UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	§	
	§	
HOUSTON LIGHTING & POWER COMPANY	§	
	§	Docket No. 50-466
	§	
(Allens Creek Nuclear Generating Station, Unit No. 1)	§	
	§	

Statement of Material Facts As To
Which There is No Genuine Issue To Be Heard

(1) "Doppler broadening" is the term used to identify the increased range of energies at which neutrons will be absorbed by a target nucleus at higher reactor temperatures. This "broadening" has the effect of reducing reactivity. (Affidavit, p. 2)

(2) In calculating the reactivity effect caused by Doppler broadening in a BWR-6, General Electric uses a mathematical model based upon the universally accepted fundamental principles and empirical values of Doppler broadening. (Affidavit, p. 3)

(3) The General Electric model was compared primarily to the Hellestrand tests which measured the temperature dependence of resonance neutron absorption in clad uranium dioxide fuel rods. The Hellestrand test results corroborated General Electric's prediction of the effect of Doppler

broadening. In addition, the General Electric model was secondarily compared to data derived from the appropriate SPERT tests; however, data from the SPERT tests were not relied upon to support the Doppler reactivity model. (Affidavit, pp. 3-4)

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EAF/COMP

Doherty Contention No. 33/
Doppler Effect

COST $ _____
PAID BY PLF. DEF.

IN THE UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:	)	
HOUSTON LIGHTING AND POWER COMPANY,	)	DOCKET NO. 50-466
(ALLENS CREEK NUCLEAR GENERATING STATION, UNIT NO. 1)	)	

DEPOSITION OF:
JOHN F. DOHERTY

Forrest Reporting Service, Inc.

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do not know how large that will be, however, or how great it will be.

Q. What's the maximum flow rate that's possible to the CRD return line?

A. I don't know how much it is with ACNGS.

Q. What's your understanding as to other units?

A. Something in the order of 60 gallons per minute.

Q. Is this the essential cooling flow rate which you maintain is necessary for the safety design of Allens Creek?

A. Yes.

Q. Let's go onto your contention --

A. I regret not having that with me.

Q. -- on dopler effect.

A. Because you would like to have that I'm sure.

Q. That is your contention number 25 -- I'm sorry. That's wrong. Your contention number 23.

A. That material is not here. It's being xeroxed unless it's returned -- no, I'm sorry. I do have that. I was thinking of 15.

Q. What is the dopler effect?

A. The classical doplet or the applicable

affect here --

Q. The dopler effect mentioned in your contention.

A. The dopler effect is a system where the absorption of neutrons in a fissioning process is changed due to temperature of the fuels or of the material during the absorbing of neutrons.

Q. Why is the absorption of neutrons dependent upon temperature?

A. The ability to absorb changes with temperature as a physical system. It increases the coolant as I understand it.

Q. What increases the coolant?

A. The ability to absorb neutrons.

Q. What material are we speaking of?

A. Uranium oxide.

Q. It's your understanding that uranium oxide has an increased ability to absorb neutrons at lower temperatures?

A. Yes.

Q. So as you increase temperatures, uranium oxide is less capable of absorbing temperature?

A. Yes. Normally.

Q. So that increases in temperature decrease the capacity of uranium oxide to absorb

neutrons and, therefore, decrease reactivity?

A. Normally.

Q. Are there any abnormal occurrences which are of concern in this contention since you have qualified all your answers with the adjective "normal"?

A. In the event of rapid reactivity insertion, the doppler effect may not respond rapidly enough to work in the negative way. In other words, to decrease fissioning.

Q. On what did you base that opinion or conclusion?

A. On a book by Richard F. Webb.

Q. What's the title?

A. "Accident Hazard of Nuclear Power Plants."

Q. Do you have a page or chapter reference?

A. Chapter four.

Q. Is it Mr. Webb's position that doppler reactivity feedback does not act quickly enough to be of any influence in power excursion accidents?

A. Yes.

Q. Is that all power excursion accidents, or does he have reference to a particular power excursion accident?

A. All.

Q. Is that the sole basis of your like opinion is what Mr. Webb states, or have you found other references of this phenomena?

A. Mr. Glenn Bright writing in "Nuclear Safety," volume eight, part -- well, two, page 121 states that there is much more information needed on the effects of initial temperature and understanding shutdown mechanism of a dopler -- dopler is a shutdown mechanism. It has considered that.

Q. Mr. Bright was writing in reference to General Electric BWR's in particular a LOCA?

A. No, sir. Mr. Bright was writing in 1967.

Q. That is he writing in reference to?

A. In reference to accidents in general and the needs for research --

Q. So in 1967 --

A. -- in nuclear reactors.

Q. So in 1967 it was Mr. Bright's opinion -- what was that again? More needed to be understood about initial temperature affects?

A. Yes.

Q. All right. Is that the two sources of your opinions, precarious opinions are Mr. Webb's

and Mr. Bright's opinion?

A. Well, General Electric has stated that these affects, that their understanding of these affects have come from research which predates the statement of Mr. Bright.

Q. Okay. Where did General Electric make such a statement?

A. I don't have that with me.

Q. But you know for a fact that General Electric did make such a representation?

A. Yes. I discussed it at the prehearing conference held in October. It's in the minutes there.

Q. I'm sure you made the statements there too. I'm trying to find the basis for those statements. Will you provide us with a reference where General Electric makes the statements that you allege they make?

A. I think I can. I can't today probably, but the statement was referenced at that time. It was not a bald statement at that time.

Q. So you say that the transcript at the prehearing conference has reference that your seeking?

A. Yes.

Q. All right. Could you supply us --

A. I beg your pardon?

Q. If per chance it's not recorded there, will you provide us with that information?

A. There's a request then to --

Q. To supply the reference wherein General Electric states that it's prediction of dopler reactivity feedback is dependent upon data which predates 1967.

A. Yes. That's correct. All right.

Q. How does does General Electric calculate dopler reactivity feedback?

A. I don't believe I have any specific code for it. They rely on it to be the controlling mechanism in only the sort of moderate what they describe as moderate accident conditions.

Q. It's your understanding that General Electric does not try to predict dopler reactivity feedback --

A. I don't think they think --

Q. Mr. Doherty, what is at issue here in this contention if you think --

A. I think that that they should rely upon it. They should calculate it.

Q. If they have provided reactivity control

systems which operate without the benefit of doplar reactivity feedback, what is non-conservative about that approach?

A. It's all calculations. There's no basis in experimentation.

Q. If I understand the phenomena, you discussed negative reactivity --

A. Under certain conditions that we mentioned.

Q. What are those?

A. That the insertion is not rapid enough. That the process has time to occur.

Q. So there are instances where it would be inappropriate to consider doplar reactivity feedback?

A. Yes. I think there are some.

Q. You have asserted that General Electric does not account for doplar reactivity feedback, so it can't be a concern that they have accounted for when it was inappropriate, so we can set aside those instances where you have rapidly changing conditions or reliance on the doplar reactivity feedback to be inappropriate. Those are not of concern.

A. The doplur effect is the principle

shutdown mechanism. They believe that two to --

Q. You mean -- excuse me, but I believe you just previously testified that you were urging General Electric to account for the dopler reactivity because they had not prior to this time.

Now are you saying that they do in fact incorporate it into their analysis?

A. No. I'm not saying that. Incorporating it into their analysis --

Q. Pardon me.

A. Incorporating it into their analysis. What do you mean by that?

Q. Does General Electric rely on or predict and use dopler reactivity feedback in it's accident analysis, or doesn't it?

A. It mentions it.

Q. Let me try again. Let's get a straight-forward answer to a straight-forward question. Does General Electric predict feedback and use that phenomena in its accident analysis?

A. As I said before, it mentions it.

Q. So you have no knowledge whether or not General Electric uses or relies upon or predates any of its conclusions in its accident analysis

upon dopler reactivity feedback?

A. The mathematical model used by them relies upon data similar to experimental data produced by the SPERT-1 and SPERT-3 reactors.

Q. I thank you for that recitation of the contention. Maybe we can return to the question I asked.

A. I think that that answered the question, sir.

Q. I believe that it was totally unresponsive, so let me restate it. Maybe we can resolve this impass.

A. Then restate it.

Q. Do you believe that General Electric does account for dopler reactivity feedback in its accident analysis?

A. No. Not sufficiently.

Q. Do you believe that General Electric attempts to account for dopler reactivity feedback but does so inadequately?

A. Yes.

Q. What is inadequate about the way General Electric predicts dopler reactivity feedback?

A. It over estimates.

Q. How does it over estimate? Why does it

over estimate?

A. I have no idea why.

Q. How do you know that it over estimates?

A. The contention.

Q. The contention is a bald statement --

A. The contention states that the data is based on -- will come out with the same results as the SPERT-1 and SPERT-3 reactors.

Q. So what?

A. The SPERT-1 and SPERT-3 reactors are not sufficiently similar to the reactor that Houston Lighting & Power intends to construct.

Q. Are you alleging that General Electric's only knowledge of reactivity feedback is from data derived from the SPERT tests?

A. No.

Q. Then what relevance is your references to the SPERT tests?

A. There are no other experiments.

Q. There are no other experiments. What does that mean?

A. There are no other experiments with which to make a judgment that they have properly accounted for dopler reactivity feedback.

Q. Are you now alleging that General

Electric's prediction of doplar reactivity feedback has not been compared to acceptable test data?

A. Yes.

Q. Is that the sole basis of your contention?

A. As it stands, yes.

Q. How did you determine that the mathematical model used by GE has compared to the SPERT tests and only to the SPERT tests?

A. Through Mr. Webb's work.

Q. Do you have a page or chapter reference?

A. Chapter four.

Q. Is that the only reference you used to support your allegation that General Electric compares its mathematical computations only to the SPERT tests?

A. That's right.

Q. If it's shown that General Electric compares it's mathematical computation of doplar reactivity to appropriate test data, that is test data gleaned from tests that use a suitable mock up of a BWR core and design performance, does that alleviate the concern expressed in this contention?

A. Yes.

Q. All right. Let's go to your contention number 25.

A. Contention number 25?

Q. Yes. I'm not exactly sure how to describe it succinctly.

A. I'd like a copy of the contention. It would help.

Q. Let me give you this one.

A. Thank you.

Q. Would you --

A. This quotes the entire test, is that correct, of contention number 25?

Q. To the best of my knowledge.

A. That will cause some problems, because the contention was broken up. Part of it was accepted sooner, and part of it later by the Board.

Q. Both parts have now be admitted?

A. Yes.

Q. Would you indentify for me what the concern was by the Board's order of March 10th, and we'll discuss only that?

A. Yes. The Board's order seemed to indicate that they were concerned -- well, that