by writing a letter to CEQ indicating to themthat we have done the evaluation and we see no problem.

I have handed this out to the Board and to the Parties because I am just not certain the best route to go. But I also think if we are going to get hung up on this which I consider a non-issue, really, to me what I can see from the Skagit site and everything there, there is really no problem with the flood plain management criteria. I am concerned that Mr. Lead might use this as a vehicle to stretch things out.

But I am also cognizant of the fact that perhaps maybe he should be given a limited opportunity to respond to this just the same as Skagit County, if they do see some problems here that perhaps the Staff hasn't focused on.

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So I am willing to give them a very limited opportunity to respond to what is set forth in Exhibit 193.

But, insofar as the Staff coming forward with anything more, I don't think it is necessary.

I think that all the parties and the Board are fully cognizant of what these hydrology problems are surrounding the Skagit site. They have been addressed many times before. So I don't think that we have to set forth anything further.

These conclusions, pursuant to the Executive Order 11,988 are based on facts that are in the record and they are equally available to SCANP as well as tothe Staff.

Now we will make witnesses available at the August session to answer any questions as to how they came to these conclusions, but I don't believe that we would be in a posture to set forth anything further than what we have done here insofar as the hydrology and terrestrial ecology goes.

CHAIRMAN DEALE: Mr. Black, a question here.

This study has been a result of the Executive Order.

MR. BLACK: Which was passed sometime this spring, I believe.

CHAIRMAN DEALE: Which was what?

MR. BLACK: Passed sometime this spring, spring of '79.

CHAIRMANDEALE: Yes

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Now, is there any vehicle -- you suggested one and I'm asking for perhaps an elaboration of the previous comment of yours -- to determine whether the Executive Order has been complied with?

MR. BLACK: I was just merely trying to think of one other than having all of this get into the record and what have you.

I suggested merely, no one back in Bethesda has given me a response as to whether this is right or wrong, that we could just write a letter to CEQ indicating we have complied with the Executive Order, or some other branch of the federal government that is responsible for Floodplain Management Act, such as the Department of Interior or something like that, indicating we have considered it and see no problems with it.

I think that would probably satisfy the requirements of the Executive Order.

I think I have gone beyond that by indicating we are showing to the parties that we have considered it and given them a fair opportunity to respond to it. But, like I said, if it becomes protracted I just might take another vehicle.

MR. LINENBERGER: Does the Executive Order itself, Mr. Black, establish any administrative procedures with regard to responding to it that would -- does it require any

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reporting back to somebody, or give a clue as to what the Executive thinks is responsiveness?

MR. BLACK: I have not read the Executive Order, but my understanding is that there is really no vehicle of response other than it just indicates that all federal agencies that are doing construction projects in the floodplain should consider these things.

MR.LINENBERGER: Thank you.

MR. BLACK: And that's it.

I have no further questions of this panel.

And, I guess to get back to Exhibit 193, there is an objection standing from Mr. Lead.

CHAIRMAN DEALE: Yes.

Well, your general position is that you would recommend that we treat this subject of floodplain management at another time. And at the same time give Skagit County the opportunity to, let us say, study whatever testimony you propose to introduce. And also, to make whatever suggestions or comments it has on this general subject at the next month's hearing.

MR. BLACK: Right.

I also would like to set forth my position that I believe now the burden of going forward is both for Skagit County and SCANP as far as this issue is concerned. As I said, the facts are on the record here as to how the STaff made

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its conclusion.

We would be willing to address any concerns that they might come up with insofar as these conclusions go.

But, if they say merely no, we want these witnesses to come forward and answer questions insofar as how they arrived at these conclusions, I think that we might object to that other than the fact that it merely is another third or fourth or fifth bite of the apple on these issues of hydrology and terrestrial impacts.

I think these things have been gone over before. I think it is clear at least in my mind, the facts are in the record as to why and how these conclusions were derived. And I would object unless we saw something before that August session as to what the specific concerns were.

MR. LEED: I want to make a couple of statements, Mr. Chairman. I guess my boiling point is being reached here.

First of all, I am disturbed when two counsel stand before this Board and tell the Board they don't want the Board to receive evidence because it might stretch things out. Staff counsel made that statement. I believe that is an accurate quote. Stretch things out.

That, I think, shows a disrespect for these proceedings and for the entire process and for the law under which this body is constituted.

Now there are implications from that which are

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troublesome for other reasons, but I want to register a strenuous objection for any such remark. And I would suggest it be either withdrawn or stricken from the record.

I don't think counsel should engage in that kind of discussion in the future. We are here to try to consider whether a nuclear plant should be licensed on this site, and we are here to consider all appropriate and relevant evidence. And it seems to me for counsel to broach such a suggestion is improper in the extreme, as a grounds for not considering evidence.

If counsel want to make proper objections, that is one thing. But to resort to this kind of talk is something I just never expected to encounter.

More importantly, Mr. Black has just repeatedly made misrepresentations about the record; specifically he has represented that there has been any consideration whatsoever of floodplains in this record.

There has been no witness to testify on pfloodplains, there has been no issue with respect to floodplains, as Mr. Black might have recalled, if he recalled Mr. Thomsen pointing out we had no contention. Mr. Thomsen is vigilant and he doesn't let us go beyond our contentions. So there is nothing in the record regarding floodplains. I want that to be absolutely clear.

I will make that representation, Mr. Black, right

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here and now. I am sure the record is going to show what it is. And if youthink there is any basis for contending otherwise, I'd appreciate it if you would bring it to our attention.

Furthermore, the record before this Board does not reflect any consideration of Executive Order 11,988. As Mr. Black has already explained, while he was contradicting himself by asserting that the record contained this information, he also pointed out that the Executive Order had only been adopted this spring.

So, no reference to the Order, no reference to the criteria under the Order, the procedures under the Order, or the substance of implementing the Order appears in the record.

Now that is something I wanted to preface my remarks with because I am going to direct a request for information to the Staff. Since Mr. Black has chosen to try to cloak whatever analysis the Staff did do under this rhetoric about, "let's not stretch things out," and"the record is already full of this information."

If we are to have a witness to explain how this was done, I would like the Staff to respond as soon as possible so that if there are going to be any prefiling dates I can have this information in hand, to the following inquiries:

Would you please tell us what base flood was utilized with respect to any floodplain analysis done of the

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Skagit site? And I am using that term advisedly referring to Floodplain Management Guidelines for Implementing Executive Order 11,988 issued by the U.S. Water Resources Council, Citation 43FR6030, February 10, 1978.

We would also like to know what the critical action was identified by the Staff for purposes of these Guidelines.

We would like to know the base floodplain identified for purposes of these Guidelines.

We would like to know the facility identified for purposes of these Guidelines.

The flood fringe, the flood proofing, the 1 percent chance flood, the critical floodplain.

We would like to know specifically what areas -- when I say we want to know what the Staff designated to be the floodplains, we would like to know with reference to a map that has been published by a recognized source, what floodplain has been analyzed by the Staff.

We are interested in knowing whether or not the Staff's analysis included analysis of potential monetary loss, analysis of effects on human safety, health and welfare, analysis of shifting costs or damage to others, and the potential for affecting a natural and beneficial floodplain values.

CHAIRMAN DEALE: Mr. Leed, I believe the point that

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you are making is fairly clear without having to read every paragraph of the booklet that you have in hand.

You might cite the booklet and be sure that the Staff takes into consideration the major matters identified in the booklet. But I don't really believe we are making any headway here by your further recitation of the material in the booklet.

MR. LEED: I am making specific information requests to the Staff on the record now, so that Mr.Black will have the opportunity to make the information available.

CHAIRMANDEALE: All right. You can make those references if you wish, you know, at another time.

Mr. Black has indicated that he would have a basis for these conclusions and to what the Staff has done with respect to this Executive Order. And this, I take it, is a reference-- ties into the Executive Order. And it is idle for us to, you know, all have to sit here and listen to a recitation of paragraphs from a document that is already in existence and which you can identify for Mr. Black and go from there.

MR. BLACK: I, obviously, stand corrected as far as date of implementation. I thank Mr. Leed for that correction.

I am not so certain that his reading is accurate and what have you, but I will look at that Order. I certainly want the Staff to respond fully to the criteria that are set

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forth in the Executive Order and the implementation of it.

I'm not so certain again, that it is going to take anything different than what we have done here. But I will take a look at it.

CHAIRMAN DEALE: And, so far as this is concerned, this Exhibit is concerned, we might correctly handle it in this manner:

Inasmuch as you will have somebody to introduce it who will be able to explain how it was arrived at and so forth, keep it in the record for identification purposes only, and subject to the introduction into evidence at a later date with an appropriate witness.

MR. BLACK: That's fine.

CHAIRMAN DEALE: This subject we'll have to postpone until the next hearing session -- we will get to this a little later when we talk about the schedule for the hearing session, and at that time we will talk about when the testimony, whatever testimony is going to be presented, and must be prefiled.

We, too, have in mind that a witness may not come on unless his testimony has been prefiled per schedule. We can't get too committed to allowing testimony to be brought up at the last minute without giving the opposing parties a chance to look it over and prepare themselves for cross or have appropriate witnesses, other witnesses about.

So with respect to this subject of floodplain

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management, we will have the matter -- the whole subject will be postponed and it will be taken up at the next month's hearing session.

Now at this time --

MR. BLACK: Mr.Chairman?

CHAIRMAN DEALE: Yes?

MR. BLACK: One further thing.

Mr. Lead invited my reference to a transcript cite about this Woodward-Clyde. I merely indicate TR.13,137:

Question, Mr. Leed:

"Isn't it true that the Skagit site area was excluded in the Woodward-Clyde study on the ground of the application of the regional seismic characteristics criteria?"

Answer: "I don't know why they excluded the area. I do know that many of their maps did not go as far north as that."

And that is basically the gist of what I was getting at.

CHAIRMAN DEALE: Fine. Thank you, Mr. Black.

(Board conferring)

MR. LEED: I wouldpoint out that there is no representation involved in that question, and it was not answered.

CHAIRMAN DEALE: Well, the representation just

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speaks for itself.

MR. ENNIS: I invite the Board's attention to page 13,133 of the transcript. 132 and 133, where the question was put:

"Does anyone on the panel recollect whether the Skagit site was in an area that was seismically acceptable in the Woodward-Clyde regional study. . ."

And the answer is:

"Apparently no one recalls seeing that."

The Chairman then on 133 asked whether it was seismicity, et cetera.

And then the Staff did represent -- my question was:

"Isn't it true through the application of all criteria employed, the Woodward-Clyde study concluded that the Skagit site was in an area in which nuclear sites should not be located?"

And the answer is affirmative based on a recollection here.

It does not refer to seismicity and that is the danger I foresee of having a witness testify without the document in front of him.

There is a very specific representation here.

"It was screened out?"

"It was screened out, yes." That is the answer

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at the top of page 13, 134.

MR. BLACK: And it certainly is clear to me that there was a representation by you that it was screened out because of seismic -- regional seismic characteristics.

MR. LEED: That is not true.

I said on line 11, Mr. Chairman --

CHAIRMAN DEALE: Line 11, which one?

MR. LEED: Line 11 on page 13,133:

"Mr. Chairman, perhaps you are limiting my question. I did not refer to seismicity."

MR. BLACK: Certainly later, Mr. Leed, you did limit it to seismicity. And I think the statement speaks for itself.

MR. LEED: I made no attempt to limit it, and that's clear from this proceeding discussion, Mr. Black.

I made no representations to the report or to you.

MR. LINENBERGER: I'm confused, Mr. Leed. I have to understand at the top of page 13,137, is that your question there beginning with line 1:

"Isn't it true that the Skagit site area was excluded from the Woodward-Clyde study on the ground of the application of the regional seismic characteristics criteria?"

Transcript page 13,137, lines 1 through 3?

MR. LEED: That's right.

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MR. LINENBERGER: That was your question, was it?

MR. LEED: That's my question.

MR. LINENBERGER: Thank you.

MR. LEED: And there was no answer to that question in this record. And it could have been answered yes or no.

MR. BLACK: It was answered, "I don't know."

MR. LEED: That's right. That was no answer to the question.

MR. LINENBERGER: Excuse me, Mr. Leed.

We weren't talking about answers. I thought you said you didn't ask such a type of question and that was the only point.

MR.LEED: No. I said I made no representation, Mr. Linenberger. There is a difference between a quesetionand representation.

MR. LINENBERGER: I see what you mean.

MR. LEED: If I make a representation, I try to be very careful about it. I do not represent something --

MR. LINENBERGER: I have the clarification I need.

MR. LEED:--have to have it representing matters relating to evidence to the Board, because that is not counsel's role.

CHAIRMAN DIALE: Mr. Black, I don't know whether you care to go forward after this limited redirect that you

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have had or not, but you will have the opportunity now.

MR. BLACK: No, I am through with my redirect, Mr. Chairman.

CHAIRMAN DEALE: All right.

MR. LEED: I would like to raise one point relating to this floodplain issue for the information of the Board and Staff.

The source I am referring to, for Mr. Black's information also, describes floodplains as "any land areas susceptible to being inundated from any source of flooding including those which can be flooded from small, and often drywater courses."

And that is one of the reasons I am interested in having the Staff define which floodplain area it dealt with.

MR. THOMSEN: Could I have a citation to the pamphlet, Mr. Leed?

MR. LEED: Why don't I give it to you off the record. I have given it to you on the record already.

MR. THOMSEN: That would be fine.

CHAIRMAN DEALE: We now come to the point of questions by the Board of the panel.

If the Board has questions, why they should say them now or forever hold their peace.

Dr. Hooper?

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EXAMINATION BY THE BOARD

BY DR. HOOPER:

Q Dr. Stull, I wanted to clarify some of the things you said yesterday about the Woodward-Clyde report.

I believe you said you had inspected it from the standpoint of environmental criteria, but you had not inspected it in terms of geological criteria.

But I believe you also said that the evaluation was done by a series of overlays, photographic overlays.

A (Witness Stull) That's correct.

Q Do you recall whether the series of photographic in the series of photographic overlays, there was only one overlay that was used for Skagit because of the Wild and Scenic Rivers problem, or was there more than one overlay used?

A There were many overlays used, but the overlay that I recall excluded the Skagit site, was the Wild and Scenic Rivers Act.

Q And this was the only one?

A It is the only one that I recall that excluded it.

Q Now, to clear up another point.

Mr. Lefevre, I believeyou told us that you had some additional information this morning regarding the Woodward-Clyde study from some communications with some of your colleagues.

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And this information is relevant to the matter of whether the Skagit site was excluded on the basis of seismology.

MR. LEED: May I have a preliminary question, Mr. Chairman?

Will the Board deem that the Washington Public Power Supply System has volunteered to make a copy of the Woodward-Clyde study available to us if Mr. Lefevre is going to report communications made by them?

CHAIRMAN DEALE: I don't want to interrupt Dr. Hooper here.

Let's proceed, Doctor.

BY DR. HOOPER:

Q Could you give us the information that you say -- that your counsel has represented was received regarding the Woodward-Clyde study?

A (Witness Lefevre) Yes.

This morning I called Mr. David W. Tillson, Chief Geologist of the WPPSS organization, and inquired of him as to the reason, if any, for screening out the Skagit area in the Woodward-Clyde 1975 report. And I specifically asked Mr.Tillson if, on seismic grounds was the Skagit area excluded from further consideration in the Woodward-Clyde report.

Mr. Tillson's response to that was, no, it was not

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screened out on the basis of seismicity, but on the basis that the WPPSS organization was looking for new sites, not sites already occupied or spoken for, for nuclear power plants.

Obviously in 1975, the Skagit proceedings had been underway for sometime, several years. On that basis --

MR. LEED: Are we permitted to object to this answer?

WITNESS LEFEVRE: -- they were excluded.

CHAIRMAN DEALE: You can make whatever objections you want. But allow Dr. Hooper to conclude his examination of the witness. Then you can make any objections.

WITNESS LEFEVRE: And Mr. Tillson went on to say that indeed, the Woodward-Clyde report did consider areas very near Skagit, just over the Whatcom County line, essentially immediately to the north of Skagit.

I didn't pursue it beyond that point.

DR. HOOPER: Thank you.

MR. LEED: Now here is my problem, if I can state it, Mr. Chairman.

The witness has gone ahead --

CHAIRMAN DEALE: No, Mr.Leed, what I am saying is, I would like to have you make your objections, if you wish to make objections, to any of our questions at the conclusion of the questioning by the individual.

In other words, I believe that Dr. Hooper ought to

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have the opportunity to proceed with whatever questions he wishes.

Similarly, with Mr. Linenberger and myself.

At the end of Dr. Hooper's statement, at the end of Mr. Linenberger's statement, or at the end of my statement, you can summarize whatever objections you wish to make.

This is the procedure that we intend to follow. So, recognizing that you may have objections to what one or the other of us is asking, we ask you to hold the objections until the end of the interrogation.

MR. LEED: I may or may not be able to recall the objection.

CHAIRMAN DEALE: Well, that is a problem, Mr. Leed, that you might have.

MR. LEED: In fact, I will have it, I'm sure.

CHAIRMAN DEALE: All right.

MR. LEED: But I also want to --

CHAIRMAN DEALE: No, please. This is Dr. Hooper's and he should continue his questioning without interruption.

MR. LEED: All right. I'll accept the Chairman's ruling, that I may not say anything further at this point.

CHAIRMAN DEALE: At this point, that is correct.

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BY DR. HOOPER:

Q Mr. Lefevre, the other day -- this goes back to about Friday, I believe; I'm not sure -- you were questioned about the relative seismology of these various sites and the question of the 1872 earthquake came up.

And I believe you made some statement -- a statement that the staff believes that the 1872 earthquake was an intensity eight; is that correct?

A This is the value we've accepted.

Q You've accepted. Right.

Do you know whether all your geological colleagues have accepted the value of intensity eight or is this a matter of some dispute?

A It's a matter of some dispute. There are varying thoughts on what the numbers might be. Two reports that were brought to my attention by Dr. Chaney earlier in these proceedings -- one, the Malone-Bor report -- indicated an intensity of seven; and the Woodward-Clyde report, which we referred to earlier, also indicated an intensity of seven, which is obviously one level of shaking, so to speak, below that, that the staff has accepted.

I might clarify that further, however, just to set the record straight: the U. S. Geological Survey, however, has considered, based on one criteria assumed to be an intensity nine.

david2

Q Yes, have you see the report written by, I believe it was a NOAA panel, that evaluated the 1872 earthquake? And I believe one of the members of this panel gave it a -- have you see this report?

A There -- I think you're referring to a joint USGS-NOAA report. Yes, I've seen that report.

Q And wasn't one of the members of this panel -- didn't he give it a nine? Perhaps a 10?

A It may be; I think the overall consensus of that panel, though, was an eight. It was outstanding that it was higher. There was not unanimity of opinion on that panel.

Q Well, now, just to bring this back to alternate sites, would your testimony be changed regarding alternate sites if you moved the 1872 earthquake west of the Cascades and more specifically if you moved it to, say, the Devil's Mountain fault?

Would this make a difference in the alternate site question as regards seismology?

A Well, as I indicated earlier, the staff has accepted an intensity eight for that earthquake.

Q If we accept intensity nine now, just to hypothesize if we say that's an intensity nine, would your testimony be changed regarding alternate sites if this intensity were moved, say, to the Devil's Mountain fault?

david3

A That's difficult to say because, as I mentioned on another occasion, the USGS has done that, and they have moved the intensity nine earthquake near the Skagit site, and again have accepted the .35g that the staff has considered for the Skagit site.

So it's hard for me to --

Q You say you really can't answer this; you're not quite sure whether or not the site comparisons might be different if certain values are used in terms of the 1872 earthquake.

Let me ask you another question: maybe I'd better let you respond to what I just said.

A I think that's correct. This moving of the 1872 earthquake was a USGS consideration, and they would have to go into whatever considerations are involved in that.

Q Let me ask you another question: assuming we take that intensity and also assume that -- also use the premise that earthquakes in the Cascades need not be associated with faults -- and they aren't often associated with a fault -- now, would you change your testimony if you move the earthquake to the site at a depth of 30 kilometers?

Would this be a -- change your testimony as regards alternate sites?

A It needn't necessarily do that because if we can move it to the Skagit site, we can move it to the other

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sites as well. And we'd again have a similar situation.

Q Is moving it to the Skagit site in your view the same -- have the same credibility -- equivalent credibility as moving it to the Hanford site?

A I'm not sure of that, but I don't believe, since I wasn't involved in the review of those; however, I did make a statement that as far as I understood the U. S. Geological Survey's position, which was reached on the Pebble Springs site, the U. S. Geological Survey considered the Columbia Plateau boundary as being somewhat of a deterrent for that earthquake moving into that area.

Q I believe you also said something about the matter of the basalt at Hanford during cross examation. What is the significance of this basalt layer at Hanford? Is it -- is this a recent basalt layer or is it -- what is the age of this, do you know?

A The age is several tens of millions of years. It's hard; it's a lava, so it's a hard rock.

Q Is this an outflow from some of the Cascade volcanoes?

A No. It from flows from fissures opening up in the Columbia Plateau itself.

Q Is this tertiary?

A Yes, it's tertiary, yes.

Q Is the significance of the basalt layer the

david5

fact that any faulting that occurred could be readily seen in this fault layer? Is that a factor in determining the past seismology of the Hanford site?

A Yes, because these rocks are at the surface and readily available.

Certainly, faulting which may have occurred as a result of any seismic disturbance could be seen in some instances.

Q Dr. Stull, I have a few questions here. There are additional matters to sort of clear up from the cross examiantion.

I believe there was a good deal of cross on the matter of cultural value. Mr. Leed asked you quite a few things about cultural values and they were a little bit hard to define. I believe he started off with a series of questions about the sites listed in the Bechtel report and asked you about three of them and asked if they were of cultural value

But he didn't ask you anything further regarding that report. Were any of the others -- were there, in fact, any cultural values shown in the list of factors in the Bechtel report?

A (Witness Stull) Many of the cultural values that were explicitly stated in the Woodward-Clyde report are implicit in the categories Bechtel used.

david6

I think I can refer you to one of the figures which includes, let's see --

Q I merely want you to go over the list of cultural values that Mr. Leed was asking you about in the Bechtel report the other day and point out the one which -- go through the whole list and state which one you consider of cultural value.

A Okay. I can give you the factors used in the Bechtel study, which ones of the cultural values are implicit.

Q In your opinion?

A Yes, in my opinion.

If we could start off, fish and wildlife propagation would include valuable wildlife habitat, sensitive biological areas, which was included in the Woodward-Clyde report.

Recreation would include areas of cultural value. This would include lands set aside for multi-use -- multiple purposes uses, including recreation; also lands to be reserved for recreation or for preservation purposes.

Land use is a general category which could include -- which includes any kinds of cultural lands to be used for cultural -- which have cultural value.

I would say those are the major factors in here which are related to cultural values.

Q To summarize what you just said, then, there are manycultural values which have been summarized in the

david7

Bechtel report.

A Yes.

Q All right. Let me ask you something else about cultural values: does either the Woodward-Clyde report or the Bechtel report have anything to say about aesthetics or this sort of thing?

A I'm not familiar with aesthetics, per se, as a category. In reading the descriptions of the 117 sites, there may be a few of those that were eliminated on the grounds of aesthetics, but I'm not certain about that, since many of the plants in the Bechtel study were considered for once-through cooling on marine situations.

Aesthetics was not a major criterion used.

Q Well, would you consider it to be a criterion that should be used?

A Yes, it was a very important criterion in my analysis of the 117 sites.

Q Can you tell me, have you -- is this another nulcear procedure? Has this been a critical issue?

A Yes.

Q Can you give me some that have --

A It's been a critical issue; I think there may have been one license denied on aesthetic values.

Q All right, thank you. So this is something that should be considered very strongly?

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A Yes, it should be.

Q The other questions, I have, Dr. Stull, go to the matter of Salmon, and I believe you told us a good deal about the specificity of salmon spawning streams and populations yesterday. And you told us that each stream did in fact have more or less a unique population of salmon that were maintained on the basis of coming back to spawn each year at the same site.

I think—this is --

A That's correct.

Q -- the subject of your testimony.

Would you say this is a value that should be -- a positive value, correct that -- a positive value for any site that you would -- would you say this is a positive thing that should be protected?

In other words, would you consider this losing of stocks if you were choosing sites?

A Yes, I would do this on the basis of my own scientific opinion and in consultation with state agencies. I know they're very concerned with the preservation of specific salmon stocks.

Q Would you tell us why they are so concerned about protecting the specific salmon stocks?

A Well, the salmon, the naturally spawned salmon in both the Skagit and the Columbia River are considered to

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be much more viable than hatchery reared stock. They have, as I understand it, a little better growth performance; their survival rates are much better than thatof the hatchery reared stock. It is the stock from which they draw their fish for their hatchery operations.

Q Could you tell me why you're concerned about losing the -- in the streams. Start over. Correct this.

Could you tell me: in streams that have both hatchery fish and native runs, what is the -- what's the concern about the relative proportions of these two groups of fish?

A Well, therehas been some evidence that there is competition between hatchery and native salmon in these streams, and there has been some concern that large amounts of introduced salmon may cause loss of viability or reduction in population of the native species;if those native species were to decline or were lost, that gaetic stock could not be reconstituted.

Q My next question comes to something -- in view of that last statement, would it be wise to put a hatchery and stock the Skagit hatchery at the site and stock salmon in the Skagit River?

You know, there is a proposal for a hatchery facility.

A Salmon fishes aran't my primary level of expertise.

david10

I would have to look into that matter more. Personally, I would prefer to see the native runs.

Q All right, thank you. But to sumarize the matter of salmon, it's -- it would be your testimony that it's best to, in any site consideration, some weight should be given to maintaining the native stocks?

A Yes.

CHAIRMAN DEALE: Mr. Linenberger.

BY MR. LINENBERGER:

Q Mr. Leech, concerning the staff's testimony on alternative site comparisons, to what extent does the -- did the analyses that went into the production of this testimony give consideration to the ease or difficulty with respect to which a feasible emergency response plan could be developed for each of the sites considered in the screening process?

(Panel conferring.)

A (Witness Leech.) The consideration was primarily in terms of population density. The population density of 500 persons per square mile has generally been used to -- to consider that question.

NOw, let me see, the reason for that --

(Pause.)

CHAIRMAN DEALE: Mr. Leech, would it be convenient if we take a break now?

WITNESS LEECH: I think so, but I can find it.

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CHAIRMAN DEALE: Very good. We'll take a break for 15 minutes.

(Brief recess.)

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CHAIRMAN DEALE: All right, please come to order.

Mr. Linenberger will continue his questioning of the panel.

And I think Mr. Leech was developing an answer when we broke for our recess.

WITNESS LEECH: Mr. Linenberger, I think I mis-spoke when I answered your question before the recess, and I would appreciate it if you could repeat that question.

BY MR. LINENBERGER:

Q All right, sir. I am not sure I can use the same words. I will try to express the same thought in the question, however.

I am asking whether or not the candidate site screening studies, the results of which went into the Staff's supplemental testimony dated 2 July 1979, took into account in establishing the ranking and screening of sites the amenability of each site to the establishment of a feasible emergency response plan or evacuation plan, whichever you want to call it.

A (Witness Leech) I would have to say we did not explicitly do that.

Q You say "explicitly". Should I infer from that in some implicit way this was worried about with respect to various sites?

A I believe it would be true that wherever we

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might have become aware of difficulties with roadways in the vicinity of a possible site that we would have noted that. And I think in one case we were alert to that. It was, I believe, the Roosevelt Beach area over on the ocean.

Q I should like to inquire, then, whether or not -- I should like to inquire what was the Staff's rationale in not giving explicit consideration to that factor in the site screening process?

A May I consult with Dr. Stull here for a moment?

Q Surely. I'm asking the panel. And I'm only assuming you are the spokesman, so....

(The witness panel conferring.)

A Dr. Stull will answer your question.

A (Witness Stull) Yes. As we visited the sites and site areas to screen the potential sites to determine if any of them might be continued further in the study, we did discuss site access and in many cases, whether or not we felt that in case of accident there may be evacuation routes present in the area; this was one of our topics of discussion in general discussion about the site areas.

But we did not explicitly use that as a factor in the sense that we just noted sites which we felt appeared to be deficient in this matter.

Q Did you, in noting this as a factor, was it a matter that you considered to be of lesser importance than

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some of the other considerations you were investigating?

A Well, if a site appeared to have difficult access or if, say, there was one road leading to the site and no other way to get out, or if the site was in an area such that it would obstruct access from an urban area, say, along an evacuation route, this was sufficient reason for not considering a site further. So that we gave this heavy weight, as heavy or heavier than most of the other factors.

Q Can you recall whether there were in fact any sites for which that was an overriding consideration that caused the site to be --

A Yes, there were several areas in Puget Sound, I think in the area of Whidbey Island, where if a plant had been placed at the site specified in the document, a nearby town would have been unable, the populus of that town would have been unable to move in any direction in case of an accident.

So that was one of my most stated reasons for rejecting particularly sites located south of Anacortes, because access would be cut off for Anacortes.

Q Thank you.

Mr. Leech, there was the introduction this morning of Exhibit 192, which appears to me to be an internal NRC document regarding the Skagit Nuclear Plant alternative site study, a memorandum from a Mr. Hulman to a Mr. Regan.

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I believe that you said you had seen that memorandum?

A I have.

Q I would like to inquire about the last sentence on the cover memo, the second sentence, which says that:

"Appendix A to the study was prepared at the request of Paul Leech and may not be germane to the testimony."

Now is the Appendix A referred to there the Appendix A in the 2 July 1979 testimony?

A No, it's an attachment to this memorandum.

Q I see.

And do you understand the -- Can you tell me what you consider to be the meaning of that sentence, that it "may not be germane to the testimony"?

A Well, I had noticed that in the -- I believe it's in the 1970 Bechtel study -- I had seen a flow rate in the Snohomish River of a certain value. And I believe the Snohomish, if I recall correctly, is made up from flows of rivers that join into it. And I couldn't understand why the difference in the numbers, where the difference came.

So I requested that they analyze that and tell me where it came from. That's what this Appendix A is.

Q And as to its being or not being particularly germane to the testimony, can you comment on that?

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A My recollection is that Dr. Stull and I had talked about the amount of flow there would be in various rivers, and I wanted to be sure that the numbers we had were ones that she would be able to rely on for her view. And I think that all this does here is try to explain the discrepancy and it turns out, I think, that it's a matter of where the gauging has occurred.

Q Is it your position, then, that nothing about the results of Appendix A to the 8 March '79 memo, which is Exhibit 192 in this proceeding, would alter the -- your panel's prefiled testimony?

A I don't believe it would, but I would appreciate it if Dr. Stull would tell you if it would.

A (Witness Stull) No, it would not.

Q Thank you.

Mr. Lefevre, I would like to go to page 19 of the prefiled testimony, which at the top of the page -- well, I should say the bottom of page 18 and the top of page 19 -- seem to address itself to at least one aspect of landslide stability of the terrane in the site vicinity.

Now I realize that there is yet to be final testimony from the Staff with respect to seismological considerations. But for the purpose of this question I am considering natural landslides here as non-seismic events, if you will. And there is a sentence, the second full

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sentence at the top of page 19 that says:

"Zones of coals, shales and shear zones two feet or greater in width measured horizontally on the exposed surfaces will be treated with dental concrete."

In the first place, can you just tell me what "dental concrete" is?

A (Witness Lefevre) Dental concrete refers to filling of an area that is occupied by coal, scraping out the coal and replacing that with concrete.

Q All right, sir.

Now that sentence would also seem to say that this dentistry would be undertaken on surficially exposed features, on the exposed surfaces they will be treated with dental concrete.

A Yes.

Q Now I can't recall whether you were present or not, but I would make the observation that the Board had some testimony from a gentleman by the name of Blendon. I believe he was SCANP's witness. He indicated that his interpretation, as I remember it, he indicated that his interpretation of certain of the shear zone findings that came out of core drillings at the proposed Skagit site indicated shear zones beneath the surface that he interpreted to be a manifestation of natural landslide or gravitational landslide

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instability or slope instability of the plant site, independent of seismic considerations.

The question I am leading here to is:

Does the Staff consider that looking only for surface manifestations of landslide shears or repair with dental concrete, is that an adequate approach or should indeed concern be given to the finding of these shear zones beneath the surface in the core drilling that Applicants' contractor undertook and some concrete or other remedial or mitigating measures be taken with respect to those shear zones?

A Okay.

Well, obviously, certainly what one sees at the surface is most readily understandable. And there are landslides that have occurred on the roadside of the proposed plant, adjacent to Route 20. There has been sliding of surficial materials crossing part of the roadway. That obviously one can handle.

Now what you're asking is what about the rock itself, do we consider that in our assessment of landslide potential. And the answer is yes.

As far as Mr. Blendon's testimony, that did occur post-our March hearings, and that will be one of the items that we will address at greater length in the October, early fall -- I mean, it came to our attention after the

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hearing of March of last year. So we will consider that.

Q All right. Then I won't press further on this if you're coming in with more information.

A Yes.

Q Mr. Winters, we heard some rather extensive examination of your portion of this prefiled testimony yesterday afternoon from SCANP's interrogator, Mr. Lazar. And I have the impression from that interrogation that Mr. Lazar might have approached the analysis that you made in this prefiled study in a little different way.

I can't speak for him, that's only my impression. But he raised questions about the appropriateness of certain inputs that you used. One of them was the capital cost of the plant. Another was consideration of what rate of inflation or cost escalation should be used. Another was I believe an appropriate value to use for the cost of oil in the context of replacement power.

Without trying to make a complete listing of these things, which I don't have on the top of my head, I am constrained to ask, however, the extent to which you feel any of the inputs that you use as questioned by him would cause you to want to modify the results of your testimony as printed in this prefiled testimony.

Can you comment on that for us, please, sir?

A (Witness Winters) Well, there are some places

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I would like to -- or I would prefer to make corrections to the numbers.

However there is nothing that he brought up that would indicate that I would do my analysis differently or that I would come to a different conclusion in the prefiled testimony.

There are some areas where we did understate the capital cost, we did understate the capital costs of the plant. And for the record that could be recalculated.

But as I pointed out yesterday when I did do the scratch calculations it did not affect the outcome because of our estimate of line losses. So we have offsetting values here which do not affect the conclusions that I arrived at. But it would affect some of the computations which I had done in the prefiled testimony.

Q Do you want the opportunity now to comment on those corrections explicitly?

A Well, I can comment on the -- I wouldn't want to go through and make all the computations now.

Q No.

A But I can indicate where in the Appendix A I used the wrong figures.

Q Could you do that for us? We would appreciate it.

A Under Date of Operation -- I'm sorry, it's the -- it follows page 110, it's the second page after 110.

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Q All right.

A Under the Applicant's capital cost in the third column, the first figure should be $3,864,000.

Q Instead of?

A Instead of $3,325,000.

Q Okay.

MR. BLACK: What was that number again?

WITNESS WINTERS: 3,864,000.

The next line should read 630 million as the levelized cost instead of 542 million.

CHAIRMAN DEALE: Would you repeat that, please?

WITNESS WINTERS: 630 million.

The last line should read 46.5 mills per kilowatt hour rather than 40 mills per kilowatt hour.

Now we adopted those estimates in the testimony, and if I went back and redid the calculations I would use those figures instead of the ones that I did.

BY MR. LINENBERGER:

Q Would you make any adjustments to the figures you use for percentage escalation rate in the context of Mr. Lazar's comments of yesterday?

A (Witness Winters) No, I wouldn't, because his figures that I've seen did not indicate the time schedule of the plants, and I couldn't conclude from his figures that there would be any reason to change the escalation rates

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I used.

Q Do I recall correctly that you used seven percent?

A Seven percent escalation per year.

Q Yes.

And you may have commented on this before, but would you do it again, please:

Tell the Board why you think at this time seven percent is an appropriate number to use rather than a higher number?

A Well, it seems to be -- I've seen other reports which I consider to be reliable sources and they indicate that range for escalation over the time period which you construct the plant, in this case approximately seven years.

Q You've indicated that you consider seven percent reasonable in the context of reports that you rely on?

A If you're asking could it be higher, yes, it could be higher.

Q Well, I guess really all I was going to ask is whether in your day to day reading in the newspapers of what's going on in the world these days you're still comfortable with that figure. And I gather you are or you would....

A Well, there is nothing reflected in here if there is a scope change in the project, for example if there are new licensing requirements --

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Q No -- Okay, when I use the word "escalation", I was eliminating in my own thinking -- you can't read my mind -- scope changes and unanticipated delays for whatever. I'm just talking about how money -- costs generally.

Now perhaps the problem here is that I am using a slightly different definition for escalation than you are, and maybe I'm thinking more nearly in terms of inflation.

Would you please define "escalation" as you use that word and to what extent does that definition include or exclude considerations of inflation?

A The escalation that I used was the escalation of the costs of the project during construction from the point that the construction starts to the completion of the plant.

Q Is this in some unit of constant dollars that excludes inflation considerations?

A This would be in constant dollars, yes.

Q It excludes inflation, in other words. I guess that's the meaning of "constant dollars", is it?

A This would be the cost -- yes, it would be in -- well, it's escalated to the point when the plant starts operation so that it reflects the total cost at the point the project starts operation.

We have other costs in there. For example, if the project stretched out, it doesn't reflect that, it doesn't

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reflect a stretch-out in schedule. It assumes the same schedule.

Q Yes.

But I'm having trouble getting a handle on something. Let me see if I can explain my problem and then perhaps you can help me.

Let's say that the project is due to come on line in September of '86 and there are no schedule delays. There are no changes of scope, no additional licensing requirements of any sort. But during the last two years, '84 to '86, before the plant is completed and comes on line, the cost of labor turns out to be higher than is projected at this time.

A Yes.

Q Nothing else has changed but the cost of labor.

I consider that to be an inflationary --

A Yes.

Q -- consideration.

Is that included in your seven percent?

A That's included in the seven percent.

Q So it is not free of inflation in that sense?

A No.

Q Okay.

Let's go back to page 110, Section 8, labeled "Conclusion". On the last paragraph of that page you have

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already made some changes to, and the last paragraph reflects a breakdown of costs to the public and costs to the rate-payer in terms of percentage of the increase to relocate the site.

A Yes.

Q Now should these figures be further altered as a result of the changes we made in Table 8.1 just now, just this morning?

A Well, in a very small way they would be altered, and I don't have exact calculations. But the --

Q Can you give me a handle on "very small"?

A One percent.

Q One percentage point or one percent of the value quoted?

A One percentage point; for example.--

Q Okay.

A --I made the calculation using 48.2 mills per kilowatt hour, which is even higher than the figure I quoted earlier. And for the rate-payer I calculated a range of 16 to 33 percent as opposed to 16 to 37 percent.

So there's a slight difference there. For the public, instead of 8 to 32 percent, when I used the higher figure the range was 7 to 29 percent. So that gives an idea of how the higher capital costs would impact the calculations which I had made.

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Q Now, without stumbling over what value is precisely the correct capital cost to use, can you tell me, whatever it is pegged at, how do you decide the way in which you should make the breakdown between cost to the public and the cost to the ratepayer?

How did you --

A Well, conceptually, my approach was to consider societal costs as ones in which resources would be employed that would otherwise not be employed if the project had to be moved.

The cost to the ratepayer was an estimate of the participants ratepayers' costs, incremental costs for the decision to move the plants. And so I eliminated in the societal costs, what economists might call transfer payments.

In other words, if you can use the same resource but send it -- deliver it to someone else, that was not considered a societal cost.

Q Instead of expressing societal or public costs and ratepayer costs in terms of -- well, excuse me, let me start that question over again.

If you were to take the sum of cost to the public, cost to the ratepayer, what percentage of the total cost does that --

A You cannot sum those two. The ratepayer costs are higher, the society costs are lower. They cannot be summed.

mm2] They are just -- they impact on two different groups, if you will.

The group most impacted is the ratepayer, the group that is less impacted, is society. It depends on whose ox is being gored.

Q Did you consider the cost of oil to provide replacement power a societal or a ratepayer cost?

A A societal cost only insofar as new oil resources wouldn't be necessary. Under some scenarios, the oil resources would not be necessary.

But where oil-fired generation was required, the difference between that and what you would save by using nuclear represented a societal cost. It's resource that was being used which would otherwise not be used.

But you do subtract the savings for not using nuclear resources.

Q So in this sense you are using societal costs as something analogous to a value-added or value-subtracted kind of picture of what is happening as a result of this plant relocation. Is that correct?

A Yes.

Something that society -- in this sense it would be the Pacific Northwest -- would pay for that couldn't be accommodated in the normal business fashion by sales of power back and forth.

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Q Something the country may lose or gain because this move is being made.

A That's it.

(Board conferring)

CHAIRMAN DEALE: Dr. Hooper has some questions.

BY DR. HOOPER:

Q Dr. Winters, yesterday we got a copy of Exhibit 187, which is labeled Figure 6, and it is Western Systems Coordinating Council.

Are you familiar with this document? Have you seen this before?

A (Witness Winters) No, I have not.

Q In other words, this publication that Mr. Leed had is not one that you examined or looked at in preparing your testimony?

A No, I had not seen this prior to my prefiled testimony.

Q Will you help me interpret what is on Figure 6.

I believe yesterday Mr. Lazar referred us to this graph at the bottom of the page which relates to the Northwest Power Pool area, and it is supposed to take into consideration the most adverse hydro conditions. And I believe what he was suggesting was that if you go to the -- from the bottom axis on 1986, if you go -- if you project a line up to the generation in firm transfers line, and then take that point and

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then go horizontally over to the right-hand margin, that that line would represent the situation when and if, or if you did not attempt to replace the power for three years.

Is that correct?

A Yes, that is correct.

Q Then is it correct that the width of the area between the firm peak load and the projection of that line to the right-hand axis, would represent the reserve power at 1988 that would be left in 1988.

Is that correct?

A He made two assumptions in doing that.

Q Let me ask you if that was what he was suggesting?

Let me see if I'm right, and then you can go back and -- And then some point from about 375 to maybe 400 on that scale, 420, 410 or -20, something like that on the right-hand scale would represent according to what he was suggesting, the reserve power you would have in 1988 at the end of this three-year period.

A Yes.

Q Do you have any idea of what percentage this would be, roughly?

Can you tell me roughly how much percentage reserve there would be?

A No, I don't know what that figure would actually be.

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Q Well, would it be 10 percent or would it be 20 percent, or something between?

Do you have any idea? Do you have any judgment as to how much reserve this could represent?

A I don't, because I never--when looking at nuclear plants, I think in terms of firm energy rather than peak.

Q But the width between the two lines, which one is labeled generation in firm transfer, and the other is firm peak load, that the width between those two lines represents, does it not, the reserve margin at any time?

A Yes, it does.

Q So that this -- going through this exercise Mr. Lazar suggested yesterday, would indicate there would be a reserve margin if you didn't really replace the power at all?

A Yes.

Q All right.

Now, can you give me your qualifications to this. You said a minute ago you were going to give me some corrections. Would yougo ahead withthat, please?

A Yes.

Well, one reservation, one comment I have to make is, if you look at the distance between the generation of firm transfers in '77 and '78, and the firm peak load, it is approximately comparable to the distance between these two

mm6

lines in 1988 or 1986. So what he is implying is that we are willing to accept the lower reserve margin than we have today, based on these forecasts.

Q Would you say that reserve margin is about the same as projected here for 1982, which shows those two curves get fairly close together?

In other words, all we have to do is accept about the same -- that looks to me like that projection would be greater than the reserve margin that is going to be present in 1982.

Would you agree to that?

A Yes. That is the implication.

Q Fine.

So, in other words, you acknowledge it would be some reserve margin, but it is not necessarily what you would like to have for reserve margin. Is that correct?

A Well, I don't have a professional opinion on the matter. It does get into questions of reliability.

Q I see.

Now,tell me this. If you went through this exercise like Mr. Lazar was suggesting yesterday, and eliminated the costs of replacing that power by drawing this line like he suggested, how much difference would this make in your calculations that youhave given us over here,and that you have been correcting this morning?

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Would this make a sizeable difference? Can you give me some feel for this?

A Well, what I might do, what Mr. Lazar suggested, would be to look at the cost of WPPSS 5, for example, as a replacement source for the Skagit units which would be purchased by the participants.

I have no reason tobelieve that -- there is no reason to believe that WPPSS would want to sell it for less than that. I don't know what the going market would be in that time period.

I might take his suggestion and use that as the value in cost in mils per kilowatt hours for the replacement power, rather than the expected cost of the Skagit unit.

But, as I indicated yesterday, I did not know what that cost was.

Q But what I am suggesting here is more than that. I am suggesting that doesn't this line say that supposing you are willing to sacrifice some percentage reserve, you wouldn't need any replacement at all, wouldycu?

A I thought the interpretation was that the extra reserve there was what Skagit was providing, that would not exist. So that you have reduced the reserve, and you have accepted that reduced reserve by not building the Skagit units in that period of time.

Now the question is, in terms of the participants

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themselves as opposed to the total West Group, what are their options. As far as their ratepayers are concerned, they would still have to turn to some other source of energy.

And I would assume thatthat source would be, for example, the WPPSS 5 unit, if that were available.

I'm drawing distinction for the whole West Group there might be that reserve. But the question then is, well, how about the participants? Are they similarly in a position to call upon --

Q All right, I see your distinction here.

In other words, you are talking about purchasing some power which these people would need.

But in terms of the whole West Group here, if you had to have power for reserve power, there would be a certain amount available thatyou could purchase.

Is that right?

A Yes.

Youwould then say that the societal cost of replacement power would be zero. There would just be a question of the participants ratepayers, or it was better for them to have the Skagit unit on line or to be purchasing the WPPSS supply.

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Q You'renot purchasing any makeup power at all; what would bethe difference in cost -- you're willing to live -- as I understand, this is reserve and this -- you can get this from the West Group somewhere. The -- what I'm still not clear about is as to whether you have -- this would make any difference in your overall assessment of these two site costs if you just ignored the fact that you didn't have to buy the power. You get it somewhere in the system where it's available.

Now , maybe -- I guess your point is you're going to buy it -- you're going to buy power from WPPSS, but does this mean you're going to buy reserve power from WPPSS or you're just going to buy power from WPPSS that you'll actually have to use in the worst energy situation.

A The assumption would be on your scenario that the West Group would not have to get additional power, but the participants may well have to because they're in a more energy deficit situation than other members of the West Group; so they'd have to purchase power from the West Group. And the question is: what price would they have to pay for that power?

As far as societal costs go -- then they'd have to compare that against their escalation of the plant cost. But under that scenario the societal cost of replacement power would be zero.

david2

Q Zero. That's what I'm trying to get out. The societal costs would be zero under that situation.

A Yes.

Q All right. That was the point I was trying to get at. Okay. I think I -- I think I have some feel for that, and I just wanted to be sure that I understand what Mr. Lazar was talking about.

MR. BLACK: Dr. Hooper. Dr. Hooper, to follow up on your line of questioning relating to Exhibit 187, can I ask the witness a couple of questions to make sure we're focused on the right thing here? I don't know if you're finished or not.

DR. HOOPER: Mr. Linenberger is going to -- I don't care. It's not going to bother me.

CROSS ON BOARD EXAMINATION

BY MR. BLACK:

Q Dr. Winters, would you refer again to Exhibit 187.

A Yes.

Q And under the hearing of Northwest Power Pool Area, down at the bottom it indicates firm peak load, total resources,and firm energy load as what is depicted on the graph; is that correct?

A Yes.

Q Now, when it says "Total Resources," which is the top line on the graph -- down below it says "firm generation"

david3

and "firm transfers."

When it indicates total resources, in your mind, what does that indicate?

A Well, that would include hydro, nuclear, combustion turbines.

Q Does it also include peaking resources?

A Yes. When I said combustion -- combustion turbines, I was thinking of peaking resources.

Q And so when you're comparing a line that indicates total resources, which is indicated at the hearing on the table but is indicated on the graph "generation and firm transfers," that does not indicate what -- I should say energy resources is -- it's a -- is it a combination of energy and peaking resources, that top line on the graph?

A Yes.

Q And so when we're comparing total resources, should we not compare it against -- should we not compare energy resources against energy load when we're making this kind of comparison?

A Yes, that would be correct.

Q And so would you not say that it is -- that it's incorrect to compare a graph showing total resources with a line in a graph that indicates energy load to determine what a reserve margin would be?

A Well, it would be incorrect in the sense that we're

davids

talking about replacement power, not -- not overall reserve. What would be implied by this is that you would -- some of your replacement power may very well have to come from these -- these higher cost resources.

But it is an unfair comparison in the sense that replacement power and adequate reserve margin are two different subjects.

Q So when we're talking about a reserve margin, we don't want to compare peaking resources against firm load, do we?

A Repeat that, please?

Q When we're talking about a reserve margin, we don't want to compare total resources which includes peaking resources against the energy load, do we?

A I don't want to talk about reserve margins.

Q I know you don't. But it has come up in the context of this exhibit, and I was just wondering whether that's -- that's a valid comparison in the context of what has been compared here in Exhibit 187 by SCAMP?

A It is unclear as to whether the generation of firm transfers are resources that you would have available during the peak. So there is some -- there might be some confusion on that point as to whether all these resources are resources that would be available to meet the peak at any particular point in time.

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Q But getting back to my original question, when we're talking about a reserve margin --

A Uh-huh.

Q -- is it correct to compare total resources against the firm energy load?

A I'm sorry. No, you always compare reserve margin as the margin over the load, not the margin over the resources. That's your reserve margin. Is that --

DR. HOOPER: Are you saying it's good to compare -- from what he's saying -- compare firm -- the distance between firm energy load and generation and firm transfer, the width between those two things? That's what I'm understanding Mr. Black to say.

MR. BLACK: I'm saying --

WITNESS WINTERS: The problem is you don't have a line -- you have a firm peak load line, but you don't have a firm peak load resource line.

BY MR. BLACK:

Q Isn't that the top line, though?

A It may or may not be the top line.

Q We don't know that from what's depicted on that graph, then?

A Yes, we just --

Q But wouldn't it make a difference if that top line represented -- well, it does say total resources at

davids

the top.

Wouldn't it make a difference if total resources included firm resources as well as peaking resources when you -- and would you compare -- if you had a resource that had indicated firm plus peaking resources, would you compare firm plus peaking resources against a firm energy load to get a reserve margin?

A Yes.

Q You would?

A Yes. I'd use -- I would look at the resources available during the peak. What I don't have here is a fourth line indicating what the -- what resources would be available during the peak.

They may include nuclear resources and hydro and oil and -- as well. But --

Q But I'm --

A So --

MR. BLACK: I think I've created more problems here. I guess this is a problem that we had with accepting Exhibit 186 through whatever -- 188 -- which are a bunch of graphs taken out of a report without really knowing what the underlying data is.

Even my witness and I have a different interpretation of this graph, and I think I've totally confused this issue now. But I think that I would want to indicate that we

david7

would want to study this WSSC report before we give our comments back to the board as to whether these exhibits are acceptable or whether we should put the full report in.

MR. THOMSEN: May I say that we had a chance to look at the book a little bit yesterday afternoon during the hearing and certainly would urge that the entire book be put in rather than these extracts.

I think we've seen here that the selected pages are ambiguous at best. So I would urge that the entire book be obtained and put in and if the board would like, I don't know -- there seemed to be a problem about copying this.

Maybe Puget Power can get 20 copies easily. I don't know. I'll try if that will help.

CHAIRMAN DEALE: You made some kind of an offer like that yesterday.

MR. THOMSEN: I will --

CHAIRMAN DEALE: Really, I think that at least from the board's standpoint we took you up on it; that is, to duplicate the book somehow.

MR. THOMSEN: I"ll try to get some originals. It has an interesting map in it, and so on.

DR. HOOPER: I'd like to ask one further question.

BY DR. HOOPER:

Q THis goes to something that's bothered me all

david7

during this alternative site testimony, and it all goes back to some of the questions I asked Mr. Eastvedt.

Why did the staff use only the West Group forecast? Why did they not look at this document when they prepared this testimony?

It seems to me that the resources are going to be used in a wider areathan the West Group, if they're shipping power elsewhere, and I can't understand why this document was not utilized in some of your considerations. Can you explain why you excluded using this document, which is the broader power area.

MR. LINENBERGER: Water resource area.

BY DR. HOOPER:

Q Water resource area, in view of Mr. Eastvedt's statement the other night -- the other day -- the afternoon -- that we've got to look at the big area in the West Group, rather than the West Group. We've got to look at our resources in the whole of the western United States.

And I'm confused, frankly, concerning this matter. One time one person is telling us one thing, and now you're saying you only used the West Group forecast. And personally this is very confusing. And I'd like to see why -- I'm suspicious that you can use one when you want to and not use it when you don't want to. And I don't know what the -- in order to make your numbers come out better or worse, you

david9

can say, well, use all of this whole areaand do my calculations on this in one instance.

And in another instance you do not. Now, that's -- I don't understand it fully. That's some of the lingering doubt I have regarding these various areas.

A Yes. Well, the transmission system -- the power is certainly is for all those areas.

Q Right.

A Much of it is not firm power. It's non-secondary energy.

And our assumption here is that the nuclear units are built primarily to provide firm power and not with the intent -- the intent to meet the West Group loads.

The intent was not to build the plants to serve firm loads in California.

So when you get into the transfer of the power to California and back, we're getting into operating decisions on the one hand, and you're getting into the use of surplus power on the other.

And it didn't seem to me to be a -- go to the question of whether you build the Skagit units or not. But it is true that the power is sent.

Q So if you are really interested --

A Throughout --

Q -- in the two things here that we were talking

david10

about, the cost of replacement power and the need for replacement power, and whether you look at -- look at this on a small basis, wouldn't make a difference in your answers, from what I've heard here.

Would that be correct?

A No. Because we're not talking about transfer. large transfers of blocks of firm power. These discussions are undertaken with respect to transmission lines. I believe that most of those -- most of that power is secondary power, and when it's available it's sent. And when it's needed, it's sent back.

It's my understanding that the Skagit units are not constructed with that purpose in mind. So I did not look at those aspects when estimating the replacement power of Skagit units.

The assumption here was that replacement power needed would have to be firm power, and not -- if it were secondary power, then one could have to consider going -- looking at British Columbia first and looking down at California second as a -- as sources for this energy.

But since it was firm power, the assumption was that the energy would be provided within the West Group participants.

CHAIRMAN DEALE: Mr.Leed?

MR. LEED: Well, let's see. I guess I'll take up

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where I left off.

Just in case Mr. Lefevre didn't ask Mr. Tillson the right question or just in case --

CHAIRMAN DEALE: Who is Mr. Tillson?

MR. LEED: He's the gentleman whose testimony we've had introduced by Mr. Lefevre.

Just in case Mr. Tillson didn't understand Mr. Lefevre's question or just in case Mr. Lefevre didn't understand Mr.Tillson's answer, we are at a loss to deal with the problem created by having Mr. Lefevre's testimony respecting what Mr. Tillson told him about a document which is not in the document shows or didn't show.

It's for that reason I have to move to strike the answer Mr. Lefevre gave to Dr. Hooper's question.

(Board conferring.)

DR. HOOPER: I would like to make a comment on this motion of Mr. Leed's. If you're -- I think in this hearing time and time again during objections, the board has bailed you out, gotten answers that we were interested in and that we wanted to hear for our -- that you were trying to get into the record.

Now, in this instance it's working the other way: now, we think -- the board feels that we have operated in this instance against you and in terms of your participation in this hearing, we think it's only fair to do this for

david12

some of the other applicant's -- some of the other parties.

MR. LEED: I appreciate your comments, Dr. Hooper. However, it's based on an assumption that we want to keep the answer out. I'm going to bring facts forward, I hope, which will illustrate whether or not that assumption is warranted.

CHAIRMAN DEALE: You're talking about thereply to Dr. Hooper's question which Mr. Lefevre -- which was saying to the effect --

MR. LEED: The reply was: "Dr. Tillson told me this." And then he went on to narrate Dr. Tilson's statements regarding the basis on which the Woodward-Clyde siting study, which Dr. Tillson did not conduct since he's a WPPSS employee, excluded the Skagit site.

And in so doing, he impeached the testimony of Dr. Stull yesterday, and --

CHAIRMAN DEALE: I don't kow, but be that as it may, this is what you're saying. But I'm really not aware that Dr. Stull's testimony has been impeached, but --

MR. LEED: Dr. Stull yesterday stated on what basis -- in fact, she stated again today this site had been disqualified in the Woodward-Clyde study.

Mr. Lefevre's answer, based on what Dr. Tillson told him, contradicted Dr. Stull.

CHAIRMAN DEALE: What did Dr. Stull say, Mr. Leed?

david13

MR. LEED: In effect she said that the Skagit site had been disqualified because of its cultural values.

MR. BLACK: I don't -- that's not my recollection. I believe Dr. Stull indicated that some sites were eliminated because of national park -- and she even indicated scenic.

Now, I don't know whether she indicated whether the Skagit site was eliminated for that reason. Now, remember, this is a screening process and just because one overlay of the map indicated a certain site perhaps might be in that particular overlay -- I'm not certain that Dr. Stull indicated that that site was in the process eliminated because of that reason.

I think that's the confusion that's indicated on the record here.

MR. LEED: There's no confusion on the record. It's on -- if I could borrow your copy of the transcript, I'll point you to it.

MR. THOMSEN: I would like to know -- we have this study available over the noon recess in my office. What do you want me to do with it is what I'm asking.

MR. LEED: The question of Mr. Tillson's statement to Mr. Lefevre as to why Woodward-Clyde did or did not do something can't be resolved by inspecting something in Mr. Thomsen's office.

david14

That's my problem.

CHAIRMAN DEALE: This a copy of the study that I think Mr. Thomsen is talking about.

MR. THOMSEN: Yes.

CHAIRMAN DEALE: And, Mr. Black, do you suppose would the copy of the study -- would that indicate any reference to Skagit and why Skagit was eliminated from further consideration?

MR. BLACK: I've never seen the document myself, so I don't know. But I also know what the gist of Mr.Lefevre's statement was. It was in response to something that was brought up yesterday about whether the Skagit site was eliminated for seismicity reasons.

Mr. Lefevre's answer indicated that it was not.

(Board conferring.)

MR. BLACK: And I believe he also indicated one of the reasons it was eliminated was because they were looking for new siting areas, not ones that were already under consideration.

MR. LEED: That's correct. That was Mr. Lefevre's report of Dr. Tillson's statement this morning.

MR. BLACK: Would you be willing to accept the statement that the Skagit site was not eliminated for seismic reasons?

MR. LEED: No, I don't intend to accept anything about seismic reasons relating to the report. I

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intend to interrogate and if this is -- if Mr. Lefevre is all I get, then I'm going to have to interrogate him.

MR. BLACK: I don't know the fruitfulness of this interrogation.

MR. REED: Yesterday I asked him about this. He didn't have the report so I couldn't proceed with the interrogation. Now, come forward; put him into the arena so we can have some.

(Board conferring.)

CHAIRMAN DEALE: We're not going to eliminate the testimony on the basis of hearsay.

On the other side, he does know exactly what weight, how much of his testimony -- how much it's worth. And so for whatever it's worth, it can stay in the record. But from our standpoint, whatever weight that is given is a matter of question.

We do hear quite a bit of hearsay testimony and admittedly we take into account the weight that ought to be given to the testimony. And it isn't clear on either side just whether Skagit was eliminated for seismicity reasons. Was Skagit eliminated for this reason or that reason.

And Mr. Lefevre indicated that he had spoken to a man fromWPPSS and WPPSS said they didn't consider Skagit because it was already an area where a stake had been made

david16

and we didn't want to -- this is what he said, that this might be a mason why the Skagit wasn't considered.

So let's proceed.

BY MR. LEED:

Q Mr. Lefevre, did you inquire of Mr. Tillson the nature of the Woodward-Clyde consideration of seismicity in relation to eliminating areas in the state which were not suitable for nuclear or thermal sites?

A No, I did not ask that question.

Q Okay. Do you know what criteria were employed for seismicity?

A No, I do not know what the Woodward-Clyde used.

Q Do you know whether they relied on any underlying documents such as the seismic risk analysis of the state prepared by the USGS or some such similar document?

A I'm sure they must have, as any consulting engineering firm would have.

Q Okay. You recall yesterday testifying relating to seismic risk analysis of Puget Sound.

A You may have mentioned something along these lines.

Q Varius zones --

A Yes.

Q That was mentioned yesterday.

A Plate three of the Bechtel 1970 report, yes.

david17

Q You said the lines really didn't mean very much to you, is that right?

A I indicated they were indefinite lines because zone three, outlined as indicated by a dahsed line which implies the originator was not certain as to the zone --

Q Okay. Is there in fact some kind of sharp line you can draw on the map and then everything on this side is safe and everything on this side is measurably less so?

A The lines on the map are the one -- theone that outlines zone three makes no distinction whether something is safe or not: the line is not a definite line.

There is some latitude in its -- in the originator's location.

Q All right, now --

(Counsel for Intervenor SCANP conferring.)

Can we agree that there's a seismic zone somewhere in the vicinity of Sedro Woolley zone boundary as far as the seismic risk evaluation is concerned?

A The originator of this plate three cites the seismic risk map of the U. S. -- the author of that paper certainly indicates there is some sort of boundary there; that's correct.

Q Okay. NOw can you tell us precisely where that boundary is?

david18

A As depicted on plate three, the boundary is just a very few miles east of what's indicated as site 21 -- 71 on the Skagit River.

Q In relation to Sedro Woolley, can you tell us precisely where that boundary is?

MR. THOMSEN: Dr. Hooper, you can borrow ours.

WITNESS LEFEVRE: No, I can't tell you precisely where Sedro Woolley is. There are no towns designated on this map.

BY MR. LEED:

Q Now, even if there were some way to precisely locate thatboundary with reference to Sedro Woolley, how much range of uncertainty or how much play do you feel there is in drawing the edge of such a boundary?

A I don't know. You'd have to ask the author of this paper.

Q As far as you personally are concerned, could it be a matter of miles?

A It could be miles, yes.

Q And I'm after the basis for your statement where you, I believe, told Dr. Cheney that these were uncertain boundaries.

You must have had that fact that you just described to me in mind, that --

A Yes, I did. And I indicated earlier the line is

david19

dashed. Therefore, if the author himself has uncertainties, I do as well.

Q Uh-huh. Now, do you happen to know whether the Woodward-Clyde study utilized this particular map?

A They may very well have. I can't say that. They certainly had it available to them.

Q Do you hapen to know whether the Woodward-Clyde study shows the high seismicity zone, insofar as can be ascertained, located very close to Sedro Woolley?

A I indicated -- I don't know how many times -- I've not seen the report, and you repeatedly ask me about the report. I can't answer that.

Q You only know what Mr. Tillson told you?

A That's right. It seemed to be of some interest to you and undoubtedly the board and myself. So I explored that for your edification.

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Q So you wouldn't know whether the Woodward-Clyde study shows a seismic boundary just west of Lyman, then?

A That's correct, I wouldn't know that.

Q You just know what Mr. Tillson told you?

A That was my only line of inquiry, that that you were interested in.

Q You didn't call anyone connected with the Woodward-Clyde firm that did this study, did you?

A No, I did not.

MR. LEED: I guess that's all I can pursue with this witness at this time.

CHAIRMAN DEALE: Thank you.

The Board is afraid to ask further questions.

(Laughter.)

MR. THOMSEN: I don't have a question, but if lawyers could testify I think I could help clear up this Figure 6. But I'm hoping the complete document may help us do that. And I know I can't testify.

CHAIRMAN DEALE: Fine.

I believe we're -- I hate to say this -- at this point we have no further questions of the panel. And I think this is a fine time to break for lunch, it being quarter to one.

I would suggest we come back at two o'clock.

MR. BLACK: Does this mean that the panel is

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excused?

CHAIRMAN DEALE: I think it is.

MR. LINENBERGER: Are we retaining Dr. Winters for other purposes?

MR. BLACK: Yes.

MR. LINENBERGER: Thank you.

MR. LEED: Let me ask whether we're going to go with Dr. Winters after lunch. Is that the plan?

I have some witnesses that I had available. It is not intended to put them on; we're going to go with Dr. Winters?

MR. THOMSEN: It had been my assumption that we would do that. Is that right?

MR. BLACK: I think it logically flows that Dr. Winters, since we have been discussing a lot of the costing of the plants, should logically follow now. And he has been waiting around.

I think maybe -- it seems to me that would be logical.

CHAIRMAN DEALE: Well, let's see. These are your witnesses, as I understand it, Mr. Black. And do you have further witnesses on this subject of alternative sites?

MR. BLACK: No. It would be we're switching into socioeconomic and cost-benefit analysis of the Skagit site with Dr. Winters.

mpb3

CHAIRMAN DEALE: Yes. So we really are continuing on the subject of alternative sites. are we not, and your suggestion is that we have Dr. Winters before we continue on alternative sites?

MR. BLACK: That's my suggestion, because I note that --

CHAIRMAN DEALE: There's a matter of availability here?

MR. BLACK: Well it is a matter of availability for Dr. Winters, and it's also a question that much of, or some of SCANP's alternative site testimony deals with questions that Dr. Winters presents in his socioeconomic cost-benefit comparison as well.

So to me it's logical to put that presentation on first and then we can follow with SCANP after that.

CHAIRMAN DEALE: Follow with SCANP on the alternative sites.

MR. BLACK: Alternative sites.

MR. THOMSEN: It sounds good.

CHAIRMAN DEALE: All right.

And, Dr. Winters, we look forward to seeing you this afternoon.

The rest of the panel is excused. Thank you very much, members of the panel, for coming.

(The witness panel excused.)

mpb4

CHAIRMAN DEALE: We are adjourned.

(Whereupon, at 12:55 p.m., the hearing in the above-entitled matter was recessed, to reconvene at 2:00 p.m., this same day.)

T10 mm1
MELTZER

AFTERNOON SESSION

2:05 p.m.

CHAIRMAN DEALE: Let's come to order.

Mr.Black, I think under the schedule it is your witness, and he is going to give testimony on socioeconomic impacts at this point.

So, you may proceed.

MR. BLACK: I might note for the record that Dr. Tobey L. Winters is the Staff witness on socioeconomic impacts and he has been previously sworn.

Whereupon,

TOBEY L. WINTERS

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

DIRECT EXAMINATION

BY MR. BLACK:

Q Dr. Winters, do you have a copy of the Supplemental Testimony of Tobey L. Winters on Contentions G, J-10, J-15 before you?

A Yes, I do.

Q And also do you have the Supplemental Testimony of Tobey L. Winters on Staff Update of Skagit Costs to Reflect Schedule Changes before you?

A I will in a minute.

mm2

CHAIRMAN DEALE: This is material which you have already distributed?

MR. BLACK: Yes. I might note that the first testimony I indicated was prefiled in February of 1978, and the Supplemental Testimony to reflect update of costs was prefiled, I believe, July -- June 29th, I believe, of 1979.

CHAIRMAN DEALE: Wait a moment until we get our papers lined up.

(Counsel distributing documents to the Board)

BY MR. BLACK:

Q First of all, Dr. Winters, is there any modifications or corrections that you wish to make to your testimony dealing with the cost-benefit analysis, the first testimony mentioned?

A Yes. There is a change I want to make.

We misquoted the Applicants' capital costs, because we used an old allowance-for-funds-used-during-construction figure.

Q Now is that reflected in the first testimony that I mentioned, or is that in the supplemental testimony, or is it in both?

A This would be in the supplemental.

Q So this would be the updated cost figure?

A The updated cost.

Q And is this the number that you mentioned previously

mm3

with regard to -- I believe you mentioned it first yesterday, and then reflected in response to a question from Dr. Hooper this morning?

A Yes, that is correct.

Q Could you tell us what that correction is and where it is located on the testimony?

A If you look at the supplemental testimony in the last column -- that's on table 1?

A Table 1 of the two-page supplemental. The Applicants' cost figure should be 3 billion 864 million.

Q Instead of 3 billion 325.5 million?

A Yes, that is correct.

And the levelized cost based on our calculation should represent 46.5 mils per kilowatt hour instead of 40 mils per kilowatt hour in the line -- in the third column in the third line.

Q Could you repeat why the Staff has made this modification to its cost, the Applicants' cost?

A At the time we made the estimate, we had not seen -- I had not seen the allowance-for-funds-used-during-construction estimate which had been increased, and my cost estimate did not reflect that.

So I am simply reflecting that fact which I believe Mr. Gittleman discovered in the financial qualifications submitted by the Applicant in June, June 1.

mm4

Q When you talk about Mr. Gittleman, just to make this --

A Mr. Gittleman is the Staff witness on financial qualifications.

Q And he was the one that pointed out the error in your number?

A Well, it was based on the information submitted by the Applicant that he received that I found this.

Q And you had not previously seen that number before?

A No, I wasn't aware of that particular number.

Q Now, is that the only correction to your testimony that you wished to make?

A Well we are talking about the supplemental?

Q Either testimony.

A There was a statement on page 21 under the aesthetic impacts, the last sentence -- it is the third paragraph and it is the last sentence, and I would like to strike the portion of that last sentence after "Intrusion" and before "quantified."

MR. LINENBERGER: Which page, again?

THE WITNESS: This is on page 21.

MR. LINENBERGER: 21. THank you.

MR.STACHON: Did you say including intrusion?

THE WITNESS: Excluding from the word "is" to the

mm5

word "quantified." Insert "cannot be" instead of the existing wording.

BY MR. BLACK:

Q So could you read that full sentence as corrected?

A "However, this visual intrusion cannot be quantified as a cost in the cost-benefit analysis."

Q Is that the extent of your corrections and modifications to both sets of testimony?

A Yes, it is.

Q Now as corrected, do you adopt this testimony in this proceeding as your testimony? And, is it true and correct to the best of your knowledge?

A Yes, that is correct.

MR. BLACK: Mr. Chairman, at this time the Staff would like to incorporate into the record as if read, two pieces of testimony. One, entitled "Supplemental Testimony of Tobay L. Winters on Contentions G, J-10, J-15, Cost-Benefit Analysis" and the "Supplemental Testimony of Tobay L. Winters on Staff Update of Skagit Costs to Reflect Schedule Changes."

CHAIRMAN DEALE: Hearing no objections, the testimony is incorporated into the record as though it were read.

(Documents follow:)

439

125

PUGET SOUND POWER & LIGHT COMPANY ET AL.
(SKAGIT NUCLEAR POWER PROJECT UNITS 1 AND 2)
(DOCKET NOS. 50-522 AND 50-523)

SUPPLEMENTAL TESTIMONY OF
TOBEY L. WINTERS

ON

CONTENTIONS G, J-10, J-15
COST-BENEFIT ANALYSIS

CONTENTION G STATES:

The Applicant and the Staff have not prepared an adequate cost-benefit analysis for the project.

CONTENTION J-10 STATES:

The DEIS ignores the following social and economic costs associated with the generation of electricity to meet regional needs: economic and personal hardships associated with price increases for consumers and businesses; induced industrial growth with attendant costs in terms of resource commitments and public services; destruction and modification of natural resources.

CONTENTION J-15 STATES:

The cost-benefit analysis is grossly inadequate and involves assumptions designed to bias the conclusion in favor of the plant. The assumed capacity factor of 75% is far too high in view of present experience with operating reactors. Many direct and indirect social, economic, and environmental costs are completely ignored, and no attempt is made to quantify such costs, although the methodology exists to do so. The effect of accidents, including a major release accident, is completely ignored in the cost benefit analysis. There is no assessment of present and potential recreation value of the area impacted, and no attempt to quantify such value. The benefits to be derived from the plant have been overstated, and the costs associated with it have been understated. It does not reflect the opportunity cost of the investment proposed.

INTRODUCTION

The above contentions appear to be an all-inclusive attack on the Staff's cost-benefit analysis set forth in Section 10.4 of the FES. A number of other contentions relating to the impact of the proposed plant on the Skagit River fishery (Contention J-3), local agriculture (J-4), and scenic and aesthetic values (J-8), would all enter into the cost-benefit analysis if they were of significant magnitude or effect. These other contentions have been evaluated in the following testimony, and, as that testimony indicates, the Staff is of the opinion that the effects are minimal. (See also, FES Table 10.1). The potential effects of the proposed Skagit project on those values for which the Skagit River was designated as a study river under the Wild and Scenic Rivers Act were identified and evaluated in the Final Supplement to the Skagit FES (NUREG-0235) and were considered in previous sessions of this Skagit proceeding. The probable impacts on secondary growth, fish resources, recreation, traffic, and visual quality were some of the impacts considered in that assessment. To the extent that these impacts may have an effect on the overall cost-benefit analysis for the Skagit project, they have been considered in this testimony.

This testimony is divided into 2 parts. Part I considers the impacts of (a) secondary development, (b) traffic, (c) visual quality, (d) recreation, and (e) accident, and Part II considers the capital and total cost of electricity generation for the Skagit units; and costs of electricity generation attributable to the fuel cycle.

PART I

IMPACTS

A). Secondary Development

1. General Background

Secondary growth impacts include such developments as new industries attracted to the area, jobs created by the presence of the plant (either through the supply of local services to the plant or expenditures by plant employees), and expanded local businesses which result from an improved local economy. The location of expected growth depends on how the nuclear power plant is related to the local economy, the magnitude of income and jobs which the plant creates and location of the plant relative to likely locational decisions for firms and households.

The plant (measured from the proposed cooling towers) is about 1/2 mile from State Highway 20 and six miles northeast from Sedro Woolley, the nearest urban community (Figure 1). State Route 20 is a rural two-lane highway with wide 12-foot lanes and adequate shoulders. The route does not connect major urban areas, but does provide access to the North Cascades National Park, the Snoqualmie National Forest, and the Ross Lake Recreational Area. The location of the plant is about 1-1/2 miles from the Skagit River at river mile 32.6. Land use in the vicinity of the plant is forestry primarily. A pipeline utility corridor crosses the Skagit River at river mile 25, about 5 miles south of the site. The nearest community east on SR 20 is Lyman (population 324).

Further east on SR 20 are the communities of Hamilton (196), Concrete (573), and Rockport. Rockport is located 18 miles east near the

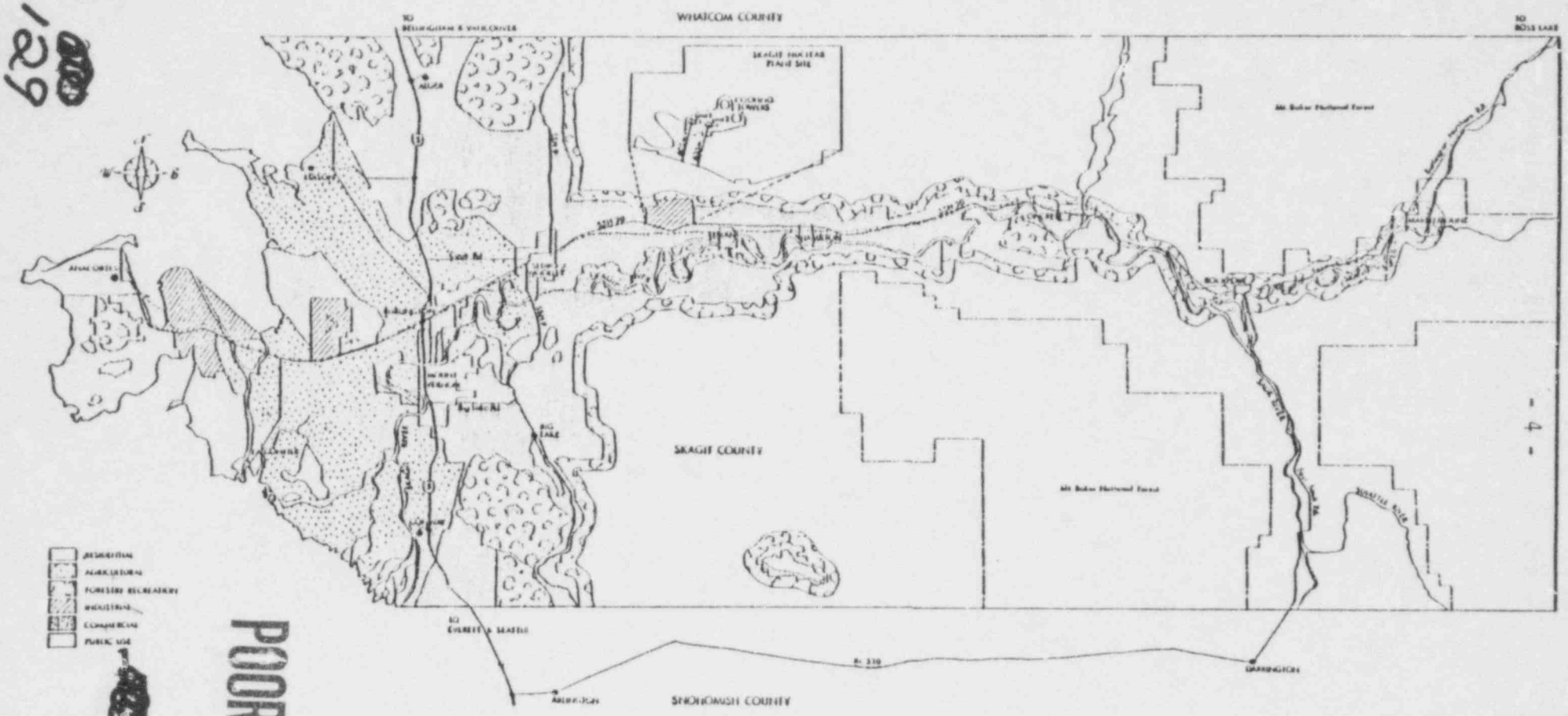


FIGURE 1

junction of East Sauk road that intersect SR 20 from the south. Moving west along SR 20, communities are larger. Six miles west is Sedro Woolley (4598), 12 miles west is Burlington (3138), and Mount Vernon is 16 miles southwest (8804).

Land use adjacent to and surrounding the site is forest and is zoned forest and recreation use on the north side of State Route 20. Further east and west of the site (north of State Route 20) the land is zoned for residential purposes and most of the land is in agriculture or forest.

South of State Route 20, but north of the Skagit River, the land is also in residential use. Various rural roads connect to or run parallel to State Route 20 between the highway and the river. South of the Skagit River, the principal road is the South Skagit Highway which parallels the Skagit from State Route 9, south of Sedro Woolley until the Sauk meets the Skagit River where the road parallels the Sauk River south and east. There is no major arterial road intersecting State Route 20 between Sedro Woolley (six miles west of the site) and Rockport (18 miles east) because the Skagit River is not bridged between these towns. Immediately adjacent to the Skagit River on both sides of the river, the land is zoned for agricultural use. Depending on the extent of the flood plain, the area of agricultural zone varies in width. It is the intent of Skagit County to keep areas subject to flooding in agricultural use. and restrict or prohibit development within the flood plain.[1]

Primary deterrents to development of State Route 20 east of Sedro Woolley are the existing zoning, hilly topography, and the lack of infra-structure

suitable to development. Obstacles to development would include the lack of sewers, supporting service industries, employee amenities (including advanced education opportunities), skilled labor pool of size, and distance from Interstate 5. The Skagit River is not crossed by a bridge between State Route 9 in Sedro Woolley to East Sauk Road at Rockport, a distance of approximately 24 miles. This factor is significant in maintaining the present rural nature of the Skagit Valley northeast of Sedro Woolley. Although the site is accessible to opportunities and amenities, on a relative basis, the area east of Sedro Woolley would be inferior to other possible locations for development-locations closer to Interstate 5 and nearer to existing population centers offering housing and educational opportunities. For example, among the residents within 4 miles of the site, 495 are employed (1970), 388 of whom work outside the four mile area in Sedro Woolley, Burlington, Mount Vernon, Hamilton, and Anacortes.[2] Only Sedro Woolley and communities west of the site offer employment opportunities. The nearest four-year college (Western Washington State) is in Bellingham and the nearest two-year college (Skagit Valley) is in Mt. Vernon.

Development in the past in the upriver Skagit Valley depended on the natural resources of the area, primarily forest products and agriculture. A spur of the Burlington Northern railroad runs parallel to State Route 20 between the road and the river. The spur is not presently in use, but the presence of past development exists in the form of manufacturing structures (e.g. former concrete plant), warehousing, and sites for the transport of forest products. Upriver from Sedro Woolley, housing deterioration is about 3 times the average county rate of 3 percent.[3] This is another indication of declining development attraction.

Population in Skagit County has been stable (two percent growth in ten years), but the County had 2269 more people moving out of than into the County between 1960-1970 (mainly from upriver).[4] The County has lost agricultural jobs and has become more urban with people settling in the larger towns rather than rural areas. These population and housing trends tend to reduce the attraction of upriver locations for development in favor of north-south development along Interstate 5.

Trends in development would indicate that the area east of Sedro Woolley is less attractive to industry then it was years ago, when the county was more dependent on extractive industries. Growth that takes place along State Route 20 would be attributed to development of tourist and recreation facilities, rather than industrial activities.

2. Housing and In-Migration

The main axis of development in Skagit County is along Interstate 5 which connects Seattle and Vancouver. Principal communities within a one-hour commute to the site are Bellingham (pop. 39,375 - 1970) in Whatcom County, and Everett (pop. 53,622 - 1970) in Snohomish County. Workers hired locally from these communities and all communities between these cities would not be expected to move in order to work at the Skagit nuclear power project. Workers living as far away as Seattle may move depending upon the availability of housing nearer the site, personal perception of how long construction work will last, and lifestyle of the worker and his family. Single workers generally prefer to live in larger cities. From purely economic grounds, a construction worker may consider purchase of a home in Skagit County too risky based on an expected employment horizon of few years, particularly where he or she is in a skilled craft trade subject to high unemployment. It was estimated that in 1975-1976

the average availability rate of skilled craft trades (workers offering their services) was 22.8 percent.[5] Workers choosing a residence, who may face unemployment, are likely to live near Seattle where access to alternate employment is greatest. The advantages of Seattle as a residence choice include access to jobs at the Trident submarine project near Poulsbo and the Satsop Nuclear Power Plant Project near Elma.

The Skagit site is at the edge of the commuting range of Seattle (about 60 miles from the northern junction of I-405 and I-5) and 75 miles from the southern junction of these roads. More specialized and higher income workers tend to travel further to work than the average worker. In 1970, about 1 percent of the workers residing in Skagit commuted to Seattle or some part of King County for work purposes. It would be expected that a higher proportion (perhaps 5 to 10 percent) of all construction workers at the Skagit site would be willing to commute in the reverse direction from Seattle given the temporary and specialized nature of their jobs.

It is probable that a large percentage of the highly skilled craft workers (pipefitters, electricians, iron workers, boilermakers) will come from the Seattle area. Because the Seattle area may be beyond the commutation shed for some of these workers, they will relocate temporarily without their families and seek transient and mobile home accommodations; that is this group of workers will be weekend commuters.

Secondary growth impacts depend on the magnitude of primary impacts. Surveys of craft trades within the Seattle to Bellingham labor pool indicate that there is an excess of workers for jobs as shown in Table 1-1. Skilled crafts for which Skagit would have to use Seattle workers include pipefitters,

Table 1-1

WORKER AVAILABILITY COMPARED TO
SKILLED CRAFT WORKER NEEDS

Craft	Membership Strength† 4/1975	Workers Needed*	Area
Boilermakers	5,000	200	Seattle to Bellingham
Carpenters	1,500	340	Seattle to Bellingham
Electricians	500	490	Everett to Bellingham
Electricians	2,000		Seattle Area
Iron Workers	500	370	Seattle to Bellingham
Operating Engineers	800	230	Seattle Area
Fitters	400	900	Everett to Bellingham
	1,000		Seattle Area
Laborers	500	260	Whatcom
Laborers	300		Skagit
Laborers	500		Snohomish
Laborers	7,000		Seattle Area
All Others		210	
	TOTAL REQUIRED	3,000	

*Based on average distribution of workers required by craft based on NUREG 0241-COO-2477-5, Vol. I.

†Table 8.1.1-1 in the ER.

ironworkers, and operating engineers. Given a skill distribution from a typical nuclear power project and an expected total peak workforce of 3,000 (Table 1-1), it can be shown that some workers will necessarily have to come from Seattle. Although the pipefitters, operating engineers, and ironworkers may be attracted to other projects (such as Satsop and Trident) a report by Westinghouse indicated that 150 ironworkers, 1200 operating engineers, and 550 plumbers and fitters were in the Tacoma area and an additional 270 plumbers and fitters were located in Centralia.[6] Some of these workers would also be available for Trident and Satsop.

Given the changing nature of supply and demand for workers depending on project schedules and migration, precise determination of worker availability is not possible for a future construction date. The evidence indicates, however, it is unlikely that Skagit will require workers from outside the Bellingham to Seattle labor pool. Workers from other states seeking employment in the Northwest will likely locate in Seattle, in order to maximize their opportunity for employment and reduce their costs of relocations. Given this kind of residence choice by newcomers, secondary growth in the Skagit area is not expected.

It is estimated that about 20 percent of the peak labor force will move to Skagit for the power project. This estimate is higher than the experience at Trojan where it was estimated that no more than 10 percent migrated.[7] The migration to Skagit is expected to be higher, because Trojan is closer to major cities (Kelso, Longview, and Portland) than is Skagit near comparable areas.

If 20 percent, or 600 workers, moved to the impact area (Everett to Bellingham), a variety of communities would receive these workers. Experience

at other projects indicate that relocating workers tend to locate in a number of communities. Movers tend to choose a residence closer to work than the average commuter who already lives in the area. Based on proximity, housing availability and range of urban services, it is likely that nearly all of an expected 20 percent in-migration would locate in the following communities: Bellingham, Everett, Mount Vernon, Burlington, Anacortes, and Sedro Woolley.

Housing vacancy is relatively tight in Skagit County (about 1.3 percent)[8] so that choice of residence of likely to follow availability patterns. During 1970-1976, an average of 550 units per year were built in Skagit County,[9] indicating that worker housing needs represent about one year's growth in housing to accommodate new migrants. Workers preferring a larger community outside the County would settle in Bellingham or Everett. Locations for new housing construction in Skagit County are expected to concentrate in Mount Vernon, Sedro Woolley, La Conner, Burlington, and Anacortes.[10] The location of sewer extensions and formation of sewer districts is expected to be a prime mover in this expected housing development. No such sewer development is planned near the site nor along SR 20 east of Sedro Woolley. Neither residence choice patterns, planning objectives, zoning ordinances, and returns to the builder would encourage development along State Route 20 in the vicinity of the plant relative to other areas.

Despite ample choice of communities, both within Skagit County and in King, Whatcom and Snohomish counties, some construction workers (some fraction, perhaps 35 percent of the estimate of 600) may choose to live in mobile homes. From 1970 to 1976, Skagit County added 577 mobile homes to its existing stock. Two sites have been identified in Skagit County where an estimated 1000 units could be placed.[11] These sites are located in existing urban areas

near I-5 and are located in areas presently zoned as industrial. The preference for a rented mobile home, or other temporary accomodation, would be greater among married workers who would like to live in Seattle on weekends with their families, but who would not like to commute from Seattle everyday. Single workers or married workers without families (about 30 percent) who could not find permanent accommodation in these communities may seek mobile homes as an alternative.

The most likely effect of any shortage of new housing in Skagit County to meet the increase in demand, would be to alter worker residence patterns away from Skagit County, and for workers to move to Bellingham or Everett.

Housing development which occurs will be concentrated in existing urban areas near Interstate 5. Short length of stay and the dispersed pattern of residence choices by relocated workers would tend to minimize service oriented businesses that would cater to newcomers. Workers would choose established communities and no housing development would be expected to occur east of Sedro Woolley. About 600 workers may be expected to live in the impact area (Everett to Bellingham) and their choice of residence would likely follow housing availability patterns in a tight housing market; or consider a mobile home in the local area. The staff therefore concludes that the impacts associated with the in-migration of workers, including housing and impacts on local businesses and governmental services will be acceptable.

3. Effect on Industrial and Service Growth

The power plant itself requires materials and services and theoretically may offer special advantages to local industry in the production of power.

The site for the project does not offer these advantages, however, given that it is located in a rural area too far from other industrial facilities to export steam and lacks suitable industrial sites near the plant. The uniform pricing of electricity with respect to distance from the generating station eliminates electricity pricing advantages. These factors combined with available industrial sites near I-5 in the Burlington and Anacortes area would indicate that secondary industrial growth would not be expected to occur.

Services and industries within 10 miles of the site include 28 establishments none of which are closer than five miles.[12] Total employees of these firms are 2901, but all the employees do not work either within the area or all year around. The three leading employers have 1370 workers, some of whom are seasonal. One employer is a logging equipment manufacturer (770 employees), one is a general contractor in heavy equipment (400 employees), and the other is a lumber, shake, and shingle mill (65-200 employees).[13] Other large employers have a considerable seasonal component: a fruit and vegetable processor (50-600 employees) and a frozen food storage company (65-350 employees). All of these establishments are in Sedro Woolley. All of the industries within 10 miles of the site might be characterized as dependent upon forest products, mining or agriculture; none of which have an economic connection to proximity to a power station. Again, the factors that would provide agglomeration economies east of Sedro Woolley are absent. The existing firms are specialized in the forest product sector primarily in an area that is relatively disadvantaged compared to the rest of the County with respect to supporting services, and growth trends.

4. Price Increases for Consumers and Businesses

Based on the dispersion of about 600 workers and their families in the region from Everett to Bellingham, price effects are not expected. Whatever sectors in the local economy, such as housing, that may have had relatively rapid price increases may continue to have such effects as a result of normal growth trends. Many consumer expenditures would take place outside the local impact area, because of the greater ability to engage in comparative shopping. In the staff's view only the housing sector would feel price effects and these would stem from ongoing growth pressures, rather than nuclear power plant construction. Accordingly, the staff concludes that the construction and operation of the Skagit Nuclear Power Project will not result in induced service growth or price pressures in the Skagit Valley.

B). Traffic Impacts

Although no impacts from secondary growth are expected, the nuclear power station will generate considerable traffic during construction. Traffic impacts have been previously considered in the FES Supplement §11.8.16. These impacts will be compressed in the time frame of construction project scheduling, and will occur primarily during the morning and afternoon work commuting period. If it is assumed, as a worst-case analysis, that work shifts are not staggered, about 90 percent of all traffic impacts will occur one hour in the morning and one hour in the evening each weekday. The evaluation of traffic impacts will consequently be restricted to the peak hours, because this is when traffic delay and the attendant frustration can be attributed to the Skagit Nuclear Power Station. The impact on scenic values will also be restricted to the summer months as the overwhelming amount of tourist traffic is compressed into the months of May, June, July, August, and September.

Several factors enter into the amount of time that residents, recreationalists, and tourists would be inconvenienced by plant related traffic. Taking all the months tourists are likely to use the roads (defined by each month the average annual daily traffic for the year is exceeded by annual average traffic for the month) and assuming tourists will likely be on the road only during 12 hours of the day in each of these five months, an estimate can be made of the total number of hours during a year which anyone driving SR 20 may be inconvenienced. Total hours of tourist use is estimated at approximately 1800 hours. This estimate can then be compared to how many of these total hours the tourist is likely to be affected by plant traffic (Table 1-2). Tourist and workforce traffic would not be expected to peak at the same time except on Friday afternoons.

Another estimate can also be made as to how great the impact will be as measured by the extent to which the volume of traffic exceeds the capacity of State Route 20 to handle free flowing stream of traffic. Any traffic generated by the plant which does not exceed the free flowing standard is assumed to have no impact on the driver's (and the vehicle's occupants) ability to enjoy scenic vistas, turn off the road when he so desires, or otherwise add to the normal attention to traffic that safe driving requires.

The number of hours in which the plant is expected to affect traffic are shown in Table 1-2. The extent of the impact depends on project scheduling so that the peak year construction employment estimate indicated in Table 1-2 may have twice the traffic impact of the second and third highest years of construction, and four times the impact of the fourth and fifth highest employment years of construction. Consequently, there is no typical year of construction impact.

Table 1-2

HOURS (PERCENT) OF TOURIST TRAFFIC AFFECTED BY THE NUCLEAR POWER STATION IN THE PEAK YEAR OF CONSTRUCTION* (AT MINKLER ROAD NEAR PLANT ENTRANCE)**

	May	June	July	August	September
Estimated One-Way Peak Hour Traffic Without Plant[1]	490	490	520	570	490
Hours Free Flowing Conditions Do Not Exist Without Plant[2]	0	0	0	0	0
Estimated One-Way Peak Hour Traffic With the Plant[3]	2635	2635	2665	2715	2635
Hours Free Flowing Conditions Do Not Exist With Plant	60 (3%)	60 (3%)	60 (3%)	60 (3%)	60 (3%)

[1]Estimated as either the higher of 20% of average annual daily traffic or 10% of average monthly traffic. The average annual daily traffic is 3,750 (73) which was higher than 1974 or 1975 traffic at Minkler Road based on State DOT traffic counts. Assumes traffic will grow 30% before peak year of construction.

[2]Free flowing is defined as 750 vehicles per lane for a rural two-lane road without controlled access.

[3]Based on 100% of workers leaving plant during peak hour (3,000) with an average automobile occupancy of 1.4 persons per vehicle.

*1800 hours of tourist traffic--May through September.

**Chosen for representative traffic volumes rather than expected worst traffic conditions described in text.

Impacts estimated in Table 1-2 may be moderated by 1) reducing the peaking of labor force, 2) introducing worker carpool programs, 3) using buses from remote parking lots, and 4) using alternative routes for either the plant traffic or the tourist traffic.

One method to reduce impacts is to have tourist traffic diverted to Route 530 (from I-5 to Rockport). With such route diversion, tourist traffic would not be affected by the daily peaking from the plant traffic. This alternate route parallels the Sauk River (East Sauk Road from Darrington to Rockport) and does not pass through as populated areas as SR-20. The road does not, however, have as good a sight distance or as adequate shoulders or pavement conditions as SR-20. As this alternate route passes through more forest area and less agricultural and urban area than SR-20, and owing to fewer vistas of distance, the visual experience of the alternate route would be different.

The traffic impacts examined here characterize traffic conditions expected between the plant entrance and Sedro Woolley (about six miles). Traffic will be the worst at State Route 9 (northbound) where it intersects SR-20. Traffic congestion should decrease further westward from State Route 9 as plant traffic takes alternative routes: Cook Road north and west, State Route 20 west and State Route 9 south. Rather than 2,700 vehicles per hour in the peak hours in August, traffic may reach 3,000 vehicles in the peak hours at these two intersections (SR-9 northbound and SR-9 southbound). Again, carpools and peaking characteristics of arrival and leaving times for the workforce can affect traffic. Even 15 minute staggering of work hour starting and quitting

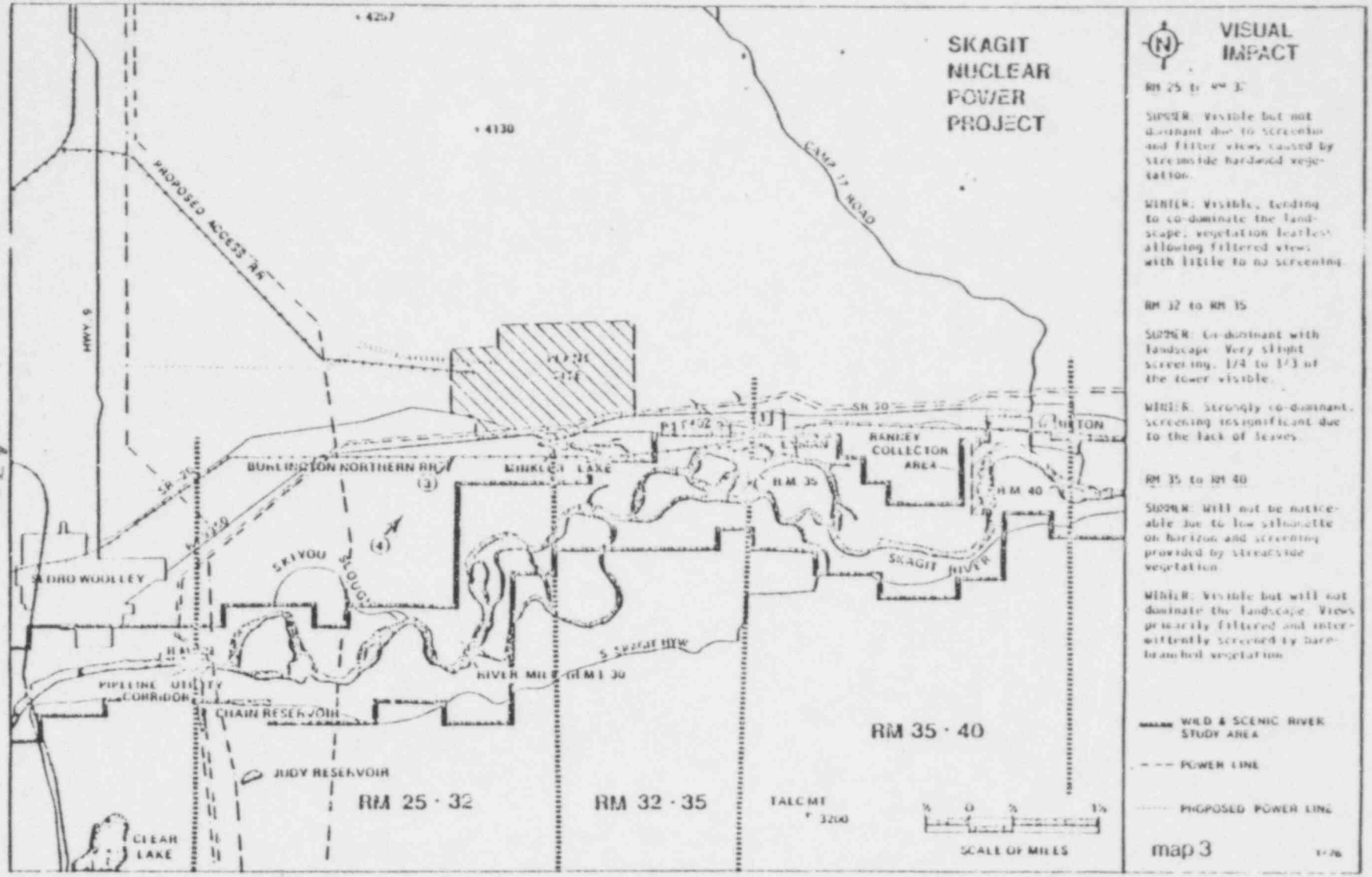
times can reduce travel delay.

A combination of carpools and bus program efforts can reduce traffic to levels of about 1,300 vehicles per hour, as reported by the State of Washington Thermal Power Plant Site Evaluation Council.[14] Staggering work shift hours and diversion of some portion of tourist traffic to Route 530 can further reduce traffic volumes to levels that do not impede free flowing conditions on State Route 20.

The staff is of the opinion that any of the above measures can be instituted by the applicants, in conjunction with state and local officials, as agreed to in the site certification agreement: Article III(N) "Construction Traffic", pgs. 22-23.

C). Visual Impacts

The visual impacts of the Skagit Nuclear Power Project were analyzed in the FES Supplement and were previously considered in this proceeding. That previous analysis indicated that the cooling towers and their plumes would be visible from certain segments of the river and the road and present a visual intrusion on the natural landscape. This visual intrusion, however, would be dependent on the distance from the site, the number of other man-made features visible, and the season of the year. Furthermore, man's perception of his works upon a natural landscape have a subjective aspect as they are a function of his experience, education, and length of residency in the immediate area. The visual impacts are described on Map 3 on page 4-26 of the Skagit FES Supplement. Map 3 depicts what the U.S. Forest Service has defined as Segment 2 of the Skagit River. The visual environment in this segment is classified as rural in an environmental classification system of: urban, rural, pastoral,



primitive, and wild.

River segment 2 is described as follows:

> *"As the definition suggests, open country and farming typify this landscape environment. It occupies the entire lower floodplain to saltwater. The land is heavily modified and intensively used for agriculture. Structures, low in density, are associated with this kind of land use; farm and ranch buildings and homes. Residential units independent of agricultural uses appear amidst this farming backdrop. River frontage is occasionally occupied with residential units. But the valley floor is typically farmland; fields, fence rows, groves, and woodlots, interspersed with a well-developed transportation network. The rural environment occupies about 30 miles of the study area."*[15]

Although the cooling towers are symbolic of urban rather than rural society, there are many other reminders of the twentieth century in the visual experience along river segment two. These reminders are more obvious along the road and include structures of various kinds that symbolize industrial society. In contrast, other river segments of the Skagit system earn the identification of pastoral or primitive. For example, the study defines pastoral as "a feeling of idealized simplicity, peacefulness, and apartness from the rest of the world."[16] The particular river segment affected by the cooling towers did not qualify for this designation.

Visitors who pass through the Skagit Valley for the first time may have a more intense visual experience than residents, but the change from urban, rural to pastoral setting is gradual. Within the area affected by the cooling towers, the rural aspect predominates. In terms of distance (and hence, time) the motorist or River traveler cannot be said to have the visual experience of a pastoral scene. The most immediate past visual experience is conditioned by

driving through Sedro Woolley. The cooling towers are not inconsistent with this experience, nor is the [illegible] setting affected by the cooling towers either pastoral or unique.

Moreoever, management of a "recreation" river segment contemplates development for recreation purposes that improve access to the River. The presence of cooling towers more than 1-1/2 miles away should not interfere with this recreational experience.

Accordingly, the staff concludes that the visual impacts associated with the cooling towers and their plumes will represent a visual intrusion on the natural landscape. However, this visual intrusion is not of sufficient magnitude either on the visual or recreational experience to be quantified as a "cost" in the cost-benefit analysis.

D). Impact on Recreation

Estimated 1975 use of the Skagit River is shown in the table below. In 1975, anglers spent an estimated 5,383 days (2,216 four-hour days and 3,167 twelve-hour days on the Skagit.[17]

Skagit River

1975 Visits/Use
(12-hour visitor days)*

Camping	3,856
Picknicking	3,085
Boat Fishing	2,862
Bank Fishing	305

*Estimated by the Forest Service.

The river also attracts canoeing (2,000 visitor days for the Skagit River system in 1975) and sightseers particularly during the peak tourist months. Canoe trip excursions are available. North of Rockport is the Skagit River Bald Eagle National Area. The nature conservancy will attract sightseers, but the eagles only appear in the winter season when the salmon spawn and die, providing food for the wintering eagle population. The Northern Bald Eagle is protected by the Bald Eagle Protection Act of 1962.

The eagles require "habitat, food, and a degree of solitude" which is consistent with the provision of a 355-acre conservancy at the sites where the eagles spend winter. Management of the conservancy would prohibit certain activities (camping, hunting, and shooting), restrict other activities during the winter season by permit, and prohibit bank fishing in winter. Viewing eagles from the highway is the recommended method of eagle watching. Unwanted boat traffic along the river will be most likely self-regulating, because few people use the river in winter.*

As measured by visits and use, the Skagit nuclear project will have no measurable impact on recreational use of the river. Designation of the river under the Wild and Scenic Rivers Act, investment in recreation resources, and recreation management of the Skagit will attract visitors. If canoers, anglers, and sightseers preferred to avoid the area adjacent to the Skagit project for visual aesthetic reasons, the impact on total usage would not be discernible. It would be expected that users would move either up or down river and the impact on river use would not be affected. On the other hand,

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*Source for this discussion "Skagit Eagles: A Management Program for the Skagit River Bald Eagle National Area."

future management of the river would be expected to attract recreational use, and more rather than less use of the river is expected.

As the intake and diffuser structures are not expected to disturb the salmon runs, the plant will have no noticeable deterrent on fish caught or angler days on the Skagit. The intake and outflow structure sites might be avoided by anglers during construction. Fishing activity would increase, however, if the barge slip used in transporting the reactor vessel were later turned into a public boat launch (Supplement to FES 4-22).

The possible negative effect of the barge unloading facility, intake and diffuser structures is siltation. The staff did not view this siltation as having a substantial impact on salmonid population (FES 4-8). The impacts would, however, be greater in the various creeks and less in the Skagit River.

The staff concluded that siltation can and will be controlled according to existing EPA regulations. None of the possible effects discussed by staff indicated that fish losses due to siltation, or impacts of siltation derived from diversion of creeks, would reduce the fish population in the Skagit in the future to the extent that it would be discernible to anglers in the Skagit River or measurable by subsequent monitoring. This conclusion is based on the proportion of total fish populations that would not reach maturity as a function of plant impacts compared to the total fish population species in the Skagit River.

Staff has identified the maximum loss to fish populations due to siltation and thermal plumes as 12-150 adults (Table 4.4, FES). Comparing this amount to the worst sport steelhead catch in 12 years (1960-1972) indicates that 150

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adults represents about 1 percent of all fish caught in the Skagit River in that worst catch year. The number of resident species that would be lost were estimated at 400 cutthroat adults in Black Creek and 30 cutthroat adults in Wiseman Creek.

No monetary values were assigned to these improbable (worst case) effects on fishing. The potential losses to fish in the various creeks were also not assigned monetary losses, because none of the fish losses would be noticed by anglers by their absence at maturity. It was concluded that the magnitude of impacts associated with recreational activities was not sufficiently discernible to assign a monetary cost penalty to them.

E). Accidents

The environmental impact of postulated accidents was evaluated in Chapter 7 of the FES. It was concluded in Chapter 7 that "the environmental risks due to postulated radiological accidents are exceedingly small and need not be considered further." Accordingly, these risks were not factored into the cost-benefit analysis.

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6. Westinghouse Electric Corp., Socio-economic Effects of Construction and Operation of WPPSS III and V, Pittsburg, PA, 1974.

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8. Skagit Regional Planning Council, Housing Assistance Plan, p. 6.

9. Skagit Regional Planning Council, p. 2.4.4.

10. Skagit Regional Planning Council, Housing Assistance Plan, Appendix A, p. 1.

11. Conversation with Paul Scofield, Skagit Regional Planning Commission.

12. Puget Power and Light, Preliminary Safety Analysis and Safety Report, Table 2.2.2.

13. Ibid, Table 2.2.2.

14. Final Environmental Impact Statement, Appendix, Table 4-7, p. A-28.

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16. U.S. Forest Service, The Skagit: Wild and Scenic River Study Report, p. 138.

PART II

CAPITAL AND TOTAL COST OF ELECTRICITY GENERATION

In addressing these contentions, the staff has investigated the principal areas in which uncertainty, impact on cost, and recent change in seismic design would affect the cost of the plant and the advisability of building the two Skagit units. The staff has also made an independent estimate of capital costs. The staff has concluded that the major uncertainty regarding the 30-year levelized cost and price of electricity generation is in the fuel cycle. Principally, these uncertainties are 1) price of uranium fuel, 2) waste disposal costs, and 3) enrichment services. Consequently, the staff has performed a detailed analysis on fuel cycle costs including a sensitivity analysis of different prices for the utility on ultimate electricity generation costs. Sensitivity of generation costs to different plant factors from 50 to 70 percent is illustrated as well.

This section of Part II addresses capital costs and overall costs of electricity generation. A more detailed look at the fuel cycle follows.

Seismic design criteria were examined for safe shutdown earthquake of 0.25 g to 0.35 g as it affects the cost of construction. Staff analysis relies on the CONCEPT computer code developed at Oak Ridge National Laboratory which is based on a plant designed for 0.25 g. Recent updating of the computer code has tracked well with plants being brought on line in the 1980's.[1] Recent construction costs developed by United Engineers and Constructors (which are used in CONCEPT) are based on meeting all licensing requirements for safe-shut earthquake (SSE) design level of 0.25 g.[2]

Staff then examined an independent assessment of the direct cost effect of increasing seismic design level from 0.25 g to 0.35 g.[3] These dierct cost increases were factored into the CONCEPT code to estimate total cost effects of design increases. Staff and Bechtel's estimated impacts of the design changes are compared in Table 2-1. Bechtel's estimates are increased at 7 percent per annum to reflect 1977 dollars. (Applicant testimony estimated costs of $42.9 million 1974 dollars.[4])

Total capital costs including direct and indirect costs, escalation, and allowance for funds used during construction are presented in Table 2-2. Staff estimates are lower than Bechtel's estimate by $13.7 million dollars -- a difference of less than one percent. The differences between staff and applicant cost estimates are primarily in the area of accounting for escalation and allowance for funds used during construction. Total costs are then translated into costs per kilowatt.hour at different capacity factors. Operation and maintenance cost is estimated separately.[5]

Financing costs reflected in a fixed charge rate of 16.3 percent, which is equivalent to a 13 percent return on investment and a cost of money of 10 percent. Both capital and financing charges are levelized over a 30-year period in line 6 of Table 2.2.

Total generation costs vary from 36 mills per kilowatt hour to 56 mills per kilowatt hour depending primarily on variations in capacity factor and fuel cycle costs (Table 2-3). The range considered most pertinent is narrower, however, 43 to 46 mills per kilowatt-hour is considered a likely range of

Table 2-1

STAFF ESTIMATE OF INCREASE DUE TO CHANGE
IN SEISMIC DESIGN LEVEL FROM 0.25 g
(millions of 1977 dollars)

Cost Item	Staff Estimate 0.35 g	Bechtel* 0.35 g
Structures and Site	$ 8	--
Reactor/Boiler Plant Equipment	8	--
Turbine Plant Equipment	1	--
Electrical Plant Equipment	11	--
Total Equipment	28	$ 30.87
Allowance for Funds Used During Construction	24	18.38
Engineering and Construction Management	1	3.31
Total Cost	$ 53	$ 52.56

*As presented by Warren J. Ferguson, May 22, 1976, before the Atomic Safety and Licensing Board. Costs were escalated from 1974 dollars at 7 percent per annum.

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Table 2-2

STAFF ESTIMATE OF CAPITAL COSTS: UNITS 1 AND 2
(in millions of dollars)

		Staff†		Bechtel††	
		@ 0.25 g	@ 0.35 g	@ 0.25 g	@ 0.35 g
(1)	Total Direct and Indirect (1977 dollars)	$ 1484	$ 1515	$ 1580.1	$ 1614.3
(2)	Escalation*	549	547	629.8	629.8
(3)	Allowance for Funds Used During Construction	638	662	475.2	493.6
(4)	Total	$ 2671	$ 2724	$ 2685.1	$ 2737.7
(5)	Present Value of Charges on Capital (13 percent per annum)**	Staff			
		3273.3	3338.3	3290.6	3365.1
(6)	Total Levelized Costs to the Utility†††	436.7	445.4	439.0	447.6

*Both estimates include escalation based on commercial operation in July 1984 and July 1986.

**13 percent return on investment, 5 percent inflation and discounted cash flow of 10%.

†Based on a December 1977 run of the CONCEPT Computer Code.

††Based on January 1977 estimate by G. W. Jacobson and W. J. Ferguson.

†††Equivalent to a fixed charge rate of 16.3 percent as reported in ER, Volume No. 3, Table 8.2-2.

Table 2-3

STAFF ESTIMATE OF CAPITAL COSTS AND FUEL CYCLE COSTS
LEVELIZED COST PER YEAR OVER 30 YEARS
(mills per kilowatt hour)

		Capacity				
		50	60	65	70	75
Total Capital Including Fixed Charges		39.5	32.9	30.4	28.2	26.3
Total Fuel Cycle Including Carrying Costs*	Low	8.2	7.9	7.8	7.6	7.5
	Middle	11.1	10.8	10.7	10.5	10.4
	High	13.8	13.5	13.4	13.2	13.1
Total Levelized Operation and Maintenance Costs		2.5	2.1	1.9	1.8	1.7
Total Costs	Low	52.2	42.9	40.1	37.6	35.5
	Middle	53.1	45.8	43.0	40.5	38.4
	High	55.8	48.5	45.7	43.2	41.1

*See subsequent discussion for analysis.

generating cost over 30 years. This range reflects 60 to 65 percent capacity factor and the middle uranium price range.

Cost of Electricity Generation-Fuel Cycle

The staff has examined fuel cycle costs in light of uranium pricing developments and uncertainty over public policies regarding the fuel cycle. The impact of uranium cartel on yellowcake prices is not discussed directly, but it is indirectly evaluated through an examination of a number of price assumptions. All prices are estimated in 1977 dollars and 1985 delivery dates.

The principal price factors that would affect the price of fuel to the utility are 1) yellowcake, 2) enrichment services, and 3) spent fuel disposal. Other factors are important, but relatively speaking their future prices are either estimated with less error or do not contribute greatly to the total cost of fuel. Two other factors that are important to cost per kilowatt hour are: the opportunity cost of money (and inflation), and the capacity factor. A discount rate of 10% and a range of capacity factors of 60-70% were used in this assessment. Capital costs were discussed previously.

Staff used more conservative estimates of reactor characteristics than presented in WASH-1139 (1974) for assumptions on thermal efficiency, tails assay and initial core fuel enrichment (Table 2-4).' Staff expects that by 1980, DOE policy on tails assay will be 0.25 percent rather than the current 0.20 percent.[1]

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Table 2-4

ASSUMPTIONS ON REACTOR CHARACTERISTICS
1288 MWe BWR

	Staff Fuel Cycle Costs	WASH-1139 (1974)
Thermal Efficiency	31%	34%
Specific Power MWe/MTU	28	28
Burn-Up MWD/MTU	27,500	27,500
Fresh Fuel Enrichment		
Initial Core % U-235	2.1	2.03
Replacements % U-235	2.73	2.73
Tails Assay % U-235	0.25	0.2

Sensitivity analysis on all cost factors showed that fuel prices are more dependent on yellowcake prices than any other single factor. For this reason, price assumptions merit greater discussion.

Recent work on cost models of yellowcake prices indicates that an average minimum acceptable asking price across the industry for a yellowcake producer in 1985 is about $20 per pound.[2] This price is a cost base approach to the average producer. A recent 1977 survey of yellowcake prices for delivery in 1985 indicate that the average price for delivery is $24.[3] About 10 percent of all deliveries were at prices greater than $40. Depending on how well the utility gauges the market, three cases where chosen for weighted prices for 30 years: $24, $40, and $56. After 1985 prices are assumed to rise at the same rate as general inflation. Fuel cycle costs were levelized.

Enrichment prices were estimated in a somewhat similar fashion to yellowcake prices. Government policy on enrichment is the key variable. The costs represent a range of prices reported in the literature.[4]

Recent 1977 price changes for enrichment services indicate a range of $61.30 to $71.68 per separative work unit depending on the type of contract held. DOE charges reflect their costs and concern for cash flow. The average weighted price for enrichment services in 1985 for three cases $92, $100, and $133.50 reflect (implicitly) different policies by the federal government. One policy is the posture on return on capital assumed for federal expansion of enrichment capacity (middle case). Another policy is federal position regarding turning over enrichment services to private industry and the rate of return allowed on private enrichment services (high case). The upper limit in price is one assumed to be approximately the upper limit used in private sector estimates of future prices.

The most uncertain area regarding federal policy is the impact of future regulations on ultimate waste disposal costs. 1977 costs were based on GESMO. GESMO costs were escalated by 5 percent and 10 percent on the low and middle GESMO cases.[5] The low and middles cases represent a 5 percent annual escalation on $50 per Kg/HM and $100 per Kg respectively. Waste disposal costs are less significant than yellowcake prices. The staff has probably over-estimated the impact of disposal on generating costs because the actual cash expenditure by the utility would be delayed and not be incurred on an annual basis during the thirty years of plant operation.

All price assumptions for three cases are presented in Table 2-5. Decommissioning costs are based on three modes of increasing cost: mothballing, mothballing with delayed dismantling, and immediate dismantling.[6,7] Spent fuel storage costs are based on work currently underway at Argonne National

Table 2-5

1985 PRICES TO THE UTILITY FOR FUEL CYCLE AND DECOMMISSIONING
($ per unit in 1977 dollars)

Cost Basis	Low	Middle	High
Yellowcake $ per lb.	$ 24.	$ 40.	$ 56.
Conversion UF_6/Kg HM	7.40	7.40	7.40
Enrichment SWU/Kg HM	90.	106.	129.
Fabrication Kg HM	172.	172.	172.
Spent Fuel Storage Kg HM	9.	9.	9.
Shipping Kg HM	22.	22.	22.
Disposal Kg HM	74.	148.	214.
Decommissioning both units (in millions of dollars)	11.67	15.04	58.39

Table 2-6

FUEL CYCLE COSTS TO THE UTILITY
1985-2015
(in millions of dollars and mills per kilowatt hour)

		Capacity				
		50%	60%	65%	70%	75%
		(Millions of Dollars)				
1985 "Present Value" (10% Opportunity Cost and 5% Escalation)	Low	331.8	398.1	431.3	464.5	497.6
	Likely	481.4	577.7	625.8	674.0	722.1
	High	627.6	753.1	815.9	878.6	941.4
Levelized Cost to the Utility (at 10 percent)	Low	35.2	42.2	45.7	49.3	52.8
	Likely	51.1	61.3	66.4	71.5	76.6
	High	66.6	79.9	86.6	93.2	99.9
		(Mills Per Kilowatt Hour)				
Levelized (Mills per Kilowatt Hour)	Low	6.2	6.2	6.2	6.2	6.2
	Likely	9.1	9.1	9.1	9.1	9.1
	High	11.8	11.8	11.8	11.8	11.8
Carrying Costs on Inventories at Capitalized Cost of First Core		2.0	1.7	1.6	1.4	1.3
Total Cost of Fuel Cycle (Mills per Kilowatt Hour)	Low	8.2	7.9	7.8	7.6	7.5
	Likely	11.1	10.8	10.7	10.5	10.4
	High	13.8	13.5	13.4	13.2	13.1

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Laboratory and based on GESMO. Transportation, fabrication, and conversion costs were also based on GESMO. Although fabrication costs are large, they are reasonably predictable cost based estimates.

On a cost per kilowatt hour basis, lower capacity factors increase cost to the utility, but the impact is about half as important as price impacts. Of the price impacts, the impact of yellowcake price reflects about 55 percent of all impacts on the utility's fuel cycle costs. Total costs of the fuel cycle are calculated in Table 2-6.

Impact of Cost Increases on Financing

Contentions have implied that factors leading to increased costs in plant construction and operation may jeopardize the investment. From the revenue side, increases in construction costs will be passed on to the consumer after the plant is completed and generating electricity. The higher cost of a nuclear or coal fired plant will be rolled into the rate base that is heavily leveraged by much cheaper hydropower. The range of expected or possible cost increases have been examined already and would not make construction and operation so prohibitively expensive as to require a reconsideration of electric generation alternatives.

In considering the impact of investment opportunity on generating cost, staff used a 16.3 percent fixed charge rate which is equivalent to a 13 percent rate of return on investment for the applicant at a cost of money of 10 percent. The applicants expected borrowing cost is in the range of 8-1/2 percent to 9-3/4 percent. Staff used a cost of money discount rate of 10 percent.

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The current allowed rate of return on all investment by all four of the applicants ranges from 8.57 to 9.25 in the State of Washington.[1-4] It would be expected that the rate of return may go up slightly to reflect increasing borrowing rates for all utility investments. By taking a high rate of 13 percent, staff has illustrated these financing effects on cost. A lower rate of return will decrease the cost of electricity.

The opportunity costs of the investment have been considered in the analysis and are conservatively assessed in the capital and fuel cycle estimates.

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FUEL CYCLE

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COST IMPACT ON FINANCING

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SUPPLEMENTAL TESTIMONY OF TOBEY L. WINTERS ON
STAFF UPDATE OF SKAGIT COSTS TO REFLECT SCHEDULE CHANGES

The staff has updated previous estimates of Skagit nuclear costs in Table 1 due to a revision in applicant's schedule and costs. Previous estimates of cost comparisons (which are also shown in Table 1) showed close agreement between the applicant's and staff's costs both in the original submission in 1977 (reflected in Table 2-2, Supplemental Testimony of Tobey L. Winters, Cost-Benefit Analysis) and the update in 1978 (reflected in applicant's answer to Interrogatory No. 7, January 6, 1978). The staff has updated these costs again to reflect the applicant's testimony on Financial Qualifications dated 1 June 1979. The format for this latter submission is different than previous submissions by the applicant. For consistency, the staff has adjusted the applicant's financial data to reflect (1) scope changes; (2) escalation on new scope; (3) change from 1978 to 1979 dollars; and (4) increased escalation due to an 18-month rather 12-month schedule change. These changes were added to previous estimates of escalation and Allowance for Funds Used During Construction (AFDC).

The old staff estimates were then updated to reflect the same inflation and escalation factors of 6% and 7% based on previous staff estimates of escalation and capital. The staff estimates of AFDC were retained, but applicant scope changes were added to the staff's previous estimates. With these adjustments, the staff finds that the applicant's estimates of costs are again in close agreement with staff's independent estimates and are, therefore, reasonable.

Consequently, based on the staff's update of fuel (14.5 mills/kWh) and the applicant's update of capital (40 mills/kWh), the staff now estimates the cost of Skagit at 54.5 mills/kWh. This compares with the staff's estimate in 1977 of between 43 to 46 mills/kWh and our estimate in 1978 of between 44 to 47 mills/kWh.

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TABLE

Comparison of Estimates of Capital Cost: Units 1 and 2
(in 10^6 dollars)

Cost Item		Date of Operation for Units 6/84 & 6/86	3/85 & 3/87	9/87 & 9/88
Total Direct and Indirect Costs (at 0.35g), including Escalation and AFDC at time of operation	Applicant	$2738	$2934	~~$3325.5~~ [c]
	Staff	$2724 [a]	$2827 [b]	$3191.1 [d]
Estimate of Total Levelized Cost to Utility (Mills/kWh)	Applicant	33.1	35.4	40
	Staff	32.9	34.1	38.4

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a Based on December 1977 run of the CONCEPT Computer Code

b Based on staff estimate of updated costs as reflected in applicant's answer to Interrogatory No. 7 dated January 6, 1978

c Extracted from applicant's testimony on financial qualifications, 1 June 1979, Tables 1-1 through 1-3. Costs include new plant, percentage of new escalation attributable to new plant, inflation, and previous estimate of AFDC and escalation

d Includes applicant's adjustment factors for inflation escalation, and plant costs with previ staff estimates

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MR. BLACK: The staff does not have any supplemental direct.

MR. THOMSEN: Applicant has no questions.

CHAIRMAN DEALE: Mr. Gendler, questions?

MR. GENDLER: I believe Mr. Stachon has some questions.

Is he can proceed first?

MR. STACHON: That's fine with me.

CROSS-EXAMINATION

BY MR. STACHON:

Q Is it Dr. Winters?

A Yes.

Q Dr. Winters, can you turn to page 5 of your Supplemental Testimony relating to the contentions. And, in the second complete paragraph, there is a sentence starting with, "Depending on the extent of the floodplain, the area of agricultural zone varies in width."

And then it goes on with the next sentence.

A Yes.

Q Okay. For the purposes of this testimony here, did you define the floodplain at all?

A No, I didn't.

This is based on what I learned from Skagit County.

Q Okay.

And at the time you wrote this testimony -- well,

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at the time you wrote this testimony, were you aware of Executive Order 11,9087

A I don't believe the Executive Order existed at the time I wrote this testimony.

Q That's right. Okay. I'm sorry.

Onpage 6 you speak of "housing deterioration."

Can you tell me what you mean by that?

A I am looking for the place that is mentioned.

MR. LINENBERGER: Third line from the bottom of the page.

BY MR. SACHON:

Q Do you see it. It speaks about:

"Upriver from Sedro Woolley, housing deterioration is about three times the average county rate of 4 percent."

A I think that reflects a definition, I believe, by Housing and Urban Development, which distinguishes standard, substandard and other -- and another category considered deteriorated housing. I think it is their definition of deterioration.

I believe it is a housing unit which is standard, but deteriorating, but not -- that's the definition.

Q Not on its way to becoming substandard?

A I don't know how they interpret that term. I'm

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not sure of the interpretation of that term. But I think it is a housing unit which is sound, but may be in a deteriorating condition.

Q I'm unclear. Is it housing that could possibly face condemnation?

A No. It doesn't reflect anything along those lines.

I think it reflects housing units for the purposes of a housing plan that the county may have with respect to their plans about housing.

Q Okay.

I notice in regards to population figures, in your testimony you use 1970 population figures. Are there any population figures more current?

A Well there aren't any -- to the same extent, to the same detail, there aren't more current population figures.

But there are updated figures that I believe the county has, and they are often interdicensial estimates made by the Census Bureau.

Q You felt that they wouldn't be helpful for purposes of this testimony?

A Well the fig[illegible]ning here in this paragraph --

Q I'm not speaking just of this paragraph.

I'm speaking basically throughout the testimony.

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A I did look at updated figures when I looked at Skagit County as a whole. But when I focused in on the area around the site I thought the 1970 figures were the best guide.

Q In that regard, what are you using as a definition for area around the site in your testimony?

A I suppose it would be within five miles of the site, generally speaking.

Q So when you are speaking about, say, impacts of construction, worker relocation, secondary impacts, that sort of thing, you are speaking within five miles?

A Oh, no. When I talk about in-movement, migration to the area, I consider much wider region than that, because the expectation is that a workforce would move to areas near the site but not necessarily those very close to the site.

Q Okay.

I think on page 12 you use Everett to Bellingham regarding in-migration as far as the workers.

A I would generally consider Skagit, Snohomish and Whatcom Counties as being applicable areas with respect to in-migration.

Q Now on page 8 of your testimony, you estimate that perhaps 5 to 10 percent of construction workers would be willing to commute from Seattle to the site.

Is that correct?

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A Yes.

Q And on page 10 you estimate that approximately 20 percent of the peak labor force will move to Skagit for the project.

A I have in mind there Skagit County.

Q Skagit County?

A Yes.

Q But then the next paragraph down you say 20 percent move to the impact area and then in parentheses you have "Everett to Bellingham."

Those two cities are not in Skagit County, are they?

A No, that's correct.

If I consider -- it depends on that definition. I might also estimate up to 30 percent if I was including Whatcom and SnohomishCounties as being a fair relocation.

Sometimes in my own mind I wasn't quite clear as to what -- it depends on what impact area you are considering. And in my mind 20 percent would relocate to Skagit County, 30 percent if you considered a three-county area.

Q Okay.

So if we add that 30 percent to the possible 10 percent that would commute from the Seattle area, we get 40 percent. And I am wondering where the other 60 percent of

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the workers are coming from.

A They would come from communities within commuting distance of the site.

Q Well, didn't you say that Seattle was pretty much the borderline as far as the commuting distance, on the outer fringe of the commuting distance?

A Yes.

Q So you are saying the other 60 percent aren't included in that 10 percent, or the 30 percent that would be located in the three counties you mentioned?

A Well the 30 percent are those which would relocate to the impact counties.

I was estimating that perhaps 10 percent would actually drive as far as Seattle, and the remainder would be drawn from the area -- from other areas which are within commuting distance of the site.

Q What are the other areas you are referring to?

A That would include Everett and Bellingham and Anacortes, Mt. Vernon.

Q So, in other words, you are assuming that 60 percent of the workers, the construction workers for the project are already living in the Everett-Bellingham area?

A Well they would probably be living in the three-county areas, Snohomish, Whatcom, Skagit.

Q Okay.

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ON page 7 you talk about the development along State Route 20. You assume that development to be tourist and recretational facilities, not industrial-type of facilities?

It's the second paragraph.

A Yes, that's correct.

But I am thinking of those areas east of Sedro Woolley.

Q What sort of facilities did you have in mind? A small Disneyland, perhaps, or a campground?

A Well, I'm aware of the proposed designation, or the designation recreational river, and the tourist traffic which exists during the summer months. And there would be some development related tothose, those kinds of activities.

Q Does SR-20 fall within the river boundary included in the Wild and Scenic Rivers Act, do you know?

A I may be wrong. I believe the boundary is a half a mile on either side of the river. I don't believe SR-20 falls within that.

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Q Okay.

On page 13 you talk about secondary impacts relating to industrial sites, and I think what you say in your testimony is that industries are more likely to relocate along Interstate 5 than they are near the plant area.

A That's correct.

Q So you don't consider that possible secondary industrial growth in that general vicinity could be attributed as a secondary growth from the plant being built?

A Whatever secondary growth that might come about as a result of the plant, it is not assumed that it would be located east of Sedro Woolley.

Q So Sedro Woolley, for this testimony, is the western border as far as what you consider secondary impacts from the building of the project would be?

A In terms of any secondary growth industrial impacts that might be created by the project, yes, that itis correct.

Q Okay.

On page 21, the sentence regarding visual intrusion that you had corrected --

A Yes.

Q Was that correction because it's not so much that the visual impact of the cooling towers is not necessarily sufficient, but is more of a subjective type of thing

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that's hard to quantify in a dollar-sense type --

A Yes, your second statement.

Q So in other words, how do we deal with that sort of thing when we're trying to deal with deciding the cost versus the benefits? Do we ignore it because it can't be quantified?

A No. I'm not suggesting that.

What I am suggesting here is that the Staff testimony on the subject of visual impacts and that of the Forest Service indicates to the Staff that the visual impacts are of such a nature that they would not be something to preclude the licensing of the plant.

Q I notice when you speak about the cooling towers that it looks like a lot of what your testimony is comes out of the Forest Services Environmental Report regarding the Wild and Scenic Rivers Act.

A Yes, some of the conclusions are based on the Forest Service report.

Q You did not try to make an independent analysis of your own, then?

A Well, this is testimony that was given previously, so that my understanding is that's the Staff position as reflected in the Forest Service findings.

Q Okay.

A I don't believe there have been other Staff

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witnesses on that subject.

Q On page 23 you talk about the intake and diffuser structures. You say they're not expected to disturb the salmon runs.

What did you review for purposes of that statement?

(Pause.)

A I'm looking for the statement. Oh. This is the substantial impact on salmonid population?

Q Well, I'm just wondering what you evaluated, or is this your own wording when you talk about the:

"...diffuser structures are not expected to disturb the salmon runs..."

A This is based on the supplemental FES.

Q And at this point in time we don't really know the plans for installing the diffuser other than it's going to be located in a five foot trench in the bottom of the river, is that correct?

A Well, there has been considerably more on the record on that subject. But the supplemental testimony was completed, I think, in '77. So this is based on the exact specifics of location of the Ranney Collectors and how -- and the hydrologic considerations were based on knowledge at that time, and in the record at that time.

The Staff -- those representing the aquatic

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impacts on the Staff haven't changed that conclusion.

Q Well, if we don't know the actual plans regarding construction and installation of the diffuser, then how can we assess the impacts related with that?

A Well, the Staff has looked at the plans that the Applicant submitted.

Q What plans are those?

A I believe they are the ones that the -- the plan the Applicant submitted in response to their proposed alteration to the Ranney Collectors to meet the criteria of the Forest Service. They have seen those. And they have seen earlier submissions.

Q Who on the Staff? Do you know offhand?

A Well, the project leader on the Staff.

Q That would be Mr. Leech?

A Well, at Argonne it would be Dr. Dvorak.

Q Okay.

On page 24 you have one paragraph regarding accidents, and it's assumed that risks are exceedingly small and need not be considered for purposes of the cost-benefit analysis, correct?

A Yes, that's correct.

Q So in other words, for the purposes of a cost-benefit analysis we aren't looking at the worst possible case of a possible environmental effect that could happen, is that

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correct?

A In an environmental review the Staff does not assign risks to the siting of any plant, nor does it do a risk-benefit analysis as part of the environmental review.

Q Well, tell me, what's the purpose of the cost-benefit analysis?

A The basic purpose is to indicate whether with respect to the NEPA process, whether there's a reason not to license the plant at the proposed site.

Q It's only to assess whether or not to license it?

A Well, whether there is sufficient reason in the environmental review to indicate that it's better to not license the plant, that the benefits do not exceed the costs.

Q The costs.

A The costs can be environmental or economic.

Q Well, wouldn't the effects of an accident be a cost associated with the facility?

A It would if the Staff had any way to assign a probability to that.

Q Well, aren't there studies that assess what potential costs are resulting from an accident?

A Well, you have to assume an accident.

Q But there are ways to estimate the possible costs related to an accident, are there not?

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A Yes.

Q And don't you think for the purposes of a cost-benefit analysis that it would be appropriate to look at all possible costs related to a project?

A You would have to assume events in order to do that analysis.

Q Well, I'm not saying you have to assume an event, you just have to assume a possibility of an event.

It is a possibility, is it not?

A Yes, it is. There is a possibility, yes.

Q So there is a possible cost related to that potential, is there not?

A That's correct.

Q You don't for the purposes of assuming benefits not take into account any benefit because you assume it to be not likely -- I'm sorry, let me start over.

You do assume all possible benefits when you tally up the benefit side of a cost-benefit analysis, do you not?

A Well, we try not to -- we do not consider remote or speculative benefits.

Q What would be an example of a remote or speculative benefit?

A Well, I suppose if the Skagit units happen to be operating at the time of a severe shortage in the

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Pacific Northwest and for some reason the timely licensing of that plant led to benefits that -- in terms of energy benefits or reliability benefits. For example, we do not discuss increased reliability explicitly in looking at the benefits.

Q Well, isn't that a part of the benefit of the generation of electricity provided by the units?

A We generally just look at the energy provided, we don't get into what would happen in a brownout or blackout. We don't get into those kinds of considerations.

Q That's not important?

A We assume normal operation and normal circumstances.

Q Well, isn't one of the justifications for building the plants to avoid brownouts and blackouts, that sort of situation?

A We don't explicitly consider any representations on that as part of the NEPA process.

Q Well, isn't that inherent in consideration of the benefits of electricity generated, that the electricity will help avoid brownouts and blackouts?

A Well, it's implicit, yes.

Q Okay.

But the costs due to a potential accident are not implicit in the costs associated with the costs as you've defined them in the cost-benefit analysis?

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A Well, in other aspects of the NEPA process it is considered. I mean, a lot of them have been discussed, a lot of the environmental factors are related to safety factors. So in the sense that the environmental considerations include the safety aspects of the site, in that sense those types of costs are considered, or should be considered.

Q Should be.

But nowhere is it quantified in regards to the potential costs associated with a major accident, correct?

A That is correct. We do not have a probability that we can assign to that event.

Q Is this a Staff policy in all dockets?

A Yes, I believe it is.

Q To your knowledge, has the Staff ever conducted a cost-benefit analysis that has determined that the costs outweighed the benefits?

A I believe in most of those instances the application for a license is withdrawn. I know of no case where, on the basis of a cost-benefit analysis by Staff, that such a license was withdrawn.

Q Okay.

I would like to turn to your supplemental supplemental, Table 1 on capital costs.

You've updated the Applicant's capital costs, right?

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A Yes, that is correct.

Q Okay.

Does that change the Staff's estimate at all?

A It would in the sense that we usually rely on the Concept Code and our most recent Concept Code update used the operational dates of March '86 and March '88 instead of September '86 and September '88. And those changes aren't reflected here.

Q Well, I'm also referring to the -- well, Do you have a handle on what sort of change that would create?

A I suspect that we would come out with an estimate that is slightly less than the Applicant's estimate.

Q I haven't had a chance to gear out the percentage increase from the figure to the immediate left, the 3/85 and 3/87 operational dates versus the 9/86 and 9/88.

Do you know offhand what,for the Applicant's cost estimates, what percentage increase that would be?

A No, I couldn't give that to you. We have run the Concept Code twice before and it showed good agreement with the Applicant's figures. But we may be a little lower this time than we were the last time.

Q Would you agree that -- this is just roughly looking at it -- that it's roughly a 25 percent increase in the Applicant's capital cost estimate there?

A From our old figure?

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Q No, from the Applicant's old --

A From 7.9 billion to 3.8 billion.

Q Yes.

A Are you comparing the '85-'87 versus the '85-'88?

Q Yes.

A It looks like a 50 percent increase.

Q 50 percent? It's not that high.

A No, not 50 percent; about 25.

Q Anyway, it's substantially more than seven percent, isn't it?

A Yes.

Q We've heard earlier today that you assume a seven percent escalation rate.

A That's during construction.

Q That's during construction.

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Well, how does that -- how can we compare that to these capital cost estimates in regards to the increase in the capital costs?

A I reflected -- I believe it's reflected in the applicnt's financial analysis, I belive. There's a reconciliation ofthe costs he's presented there. Can I just refer you to that.

Q Okay. Okay, now, for the purpose of estimating capital costs, I should say we've assumed and applicant has assumed in this table an SSE .35g, correct?

A That's correct.

Q Okay. Now, let us assume that there's a possibility that when the geology and seismology testimony comes in that that SSE design has to go up.

That would tend to drive the capital cost up, wouldn't it?

A It would.

Q Potentially of a severe magnitude, depending on the possibility of what -- of how much of an increase in the SSE design you have, correct?

A I believe it depends on your definition of "severe."

Q Okay. Assume -- okay, let's assume .45 g.

A All right.

Q Would that increase the capital cost of the

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plant substantially? I guess that would assume -- I guess that would depend on my definition of "substantially."

A I doubt if it would be -- I certainly doubt it would be more than 10 percent. But that's a guess on my part.

Q Is that a rough --

MR. BLACK: I move to strike that answer. I just don't think that Dr. Winters can offer an estimate on that. I'd hate to see that in the record.

I'm certain he has no background to give that estimate.

CHAIRMAN DEALE: Is this simply a guess of yours, doctor?

THE WITNESS: Well, it is.

CHAIRMAN DEALE: Fair enough. Strike it.

MR. STACHON: Okay.

CHAIRMAN DEALE: I think when a question comes to you that you have no particular background or competence in, why, say so, and save a lot of time, and --

BY MR. STACHON:

Q Okay, let's try it this way: we don't know what the final SSE design of the Skagit units will be, do we?

A That's correct.

Q And it's possible that that final design could impact substantially on the cost of the plant.

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A It would have an impact.

Q And it could be substantial if the increase in the SSE design were substantial?

A I just don't know.

Q Okay. Well, if that were to happen, is there a possibility that that might change your -- your conclusions in your cost benefit analysis?

A Since I don't know -- I haven't seen -- I couldn't make -- give you an answer for that.

Q It's an uncertainty.

A It's an uncertainty.

Q So, it might be fair to say the cost benefit analysis at this time is a little premature until we know what the SSE design of the plant is going to be.

A A complete cost benefit analysis is premature.

Q Fine. Well, how much weight, then, do we give to this cost benefit analysis if we have this uncertainty that this whole thing might change?

A Well, this cost benefit testimony goes to the contentions raised.

It's indicated in the -- on the first page.

Q On the first page of?

A There have been a number of contentions raised as to how these impacts addressed here would affect the cost benefit analysis, and that's what was addressed inthe

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cost benefit testimony.

Q I see. Well, this may -- say contention 3: The applicant and staff have not prepared an adequate cost benefit analysis for the project. This cost benefit analysis may be inadequate if the SSE design is changed substantially.

A Well, it would be incomplete.

Q It would also be inadequate, wouldn't it, if it did not address the higher costs, assuming that that were to happen?

CHAIRMAN DEALE: We may be playing with words here, Mr. Stachon. I think the board pursued this in another context, and it was concluded that the estimates were based on the given state of knowledge. And it was recognized that these estimates might very well be changed. And if you want to say considerably or substantially, all right; depending on the results of the outcome of the geology and seismology testimony.

I think we're on, you know, very safe ground.

MR. STACHON: Okay.

MR. BLACK: Yes, I would just add that there obviously -- the staff proferred the testimony at this time with certain assumptions, and obviously one of the key assumptions was that the plant would be designed at .35g.

Now, obviously, if it's going to be designed at

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a higher g value, then the staff's cost benefit analysis would have to be revised to reflect the additional capital costs.

Also another assumption is that the operational dates are fairly much as given in the last estimate; now if those change considerably too, the staff would go back and revise its cost estimate to reflect scheduled delays.

So those are two key assumptions that we've used in this analysis. And if they change considerably, then the staff would come back with a revised estimate.

MR. STACHON: I think that's all that I have.

CHAIRMAN DEALE: Thank you very much, Mr. Stachon.

Mr. Gendler?

MR. GENDLER: Mr. Chairman, accompanying me is Mr. Ron Carstens, and with the board's permission I would like to have him ask some questions on the capital costs portion of Dr. Winters testimony.

We had a statement of Mr. Carstens qualifications. I believe we handed it up to the reporter. Did we get it back?

CHAIRMAN DEALE: Could you recite Mr. Carstens' qualifications.

MR. GENDLER: Mr. Carstens has a masters of science and chemical engineering at the University of Michigan. His masters thesis was prepared on radiation polymerization of ethylen using spent reactor fuel rods.

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He's had eight years experience in economic evaluation of new projects and acquisition for Continental Oil Company, has published three articles and has three patents.

If necessary, Mr. Carstens could elaborate on these.

And he is the founder and president of Key Chemicals, Incorporated, a business located in Redmon (phonetic.).

CHAIRMAN DEALE: Mr. Carstens, have you read the testimony about which you're going to --

MR. CARSTENS: Yes, I have.

CHAIRMAN DEALE: -- going to do cross examination? and you're familiar with the referances in the testimony?

MR. CARSTENS: Some of them; not all of them. Since I don't have access to some of them --

CHAIRMAN DEALE: Do you have any questions of Mr. Carsten?

MR. BLACK: Mr. Carstens, when you indicate you have eight years' experience in economic evaluation of new projects and acquisition for Continental Oil Company, in that context, what do you mean by "economic evaluation of new projects"?

MR. CARSTENS: Okay. I was one of two people responsible for presenting -- preparing and presenting capital

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cost -- projects involving capital cost -- new projects for Continental Oil Company.

They would involve things as diverse as petrochemical plants, oil refineries, cement plants, power plants, in some cases where it was necessary.

It would involve alternative locations. It would involve things like transportation on the high seas, for instance; by pipeline. It also involved the evaluation of new acquisition and how they would fit into this particular company's financial picture.

MR. BLACK: Was this strictly an economic evaluation or was it part of the viability evaluation?

MR. CARSTENS: Product viability.

MR. BLACK: Product profitability?

MR. CARSTENS: Product profitability. Of course it involved evaluation of various processes for licensing, if that was the route that was to be taken.

MR. THOMSEN: Could I ask what time period that was?

MR. CARSTENS: That was until 1964, so that would have been '58 through '64 -- '56 through '64.

CHAIRMAN DEALE: Well, Mr. Carstens, you may proceed.

BY MR. CARSTENS:

Q Would you consider, Dr. Winters -- is that the way--

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A Yes.

Q Okay.

Would you consider that the estimates you've given of capital costs here are conservative?

MR. LINENBERGER: You'll have to tell us what you're referring to.

MR. CARSTENS: Oh, each time? I cannot ask general questions?

MR. LINENBERGER: Yes. But if they -- you said "here." We need to know where "here" is.

MR. CARSTENS: Precisely. In table 2.2.

BY MR. CARSTENS:

Q You have given there that the present value of the charges on the capital costs which -- do you consider those costs to be conservative?

A They could be a little higher if that's what you're referring --

Q Perhaps you could give me a definition of what's considered conservative by the staff.

Do you have a, you know, guidelines for what is conservative so that I have a feeling for what you're saying?

A The implication here is -- were based on my reading of the fixed charge rate, that it allows a 13 percent return to the stockholders.

Q Well, let's take item number four, then, the

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actual capital cost that is shown there.

Would you say those were conservative?

A They're reasonable. I don't know what you mean. If you mean by conservative that they have come in higher, yes, they have. Higher costs have been --

Q So it's not your practice to use a low or a high as a conservative figure. A median value, would you say?

A We basically estimate capital costs on the concept code.

Q All right. Okay.

Now, could you give us how long has this concept code been in existence for estimating capital costs.

A I'm not sure. I would hazard an estimate: maybe 1974 or '75.

Q Okay, and do you know on how many plants it is based, how many experiences? How large a size sample is being used to generate that code?

A I don't know the exact number, but it's updated all the time as new projects as being completed.

Q Is it your understanding it's based on all the plants that have been built to date up to -- you know, the code is updated.

A I know the code is updated to reflect that.

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Whether any particular run thatone might use, whether it has the latest -- the last plants completed or not in the code, I'm not altogether certain. But it is periodically updated.

Q Is there any attempt made to ascertain how close the code fits to the actual data?

A Yes, there have been such studies.

Q Could you give us some idea of how close that is?

Are you -- perhaps I can ask it another way: are you familiar with linear regression analysis of the fit of data?

A Yes.

Q Then are you familiar with the t statistic as regards linear regression analysis?

A Yes.

Q Okay. Then in your estimation you know the t statistic for this?

A No, I do know that they use regression analysis in checking on the concept code estimates and the concept code has in the past been slightly under actual completion costs.

Q Say it again.

A It has been under actual completion costs.

Q It has not represented the expected cost; is

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thatcorrect?

A It -- it represents very well the change in cost escalation -- escalation and costs. But it's -- it very often will produce a number that's slightly lower than figures presented by applicant.

Q Do you have any measure of how far that's off?

A It's usually less than 10 percent.

Q I see. Okay. Now that, as I understand it, that would be used to generate in table 2.2 the figure 1; is that correct?

A Line 1?

Q Yes.

A Yes.

Q Okay. To which is added the less escalation to get the total cost; is that correct?

A You add the escalation during construction and interest.

Q All right.

And I see by your testimony you use for an escalation in item 2 approximately 7 percent per annum; is that correct?

A. That's correct.

Q Could you give us a basis for this figure, your basis for using this figure.

A Well, these are the estimates that are often --

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that figure is approximate to many other cost estimates that are used in the concept code.

It's also based on --

Q Excuse me. Now, I want to ask: this concept code is this 7 percent escalation; is that correct?

A Well, they vary. It's varied in the concept runs. Often the applicant's cost estimates are used; other reports of engineering construction firms are looked at in terms of the escalation rates.

Q Would you say this 7 percent, then, is an estimate?

A Yes.

Q Are you aware of any independent analysis of nuclear power plant costs which would confirm that 7 percent factor?

A I can't give you a specific reference, but ye I have seen --

Q Can you give us some of those references? I don't see any that I'm familiar with in your list of references here.

A Well, there is one, the first one, the Howard Bowers Oak Ridge Report on capital investment costs for nuclear and coal fired plants.

Q That one you say was -- would be a 7 percent estimate?

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A Well, in his paper he compares cost as of a couple -- one or two years ago -- a couple years ago. I have seen other reports which estimate 7 percent escalation rates.

Q Okay.

MR. LINENBERGER: Excuse me, before we get off of this point, Mr. Carstens, were you referring to the second row of numbers?

MR. CARSTENS: Right, item two, table 2.2.

MR. LINENBERGER: Right. And I see there under the first column the number $549 million. NOw, you were talking about an escalation rate of 7 percent, I believe.

MR. CARSTENS: Right.

MR. LINENBERGER: Which means that 549 million is 7percent of what number?

MR. CARSTENS: It means that the number 1484 escalated at 7 percent per year will increase $49 over the life of the construction of the project from 1977 on.

MR. LINENBERGER: Thank you.

BY MR. CARSTENS:

Q Are you aware of the Atomic Energy Commission Report in 1974, estimated power plant capital costs?

A Your reference is a little too broad.

Q Okay, it's called Power Plant Capital Costs: Current Trends in Sensitivity to Economic Paramaters,

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Atomic Energy Commission, October '74.

A NO, I'm not aware of that.

(Counsel for Intervenor SCANP conferring.)

Q Are you aware -- I take it you're not aware that this reports shows roughly a 15 to 20 percent increase per year escalation factor?

MR. BLACK: Objection. He has indicated he's not aware of that report. I think it's improper for the interrogator to put out an assumption such as that without proferring to the witness the document, at least, so he can check that number out.

MR. CARSTENS: Okay.

(Counsel for Intervenor SCANP conferring.)

BY MR. CARSTENS:

Q Are you aware --

CHAIRMAN DEALE: Do you have the document that we're talking about?

MR. CARSTENS: No, I don't. I don't have it right with me, but it isn't that important right now.

(Counsel for Intervenor SCANP conferring.)

BY MR. CARSTEN:

Q Okay. Are you aware of a report published by the Rand Corporation in June of '78 entitled Cost Analysis of Lightwater Reactor Power Plants by William Moos?

A I saw a copy of that report the other night.

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Q Have you had a chance to review it?

A I've had a chance to read it.

Q Do you have any opinion -- or let me ask this: could you tell us what was your impressionof that report in terms of the escalation cost factors that we're talking about here?

A I would not use that report for making predictions.

Q I see. Are you familiar with the t statistic that was quoted in that report, the estimate of power plant capital costs?

A I have seen that, yes.

That's a large report. I don't know which particular -- it's a large report.

Q Right.

A I'm not familiar with what table you're looking for.

Q I believe it's table 11. Does it show a t statistic there?

A Yes, it does.

Q What is it?

A Well, it has the t statistic for a number-- for each one of the variables in the --

Q It has one for the total, I believe, too.

A No, the f value is 21.405.

Q All right, would you consider that to be -- what

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kind of fit would you consider that to be of the data?

A It looks like -- well, let's see. It's a good fit of the data.

Q And you are aware that this represents all of the plants through 1976?

A Yes. I mean, I'll take your statement on that.

Q That's what it says.

Okay, this is a good fit of the data. Would you tell us why you would reject this analysis then?

A Well, my view of this is that this is regression against time, and what -- if you use it as a predictive tool, all you're really saying is that costs go up with time.

Q Isn't that -- excuse me.

A And that -- that's -- you know, that's -- it's an observation we'd all make. It's not, I think -- I think Mr. Mooz on page 2 indicated: "This finding implies that even though delays were encountered, they did not significantly alter the final cost of the power plant." Then he indicates that you shouldn't use this for predictive purposes.

What you're doing is regressing the total length of the project against cost, and if you link them to the time of the project, you're going to increase the cost, and if you take the short period of time, three or four years

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where costs are rapidly escalating and you just extrapolate that trend to the future, and if you assume a very high -- a very long stretch up here, you're going to come up with balooned capital cost estimates.

Q Perhaps you misinterpreted the numbers that are in the equation; the numbers represent absolute years. They don't represent any time differential, as you're implying.

A Well, I assume that in order to make a -- use this as a predictive tool, you would have to assume a schedule a number of months from the project in order to run the equation.

Q Oh, no: the analysis in there -- if you've had a chance to read it -- merely needs on the completion date.

A It doesn't need a start date?

Q Excuse me. It needs a start date. Excuse me, that's what it needs. The total completion time is assumed to be the same.

A Oh, I thought this was an equation to predict the capital costs of a plant.

Q It is.

A Well, then you need the beginning date and the ending date in order to predict the capital costs.

Q Right, but the numbers -- the equation, as I -- if you look at it there, I believe it takes those factors into account, if you read the total report.

david18

And I would ask you --

A Well, if your independent variable is the length of the project, and if you stretch that out, and you use the equation, you are going to have a very high cost.

Q That's why I'm pointing out it's not an independent variable in that report.

MR. SWANSON: Mr. Chairman, I'm getting a little confused here. I thought Mr. Carstens was examining, not testifying at this point.

MR. CARSTEN: Okay, what I'm trying to say is --

BY MR. CARSTEN:

Q I'm asking if this data fits so well and yet you reject it, I'd like to know the basis on which it's rejected.

CHAIRMAN DEALE: I think I heard you ask that question, Mr. Carstens, but also heard, you know, many intervening questions; perhaps, you know, he was picking up on the intervening questions.

And this basic question of yours as to why wasn't the Mooz report used is still on the table, and I think maybe if this is the thrust of your inquiry, perhaps we should give the witness a chance to answer that question and then proceed with such other questions as you might wish.

end 17

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MR. CARSTENS: All right. Fair enough.

CHAIRMAN DEALE: Now, because we are asking the witness to relate himself to a report which he has indicated he has already read, he might not be immediately familiar with it.

Perhaps this is a good time to take a recess and let him orient himself, and we can come back, in let's say, fifteen minutes.

(Recess.)

CHAIRMAN DEALE: Okay, please come to order.

Mr. Carstens, before the break you were cross-examining Dr. Winters. And if we recall correctly, the question that you had made to Dr. Winters, but which has yet not been answered is this: Why is it that the Staff did not utilize the methodology in the Mooz report.

Is that correct?

MR. CARSTENS: Due to the fact that the witness has a good fit of the data.

CHAIRMAN DEALE: All right.

Dr. Winters?

THE WITNESS: My answer is thatthe Staff relies on capital cost estimates based on engineering cost estimates and not on regression equations.

As far as the Mooz report in particular, I did not see it when I prepared my estimate.

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BY MR. CARSTENS:

Q Is it not the Staff's practice then to utilize the lessons of history in terms of actual costs in determining your Concept -- let me rephrase.

If I understand you correctly then, you are saying that the Staff in their Concept computer code uses engineering estimates and not final costs of plants.

Is that correct?

A The Concept code is based on cost estimates which were done by United Engineers and Constructors of the direct capital costs of the plant.

The Concept code in addition estimates allows for funds used for construction and escalation is in the Concept code.

So they use a combination of historical evidence and actual plant capital costs estimated for a typical plant.

Q Let's see. In your answer there you said that the Staff used engineering estimates, and yet you say they use historical plants.

Couldyou tell us where they used a historical plant costs?

A Well in the escalation.

The Concept code also has escalation which it estimates separately from the capital costs and allows for funds used during construction. And both of those estimates

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are not based on United Engineers' capital costs estimates. But they are done separately.

Q So the actual capital cost estimates then are not based upon historical data? Historical accumulation of actual costs?

A Well, my reference -- one of my references here, the first reference, Howard Bowers who was responsible for the Concept code at Oak Ridge, has made presentations on how the Concept code is updated to reflect increasing capital costs.

Q I know.

But to answer my question exactly, it is your understanding that no actual finished plant costs are part of the Concept code?

A It is included. But they put it in the data base of the Concept code.

Q Well let me ask you; in your earlier testimony you said that the Concept code gave numbers which were, as I recall, slightly lower than actual cost estimates.

Is that correct?

A That's been my experience in looking at the output of Concept code runs.

Q And at that time you were unaware of how much this difference was between what the code predicted versus what were actual results.

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Is that right?

A That's in my testimony, because I have Concept runs. I have used the Concept runs at least twice before for this proceeding. Once for operational dates of '84 and '86, and the second time for operational dates of '85 and '87.

Q Excuse me. Then you misunderstood my question.

A I'm sorry.

Q My question is -- perhaps I originally stated it wrong to you.

You said that the Concept code closely predicted or was somewhat underpredicting actual costs.

Now these are not actual costs, these are estimates.

A Actual predicted costs that the --

Q Right.

Are you saying the cost estimate of Concept code is slightly below these estimated costs?

A Yes.

Q And do you have any idea of the relationship between predictions made by the code and actual realized plant construction costs in the real world?

A Well, the Concept code is predicting costs in 1986 and '88, for example. And there is no actual data for 1986 and 1988.

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When plants are complete, the data from those plants are put in as a data base for the Concept code and it becomes part of that data base. And then that data base is reflected in future estimates of Concept.

Q Okay. Maybe I'll put this question another way.

I want to know what the track record is. In other words, if you go back, you started this code you said in 1974, is that correct?

A I believe it has been around since 1974.

Q It was available in 1974?

A Approximately.

Q You were therein able to predict costs through 1979.

Do you know how well that code predicted costs of plants that are completed in 1979, when it was originally conceived?

A Based on presentation that I was at by Howard Bowers, I think it may be fair for me to characterize it as, the Concept code slightly underpredicted the actual costs.

Q Did you previously testify that these underestimated the engineering estimates of the plant, not the actual finished plant costs, so we can make a distinction here between what are unrealized numbers, and those costs which are actually going to occur when you build one of these plants?

A I have seen data which indicates the actual

mm6

experiance at a certain point in time of capital costs and the Concept prediction, and I have seen Concept prediction of future costs.

Q Could you provide us with a copy of that kind of information to see -- we would like to see how close that data fits as you said?

A Yes. I think there would be no problem about providing you a copy.

I don't have it here with me, but it is referenced in my '77 testimony.

MR. BLACK: What is that refrence?

THE WITNESS: This is the Oak Ridge Study Identifies Increases in Capital Investment Costs in Nuclear and Coal-Fired Power Plants.

BY MR. CARSTENS:

Q And you are saying that that is a track record of how well the Concept code fits actually realized costs?

A Yes, that's an example of what the track record has been and what Oak Ridge has done to reflect higher capital costs.

Q And it is your understanding then, that if one were to take construction initiation dates at various -- every year in the future, you would find thatthe difference in cost would be roughly 7 percent.

Is that correct, per year, based upon this code?

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A If you took the time between your construction permit and your operating date and you looked at the escalation of the capital costs while the project was being constructed, 7 percent estimate of escalation is a reasonable one. 7 percent per year.

Q Haveyou had a chance to look at that report during the break?

A The Mooz report?

Q Yes.

A Yes.

Q All right.

Do you have any further feeling of now why you would not use that report?

You mentioned a variable length of time as being one of the reasons why -- construction time as being one of the reasons why you might not use it.

Do you now have any different opinion, after looking at the report?

A Well, it is a regression equation which attempts to fit data -- fit equations to data.

Q Exactly.

A It is not a capital cost estimate based on engineering design and types of things that we rely on in estimating capital costs.

Q But you do agree that it is a close fit of the

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data?

A It is a close fit of the data. But my reading of this -- excuse me if I quote it out of content, but there is an indication here that the equation should not be used for projection purposes.

I don't believe trending capital costs -- costs per kilowatt against time is a way to arrive at an engineering estimate of the capital cost of a project X number of years from now.

Q Are you aware that the cost estimate derived for this plant using that formula would be over $8 billion?

A Yes. I think I have seen an estimate on that order.

Q And in view of the fact that that has a rather significantly close fit to the previous data, don't you consider that that is something that is very -- this large variation between what the code comes up with and what has been historically predictable from this equation, you don't think you should consider that?

A What I would want to do is take the length of time thatthe project would take to complete, and take varying assumptions as to how long that time would take and plug it into the equation and see what kind of costs per kilowatt I would get.

Q Okay.

mm9

But my question was the equations for this plant would generate a value above $8 billion, and that is a substantial difference from $3 billion.

I guess what I would have to ask is why isn't that something to consider in this cost-benefit analysis when the costs are so great, the cost differences, especially when they are based upon historical data?

A If I did that I may, if I assume a construction period of six years, I might get a cost per kilowatt -- an equation like that I might get a cost per kilowatt of $100.

And if I assumed a construction period of 15 years, I may end up with something like $10 billion. And plugging values into a straightline equation like that doesn't really tell me anything about the cost of a particular project.

And I believe if you use a straightline equation and you do those kinds of things, that that's the result you get. And I wouldnot rely on that kind of an analysis.

Q In your table 2.3, for instance, you have a Staff estimate of total capital costs and fuel cycle costs. And you have there a low, midd and high estimate.

A Yes.

Q But you do not have the same low, middle and high estimate on the capital costs.

A That's correct.

Q In view of the fact that some authors, Mr. Mooz

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being one, show such very great differences from your Concept computer code, wouldn't you think it would be a conservative engineering practice to include low, middle and high on your total capital charges?

A One can use that procedure.

Q Can I ask why you didn't, in view of these vast differences?

A Well, we think the Concept code is the best, is a reasonable estimating device for these purposes, and we think that the output from it is reasonable, and we compare it against the Applicants' figures.

We don't go beyond that and make "what ifs" -- ask "what if" questions regarding capital.

Q In your previous testimony you indicated that the Concept code gave lower numbers than final engineering estimates. Not plant costs, but engineering estimates.

Is that correct?

A That's correct.

Q So don't you think it would be prudent, then, to have some costs which are more in line with even engineering estimates, let alone other authors' experience?

A We see the objective as checking to see on the reasonableness of the capital costs.

We don't try to, I guess, second-guess those cost estimates. It is a question of whether they are

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reasonable or not, and how will they compare against alternatives.

Q Are you aware of the WPPSS projects in Washington State?

A Yes.

Q Are you aware that if one takes the completion dates of those projects and their respective cost estimates, you can arrive at an escalation factor of over 20 percent per year?

A No, I'm not aware of that.

Q What do you think it should be?

A I don't have an estimate for the WPPSS projects.

Q Could you obtain that data and perform that simple calculation for us so that these cost increases per year, we can note in the record?

They are, after all, similar projects built in the same state.

MR. BLACK: Mr. Chairman, I guess I would object to that request. I think it is still -- if you can remember an exhibit that was offered yesterday through Mr. Lazar, Exhibit --

MR. THOMSEN: 184.

MR. BLACK: -- 184, I believe that was also an attempt to show WPPSS escalation, annual escalation charges on their projects.

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The witness criticized those estimates. In fact, Exhibit 184 doesn't even purport to show an annualized escalation rate for the WPPSS projects.

I don't know if that data is available, but certainly if Mr. Carstens is indicating that that data shows an annualized escalation rate, I would object to it strongly.

And also, I don't believe it's incumbent at this time for a witness to make calculations for the Intervenor.

If the Intervenor wishes to show that on his direct case, or as Mr. Carstens has offered, rebuttal testimony on the cost-benefit analysis, then he is perfectly free to make those figure estimates at that time.

But to me this amounts to a late-filed discovery request. And I would object to it on those grounds.

MR. GENDLER: We will withdraw the request for the witness to perform the calculations.

MR. BLACK: Thank you.

MR. LINENBERGER: Dr. Winter, while SCANP is regrouping here, referencing the table you were just talking to Mr. Carstens about and the low, middle and high fuel cycle costs, including carrying costs, can you explain to us what that spread between low and high represents?

What has been assumed to vary between the low,

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middle and high costs.

THE WITNESS: They reflect analysis I did. It is reflected on table 2.5 which goes into different estimates of yellowcake enrichment services, waste disposal, those kinds of costs, which are varied.

end T14

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BY MR. CARSTENS:

Q Dr. Winters, in view of the fact that the WPPSS plants are in close proximity to the two that we're talking about here, would you think it would be advisable to be aware and to take account of those cost estimates as they relate to these particular plants and their variation between them, and what might account for the variation between them?

A I think it's useful information to have the actual WPPSS experience in escalation.

Q Did you take account of it in your --

A No. At the time I prepared this I did not look at the WPPSS capital cost estimates.

Q Would you think it would be an advisable thing to do?

A Well, it's a useful thing to do. I'm not sure what it would demonstrate.

Q In view of the fact that these five plants represent good experience and are local, why didn't you take account of them?

A Well, what you're getting into are some of the assumptions that -- a different approach than I took in doing the analysis. I relied on the Concept Code in developing the capital cost estimates.

Now if there are serious disadvantages with the Concept code with respect to the Pacific Northwest, and that is

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well known by, you know, many people at Oak Ridge, I may use a different approach than the Concept Code.

Q In your Concept Code analysis is there any measure taken of local conditions which may affect the capital cost?

A They do have labor cost differentials for different parts of the country.

Q That's the only item?

A I believe that's the only item.

Q Did you take account of the kinds of costs that we have on the WPPSS projects, then, in your analysis for the Concept Code for this particular number in Table 2.2?

A Well, the labor costs would only be a part of the WPPSS experience. I don't know what -- you have to look at what delays they've encountered and what period of time you're applying your escalation over.

There's a lot of considerations in comparing the WPPSS to the Skagit site. Labor costs are only one of them.

Q But they are a fact you did not take into account, evidently, then?

A No, it is a regional factor that does exist in the Concept Code.

Q But you didn't take account of it, if I understand your answer correctly, is that right?

A Well, the Concept Code takes that into account.

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Q But as I understand your answer, you did not take account of the labor rates, for instance, which are -- and their increases -- actual -- which have been experienced in Washington State on the WPPSS projects?

A No, not on the WPPSS projects.

Q So you've ignored the experience of WPPSS in generating these numbers for the Concept Code?

A Insofar as those estimates are not in the Concept Code, that's correct.

Q Okay.

In researching the sources of cost items in making cost estimates, one can find disagreement among various sources and authors on a particular cost experience, isn't that right?

A That's correct.

Q Okay.

And wouldn't you say it would be prudent cost estimation practice to reconcile differences between those sources or take them into account in some fashion?

A Well, that would depend on the contribution of these types of costs to the total plant.

Q They have to be significant in order to do this, don't they?

A Yes.

Q Fine.

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Would you consider capital costs to be significant?

A Well, there are parts of the capital costs which it just becomes a little too detailed to go into all of the various assumptions that one could make about those types of costs.

Q You felt strongly in Table 2.5 about the variations that might be experienced in the fuel cycle costs, and so you made low, middle and high estimates.

A Well, at the time there was I think more uncertainty attached to some of the fuel cycle components than there were to the capital cost components, and we didn't have any -- we didn't have a tool similar to the Concept Code on which to base the fuel cost estimates. So I made this additional analysis.

Q You say "at the time". In other words, at that time you had the Concept Code but you didn't have a similar type of thing for the fuel cycle, is that it?

A Yes, that's correct.

Q But you were aware of disagreements among others as to the final costs of nuclear plants?

A Yes.

Q And as I understand your previous answers, your reconciliation of that difference,in this case perhaps as much $3- to $8 billion dollar differences, was resolved in favor

mpb5

of using the lower estimate of the Concept Code, is that correct?

A Well, in the alternate sites we used the higher estimates.

Q $8 billion?

A Oh, that's your estimate.

Q Well, you're agreeing that that's the estimate that's derived from, for instance, one author's study, Mr. Moos?

A Well, I don't think there's any credence that can be paid to that kind of estimate, particularly when he said there's no reason to use that kind of equation in a prediction.

Q But, excuse me, you have agreed that is a close fit of the data, a close fit of history.

MR. BLACK: Mr. Chairman, this is argumentative with the witness. I believe he has given adequate reason why he hasn't used that method of projecting costs. And the author even indicates that it's not a good method to estimate costs.

And I believe Mr. Carstens is just trying to get an admission here, which amounts to badgering of the witness.

CHAIRMAN DEALE: Mr. Carstens, it's certainly clear that the witness has rested his case on the Concept

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Code. And he has disagreed with the Moon approach. And this matter has been stated over and over and results in questions.

I don't think there's anybody here who has any confusion that the witness has decided that he's staying with the Concept Code regardless of whatever merits there might be in another approach.

Now that having been settled, I do believe that the point is well taken that, you know, you can go on from there.

MR. CARSTENS: Okay. That's fine.

Just one final question on Table 2.2.

BY MR. CARSTENS:

Q You stated that you used the high estimates for the alternative sites.

A What I mean to reflect there is when the Applicant's estimates come out higher than ours, we would adopt the Applicant's estimates in terms of the alternate sites testimony.

Q That's your measure of conservatism?

A That's your characterization, I guess.

Q Okay.

On Table 2.4 regarding the fuel cycle analysis you have shown there that you've used a fuel efficiency or burnup of 27,500 megawatt days per metric ton uranium.

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A Yes, I have.

Q Okay.

And this is based upon the WASH-1139 study.

A Yes, it is.

Q Okay.

Do you know what the basis of the WASH-1139 figures are?

A No, I'm not familiar with that.

Q All right.

So you're not aware of the basis for this number 27,500?

A No, I'm not aware of the background data on which it was drawn.

Q Let's see. WASH-1139 was done in 1974, I believe, is that right?

A Yes.

Q Are you aware of actual operating burnup data from commercial power plants, the yield actually experienced?

A I don't have a specific number in mind.

Q Let's see. It's your understanding -- How many years of reactor operation has the nuclear industry experienced to date, would you guess? Over 1000? Over 500?

CHAIRMAN DEALE: Wait a minute. I didn't get the question --

BY MR. CARSTENS:

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Q 300?

A Oh, 300.

I'm not sure, are you talking about gigawatt years or reactor years?

Q Let's talk about reactor years of operation. Just take a rough guess.

A 300.

Q 300. Okay, fine.

So that represents a substantial length of actual experience.

A Yes, it does.

Q Wouldn't you think it would be good engineering practice to utilize actual operating yields in deriving these costs?

A Yes, one could do that.

Q Why didn't you choose to do so in this case?

A Well, I think a lot of that information is only becoming available now with respect to actual burnup. I also believe that with respect to the cost, there's a -- when you have an outage you often would replace the fuel. The economics of it would be that you may replace the fuel earlier than you otherwise would. And for that reason you would get a lower burnup.

And I'm not specifically aware of what each utility's operating practice in that regard may be. But it

mpb9

may be more economical to replace your fuel and have a lower burnup than to --

Q So you're saying you are aware that actual numbers may be lower than those?

A Yes.

Q But you're not aware of how low they may be?

A Well, I could find out. But --

Q Why didn't you find out for this particular practice?

A Well, my information about the lower burnup has come since I did this supplemental testimony. But --

Q Do you know what the value is?

A No, I don't.

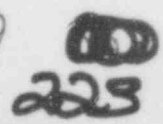
Q You said it came to you, that's why I'm asking.

A Well, I had discussions with people on the subject and I am aware that the actual burnup is lower.

Q Could you provide us with that information, since it has come to your attention, that difference between actual and the number used here?

A Well, I don't have any published reports on the subject. This is based on conversations with someone who's been working in this area.

Q But with 300 reactor years of operation, there surely is a sufficient sample to generate operating data that you could use as a basis for the study, isn't there?



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A One could use a lower estimate and come up with slightly higher costs.

Q I guess I'm asking for not the lower estimate, I'm asking for an actual estimate based upon --

A One could do that, yes.

Q Could you please tell us what the highest yield that you're aware of from a commercial plant that you've heard about or are aware of in some fashion is?

A I couldn't make a statement on that.

Q Do you know of any reactor in the United States which has had this kind of yield?

A I based it on the WASH report.

Q Okay.

A And I didn't investigate it further.

MR. LINENBERGER: Mr. Carstens, maybe at this point I might ask you to orient us a bit here, if you care to.

I draw the inference from this line of questioning that you personally consider the 27,500 megawatt days per metric ton burnup figure to be higher than -- unrealistically high, let's say.

If you care to, would you comment to the Board what you think a more reasonable value might have been?

MR. CARSTENS: Well, I don't think it's a question of what I think necessarily, it's a question of we ought to be using numbers which are based upon actual experience,

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and that's really the thrust of this questioning.

It is my understanding in talking to people who derived this number that this is a calculated number from WASH-1139, and is not reflective of actual operating data. And so that is the reason for the question as to why aren't we using actual operating data.

MR. LINENBERGER: But do you have a basis for believing --

MR. CARSTENS: Yes, there was a study conducted on about seven plants which showed yield which was half of this number. I wouldn't bring it up except a yield that's half of this -- and all of the fuel cycle costs in Table 2.5 are then reflected with this half-yield.

So that would very very strikingly affect the total fuel cycle costs. That's the only reason I mentioned it at all.

MR. LINENBERGER: Thank you.

BY MR. CARSTENS:

Q In view of the fact that this does not reflect actual operating data, don't you think it would be wise to redo this Table 2.5 based upon actual operating data?

A Well, there are other ways of approaching this.

For example, there are several reports out on the subject of fuel costs. One might also reference those rather than go and make a different assumption regarding these things.

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One might just go look at other published reports on fuel costs.

Q Well, as I understand it, you've rejected that kind of approach when it comes to capital costs. In other words, you would rather not take overall costs from some other author, you'd rather go through these specific steps as you have in Table B.5, utilizing this yield.

I would ask you if that probably is the way to this? Isn't it? Otherwise you're deviating from your game plan.

A Well, one could do that, yes.

I don't think I would choose to do it that way because the end result may not come up with -- Well, I'm not sure what the end result would be. But there are other estimates regarding fuel costs and other approaches that have been taken. And since I didn't have something comparable to the Concept Code--if I went back and did the analysis now I might take a different approach and compare other estimates of fuel costs rather than going through the calculations.

Q You wouldn't, then, compare actual operating yields with what you've used here, is that correct?

A No, I would probably go back and get information on what the actual operating yields are. I could do that.

Q You have access to that information?

A We have people at the laboratory who are working

mpb13

on the spent fuel, and they have quite a bit of data on this particular thing.

Q From the various utilities around the country?

A Yes.

Q Have you actually reviewed any of this information yet?

A This project is going on right this moment, So I've seen some of the data but it hasn't been interpreted.

Q Are you aware if this information includes a significant sample or the operating plants in the United States?

A I think it does.

Q So that we can expect these costs to be -- I mean these yields to be realistic?

A Yes, it would be.

Q Okay.

Turning now to Table 2.5, and your testimony on page 32, you indicate that one of the bases of approach of arriving at the yellowcake cost per pound was the cost of production. You indicate it on page 32, I believe.

A Yes.

Q Are you aware of any -- well, strike that, please.

Do you think it is prudent cost estimation practice to estimate prices based upon production costs?

A Well, this is a method using the concept of minimum acceptable asking price. It's a way to get at

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estimates of prices without actually trying to model the market.

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Q Would you agree that in most commodities -- and this is a commodity -- that the price of material bears almost no relationship to the cost of production?

A I don't think that's a fair statement.

Q Would you tell us what relationship the cost might bear to the cost of production?

A It depends on what kindof market it is.

Q Let's take this one as a high demand market; is it not?

A It's a market with a few producers and a few consumers. The consumers are the utility industry, and the producers are the yellowcake producers, uranium producers.

Q Then the attempt to use cost of production provides a floor for the price; would that be a fair statement of your position?

A No , the prices have historically been below this, and there has been times in the past where costs have been -- I understand prices have been at the cost of productions.

Q How do you explain the fact that producers were still producing and selling at $3 a pound when you're saying the floor of the cost of production is $20?

A This is an estimate of -- this is an average price estimated in 1985. It's not themarginal price, and it doesn't reflect the -- it's not a price that one was

david2

considering a few years ago.

Q Do you think thatthe yellowcake is a significant portion of the total fuel cycle cost?

A I indicated --

Q Right.

A Major.

Q And therefore isn't it advisable to do more than make, it's look like, an unstudied assumption about the middle and the high costs of the yellowcake.

A I've chosen a range of prices for yellowcake.

Q Can I ask what the basis for choosing that range is? None is given in the text.

A I tink I assumed different inflation rates, basically.

Q Excuse me, again, please?

A I think I assumed different inflation rates.

Q According to your thing here it says "after 1985 prices are assumed to rise at the same rate of general inflation." Page 32, second paragraph.

A Yes, but I --

Q That's not the same thing as choosing the prices.

A I took the range of prices for 1985 and then they were escalated after 1985 at a 5 percent escalation.

Q Right. Can you give us your basis for choosing, for instance, $40 yellowcake for the middle price basis and

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56 for the high cost basis. What is your --

A I believe those bases are reflected in some of the references.

Q Could you indicate which references those are reflected in?

A Well, I don't have the references with me, but I -- some of the surveys of uranium marketing activity, for example, might indicate some of the publications of UNEXO: I think I'm pronouncing it properly. But we used some of those in looking at the prices of yellowcake.

Q Let's see. But that's not referenced here, I take it, UNEXO?

A No, we have looked at those.

Q They have made some price pronostications for future price of yellowcake; is that correct?

A They have in the past.

Q Did they do so for you or did you use their studies for this report?

A We've taken a look at their reports and their surveys of uranium marketing activity.

Q But did you use to derive these number of $40 and $56 -- did you use UNEXO's estimates of future cost of uranium?

A No, these figures themselves do not come specifically from a UNEXO report.

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Q That was one of the references you used?

A One of the references.

Q And the other might be, for instance, on page 38, number 1. Is that correct?

A Yes.

Q And two and three?

A And four. On uranium?

Q Uranium.

A Pardon?

Q Yellowcake cost.

A The first three refernces -- there are some reports that I looked at that are not referenced in here.

Q So the basis for this, then, is an opinion based on the survey of these three -- one, two, and three estimates as well as other unspecified references; is that right?

A We have looked. I don't see a UNEXO reference here, but we have looked at their reports and what the going prices of uranium -- yellowcake are at different points in time.

Q Have you conducted your own market analysis of the yellowcake?

A No, I have not.

Q Due to the fact that the cost is of large significance you've indicated some uncertainty with regard

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to that, don't you think it would be wise to conduct this kind of supply and demand marketing projection yourselves to arrive at a reasonable cost because of its importance?

A Well, I only know of one -- I don't know the person specifically -- but I know of only one person who purports to have a model of uranium pricing.

Q What?

A I only know of one person who purports to have a model which reflects future prices of uranium.

Q And who is that?

A I don't know his name. He is in business, and he -- his -- his -- if you follow some of the Nucleonics Week, I think they describe -- they have given him space there and other publications to discuss the results of his model.

Q He's a private consultant; is that right?

A Yes.

Q I see. Did you make use of his information?

A No, we don't have the model available to us.

Q Don't you think it would be prudent to make use of that model in view of the fact that this cost is a very large portion of the total cost.

A If NRC would pay for us to buy this model, we'd use it.

Q Under table 2.5 under the subject of enrichment,

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you have a low, middle, and high, and you have there an estimate of $90, $106, and $129 for various enrichment costs.

A Yes.

Q ARe you aware of the present enrichment costs charged by the government for these services?

A The last time I looked, I think it was $76, but that may have been a year or two ago.

Q Are you aware that the present costs now are over $100?

A That would be my middle estimate, if that's the case.

Q Are you ware of how fast these particular costs have increased?

A My understanding is that they have increased to reflect the cost incurred in providing enrichment services, so I think the costs have been a raflection of DOE policy to -- and GAO's criticism to fully recover all their enrichment service costs.

Q But you're not aware, then, of any of the increases of costs that have been experienced in enrichment in the last few years?

A I think that change has been somewhat of a catch-up.

Q Now, but the question was: you're not aware of

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any increases in enrichment costs of a general magnitude per year?

A I base my estimates on a report which indicates what possible policies of DOE might be with respect to enrichment.

And I believe that's reflected in the references, reference four.

Q Okay. And that study -- you believe that study adequately represented the increases in costs of enrichment services that the government might provide for this project?

A I think they also made some estimate of what would happen if enrichment services were taken over by the private sector.

Q Okay. Well, my question is -- goes back to the annualized cost increases which have been experienced in this enrichment factor.

A They've increased rather dramatically in recent past --

Q All right, did you take account of that fact when you made these estimates?

A Yes, I did, in the sense that they were expected at the time that this report was prepared, and so the range was an attempt to reflect that.

Q Since you indicate that there was this attempt to find the annual increase, could you give us an idea

david3

of what that was per year -- estimate governing enrichment cost that you used?

A Well, at the time the report was written, the enrichment costs were 76 per separative work unit.

Q But, let's see, you indicated the costs -- the studies that you used indicated the cost had gone up dramatically.

A The study I used indicated that was the present cost at the time the report was written, and this range of estimates reflects the expectations about future costs.

Q What expectations?

A That the costs would go up.

Q I know, but that's what I asking, what percentage you use, because as I read your report here you're using after 1985 essentially an inflation rate of 7 percent or something like that. Is that correct?

A After 1985 it was assumedto be 5 percent.

Q 5 percent. Okay, fine.

Now, first of all you said that there were rather dramatic increases, and now you're using 5 percent per year.

A After 1985. The cost reflected in that previous table was the cost in 1977 dollars, and after 1985 they'd be escalating at 5 percent per year because we --

Q Okay, so you're saying it's going to go up

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rather markedly until 1985. And then it's going to level off?

A That was the assumption, yes.

Q Okay. And if the present price is over $100 and you're using rather dramatic increases and we still have another six years to go until 1985, don't these numbers look a little low?

A Well, these are in constant dollars, so --

Q Well, even so --

A Well --

Q Don't they look at little low? Could you indicate -- well, why don't you answer that first.

(Pause.)

A Well, we just -- in 1985 dollars they'd be a lot higher. Even today they'd be a lot higher in 1979 dollars.

Q But as I understand your testimony, you're testifying that these cost increases would be greater than what would be due to inflation alone up to 1985; is that right?

A That's reflected in the low, medium, high, that each one of those would be escalated. In 1979 dollars you'd have to escalate those dollars. If you're assuming 1985 dollars, you'd have to escalate them further at whatever escalation rate.

Q So you're saying that if I were to derive this 1985 number you're talking about, I would take $106 in

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1977 dollars and escalate.

A Escalate it up to '85.

Q At what percent per year?

A I believe 5 percent again.

Q Well, that --

A Well, I mean actual escalation is higher. Actual inflation is higher.

Q Right. So you're saying you would take $106 escalated at 5 percent per year. That would be the 1985 dollars and you would escalate it at 5 percent per year thereafter; is that right?

(Pause.)

A Yes.

Q Now, before you testified --

MR. LINENBERGER: I hear an inconsistency, and it may be in my ear; it may not. I think Dr. Winters you just answered yes to a 5 percent escalation from '77 to '85 and a 5 percent escalation rate beyond '85. Yet I thought earlier I heard you say 7 percent escalation until 1985 and 5 percent beyond. Now --

THE WITNESS: I used a 7 percent on the labor costs. I did not use 7 percent here.

MR. LINENBERGER: You didn't use 7 percent here.

THE WITNESS: I don't believe I did.

MR. LINENBERGER: Okay, then, thank you, because

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I was confused. Pardon theinterruption.

BY MR. CARSTENS:

Q Okay, in previous testimony here just a few minutes ago you said that this enrichment cost had projected into it dramatic increases to 1985 and 5 percent thereafter. And at that time you were not able to give me a quantitative number as to this dramatic increase in enrichment cost.

A I thought it was discussed in the tent.

Q Could you point that out?

A The reasons for the low, middle, high estimates were the differences in the dramatic costs. And then at that point you then start escalating your costs at an annual rate.

Q You indicate here that the differences are primarily due to the different policies of the federal government.

A Yes.

Q Okay. Are you aware of the cost factors that influence this cost of enrichment?

A Only in general terms.

Q Would you give us an estimation of the most significant cost factor in deriving enrichment costs?

A Well, energy is important.

Q Do youknow how important?

A No.

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(Counsel for Intervenor SCANP conferring.)

Q Would you be surprised to learn that in the government's calculation of these costs for industry, I think it's 1080 -- that the electricity is something like 90,95 percent of the total cost?

Would you be surprised to learn that?

A I would be surprised to learn it was that high, yes.

Q Those are the costs that the government calculates for the industry.

MR. SWANSON: Objection. Examiner is testifying. There is absolutely no basis for that statement on the record.

(Board conferring.)

CHAIRMAN DEALE: Do you have the idea, Mr. Carstens --

MR. CARSTENS: Sure.

CHAIRMAN DEALE: You're not a witness.

MR. CARSTENS: I've got it.

BY MR. CARSTENS:

Q You do agree that energy costs are a significant factor for enrichment?

A Yes.

Q And would you say that energy costs are increasing at greater than the rateof inflation?

A Yes, they are.

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Q And therefore would you say that the enrichment costs should increase greater than the rate of inflation?

A Yes.

Q Why didn't you use that factor when you derived these numbers?

A I thought I had built in a conservatism in the others.

Q At 5 percent escalation per year?

A In choosing the range of policies that might be taken, I assumed-- that's why I built the conservatism in in those estimates.

Q And so that, for instance, a policy of the federal government might make this change from 106 middle to 90 low and from 106 middle to 129 high -- is that right -- merely on the basis of federal government policies?

A Yes, in constant dollars.

Q Without regard, I take it, to effects of energy costs; is that right?

A Yes, I didn't explicitly consider energy costs in inflation -- energy costs.

Q Has the government been changing its policy in the last few years with regard to this particular item, let's say from 1975 to '78 or '79 that you're aware of? Or has the policy remained constant?

A Yes. They are changing policies all the time.

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Q No, but I mean -- in the particular aspect in which you changed these prices, are you aware of any previous changes in these prices due to the government policy changes in the last five years, say, '75 through '79?

A I can't -- can't think of one right now. I know I have read on the subject. The major one I can think of is the attempt to reflect the total costs of the service, and that --

Q It is your understanding that the policy has changed in the last five years, then? And it would be reflected in these kindsof cost increases; is that right?

A Yes.

Q Under the item fabrication, could you please -- you don't specify in your text what the basis for this is. Could you please indicate what the basis of that might be?

A Which number?

Q $172 per kilogram.

A I believe that's the reference four.

Q And are you aware that reference four -- that particular figure from reference four is based upon actual experience by the industry?

A I'm not aware of where they got all their data.

Q I see. Don't you think it would be wise to use actual costs that are being experienced by industry in deriving these numbers?

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A It would probably provide a better estimate.

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MELTZER

Q In the item under disposal, you have indicated in the text -- let me just see if I can find it for a moment.

Oh, on page 33, second paragraph, you point out that:

"The most uncertain area regarding federal policy is the impact of future regulations on ultimate waste disposal costs."

A Yes, that's correct.

Q In areas of uncertainty with regard to costs, would you say it is prudent practice to use low estimates for -- of a range of estimates on a particular cost factor? Low, or middle cost estimates?

A No, it is probably more conservative to use the high estimates.

Q Well, evidently you have used the low or middle cases to generate these costs.

A In the waste disposal instance I used the high estimate.

Q Let's see. Am I misinterpreting in the middle of paragraph 3 on page 33 it says:

"The low and middle cases represent a 5 percent annual escalation on $50 and $100 per kilogram, respectively."

A I think -- yes. When I did the calculation I believe I used the high cost estimate in Table 2.5.

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Q But in the previous sentence it says here:

"1977 costs were based on GESMO. GESMO costs were escalated by 5 percent and 10 percent on the low and middle GESMO cases."

A Yes. That is to arrive at the low and middle cases.

Q So you are saying that the high number here of $214 -- would you please explain how that is derived then, so I don't put words in your mouth?

A I think I had another source for that, but I don't see it in the testimony as to where -- I don't see the source here of that high estimate.

Q So you did not use the high GESMO then, is that right as far as you are aware?

A Well, in making the calculations I used the high estimate I represented here, but I'm not sure what the reference is for that particular high estimate.

Q I see. Okay.

Could you find that out for us?

A Yes.

Q Since you have indicated that it would be prudent practice to use the higher costs when there are large unknown factors?

A Yes, I can provide you with how I got that number.

Q Okay.

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Would you say that decommissioning costs, the last item on Table 2.5, have a large area of uncertainty?

A Yes.

Q Do you think --

A Well -- yes, they do.

Q Do you think then that it is prudent to use as a middle estimate, a figure that is almost as low as the lowest estimate for this number?

A Well those three estimates are based on actual -- what mode of decommissioning you might use.

So I think that is more of a reflection of the choice on what mode, as opposed to difference in costs.

Q So you are saying it's a policy difference, is that correct?

A It's a policy difference.

MR.LINENBERGER: In order to help the Board understand that answer, should I infer from what you have said, that there will be some kind of a policy change reflected in the difference between the middle and the high figures as contrasted with the difference between the middle and the low figures?

THE WITNESS: What that reflects is that if you -- I think the highest cost is complete entombment.

MR.LINENBERGER: Sir?

THE WITNESS: I think the highest cost, I believe,

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is complete entombment. And that cost is -- if one wanted to go with that method, that cost would be higher than if you used some other method of decommissioning.

MR. LINENBERGER: Are you saying the answer to my question is yes, or no?

THE WITNESS: I'm sorry, would you repeat it?

MR. LINENBERGER: I believe in answer to Mr. Carstens' questions about the range of values or costs quoted here for decommissioning, you commented that the large differential between middle and high, as compared with the much smaller differential between middle and low, represented a policy matter.

And I was -- so I asked you a question, should I correctly infer that indeed a policy change is reflected in the difference between middle and high values as compared with the difference between middle and low values.

I didn't understand your use of the word "policy."

THE WITNESS: I didn't mean to indicate --

MR. LINENBERGER: You didn't answer yes or no, but you talked to me about entombment with respect to the high value.

Now, should I infer from that response that you are not talking about entombment for the middle or low values?

THE WITNESS: Yes.

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MR. LINENBERGER: So in that respect, indeed, something has changed the method of decommissioning?

THE WITNESS: Yes under those other assumptions, but I didn't mean to imply that there was an intent -- it was an intent -- there was an intent to choose a method in this analysis.

MR. LINENBERGER: But can you tell us why it is reasonable -- now, since I have already interrupted -- why is it reasonable to pick 1985 to assess decommissioning costs in 1977 dollars, when 1985 is not very close to the time either plant will have to be decommissioned?

Can you explain your rationale for throwing decommissioning costs in there at 1985 dollars when, indeed, if and when it is decommissioned, it will be some many years later, quite a few years later?

THE WITNESS: Yes.

Well, that cost estimate was the estimate to decommission the units or a generic estimate of what the cost of decommissioning the units today, if you had to decommission today.

MR. LINENBERGER: I thought it was the cost to decommission in 1985 expressed in '77 dollars.

THE WITNESS: That's true, but the basic engineering estimates were -- that is correct. Your interpretation is correct.

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MR. LINENBERGER: All right, sir.

Now, why wouldn't you want the cost to decommission at approximately when it is going to be decommissioned, expressed in 1977 dollars, to put it on this table rather than today?

THE WITNESS: Yes. Well, when doing the calculations, those were the numbers that were used for the present value of the decommissioning costs.

In other words, in making the calculation what you would have to put aside today to eventually decommission were the dollars used in arriving at the estimate.

MR. LINENBERGER: I understand that kind of arithmatic. But I thought a while ago I heard you say this was based on what it would cost today to decommission.

And by the time it is actually going to be decommissioned, techniques, restrictions, all sorts of things are likely to have raised those costs considerably. And that time won't be 1985, it will be 10 or 15 years beyond that, at least.

THE WITNESS: Yes.

MR. LINENBERGER: So why wouldn't you have tried to make an estimate of the cost of decommissioning at the actual time, then put it back in today's dollars for use in this table.

THE WITNESS: Yes, that would have been a more

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correct procedure.

I just used the dollar -- in making the calculations, I used the dollar that you would have to set aside to allow for that kind of escalation in the future.

So I assumed an escalation through time of 5 percent. That may be low.

MR. LINENBERGER: To 1985?

THE WITNESS: From 1985 to year 2015.

MR. LINENBERGER: Thank you.

Sorry to interrupt you.

MR. CARSTENS: It was enlightening.

BY MR. CARSTENS:

Q Page 33, second paragraph, the last sentence.

You indicate as one justification for using these low and middle cases on disposal, that you have overestimated these because the actual cash expenditures by the utility would be delayed and not be incurred during the plant operation.

Could you explain why?

A I did use the higher cost estimate. It is just a parenthetical remark to indicate that maybe these costs had been overestimated.

Q But do you see there is no basis -- I mean the utility would incur costs on an annual basis from disposal.

Is that right? Even though the statement is to

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the contrary?

A The sentence is supposed to reflect the fact that the eventual cost of decommissioning would come later. And it is a question of how much money should you put aside to pay for those eventual costs.

Q Excuse me. I didn't mean to confuse you.

This paragraph was on disposal. It is saying here that the impact of disposal on generating costs would be delayed and not incurred during the 30 years of plant operation.

A They would have to put something aside, certainly, to --

Q Okay, that was the basis for using a lower cost according to this text here?

A No.

Q That was one of the bases.

A I used the higher cost estimate in making the calculations.

Q But it says here you have chosen the low and middle GESMO cases. And then you make this statement:

"The Staff has probably overestimated the impact of disposal. . ."

I take that to mean that this is a justification for using the low and middle cases. Is that right?

A I don't see where it says that I used the low and

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middle cases.

Q In the second paragraph, second sentence, page 33.

A Yes.

Q It says: "1977 costs were based on GESMO. . ." -- excuse me.

Second paragraph, third sentence:

"GESMO costs were escalated by 5 percent and 10 percent on the low and middle GESMO cases."

A yes. That's on the low and middle cases.

But in making the calculations, I used the high case which is not based on GESMO, and that is the reference I was to provide you.

Q Okay.

Then my question, you have testified that it is prudent in cost estimation to use the higher cost estimation where areas of uncertainty exist.

A The higher cost estimate is the one I used. But it may not be high enough --

Q Yes, but you used it in the context of the high costs, and not, for instance, in the middle costs which is probably more appropriate or not?

A I used 214 -- $214 kilograms of heavy metal.

Q Okay.

If we were to make equal weights on the low, middle and high cases for all of these costs, yousurely know

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more about the enrichment costs than you do about disposal and decommissioning, isn't that correct?

There is more certainty there than there is with disposal and decommissioning, since you are doing it every day?

A Well certainly in comparison to disposal.

Q Then is it prudent to place these in the same categories when they have greater uncertainty?

The idea of disposal and decommissioning, wouldn't it be more prudent to use the higher numbers throughout because of the area of uncertainty?

A Well, I did use the higher number on the disposal. I did not use the higher number on the decommissioning.

Q But what I am asking is, your knowledge of these various cost factors is not equivalent --

A That's true.

And it is reasonable practice to use more conservative estimates on the factors, you know, you have more uncertainty about.

Q Then why didn't you use that procedure in this?

A Well, I did it to the extent of using the high cost estimate for disposal costs, but I didn't -- I used the middle for all the other costs.

Q So thatyou might say that the middle cost estimate

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might be substantially understated with that kind of an approach?

A It could be understated.

Q Table 2.6.

You have estimated -- also in table, initial table here 2.3, you have used various capacity factors that one could choose from to pick a total fuel cycle cost or total cost.

A Yes.

Q Do you have an opinion of which one of these is most likely to occur, since you have given some estimates in other testimony of what these costs are expected to be?

A I would use 60 percent.

Q Is that the cost basis then that has been used throughout the other -- throughout the rest of the testimony concerning costs that youare aware of?

A Except for -- except for waste disposal, I use 75 percent capacity factor for waste disposal.

Q That's conservative then, wouldn't it be?

A Yes.

Q So that all the cost estimates at this point in time you think reflect the 60 percent capacity factor?

A I believe so.

Q Does that include the Applicants' as far as you know, estimates as well?

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A I wouldn't know.

Q You don't know that?

A I think they used 75, but I'm not sure.

Q Okay.

So you have chosen 60 percent throughout most of the cost estimates used by the Staff, and Applicants used 75 as far as you are aware?

MR. THOMSEN: We used 70, if you want to straighten the record here.

MR. CARSTENS: Fine.

BY MR. CARSTENS:

Q Can I ask the basis for this range of numbers from 50 to 75? Why do you use these numbers, this range of numbers?

Why not use a high, middle and low as youbave done with all the other cost factors?

A I don't think there is any particular reason. Just -- there is no particular reason for stretching the range here, or choosing a high, middle, low.

Q Because one is left -- we are left to our own devices on this, of which number we would like to choose.

A Yes, that's correct.

MR. LIEBERGER: Parenthetically I would comment here, however, if we used low, middle and high, we would have all been asking him what capacity factors do

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those represent.

(Laughter.)

MR. CARSTENS: But I assume he would have put them down.

BY MR. CARSTENS:

Q Okay. Would you say -- what would you give as a basis for using your 60 percent factor as the one you choose?

A I would use it as representative of the industry as a whole at the present time.

Q It is your understanding then that the industry experiences a 60 percent rate on these type of reactors at this size?

Is that correct?

A Oh, I don't have any specific knowledge of these reactors of these sizes. But I have seen the Gray books and other sources which reflect average capacity factors.

Q In a cost estimation would you say that the capacity factor has a large effect on costs?

A It has some effect on costs, yes.

Q Don't you think it would be wise to use the best operating data that is available for this particular type of plant and size and type?

A Well, there are a lot of variables involved in the capacity factors, including what point in time, in the lifetime of the reactor one is at, learning curve experiences,

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regulation has a large part to play in the numbers that end up being indicated as capacity factors.

So there are a host of variables.

Q Surely those are all facts of life, are they not?

A That's correct.

Q And therefore they do represent real-life operations?

A Yes.

That's why I chose 60 percent.

Q Because you believe that represents what has been an experience with G.E. boiling water reactors of this size?

A Represents a capacity factor that I have often seen. You know, average capacity factor currently being experienced in the country.

Q Then you are not aware, I take it, that G.E. boiling water reactors of this size experience this kind of capacity factor over their lifetime, brief lifetime?

A I don't know how many G.E. boiling reactors of this size you have in your sample, so I couldn't say.

Q It is not my sample. I am asking for your sample.

A No, I don't have a sample.

Q So then these don't represent, necessarily, what

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is actually being experienced, is that right?

A No, this doesn't reflect the G.E. reactor of 1000-plus megawatts.

Q Okay.

MR. LINENBERGER: Excuse me, Dr. Winters, but isn't it more correct to say that whereas any one of these numbers might represent G.E. experience, you were not looking to experience to decide which capacity factor numbers to pick for these calculations.

Isn't that --

THE WITNESS: Yes, I wasn't looking at the G.E. experience.

MR. LINENBERGER: Thank you.

BY MR. CARSTENS:

Q Again, don't you think that would be a prudent way of approaching these costs to take actual experience for the type of reactor into consideration and choose that?

A I would use that if I could -- if I had a reason to separate that kind of experience from other factors involved in capacity factors.

I think who makes the particular type of plant and the manufacturer is only one consideration in the capacity factor.

Q Okay.

With regard to the cost of seismic additions, the seismicity factors in the plant, are you aware that the projected cost increases to increase Diable Canyon to .4 SSE to .7 SSE ranged from $700 million to a billion dollars?

A I'm not aware of that particular estimate. I'm not sure if it's relevant, though, to Skagit.

Q All right.

You are aware of Dr. Cheney's testimony that an SSE of .68 might be required, his previous testimony?

MR. LITTLE: That's not in the record anywhere that I recall -- maybe it was last summer, I take it back. It's in his report which has never gotten into evidence yet. But it may be in.

We'll accept it for assumption purposes.

THE WITNESS: Yes.

MR. CARSTENS: No further questions.

CHAIRMAN DEALE: Fine. Thank you very much, Mr. Carstens.

Now I think we have a few questions from the Board, but we want to make sure that everybody has had his turn.

(No response.)

CHAIRMAN DEALE: All right.

Mr. Linenberger?

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MR. SWANSON: Excuse me, Mr. Chairman.

When you said everyone had a turn, you mean the first go around?

CHAIRMAN DEALE: Yes.

MR. SWANSON: The Staff did have two lines of redirect.

CHAIRMAN DEALE: That's right. Go ahead.

MR. GENDLER: Do we prefer to proceed with the redirect on this or with my questions on the first part of Dr. Winters' testimony?

CHAIRMAN DEALE: Oh, no, no. You should go ahead. We thought that Mr. Carstens was taking SCANP's position 100 percent.

MR. GENDLER: No,I thought I had stated, but if I hadn't I intended to.

CHAIRMAN DEALE: Well, fine. That's perfectly all right.

I guess we'd better get a sense of time here.

Is this extensive or otherwise?

MR. GENDLER: I think fairly so, and perhaps more than an hour.

CHAIRMAN DEALE: I see.

Well, we'd better take a look at the schedule.

You have roughly an hour, an hour and a half or so. We might have say, two more hours for Mr. Winters.

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Staff, do you expect extensive --

MR. BLACK: No, very little.

CHAIRMAN DEALE: All right.

Mr. Thomsen, do you want to --

MR. THOMSEN: No, we've had our turn. We'll stick with no questions.

CHAIRMAN DEALE: All right.

Today is Wednesday and this is Wednesday afternoon. We're clearly one day behind the second or third revised schedule.

Tomorrow, now, we have scheduled Mr. Ellis, and this is the first thing in the morning, I take it.

MR. THOMSEN: That is what we're planning, if that's still acceptable.

CHAIRMAN DEALE: All right.

And then we, at the moment here, could follow through with further quality assurance testimony.

MR. THOMSEN: Well, they're available. But on the other hand, I thought we were going to make an effort to finish alternative sites. And it doesn't show on this list, but we do have Dr. Cheney, alternative sites, and we have prefiled from Mr. Carstens on alternative sites and from Mr. Darland which we fairly recently received.

CHAIRMAN DEALE: Yes.

MR. THOMSEN: Three Intervenor witnesses on

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alternative sites. And I would like during this session to zap those in here, and we can defer Ferguson and the rest of QA until next Monday or whatever.

CHAIRMAN DEALE: All right.

And the general suggestion here is to go forward tomorrow with Mr. Ellis first thing in the morning, right?

MR. THOMSEN: Yes.

CHAIRMAN DEALE: And then after that go back to alternative sites.

MR. THOMSEN: Exactly.

MR. BLACK: Is Dr. Winters hanging in limbo someplace here?

MR. THOMSEN: Well, I forgot that -- That's alternative sites.

CHAIRMAN DEALE: Yes. He is twisting slowly in the wind.

(Laughter.)

CHAIRMAN DEALE: All right. I think we can go forward on this basis.

You'll have your chance tomorrow.

MR. GENDLER: Following Mr. Ellis?

CHAIRMAN DEALE: Following Mr. Ellis's testimony.

And t[illegible] this moment rather than have SCANP go forward now. I think in considering the hour and the time of day and a thousand tribulations, I think it might be

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appropriate to adjourn at this point and then go forward tomorrow on the basis we'll first hear Mr. Ellis, and this will be at nine o'clock.

MR. THOMSEN: Yes.

CHAIRMAN DEALE: And then after that we move over to further cross-examination of the Staff's witness on alternative sites. And then we'll go forward on alternative sites. And then see what happens.

MR. THOMSEN: It sounds reasonable.

CHAIRMAN DEALE: And so we'll adjourn for today.

(The witness temporarily excused.)

CHAIRMAN DEALE: Thank you.

(Whereupon, at 5:10 p.m., the hearing in the above-entitled matter was adjourned, to reconvene at 9:00 a.m., the following day.)