Official Transcript of Proceedings ACRST-3302

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards Thermal Hydraulic Phenomena Subcommittee

Docket Number: (not applicable)

Location: Rockville, Maryland

Date: Wednesday, January 26, 2005

Work Order No.: NRC-194 Pages 1-364

NEAL R. GROSS AND CO., INC.
Court Reporters and Transcribers
1323 Rhode Island Avenue, N.W.
Washington, D.C. 20005
(202) 234-4433

TR04

DISCLAIMER

UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

January 26, 2005

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, taken on January 26, 2005, as reported herein, is a record of the discussions recorded at the meeting held on the above date.

This transcript has not been reviewed, corrected and edited and it may contain inaccuracies.

1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

3 + + + + +

4 MEETING

5 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

6 (ACRS)

7 SUBCOMMITTEE ON THERMAL-HYDRAULIC PHENOMENA

8 + + + + +

9 WEDNESDAY,

10 JANUARY 26, 2005

11 + + + + +

12 ROCKVILLE, MARYLAND

13 + + + + +

14

15 The Subcommittee met at the Nuclear Regulatory

16 Commission, Two White Flint North, Room T2B3, 11545

17 Rockville Pike, at 8:30 a.m., Dr. Graham Wallis,

18 Chairman, presiding.

19 COMMITTEE MEMBERS:

20 GRAHAM B. WALLIS, Chairman

21 F. PETER FORD, Member

22 THOMAS S. KRESS, Member

23 VICTOR H. RANSOM, Member

24 STEPHEN L. ROSEN, Member

25 JOHN D. SIEBER, Member

1 ACRS STAFF PRESENT:

2 RALPH CARUSO

3 NRC STAFF PRESENT:

4 HERBERT BERKOW

5 ROBERT DAVIS

6 MICHELLE HART

7 STEVE JONES

8 N. (KALY) KALYANAM

9 RICHARD LOBEL

10 LOUISE LUND

11 KAMAL MANOLY

12 L.B. (TAD) MARSH

13 JAMES MEDOFF

14 SAM MIRANDA

15 KRIS PARCZIEWSKI

16 PAUL PRESCOTT

17 WILLIAM H. RULAND

18 ANGELO STUBBS

19 MARTIN A. STUTZKE

20 JAMES TATUM

21 JOHN TSAO

22 LEN W. WARD

23

24

25

1 ALSO PRESENT:

2 ROB ALEKSICK, CSI Technologies

3 JEFF BROWN, Westinghouse

4 PRASANTA R. CHOWDHURY, Entergy

5 JOSEPH CLEARY, Westinghouse

6 DAVID CONSTANCE, Entergy

7 STEVEN CYBERT, Westinghouse

8 THOMAS FLEISCHER, Entergy

9 JAMIE GOBELL, Entergy

10 MARIA ROSA GUTIERREZ, Entergy

11 ALAN HARRIS, Entergy

12 JERRY HOLMAN, Entergy

13 THEODORE LEONARD, Entergy

14 G. SINGH MATHARU, Entergy

15 JOSEPH REESE, Entergy

16 RALPH K. SCHWARTZBECK, Enercon

17 PAUL SICARD, Entergy

18 DON SISKA, Westinghouse

19 DAVID VIENER, Entergy

20 ARTHUR (GENE) WEMETT, Entergy

21

22

23

24

25

A-G-E-N-D-A

A-G-E-N-D-A (con't)

STAFF'S PRESENTATION

1 Okay. I also review the section on leak
2 before break. And the operating conditions under the
3 uprated conditions will not alter the conclusions of
4 the previous leak before break analysis for Waterford
5 3. It's still valid.
6 Are there any additional questions?
7 I'll turn it over to John Tsao.
8 MR. TSAO: I'm John Tsao from the
9 Materials and Chemical Engineer Branch. I reviewed
10 five sections; coding system, flow accelerated
11 corrosion programs, steam generator tube inspections,
12 steam generator blowdown systems and chemical and
13 volume control systems.
14 I will be talking about only two systems
15 here; flow accelerated programs and steam generator
16 tube inspections because they are more significant in
17 terms of power uprate.
18 For the flow accelerated corrosion
19 programs, this morning there was some issue as to how
20 much you increase. I have this backup slide.
21 The FAC program measure the wear rates in
22 terms of mils per year. And these are the changes
23 that would be due to power uprate conditions.
24 Also, I want to show you another slide
25 that gives the effectiveness of the FAC program. This

1 is provided by the licensee. And as licensee said, it
2 is more in the -- they used CHECWORKS. It's a
3 computer program that considers hydrodynamics, heat
4 balance, temperature in particular.
5 As you can see the predictive method is
6 conservative considered to actual measurement.
7 DR. FORD: I'm sorry. Could you explain
8 that?
9 MR. TSAO: Okay.
10 DR. FORD: It looks as though it's equally
11 scattered around the one to one line. So why are you
12 saying it's conservative?
13 MR. TSAO: Well, for example, you can see
14 -- let's see.
15 You can see just for example, this point
16 here the measurement is about 300 mils. The predict
17 value, let's say, from here to here is about 240 mils.
18 So what it says is that the methodology will predict
19 that the tube wall thinner than measured, therefore it
20 also indicated that the licensee may need to do some
21 monitoring or replacement of that pipe.
22 DR. FORD: But equally there are points on
23 the other side which are not, what you call it --
24 MR. TSAO: Well, that's true. Yes, that's
25 correct. But as you know this is only a prediction.

1 Predictions, hopefully -- well, from the data point
2 you can see they are scattered toward the conservative
3 side. And also the FAC program according to EPRI is
4 that it's a process. In other words, the licensees
5 would go out, make an inspection, UT or ultrasonic
6 measurements or the pipe thickness and then they will
7 come back and they input that data into the computer
8 code so that to make sure there is a certain accuracy
9 in their predictions.
10 Also predict that the -- in the prediction
11 method they include some safety factors.
12 DR. FORD: It seems to me as though
13 there's a huge amount of scatter around that one-to-
14 one line. And so the question immediately arises as
15 to what is the impact of that in terms of could you
16 get a through wall erosion event taking place when you
17 had predicted it would not have done so?
18 MR. TSAO: It could.
19 DR. FORD: Did you go through that sort of
20 "what if" argument? I mean if you look at that data
21 base, you don't really have too much confidence in
22 CHECWORKS.
23 MR. TSAO: Well, I wouldn't say they would
24 be relying on CHECWORKS per se. The licensees, not
25 only Waterford but other licensees, you know they

1 include other factors. For example, other industry
2 experience. You know if some plants have some problem
3 with FAC water lines, then they will consider --
4 DR. FORD: I recognize that.
5 MR. TSAO: Right.
6 DR. FORD: But this particular EPU is
7 putting a lot of basis on CHECWORKS to manage this
8 problem. And if this a general observation as to how
9 good CHECWORKS is, my confidence is a little bit
10 shattered.
11 MR. TSAO: I should point out that
12 Waterford is not unique. I did the review for license
13 renewal, and I also asked questions. And this is type
14 of plot that, you know, other licensee has shown me.
15 DR. FORD: Yes, I know.
16 MR. TSAO: In other words, I don't think
17 that licensee is depending solely on what prediction
18 is. They also, you know, include other experiences and
19 inspections. Not only the inspections for the fact,
20 but there are other SME code inspections they have to
21 perform.
22 DR. FORD: I'll ask again. Did you go
23 through the "what if" scenario?
24 MR. TSAO: I have Kris Parcziewski from my
25 branch to elaborate on this.

1 DR. FORD: With that amount of uncertainty
2 in your modeling capability and therefore your
3 management capability, do you not feel uncomfortable?
4 MR. TSAO: No.
5 DR. FORD: No?
6 MR. PARCZIEWSKI: Kris Parcziewski from
7 the Chemical Engineering Branch.
8 To answer your question, those points are
9 predicted. CHECWORKS predicts but in addition there
10 is a correction factor for each individual line which
11 is here at the top right hand side, line correction
12 factor which indicates that it is corrected for each
13 individual line all the points predicted in the line
14 are corrected by this line correction factor. And the
15 line is defined as a portion of the system which has
16 the same chemistry but not necessarily the same
17 temperature. If I answer your question.
18 So all those points are already corrected.
19 Ideally, if they were ideal, they would lie in the 45
20 degree line, the middle line. However, obviously,
21 there is some scatter.
22 DR. FORD: I understand the physics --
23 MR. PARCZIEWSKI: Yes.
24 DR. FORD: -- of the erosion process.
25 It's highly dependent on ph. High dependent on

1 temperature. Highly dependent on corrosion potential
2 and all of those things are interacting. So that if
3 you're a little bit off on your definition of one of
4 those parameters, then you're going to get a big
5 change. So I can understand why there is a scatter
6 there because you're not able to define your system
7 adequately enough, and therefore that's the physical
8 origin of your LCF. But I still feel uncomfortable
9 about that huge scatter and how you use it in
10 management from their point of view and in terms of
11 regulation from your point of view.
12 MR. TSAO: Okay. For regulation,
13 basically there's no regulation on FAC program.
14 DR. FORD: That's what worries me.
15 MR. TSAO: The FAC program is instituted
16 because of the bulletin. Back in the '80s it was
17 result of Bulletin 87-01 where Surry had a --
18 DR. FORD: Yes, sure.
19 MR. TSAO: -- a rupture. And Generic
20 Letter 89-08 that required the licensees to institute
21 some type of program, FAC program. And then the
22 industry, you know, with EPRI guidance come up with
23 this program. And so --
24 DR. FORD: I understand all that. I'm
25 just looking at what the history has been since then.

1 And, you know, a few months ago we had fatalities in
2 Japan because of this phenomenon, which was not
3 managed well. And you know if this is supposed to be
4 the state-of-the-art of prediction of management and
5 therefore regulation, I just don't feel comfortable.
6 MR. TSAO: Okay. Speaking of the
7 Japanese, again from my understanding is that Japanese
8 did not inspect, you know, the last 20, 30 years.
9 DR. FORD: Correct.
10 MR. TSAO: Where here under FAC program
11 the licensees will have to inspect at least they say
12 50 to 100 inspection points for their large bore
13 piping and small bore piping they probably sometime
14 inspect 100 percent. And so there's a constant
15 inspections going on to make sure that the --
16 DR. FORD: I understand that.
17 MR. TSAO: Right.
18 DR. FORD: All I'm pointing out is
19 everyone bows to CHECWORKS and says yes, yes that's
20 the best thing that's around. And I'm just
21 questioning it. Is it adequate?
22 MR. HOWE: This is Allen Howe.
23 And I'd just like to add in at this point
24 that we understand the question and we will be happy
25 to get back with you with a response on that.

1 DR. FORD: Thank you.

2 MR. TSAO: Okay. Next slide.

3 Next slide I will be talking about is the

4 related to steam generator tube inspections.

5 This morning you also raised about the

6 question that -- sorry.

7 Next slide. The power operator will effect

8 the anti-vibration tubes for locations. What it does

9 at the increase of feedwater flow will cause the tube

10 to vibrate a little bit more. And the possible

11 degradation is where the anti-vibration bar, they call

12 the bat wings on top of that square shape, hitting the

13 supports.

14 Now, we have the requirement in tech spec

15 that we have the leakage requirement, which the

16 licensee has reduced to 75 gallons per day of a steam

17 generator. This is pretty significant in that the

18 normal primary to secondary leakage limit is 150

19 gallons per day. And Waterford is willing to go down

20 to 75 gallons per day. And that it is very good

21 limits to detect any potential leakage. Because 75 for

22 tech spec translate into administrative limit.

23 Control probably would be at even lower. Therefore,

24 if there's any leak, you know they would probably go

25 into a special administrative control actions

1 by the ASME 3 code or anything like that. Similarly
2 it's just stress code in cracking that's been
3 accelerated.
4 MR. SIEBER: But wear phenomenon is
5 covered by the ASME code.
6 DR. FORD: Yes.
7 MR. KARWOSKI: Through the plugging limits
8 and what not and through the plant technical
9 specifications.
10 DR. FORD: Right.
11 CHECWORKS?
12 MR. KARWOSKI: I think Louise Lund was
13 going to talk about CHECWORKS.
14 DR. FORD: Maybe if I could just state
15 what my problem was, Louise, and that would make it
16 more efficient for you to answer it.
17 MS. LUND: Should I introduce myself first
18 for the record?
19 DR. FORD: Yes.
20 MS. LUND: I'm Louise Lund. I'm the
21 Section Chief for the Steam Generator and Integrity
22 and Chemical Engineering Section, NRR. And, anyway,
23 I was asked to come over and discuss the FAC program.
24 DR. FORD: My concern was that the way
25 that they're using CHECWORKS right now, it is

1 primarily a prioritization tool as to where you're
2 going to look in the carbon steel piping. From the
3 measures that were shown this morning, it's apparent
4 that CHECWORKS is not good on one-to-one correlation.
5 Therefore, it's quite possible that you may use
6 CHECWORKS to say that I should not look at that pipe
7 because of the particular operating conditions of that
8 pipe, but I should look at this pipe. But in fact that
9 pipe there might well be eroding at quite a large
10 rate, but you wouldn't look at it for one, two, three
11 cycles. In that time you could go through wall. So
12 that was essentially my worry that you're using a
13 model which is not precise to make prioritization
14 decisions.
15 MS. LUND: Right. And I just want to say
16 off the top, you know we have a very active interest
17 in the FAC programs. Specifically we've had generic
18 letters or generic correspondence that has asked
19 industry to put together these type of programs which
20 manage FACs and also have these predictive
21 methodologies. However, it's not a case of just using
22 the predictive methodologies blindly and looking at
23 information on one line or another; there's a number
24 of things that inform the decision as far as what's
25 inspected and how it's inspected. Because it is a

1 tool, but it's not a blind tool in that particular
2 way. And, in fact, this gentleman I believe is from
3 Waterford and he was mentioning, we had a kind of
4 offline discussion about it and that's why I asked him
5 to come up here and help discuss this, and
6 specifically for Waterford.
7 I also wanted to say that for these FAC
8 programs, I think that we have an interest in looking
9 at them through power uprate and license renewal in
10 that we ask that the licensee provide information on
11 their most susceptible lines with their measures
12 versus their predicted and whether it gave them
13 information such that they could replace the lines,
14 you know, in a timely manner. Because that's really
15 what we want to know is, is it giving you the
16 information at the time that you need it in order to
17 make the decisions you need to make good decisions
18 about running your plant.
19 So that's the kind of questions we ask. We
20 do not do a re-review of their CHECWORKS data. We do
21 not take all their raw data and subsequently do an
22 audit of it. Okay. So I just wanted to kind of
23 clarify what it is that we do, you know, in our review
24 process. Usually through a request for additional
25 information we usually will ask them for the most

1 susceptible lines.

2 MR. ROSEN: We call that a performance-

3 based regime?

4 MS. LUND: Right. Right. And when we put

5 out that generic letter where we asked the licensees

6 to put together a FAC program and also have these

7 predictive methodologies, we did inspections of those

8 programs at that time. Okay. In fact, to make sure

9 that these programs were in place and in fact doing

10 what we thought that they were doing. Okay.

11 Now, I now in license renewal, true

12 license renewal we've been asked to come and give a

13 presentation to the ACRS on FAC and FAC programs. And

14 we've actually been in contact with CHECWORKS user

15 script to ask them to come in and help present this

16 information such that you can look industry-wide at

17 how well these FAC programs are working, specifically

18 with the CHECWORKS program and give you a lot of sense

19 -- instead of looking at just one graph, kind of get

20 a sense for generically how this is working and where

21 it may be challenged in certain ways or another,

22 because they think that they have a very good story to

23 tell.

24 Now maybe if you could introduce yourself,

25 and then also explain how programmatically it's a much

1 lighter look at how you choose the lines and --
2 because there's a surrogate aspect to it where, you
3 know, if you see something you look at other things
4 that are like that. There are a lot of things that go
5 into the program that don't rely on just this
6 measurement.
7 So, anyway --
8 MR. ALEKSICK: Good afternoon. My name is
9 Rob Aleksick. I'm with CSI Technologies representing
10 Entergy today.
11 Real quick about my background. I've had
12 the opportunity to be involved with flow accelerated
13 corrosion since 1989 and in particular have modeled or
14 otherwise addressed approximately 20 EPU efforts in
15 the last two years.
16 Dr. Ford made a very good point earlier
17 when he said that the graph that we looked at did not
18 display a very good correlation between the measured
19 results and the predicted results out of CHECWORKS.
20 Programmatically -- well, let me back up a second.
21 That is certainly true in the example that we looked
22 at. That is not always the case.
23 CHECWORKS models are on a per line or per
24 run basis. The run --
25 CHAIRMAN WALLIS: Could we go back to that

1 graph that we saw? The graph was a plot of thickness
2 versus predicted thickness.
3 MR. ALEKSICK: That's correct.
4 CHAIRMAN WALLIS: Because if you looked at
5 amount removed versus predicted amount removed, it
6 seems to me the comparison will be even worse.
7 MR. ALEKSICK: That's correct. In fact --
8 CHAIRMAN WALLIS: That's what you're
9 really trying to predict is how much is removed.
10 MR. ALEKSICK: Yes, that is true. And my
11 point is that in some subsets of the model, the one
12 that we looked at here which was high pressure
13 extraction steam, the correlation between measured and
14 predicted is not so good. And in some subsets of the
15 model, the correlation is much better.
16 CHAIRMAN WALLIS: It looks to me that in
17 some cases it's predicting no removal whereas in fact
18 there's a lot of removal. So the error is percentage
19 wise enormous?
20 MR. ALEKSICK: Yes, exactly. Exactly.
21 Some runs results are imprecise and some more precise.
22 And we look at both accuracy and precision.
23 Programmatically we account for that, that reality, by
24 treating those runs that have what we call well
25 calibrated results, i.e., precise and accurate results

1 coming out of the model that are substantiated by
2 observations, we treat those piping segments
3 differently programmatically than we do areas where
4 the model is less good. If the model results do not
5 correlate well with reality, different actions are
6 taken primarily increased inspection coverage to
7 increase our level of confidence that those systems
8 can continue to operate safely.
9 In addition to the CHECWORKS results many
10 other factors are considered to assure that the piping
11 retains its integrity, chief among these are industry
12 experience as exchanged through the EPRI sponsored
13 CHUG group. Plant experience local to Waterford in
14 this case. And the FAC program owner maintains an
15 awareness of the operational status of the plant so
16 that, for example, modifications or operational
17 changes that occur are taken into account in the
18 inspection of the secondary site FAC susceptible
19 piping.
20 DR. FORD: And my final question on this
21 particular subject was given the uncertainties in the
22 model, changed by this performance based aspect that
23 you just talked about, is there any way that you can
24 come up with a quantification of the risk associated
25 with a failure of a specific pipe?

1 MR. ALEKSICK: There's currently no
2 accepted methodology to quantify that risk, no.
3 However, it is accounted for primarily on a judgment
4 basis through industry experience and information
5 exchange through the EPRI CHUG group.
6 DR. FORD: Okay.
7 MR. MITCHELL: Yes, this is Tim Mitchell.
8 Just to give you a feel for how we're
9 addressing for this upcoming refueling outage, we have
10 increased our scope for a couple of reasons. One to
11 get additional data and we always do more than just
12 exactly what CHECWORKS supports. So you're always out
13 validating and getting more data to be able to help
14 predict where do you need to be looking. But in
15 addition, we're taking some additional points to make
16 sure we have good baseline data for the next cycle to
17 ensure that those points give us a good indication
18 going forward after the EPU.
19 The analysis for flow accelerated
20 corrosion shows very minimal changes as a result of
21 power uprate. But we are taking seriously our
22 inspection program and expanding it for this upcoming
23 outage to ensure that we know what's happening not
24 just what we're predicting.
25 MR. ROSEN: Let me roll that back now,

1 Tim. Can you tell me like for the last three or four
2 outages have you done some actual replacement of
3 piping based on predictions of FAC from the CHECWORKS
4 code or have you never replaced anything? What are
5 you seeing at Waterford?
6 MR. MITCHELL: I can give you non-
7 Waterford data better than I can give Waterford to
8 ponder.
9 MR. CHOWDHURY: My name is Prasanta
10 Chowdhury and I'm working with Entergy design for last
11 20 years.
12 I was involved with FAC also for several
13 years in the past.
14 It's not the CHECWORKS model that
15 determines what replacement is to be done. We base it
16 on actual measurement we take during the refuel
17 outage. So we also project based on actual measurement
18 that what will be our future projected thickness in
19 next refueling outage. So you can survive until next
20 cycle. And then we do some evaluation based on our
21 criteria that makes the stress criteria -- or based on
22 the code requirement. Like make all the equation.
23 Now code allows to go thinning in local
24 area but the FAC is a local thinning. So we do some
25 local thinning evaluation to make sure that it goes to

1 the next cycle.

2 Does that answer your question?

3 MR. ROSEN: No.

4 MR. MITCHELL: Did we replace any piping

5 in the last three outages?

6 MR. CHOWDHURY: I don't recall. I don't

7 recall. But we did extensive modification on

8 extraction steamline in the past. But it changed to

9 crack piping or stainless steel piping or chrome moly,

10 which is more corrosion resistance piping. I don't

11 answer your question --

12 MR. ROSEN: You say you have made

13 extensive modifications --

14 MR. CHOWDHURY: In the past.

15 MR. ROSEN: -- you changed to chrome moly?

16 MR. CHOWDHURY: Several years back, yes.

17 MR. ROSEN: Okay.

18 MR. CHOWDHURY: So whatever we did, see

19 the corrosion of thinning, we took it out and made

20 modifications.

21 MR. ROSEN: Yes, well, that's typically

22 the plant's response. If you find substantial

23 thinning, then you just don't go back and put in

24 carbon steel back in the same place.

25 MR. CHOWDHURY: Right.

1 MR. ROSEN: Because what happened before
2 will happen again.
3 MR. CHOWDHURY: I mean we have also made
4 a procedural entry into this FAC that anytime we do a
5 replacement, we use a better corrosion resistant
6 material or EPRI guidelines.
7 MR. ROSEN: Okay. So you're saying you
8 have made those kinds of modifications.
9 MR. CHOWDHURY: Yes. But still we are
10 ongoing and doing things. If we see something we need
11 to change, we change it.
12 Does that answer your question, sir?
13 MR. ROSEN: It's a little better. Not a
14 100 percent.
15 MR. CHOWDHURY: Okay.
16 MR. ROSEN: I would prefer something, and
17 maybe for next meeting you can come back with some
18 real data that there are 11 locations that you changed
19 in the last five years or something.
20 MR. CHOWDHURY: Yes, we can do that.
21 Because I don't have the data with me. I can get in
22 touch with the FAC program engineer and get those
23 information. Thank you.
24 CHAIRMAN WALLIS: That would be excellent.
25 DR. FORD: Thanks very much indeed. I

1 appreciate it.

2 MR. KALYANAM: Next we have the

3 Containment Systems group Richard Lobel.

4 MR. LOBEL: Good afternoon. My name is

5 Richard Lobel. I'm with the Probabilistic Safety

6 Assessment Branch but in the Containment System area.

7 Next slide, please.

8 I wanted to talk about the review of the

9 analysis that were done for the containment accident

10 analysis. This slide lists the areas that were looked

11 at. Basically the analysis of containment response to

12 a LOCA both the mass release and the containment

13 response and the containment response to a main

14 steamline break, both mass and energy into the

15 containment and the containment response and

16 subcompartment analysis also, which is a type of LOCA.

17 Next slide.

18 CHAIRMAN WALLIS: You mean that PSA Branch

19 actually does this sort of thermal-hydraulic analysis?

20 MR. LOBEL: We're the orphan section. We

21 go to the branch meetings but don't understand what

22 they're talking about, because it's all acronyms

23 dealing with risk and we just sit there and listen.

24 But that's where they put us.

25 The mass and energy for the LOCA was