

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

HOUSTON LIGHTING & POWER  
COMPANY

(Allens Creek Nuclear  
Generating Station, Unit  
No. 1)

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§

Docket No. 50-466

Statement Of Material Facts As To  
Which There Is No Genuine Issue To Be Heard

(1) SCRAM reactivity is a measure of the amount of negative reactivity that is produced by rapidly inserting control rods into a reactor thereby shutting the reactor down. (Affidavit, p. 2)

(2) General Electric does not utilize the WIGLE code, but utilizes a one-dimensional time/space code to predict the values of SCRAM reactivity. The conservatism of this code has been demonstrated by comparison with actual plant data at operating BWRs. (Affidavit, pp. 2-3)

(3) The data obtained during the Special Power Excursion Tests (IN-1370) were conducted in a test reactor bearing no resemblance to a BWR core and did not measure the effects of SCRAM reactivity since no control rods were inserted. Consequently, that data does not provide any relevant information about the conservatism of either the WIGLE or General Electric

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code used in predicting SCRAM reactivity values. (Affidavit,  
pp. 3-4).

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(ALLENS CREEK NUCLEAR )  
GENERATING STATION, )  
UNIT NO. 1) )

DOCKET NO. 50-466

DEPOSITION OF:  
JOHN F. DOHERTY



*International  
News Reporters, Inc.*

1 turbine.

2 A. Yes. Okay.

3 Q. All right. Let's go to your contention  
4 on SCRAM reactivity function. That's your number  
5 15.

6 Would you explain to me what you  
7 understand a SCRAM reactivity function to be?

8 A. It's a term that alluded me rather badly.  
9 I've been studying it and using it in reference to  
10 the actions or the movement of neutrons through a  
11 core, and describing the effects of various core  
12 structures along that -- along the movement of  
13 neutrons from a -- it's an attempt to describe  
14 the neutron activity in the core at any time.

15 Q. Why the reference to SCRAM?

16 A. Now you got me. I've never understood  
17 that unless it's just to talk about when SCRAM  
18 should occur, or the sufficient to SCRAM  
19 reactivity or something like that. I've never  
20 understood why SCRAM is in there.

21 Q. But it's your understanding that SCRAM  
22 reactivity function discussed in this contention  
23 has nothing to do with the insertion of control  
24 rods?

25 A. No. It does have something to do with

1 the insertion of control rods.

2 Q. What does it have to do with the  
3 insertion of control rods or SCRAM?

4 A. It seems to be an attempt to describe  
5 the actions of the safety devices such as the  
6 control rods and the coolant on a -- on neutron  
7 activity. As far as I know, to both overpowering  
8 events or just changes in the system or whatever  
9 reason. Just the normal increasing in power or  
10 presumably decreasing in power.

11 Q. How is the SCRAM reactivity function  
12 calculated by General Electric?

13 A. It's calculated by one of two types of  
14 codes. Either what's called a neutron diffusion  
15 or transport theory. I had trouble keeping these  
16 in my mind. Which ever, plus several subcodes  
17 designed to take up various aspects of the core --  
18 several aspects of the core, including, perhaps --  
19 I'm not certain. Perhaps, including the affect  
20 of delayed neutrons, the affect of control rods  
21 channel boxes, guide tubes.

22 Q. Where did you derive this information  
23 about GE's information on SCRAM function?

24 A. Mostly from Dr. Webb's book.

25 Q. Mr. Webb was describing the calculation

1 for the sort used in the Allens Creek analysis?

2 A. Well, no. Dr. Webb didn't know about  
3 Allens Creek.

4 Q. How do you know that whatever he is  
5 discussing, of whatever relevance, is the same  
6 function that we're discussing as applicable to  
7 Allens Creek?

8 A. I want to add something in my earlier  
9 reply. It's CE's -- they use a diffusion theory.

10 Q. CE uses a diffusion theory --

11 A. Coupled with numerous or several other  
12 theories -- not theories, several other programs  
13 that take up various aspects of the core.

14 Q. CE uses a neutron diffusion theory and  
15 other codes?

16 A. Subroutines or codes.

17 Q. Subroutines or codes to calculate SCRAM  
18 activity function; is that your understanding?

19 A. Yes.

20 Q. What's the basis of this information?

21 A. That's from Webb.

22 Q. Okay. How do you know that Mr. Webb is  
23 discussing the SCRAM reactivity function of the  
24 same variety as is relevant to this contention?

25 A. If you mean -- I guess I'm unclear on

1        what you mean by the question, sir.  If you mean  
2        ACNCS exclusively -- is that what you're getting  
3        at?

4        Q.     You assert that General Electric has  
5        improperly accounted for SCRAM reactivity.

6        A.     They among others.  They are the ones  
7        today.

8        Q.     I asked you what your understanding was  
9        as to how GE actually calculated SCRAM reactivity,  
10       and you told me that your understanding was  
11       derived from Mr. Webb's book.  And I'm asking you  
12       how do you know what Mr. Webb is describing in  
13       that book is applicable to what GE actually does?

14       A.     I don't believe Mr. Webb would  
15       misrepresent what GE has done.  Also, I've run  
16       across articles which seemed to indicate GE's  
17       working --

18       Q.     Mr. Webb --

19       A.     -- on problems in the core.

20       Q.     All right.  Let me interrupt you.

21       A.     Which --

22       Q.     Let me interrupt.

23       A.     I would like to finish my answer.

24       Q.     Let me interrupt you.  Mr. Webb states  
25       in his book that GE is using a neutron diffusion

1 theory and various other sub-routines?

2 A. Yes. Essentially he says that.

3 Q. Would you point me to the portion of the  
4 book where he says that?

5 A. Page 45.

6 Q. Could I see it? Could you point the  
7 portion out?

8 A. In the blue there.

9 Q. Where it starts "Moreover"?

10 A. Yes.

11 Q. "Moreover the capital CE-PEA calculation  
12 methods are found on numerous mathematical  
13 approximations to the theory in order to perform  
14 practical calculations with a computer. Specif-  
15 ically it CE-PEA calculations are based on a  
16 simplified theory of neutron dynamics known as  
17 diffusion theory, a mathematical approximation of  
18 the rigorous neutron transport theory. The error  
19 which has never been determined by power excur-  
20 sion experiments or CE-PEA calculations with the  
21 rigorous theory."

22 Is that the representative portion of  
23 that?

24 A. Yes.

25 Q. Where in there does it discuss SCRAM



1 reactivity function or anything else referred in  
2 this contention?

3 A. Well, it doesn't talk about GE  
4 specifically.

5 Q. Does it talk about SCRAM reactivity?

6 A. Yes. I believe so.

7 Q. Where does it discuss that? I haven't  
8 run across those words once.

9 A. Perhaps not.

10 Q. I don't believe there is a "perhaps" to  
11 it, Mr. Donerty.

12 A. Well --

13 Q. Shall I read further?

14 A. I could read some.

15 Q. Well, I asked you from the reference  
16 where Mr. Webb stated --

17 A. Page 49.

18 Q. Yes?

19 A. Right here starting with "Since the  
20 nuclear industries."

21 Q. I'd like for you to point out where you  
22 encounter the word SCRAM reactivity in any of  
23 those excerpts of Mr. Webb. And the basic issue  
24 under consideration is whether or not SCRAM  
25 reactivity function has been properly calculated

1 By CE.

2 A. All right.

3 Q. And you assert that Mr. Webb alleges  
4 that they have not?

5 A. Yes.

6 Q. I'm at a loss, because I don't believe  
7 anything we've cited so far touches on SCRAM  
8 reactivity.

9 A. All right.

10 Q. Well --

11 A. Well. You have the questions. Go ahead.

12 Q. My question is: How do you believe  
13 General Electric calculates SCRAM reactivity  
14 function?

15 A. I believe they use a two dimensional  
16 code called WIGLE in coupling with several other  
17 codes.

18 Q. Well, that's the first time you've  
19 introduced WIGLE. Does Mr. Webb say in his book  
20 that GE uses WIGLE to calculate SCRAM reactivity?

21 A. Yes.

22 Q. Would you point that out for me, please?

23 A. All right. It says "Nuclear Industries  
24 SWR design basis" -- I'm liable to read again  
25 from what I've just read to you. "The design

1 basis accidents are checked with WIGLE."

2 Q. Wait a minute. We haven't even come  
3 close to the basic issue; (A) whether or not  
4 SCRAM reactivity function is calculated using  
5 WIGLE, and (2) we are discussing a calculational  
6 method not comparisons, are we not?

7 A. Well --

8 Q. It seems to me the passage you read on  
9 both accounts neither mentions SCRAM reactivity  
10 function, nor does it make a statement as to  
11 calculational method, but only as to comparisons  
12 made?

13 A. All right.

14 Q. Now, I need to understand what is  
15 exactly being alleged here. Are you alleging  
16 that CE uses WIGLE to show SCRAM reactivity  
17 function, and if so, what's the basis of that  
18 allegation?

19 A. I'm saying they use WIGLE to calculate -  
20 they check the design based power source and  
21 accidents with WIGLE.

22 Q. That's totally different from what I had  
23 stated. So is the answer, no, you're not  
24 alleging that CE uses WIGLE to calculate SCRAM  
25 reactivity functions?

1           A.    I'm not clear on the definition of "SCRAM  
2 reactivity," that's why --

3           Q.    It is the central issue in your  
4 contention, so your not being clear is quite a  
5 debacle.

6           A.    Whatever you wish to label it. I have  
7 no problem with your labeling process.

8           Q.    I'm having acute problems with your  
9 contention.

10          A.    Well --

11          Q.    I think these are openly simple  
12 questions --

13          A.    I didn't say they are complicated.

14          Q.    Do you allege that CE uses WIGLE to  
15 calculate SCRAM reactivity functions?

16          A.    Yes.

17          Q.    What is the basis of that allegation?

18          A.    Mr. Webb -- from what Mr. Webb has said  
19 here.

20          Q.    Can you point that out to me where he  
21 says that?

22          A.    No.

23          Q.    All right. Can you tell me what a one-  
24 dimensional time code is?

25          A.    It's a code that treats neutrons as

1 being admitted in all directions equally.

2 Q. Where did you derive that definition  
3 from?

4 A. I don't recall.

5 Q. It is your impression that that is the  
6 definition of an one-dimensional time code?

7 A. A time code I think would also include  
8 factors of time.

9 Q. All right.

10 A. Such as the amount of time that it takes  
11 for a neutron to move its migratory path. That  
12 type of thing.

13 Q. Is it your assertion that such a code is  
14 inappropriate for calculating SCRAM reactivity  
15 functions?

16 A. That it's insufficient.

17 Q. Why is it insufficient?

18 A. Because several of the incidence  
19 mentioned here have occurred particularly of  
20 these pulse neutron injections as mentioned in  
21 the contention where bursts of neutrons are  
22 injected into the side of the reactor.

23 Q. Let me ask the question again, because I  
24 totally missed the answer. You said that a one-  
25 dimensional --

1 A. Well, it does not predict the affects of  
2 a pulsed neutron injection in the contention.

3 Q. What was the purpose of the tests  
4 conducted by the Idaho nuclear experimental  
5 laboratories?

6 A. Lord, they've conducted thousands --

7 Q. I believe you only made reference to one  
8 in your contention.

9 A. All right.

10 Q. We can start there. That seems  
11 appropriate.

12 A. Well, there were several, as it is  
13 mentioned in the contention.

14 Q. There was one group. IN-1370, was it  
15 not?

16 A. Yes.

17 Q. What was --

18 A. That's several in one report.

19 Q. What was the purposes of the tests  
20 conducted in the IN-1370 group?

21 A. (No Response)

22 Q. While you're thinking about that, I'll  
23 ask a question that will clarify the first. Is  
24 the IN-1370 designed to measure the SCRAM  
25 reactivity?

1           A.    I don't have IN-1370 in front of me, so  
2 I don't know what the purpose of it was.

3           Q.    So any results produced by IN-1370 -- if  
4 you don't know the purpose of the test would seem  
5 to me to be speculative at best.

6           A.    Well, sometimes tests can yield --

7           Q.    What results did IN-1370 produce?

8           A.    That unverified FEA theory predicts that  
9 the peak energy yield per gram of fuel of the  
10 design base FEA approaches rather closely to the  
11 design safety limit of 280 calories beer per gram.

12          Q.    What does that have to do with SCRAM  
13 reactivity which is the central issue of this  
14 contention?

15          A.    It states that the unverified  
16 calculation was pretty close to what was the  
17 design safety limit of the fuel rods.

18          Q.    What does that statement have to do with  
19 SCRAM reactivity function? What's the  
20 correlation?

21          A.    Well, they are not statistics

22          Q.    I mean you can say that IN-1370 proves  
23 that zebras have stripes. What does that have to  
24 do with the SCRAM reactivity function which is  
25 the thrust of this contention?

1           A.    The issue under here is that under  
2 prediction of the energy yield and power  
3 excursion.

4           Q.    Have you changed the import of the  
5 contention now?  It does not deal with SCRAM  
6 reactivity function?

7           A.    The true SCRAM reactivity function  
8 generated is too small when compared to data in  
9 IN-1376.

10          Q.    What data in IN-1376 should SCRAM  
11 reactivity be conducted against?

12          A.    The one I just read.

13          Q.    I don't recall you reading any.  Would  
14 you read it for me again?

15          A.    Well, I could read it again.

16          Q.    Would you do so?

17          A.    As it is, the unverified PEA theory  
18 predicts that the peak energy yield per gram of  
19 fuel of the design based power excursion access  
20 approaches rather closely to design safety limit  
21 of 280 calories per gram.

22          Q.    Why would anyone choose to compare SCRAM  
23 reactivity and 280 calories per gram?  What do  
24 they have to do with one another?

25          A.    Well, 280 calories per gram is the



1 result.

2 Q. The result of what?

3 A. Of underestimated SCRAM reactivity.

4 Q. How did you draw that conclusion?

5 A. If the SCRAM reactivity is under-  
6 estimated, then the design safety limit would be,  
7 if exceeded, would indicate unsafe conditions.

8 Q. What?

9 A. Did you have trouble hearing me?

10 Q. I hope so.

11 A. I -- don't be that way, please. We're  
12 almost finish. I expect to be treated with  
13 respect here.

14 Q. Would you explain to me the difference  
15 between SCRAM reactivity and 200 calories per  
16 gram and IN-1370, and I think we can finish. But  
17 if you continue to run around in these circles,  
18 then I think you can anticipate some loss of  
19 patience?

20 A. I object to any further questioning.

21 Q. I have a number of questions. You  
22 haven't explained to me --

23 A. I'll find --

24 Q. Can you explain to me the IN-1370 test  
25 reactors and the results of --

1 A. Not without searching around.

2 Q. Was it a BWR mock up? Was it intended  
3 to simulate the design and functioning of a BWR?

4 A. I don't believe it was.

5 Q. Can you tell me how they measured SCRAM  
6 reactivity in IN-1270 tests?

7 A. Not at this moment. I don't have the  
8 document with me.

9 Q. It is your understanding that they did  
10 in fact measure SCRAM reactivity in this instance?

11 A. I'm not certain of that at this point.

12 Q. All right.

13 A. I believe they did.

14 Q. Is there anything in the report on  
15 IN-1270 which indicated that CE's calculated  
16 SCRAM reactivity was too small?

17 A. Yes. As I was reading previously.

18 Q. You were reading from Mr. Webb's book, I  
19 believe?

20 A. That's right.

21 Q. I meant in the IN-1270 report?

22 A. Yes.

23 Q. All right.

24 A. I don't know if there's anything in that  
25 report, and I don't know that it would be

1 relevant to ACNCS.

2 Q. Are you under the impression that Mr.  
3 Webb's book does, in fact, discuss SCRAM  
4 reactivity at some place?

5 A. Yes, I am.

6 Q. We have not yet discovered that place;  
7 is that correct?

8 A. I think I have. You think we've not.

9 Q. Well, do the words "SCRAM reactivity  
10 function" appear any place in that book? Let me  
11 ask you that simple question.

12 A. I haven't found them, but that doesn't  
13 mean that they don't appear in another guise.

14 Q. You mean there is another phrase that  
15 comes out to the same function?

16 A. Yes.

17 Q. What is that?

18 A. I'm not certain.

19 Q. But your sure that it's in the book?

20 A. At this point, I am. I will notify you  
21 if I have a change in mind.

22 Q. And can you indentify for me the exact  
23 portion of the book which discusses the SCRAM  
24 reactivity" and reaches the conclusion that  
25 General Electric's got the --

1           A.    Wait a minute. If you'll cut that  
2 question in half, then I can reply to that.

3           Q.    Which half do you choose to reply to?

4           A.    Well, I will answer to both, but as it  
5 stands right now, it's a yes and no answer, and  
6 that probably is confusing.

7           Q.    Can you identify in the book where it  
8 discusses SCRAM reactivity under another name?

9           A.    Yes. Chapter four.

10          Q.    All of chapter four is concerned with  
11 SCRAM reactivity?

12          A.    A great deal of it is.

13          Q.    How will we identify in chapter four  
14 when Mr. Webb is referring to SCRAM reactivity?

15          A.    I will let you know.

16          Q.    All right.

17          A.    I'm willing to let you know. If you  
18 read the book, you may identify it yourself.

19          Q.    What we need to understand is not my  
20 interpretation of the book, but yours. Since  
21 I've not filed contentions --

22          A.    I've given you that.

23          Q.    You've given me which?

24          A.    My interpretation.

25          Q.    I missed it.

1           A.    That it is a description of the core  
2 activity, the -- a description of the actions of  
3 the neutrons and how they move in the core in  
4 both normal power increasing and in accident  
5 conditions.

6           Q.    What do you suppose has to be done to  
7 correct GE's calculations of SCRAM reactivity?

8           A.    I think a three-dimensional analysis is  
9 necessary.

10          Q.    What will the three-dimensional analysis  
11 supply that's now missing?

12          A.    It will supply a certainty if it proves  
13 the experimental results --

14          Q.    Do you have reference to the IN-1370  
15 experimental results?

16          A.    I don't feel that I answered your  
17 question or quite had a chance to complete that.

18          Q.    You said that the three-dimensional size  
19 would produce results comparable to the test  
20 results. I'm asking you whether the test results  
21 you had were the IN-1370 --

22          A.    No. The test results -- what was your  
23 question again?

24                   MR. RIDDLE: Would you read the  
25 last question, please?

1  
2 (WHEREFORE, the requested testimony  
3 was read back by the court reporter.)  
4

5 A. Yes. The answer should be yes and not  
6 no.

7 Q. Let's go on to your contention on  
8 blockage of the intake canal.

9 What can cause the blockage of the --

10 A. Sliding mud would be the culprit.

11 Q. Is that your concern?

12 A. As far as I understand it, yes.

13 Q. What's the source of the mud?

14 A. The walls.

15 Q. The walls are made of mud?

16 A. Or whatever the materials is.

17 Q. Is it your impression that the sides of  
18 the UBS is made out of earth?

19 A. Some material other than concrete or  
20 solid material, yes.

21 Q. Your concern is that the walls will  
22 slip off and block the intake canal?

23 A. Yes.

24 Q. Is your concern anything different than  
25 that expressed by the WRC staff?