

ORIGINAL

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Title: **MEETING WITH CHAIRMAN OF NUCLEAR
SAFETY RESEARCH REVIEW COMMITTEE
(NSRRC) - PUBLIC MEETING**

Location: **Rockville, Maryland**

Date: **Monday, August 26, 1996**

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1 UNITED STATES OF AMERICA
2 NUCLEAR REGULATORY COMMISSION

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4 MEETING WITH CHAIRMAN OF NUCLEAR SAFETY
5 RESEARCH REVIEW COMMITTEE (NSRRC)

6 ***

7 PUBLIC MEETING

8 ***

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10 Nuclear Regulatory Commission
11 Room 1F-15
12 11555 Rockville Pike
13 Rockville, Maryland

14
15 Monday, August 26, 1996

16
17 The Commission met in open session, pursuant to
18 notice, at 2:00 p.m., the Honorable SHIRLEY A. JACKSON,
19 Chairman of the Commission, presiding.

20
21 COMMISSIONERS PRESENT:

22 SHIRLEY A. JACKSON, Chairman of the Commission
23 KENNETH C. ROGERS, Member of the Commission
24 GRETA J. DICUS, Member of the Commission
25 NILS J. DIAZ, Member of the Commission

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1 STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

2 JOHN C. HOYLE, Secretary

3 KAREN D. CYR, General Counsel

4 E. THOMAS BOULETTE, Chairman, Nuclear Safety

5 Research Review Committee

6 DAVID MORRISON, Director, Office of Nuclear

7 Regulatory Research

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P R O C E E D I N G S

[2:00 p.m.]

CHAIRMAN JACKSON: Well, good afternoon, ladies and gentlemen.

I want to first acknowledge and to welcome our newest Commissioner, Dr. Nils Diaz. Welcome.

COMMISSIONER DIAZ: Thank you.

CHAIRMAN JACKSON: And I am also pleased to welcome Dr. E. Thomas Boulette, Chairman of the Nuclear Safety Research Review Committee. And, of course, our own Dr. David Morrison, Director of the Office of Nuclear Regulatory Research, to brief the Commission on recent activities of the committee.

The Nuclear Safety Research Review Committee advises the Director of Nuclear Regulatory Research and, through him, the Commission on the quality and conduct of NRC research activities and gives recommendations concerning the overall management and direction of the nuclear safety research program.

The Commission is interested in hearing about the committee's recent assessment of research programs as well as any concerns that the committee may want to raise with the Commission. The Commission appreciates the efforts made by this committee and its reviews of research programs that support important safety issues.

1 Today's briefing will provide a broad overview of
2 many of the programmatic activities of the Office of
3 Research. I understand that the activities under discussion
4 will be probabilistic risk assessment, severe accidents,
5 instrumentation and control, as well as human factors and
6 materials and engineering. I understand that copies of the
7 committee's report to the Director of the Office of Research
8 is available at the entrances to this room.

9 Do the other Commissioners have any opening
10 remarks?

11 COMMISSIONER ROGERS: No.

12 COMMISSIONER DIAZ: No.

13 COMMISSIONER DICUS: No.

14 CHAIRMAN JACKSON: If not, Dr. Morrison,
15 Dr. Boulette, you may proceed.

16 DR. BOULETTE: Thank you, Chairman Jackson,
17 Commissioners.

18 This, of course, is a briefing of our last meeting
19 and we have prepared a series of slides that we will walk
20 through. I invite Dr. Morrison to help me out as we proceed
21 and, if we go to the first slide, please?

22 [Slide.]

23 DR. BOULETTE: The first slide depicts the
24 schedule of meetings that we have had over the last three to
25 four months. The committee met, as you know, on the 27th

1 and 28th of June. That was the full committee. The way we
2 arranged our committee is we formed four subcommittees in
3 the four areas that Chairman Jackson highlighted and I will
4 address each one in turn.

5 The committee meeting had as its principal
6 objective the review of each of those subcommittee meetings,
7 their specific reports and the attempt to compile any
8 concerns or endorsements or any specific actions that each
9 of the subcommittees may want to highlight.

10 The other meeting dates for the committees are
11 listed on the slide and we will go through them but, in
12 effect, all of the subcommittees met starting early May.

13 There is a correction on one of these slides, by
14 the way. The Subcommittee on Action Analyses is the
15 Subcommittee on Severe Accidents.

16 The first area I would like to cover is the one --
17 is the subcommittee area of probabilistic risk assessment.
18 A few points I would like to make on that specific area is
19 that the committee does believe and feels that the research
20 office is fairly well integrated into the use of PRA for
21 regulatory decisionmaking. By that we mean the development
22 of analytical tools, the transfer of training and
23 guidelines, lessons learned from the IPE and IPEEE have been
24 done fairly effectively and we commend the office for that.

25 We do have a concern relative to some of the

1 initiatives that the research is focusing on in the area of
2 updating the standard review plan and the corresponding rate
3 guides. We believe that, as the staff tries to address that
4 specific issue, the concern we have is that in 1986 generic
5 safety goals were issued by the Commission and they are, as
6 we understand them to be generic in nature. They apply to
7 the industry.

8 As we get into risk in performance based
9 regulations, how will these goals be applied to individual
10 sites and might there be an initiative that would call for
11 each site to have its own unique, specific safety goals?
12 What we mean by that is if you have 57 different sites in
13 the country, whatever the number may be, each site has its
14 own risk level, if you want, based on its design and its
15 operating procedure, what have you, some having higher risk
16 than others.

17 If the application of a standard set of goals is
18 applied to all of them uniformly, would that allow a certain
19 site, a specific site, to raise its risk or not? So there
20 is quite a bit of debate on that issue, getting into the
21 public relations realm as well. So we are suggesting that
22 some additional guidance may be needed to clarify that
23 issue.

24 CHAIRMAN JACKSON: Actually, that raises a
25 question immediately. That is, do you feel the

1 methodologies, PRA, particularly as they relate to
2 treatments of uncertainty is well enough or well enough
3 developed to even be able to address that kind of a
4 question?

5 DR. BOULETTE: I think --

6 CHAIRMAN JACKSON: Or at least is there
7 concurrence on, because I note you have a bullet here having
8 to do with preparation of capabilities for standardized PRA
9 modeling and you also refer to standardized treatment of
10 uncertainties and it strikes me that until and unless these
11 pieces of the PRA infrastructure it's in a sense difficult
12 to talk about plant specific or site specific safety goals
13 and application.

14 DR. BOULETTE: I think it's a good point but I
15 think the issue the committee was struggling with was in
16 spite of the adequacy of the methodologies and the adequacy
17 of the databases, as we proceed down this road for
18 developing any kind of approach, risk-informed, performance-
19 based regulation, one of the strategic issues that has to be
20 addressed, we believe, by the Commission, by the NRC, is do
21 the safety goals apply uniformly to all sites and if they do
22 will they then afford some flexibility to an existing site
23 to change its safety standards if you want.

24 For example, if site A has a core melt frequency
25 calculation that is like ten to the minus eighth but another

1 site has a number that is ten to the minus ninth, will that
2 site with the lower frequent number be allowed to move up by
3 two orders of magnitude and still meet a safety goal? It
4 would still be the safety goal but, at the same time, it
5 would be in effect encouraged to increase its risk. And how
6 would that be perceived and how might that affect the
7 regulations and how much that affect the research program.
8 That was really the issue we were getting to.

9 I don't believe that there is enough detail
10 information to be able to calculate all of these parameters
11 adequately but the fundamental issue of how will it be
12 applied to all the sites, I think, is still valid and should
13 be addressed fairly soon.

14 I believe I am speaking for the committee at
15 large.

16 DR. MORRISON: Yes, I think that is the correct
17 interpretation of what the committee's concerns were.

18 I would remind the Commission that there is an
19 issue paper due to you from the staff by the end of
20 September that will be dealing with four issues and one of
21 these is the use of safety goals on a plant-specific basis.
22 So that item will be elaborated in considerably more detail
23 and guidance will be sought from the Commission on that.

24 DR. BOULETTE: The other two bullets in that slide
25 we have kind of alluded to already, the Chairman herself and

1 some of the comments I made.

2 There really is, we believe -- the committee
3 believes there is a need for a bit more formal integration
4 of the various activities into some sort of an overall plan.
5 The committee feels that many of the initiatives are on
6 track and going the right direction but, probably, a more
7 comprehensive focus to bring all the pieces together may be
8 very useful.

9 CHAIRMAN JACKSON: I think what we will probably
10 do is to stop certainly on each topic and allow the
11 commissioners to ask any questions they might have but why
12 don't you finish your discussion on this particular bullet.

13 DR. BOULETTE: Very good. I appreciate that. I
14 think we are down to the probabilistic risk assessment. Are
15 there any questions on that one?

16 CHAIRMAN JACKSON: I do have one more and then I
17 will ask Commissioner Rogers and the other commissioners.

18 I note both your committee as well as the ACRS
19 spend considerable time reviewing the staff's PRA activities
20 and the question is whether these reviews are complementary
21 and supportive in nature or are they -- to what extent are
22 they duplicative and if not -- if they are or if they are
23 not as complementary or supportive as they could be, how can
24 we take better advantage of the relative committees'
25 expertise in these areas. It's really a question of getting

1 the most bang for the buck, as it were.

2 DR. BOULETTE: The subject did come up at our
3 committee as well and, quite frankly, I don't know if I can
4 answer your questions because the same questions were posed
5 to the committee. I think there is a paucity of
6 understanding as to what's going on in the ACRS relative to
7 PRA investigation, so one of the things --

8 CHAIRMAN JACKSON: By your committee?

9 DR. BOULETTE: By our committee.

10 I think some of the membership of the committee
11 are really strongly encouraging us to be more involved with
12 ACRS either by attending some of the meetings or by getting
13 the reports and paying more attention to that because we did
14 share your concern that there are two entities supposedly
15 looking at the same activity and how are we working
16 together, are we being cooperative and what have you. So it
17 is a valid comment but I really can't answer it until we
18 start pulling on that ourselves as a committee.

19 CHAIRMAN JACKSON: Is there a consensus that you
20 see between the staff and industry on the meaning of risk-
21 informed performance-based regulation?

22 DR. BOULETTE: I think so. I think that with some
23 of the recent activities and some of the workshops we have
24 had that the industry, and I can speak for the industry in
25 any case, is beginning to get a better appreciation of

1 what's meant by risk-informed performance-based regulations
2 and that whole activity.

3 On the other hand, I think more definition would
4 really serve both our purposes and I think that will develop
5 as we start putting some more meat on these bones. When you
6 get to a lower level of detail, more and more questions pop
7 up, I guess, is what I am saying.

8 CHAIRMAN JACKSON: And the last question, do you
9 have any comments on the industry pilots in the -- in this
10 area?

11 DR. BOULETTE: I don't really. I am aware that
12 they are in place and in fact Dave and I were just talking
13 about this before the meeting but I have no specific
14 comments on it.

15 CHAIRMAN JACKSON: Okay. Commissioner Rogers?

16 COMMISSIONER ROGERS: Just in the human factors
17 area, I know you will probably touch on it a little bit
18 later but in one of your meeting reports you mentioned that
19 in connection with PRA work you did consider some of the
20 problems of organizational factors in the human factors
21 area.

22 I wonder if you -- the committee has brought the
23 human factors considerations and the PRA work together in
24 your oversight of our research programs? It is clear to me
25 that the human factors area is the big one that needs --

1 that has the biggest uncertainties in it with respect to PRA
2 and the question is what aspects of human factors can one
3 tackle and how much reliability can one place on a bottom
4 line PRA number just because of the big uncertainties in
5 human factors performance and whether the negative comments
6 elsewhere in the report on organizational research are the
7 whole story as far as the committee is concerned, including
8 the PRA part of your committee?

9 DR. BOULETTE: I believe I've heard two or three
10 questions in that question.

11 COMMISSIONER ROGERS: Yeah, there's probably about
12 half a dozen.

13 [Laughter.]

14 DR. BOULETTE: Basically, it is my belief that the
15 committee strongly supports the human factors and the
16 control room human factor interface and what have you. And
17 I think that the initiatives that the research organization
18 has on that will pay off and we have confidence in some of
19 that, even though there is some question about how to obtain
20 reliable databases and what have you. But the man/machine
21 interface kinds of issues we see some promise there and
22 something going on.

23 On the other hand, in the area of organizational
24 issues, culture issues, what have you, I am sure you saw
25 some comments in the report that demonstrates that the

1 committee has significant reservations about the ultimate
2 fruition of this effort. Again, David and I were talking
3 about it this morning.

4 It is one thing to be able to define a good
5 operator and the kinds of competencies and characteristics
6 and strengths that he or she should have and how they might
7 interface with machinery and panels and what have you. It's
8 another thing to talk about culture.

9 From my perspective, my own personal perspective,
10 what is a good culture for a certain site in the spring of
11 the year may not be a good culture for another site in the
12 winter of the year. I think it is so situationally
13 dependent I am not sure that we can collect enough data to
14 make it meaningful.

15 I think I am expressing the view of the committee
16 as I speak that way. I am aware that the NRC or Dave's
17 staff doesn't quite agree with that and I think that kind of
18 tension may be useful for us.

19 COMMISSIONER ROGERS: Well, I guess the point,
20 just the point, I don't want to belabor it, but the point, I
21 think, is that when everything else is fine tuned to a
22 degree that one feels pretty comfortable with the human
23 factor that is going to dominate the performance of the
24 plant and that means that even after you've got your control
25 room all finely tuned up and you've got the best people

1 operating in the best possible way and so on and so forth,
2 there are still other aspects of the organization that can
3 cause the trouble. I mean, we've seen it.

4 And yet, how can one deal with those issues in a
5 quantitative way so that they can be included in a PRA?

6 DR. BOULETTE: And those are the questions that
7 the committee is pushing at. Absolutely.

8 I do know from my own personal experience that
9 many of the errors that are being committed, many of the
10 problems that the sites have seen, obviously, are human
11 performance errors more than anything else.

12 So we recognize the need, we recognize the effort
13 that is going on and support it. On the other hand, the
14 organizational part, the cultural part, we have some
15 reservations about how that may be managed.

16 CHAIRMAN JACKSON: Commissioner Dicus?

17 COMMISSIONER DICUS: No.

18 CHAIRMAN JACKSON: Commissioner Diaz?

19 COMMISSIONER DIAZ: No.

20 DR. BOULETTE: Okay.

21 Next slide, please.

22 [Slide.]

23 DR. BOULETTE: The next area we spent some time
24 discussing is in the area of severe accidents and a couple
25 of bullets that I might emphasize on that, we strongly

1 endorse and we know the staff supports this position --

2 CHAIRMAN JACKSON: The Commission supports the
3 position.

4 DR. BOULETTE: The Commission does?

5 CHAIRMAN JACKSON: Has supported it.

6 DR. BOULETTE: Continued participation in the
7 OECD/NEA activities. Again, not only to be able to take
8 advantage of the research taking place everywhere but as
9 much an image kind of issue that would continue to give the
10 U.S. NRC the position that it deserves in the overall
11 industry.

12 We endorse and gave kudos to Dave's staff in the
13 area of high burn-up fuel and its effects on cladding
14 failure modes and the evaluations that were done. We are
15 encouraging and support the consolidation of thermal
16 hydraulic codes. We believe that that is one way in which
17 resources can be made to be focused and taking advantage of
18 so that as any kinds of budgetary constraints may come
19 across, this is one way that may be able to accommodate some
20 of those issues.

21 Likewise, we support the maintenance and the whole
22 suite of severe accident codes. Along the same lines, there
23 is a package of three or four or five major codes that are
24 going to need to be maintained and also important that the
25 NRC maintain that kind of expertise, so we support that.

1 We also noted that the X reactor series of core
2 melt experiments were coming to a closure and we supported
3 that as well as endorse that. So no real surprises in this
4 area.

5 Any questions or comments?

6 CHAIRMAN JACKSON: Let me ask you a few questions.

7 What capability, in the committee's opinion,
8 currently exists within the staff to run, update, interpret
9 output from the suite of severe accident codes that exist?

10 And if the committee has an opinion or you have an
11 opinion that the current capabilities are not where they
12 should be, you know, what should the requirements be to
13 establish such a capability?

14 DR. BOULETTE: I believe the committee would say
15 that the capabilities do exist within the staff. There is
16 some upgrading of that capability that will be needed and
17 probably some transfer of skills and talents from
18 individuals to other individuals and possibly some training.
19 But we do not see a major concern as to whether the staff
20 will be able to meet that challenge and make that work.

21 CHAIRMAN JACKSON: The ACRS has raised some
22 concerns about the ability of the currently existing thermal
23 hydraulic codes to assess the failure of the reactor coolant
24 system or steam generator tubes coincident with a severe
25 core melt accident.

1 Does your committee have any opinion on that,
2 whether that capability exists or not?

3 DR. BOULETTE: I'm not sure whether that has come
4 up or not. Do you remember, Dave?

5 DR. MORRISON: No, I don't think that item was
6 discussed. I don't recall, either at the subcommittee
7 meetings or at the committee meeting as a whole.

8 CHAIRMAN JACKSON: Maybe I might commend that to
9 you because it is an issue that relates to ageing issues.

10 I note that in your report that a number of severe
11 accident program areas are, in fact, reaching a certain
12 level of maturity. In your opinion, what role does risk
13 analysis play or should play in the planning or sunseting
14 of severe accident research?

15 DR. BOULETTE: In the closure of some of these
16 initiatives? I think that is going to be a key aspect of
17 how we address those questions in the future.

18 CHAIRMAN JACKSON: But it is not something you
19 have explicitly --

20 DR. BOULETTE: We have not addressed that
21 explicitly but my own personal view, and again, just from
22 the discussions that we've had as a committee, we see a lot
23 of longer term benefit associated with risk informed
24 performance based regulations that will impact a lot of
25 these areas.

1 CHAIRMAN JACKSON: Commissioner Rogers?

2 COMMISSIONER ROGERS: No, I think we've covered
3 everything I had.

4 COMMISSIONER DICUS: No questions.

5 CHAIRMAN JACKSON: Okay.

6 DR. BOULETTE: In that case, slide number five,
7 please.

8 [Slide.]

9 DR. BOULETTE: I think I can say that this area,
10 the area of instrumentation and control of human factors
11 continues to be probably the more dynamic area that we look
12 at. It is new technology, it is change, it is some vagaries
13 associated with human performance, what have you. So we did
14 spend quite a bit of time on this specific area.

15 The committee endorses the continuation of control
16 room staffing studies as done at the Halden project,
17 highlighting the need to recognize that these studies will
18 be design dependent but also dependent upon whether it is a
19 one-unit site or a two-unit site, just because of the way
20 the control room is run and operated.

21 We do support the research being done on the
22 hybrid control room operator performance however we are
23 concerned, in fact, that there is enough emphasis placed on
24 the hybrid nature of the problem, specifically. By that,
25 the committee means that when you look at operator

1 performance and base it upon your design basis, the way the
2 plant has been built and try to assess how that's going and
3 the relative risks and what have you, that's one issue. But
4 as the plant evolves and changes and becomes more of a
5 hybrid system, we believe that the hybrid nature itself has
6 to be emphasized and looked at more carefully, in particular
7 the unique failure modes and effects that comes from the
8 hybridization of the system itself.

9 So we did express a concern as to how much
10 emphasis was being placed on that specific area.

11 COMMISSIONER ROGERS: Excuse me.

12 Could you just elaborate on that just a little
13 bit? I think that's a very important area.

14 DR. BOULETTE: I can try.

15 COMMISSIONER ROGERS: It certainly caught my
16 attention. Are you thinking about the hardware aspects of
17 hybridization as well as or in addition to the difficulties
18 that control room operators may have when they are faced
19 with a combined system of digital and analogue --

20 DR. BOULETTE: My recollection was more along the
21 lines of the hardware. In other words --

22 COMMISSIONER ROGERS: Itself.

23 DR. BOULETTE: Itself. In other words, you are
24 changing the overall system. You now have part of an old
25 system and a new system, the interfacing of the old and new,

1 is that being accommodated and accounted for when you do
2 your performance evaluations of the man/machine interface.

3 COMMISSIONER ROGERS: Fine.

4 CHAIRMAN JACKSON: What do you think is the
5 likelihood of obtaining useful results in the near future in
6 this particular area?

7 DR. BOULETTE: In the human -- man/machine
8 interface area?

9 CHAIRMAN JACKSON: Right.

10 DR. BOULETTE: I think you would get differing
11 opinions from some of the committee members. Christine
12 Mitchell has a significant experience in other fields, non-
13 nuclear, NASA and the aviation industry. I believe that she
14 speaks very positively about the potential for getting some
15 useful information. On the other hand, she does state
16 fairly strongly that the NRC -- the nuclear power industry
17 is far behind the curve on this issue relative to other
18 industries.

19 It is her view that the encouragement has to take
20 place within the industry to step outside itself and look at
21 the other industries and learn the lessons that are to be
22 learned so that we can make some progress there. So I think
23 it's hopeful but we are slow at coming there as an industry.

24 CHAIRMAN JACKSON: Dr. Morrison, how large a
25 program is there in research at this point in this

1 particular area?

2 DR. MORRISON: In the broad area of
3 instrumentation and controls and human factors or just this
4 narrow slot?

5 CHAIRMAN JACKSON: The broad area.

6 DR. MORRISON: The broad one. It ranges about
7 around \$4- to \$5 million a year. Roughly a quarter of that
8 is in the Halden project itself. It ranges somewhere
9 between 750,000 and a million dollars.

10 I would also point out that Professor Mitchell is
11 going to have an opportunity to visit the Halden project in
12 around the middle of September so that she will get a first-
13 hand feel of what the capabilities are there and can compare
14 those with the experience from the other areas that she is
15 familiar with in this country. So we should get a good
16 benchmark based upon her visit.

17 DR. BOULETTE: She spent a week at my station last
18 week, just being in the nuclear area, she had never seen a
19 nuclear simulator, for example. So she has to come up to
20 speed also but she has a lot of experience.

21 CHAIRMAN JACKSON: One other question in this
22 area.

23 Does the staff have any plans to pursue
24 development of approaches for addressing software
25 reliability?

1 DR. MORRISON: Oh, yes. We have had a major
2 activity under way over the last I suppose year-and-a-half
3 to two years and there are reports either in draft form or
4 just nearing completion covering I think a half-a-dozen
5 topics if I am right in the area of software reliability,
6 software engineering verification and validation methods,
7 use of case tools, the kinds of things that one is going to
8 be required to really take a look at the software part of
9 this problem.

10 CHAIRMAN JACKSON: Are there any particular
11 outcomes at this point from that research?

12 DR. MORRISON: I think most of these can be
13 embodied in regulatory guides that will be available to the
14 industry as they develop both the hybrid concepts as more of
15 the advanced concepts, seeing where software enters into the
16 thinking.

17 CHAIRMAN JACKSON: Commissioner Rogers?

18 COMMISSIONER ROGERS: Well, it does seem to me
19 that this question of the plant performance when it's
20 operating in a hybrid mode in a sense, combined digital and
21 analogue systems, is something that we really ought to make
22 sure somebody is paying attention to. I don't know that we
23 have the funds to do a lot ourselves but I think it is very
24 important for us to understand what the industry is doing
25 here, our own industry, the nuclear industry, because it

1 does seem to me that that may be a place where there really
2 are some sleepers.

3 That may appear, and I think it is very, very
4 interesting that you have brought that up and I was thinking
5 more along the lines of the challenges that a hybrid control
6 room places on an operator who has had a lot of training in
7 an old analogue system and now has to deal with a combined
8 collection of instruments that are partly digital and partly
9 analogue and there may be some special features of that that
10 challenge the operators.

11 But certainly what's going on in the plant, how
12 the control systems behave, is -- may pose some really new
13 kinds of problems that we hadn't anticipated and I do think
14 it is very important that there be several research efforts
15 in this area in the United States and certainly they are not
16 all going to be funded by NRC.

17 So I would urge you to try to see that we
18 understand what is happening and try to make our concerns
19 known to the industry that this is not an area that could
20 just be dealt with on an ad hoc basis. It really needs some
21 kind of a broad overview, I think.

22 The other -- the comment on the Halden work, I was
23 at Halden about two weeks ago, my second visit there, and I
24 have always been quite impressed with the quality of their
25 efforts. But one of, of course, the important things about

1 the Halden project is that it is supported by many different
2 countries so that I am just a little concerned that if we
3 try to establish a U.S. effort here with NRC funding, which
4 could be a real challenge to us to carry out, that that
5 doesn't cause us to drop out of the Halden project because I
6 think that it has some very great benefits because of a
7 number of participants and because of the benefits we get
8 because we put in a little bit and we get a lot back.

9 DR. BOULETTE: I feel sure the committee supports
10 your view on the Halden project. On the other hand, the
11 committee did raise the concern for the lack of capability
12 within the United States.

13 COMMISSIONER ROGERS: Absolutely.

14 DR. BOULETTE: Coming back to your earlier point,
15 Commissioner Rogers, if I could, the hybridization that
16 we're talking about, I am sure you are aware that the
17 industry is accustomed to plant modifications and hopefully
18 the updating of their FSARs, their documentation and the
19 whole kit and caboodle. The focus here, of course, is
20 instrumentation and control and control in particular and
21 how pervasive it might be as you incorporate a digital
22 system into your plant.

23 COMMISSIONER ROGERS: Right.

24 DR. MORRISON: If I might come back for just a
25 moment to comment on the Halden project, it is certainly not

1 our intention to abandon our participation in the Halden
2 project. It was my understanding that the committee was
3 raising the issue, especially, when you looked at operator
4 performance first of all in a simulator environment,
5 secondly with Finnish operators dealing with a Russian
6 reactor that there may be a culture problem associated if
7 you bring it back to a U.S. system with U.S. trained
8 individuals involved.

9 COMMISSIONER ROGERS: Yes.

10 DR. MORRISON: So it was really the human side of
11 that more than the questions with regard to the man/machine
12 interface or the machine side of it.

13 CHAIRMAN JACKSON: Okay.

14 Any other questions on this area?

15 COMMISSIONER DIAZ: Just a comment or a question
16 really. It says in here that you provide issue
17 prioritization and guidance in 1997. In -- in what form is
18 that going to be? Is that going to be something submitted
19 to the NRR? Is this what the committee is working on or is
20 this what NRR is working on? I was kind of confused on
21 that.

22 "Research on hybrid control room, operator
23 performance is proceeding and should result in issue
24 prioritization and guidance in 1997."

25 DR. MORRISON: That is an anticipated product from

1 the research effort that is under way in trying to come up
2 with a better rank ordering of the issues that we should be
3 addressing and that that would serve then as guidance to FY
4 '98 and beyond programs, so this will carry -- this will be
5 done in '97 and will be available then for future research
6 programs.

7 COMMISSIONER DIAZ: So it is kind of a first cut
8 at --

9 DR. MORRISON: Well, I would say well beyond a
10 first cut. I think we have done the first cut. This is
11 trying to get down into a better understanding of the issues
12 and what are the prospects of being able to answer some of
13 the questions through additional research.

14 DR. BOULETTE: Okay, next slide, please, materials
15 and engineering.

16 [Slide.]

17 DR. BOULETTE: The committee does express a
18 concern with the long-term availability of radiation damaged
19 testing facilities in the country and I think the concern is
20 obvious.

21 There is a concern expressed on the part of the
22 committee that there may be a better coordinated effort to
23 determine the requirements of a database for PRA for the --
24 for the ability to do PRA analyses to pressurized thermal
25 shock events. There is a typo there; that "and" should be

1 "for" or "of", either one.

2 Basically what we are looking at is, how do you
3 incorporate the results of PTS event into PRA analyses and
4 the inadequate database that currently exists and we flagged
5 that as a concern.

6 Finally, in this area, there is a growing concern
7 for how the NRC will address the possible growth of high-
8 level waste sites in the country. As the industry and the
9 NRC and the country tries to resolve this issue, we believe,
10 the committee believes, there is potential for this -- the
11 solution to grow to more than just one site at Yucca
12 Mountain and, given that potential, we are encouraging that
13 not only the expertise be maintained but that resources be
14 looked at very carefully in that area to make sure that the
15 NRC can respond to that.

16 Questions on this area at all?

17 CHAIRMAN JACKSON: Commissioner Rogers?

18 COMMISSIONER ROGERS: No, just that I think it is
19 lamentable that we are getting down to one reactor in the
20 United States that can be suitably used for material studies
21 of radiation damage in the civilian sector and that even
22 that one looks like it's on shaky ground.

23 DR. MORRISON: It seems to be on very shaky
24 grounds. In fact, just before the committee met, in fact,
25 last week or the week before last we received a letter from

1 the University of Michigan and through the Vice President of
2 Research and Development at the university, they are taking
3 another look at this question of whether they should
4 maintain the Ford Research Nuclear Reactor as an operating
5 facility. And we are in the process of trying to prepare a
6 response to their request and strongly urge them to keep it
7 operating because it is the only one that we have available
8 for irradiation of the kinds of material samples that we
9 need to irradiate.

10 There is, of course, the advanced test reactor out
11 at Idaho but there is some question of how much longer the
12 Navy will sustain that under the Naval Reactors Program and
13 that is not quite as flexible a facility for our use as the
14 one at the university is.

15 CHAIRMAN JACKSON: My understanding is there is a
16 joint NRC/DOE working group looking at this issue. What is
17 the status and what are they actually doing?

18 DR. MORRISON: Well, if it is the working group
19 that I am thinking of, it is broader than just this issue.
20 We are trying to look at what are the core capabilities
21 within the national labs that need to be maintained that are
22 of interest to both parties. I have a draft report on my
23 desk. I assume that the final report is going to be
24 available for publication within about a month.

25 Tom?

1 MR. KING: Yes.

2 DR. MORRISON: About a month? So that that report
3 will be available.

4 CHAIRMAN JACKSON: That report will be making
5 specific recommendations?

6 DR. MORRISON: Yes, they are making specific
7 recommendations, first of all, on the kinds of capabilities
8 that need to be maintained. They will not go so far as to
9 recommend which laboratory should be maintained if there are
10 more than one laboratory that have that kind of capability.
11 Haven't gone quite to that depth. So it is sort of in
12 between the very specific and the needs in areas that are
13 common to both of us.

14 Research reactors were one of the topics in that
15 report.

16 COMMISSIONER ROGERS: Have we tried to put
17 together a kind of inventory of possible research reactors
18 worldwide that we might be able to turn to if a U.S.
19 capability disappears?

20 DR. MORRISON: Yes, such an inventory is available
21 and, in fact, one of those is at Halden, which we are using
22 now.

23 CHAIRMAN JACKSON: Commissioner Dicus?

24 COMMISSIONER DICUS: In your June '96 report, it
25 was indicated that a representative from NEI made several

1 comments about the NRC research program which were not
2 particularly complimentary. I think such things as "lacks
3 effective management oversight" that some programs may have
4 outlived their usefulness and the research should be better
5 coordinated with the industry.

6 So I've got a series of questions regarding that.
7 We could maybe wipe them all out with the first one.

8 Does the committee agree with what the NEI said?

9 DR. BOULETTE: To some extent. I think some
10 members of the committee have voiced similar concerns in the
11 past and in particular in the area of how much use the
12 research arm of the NRC is making of information that exists
13 within the industry.

14 It has always been, and I am probably overstating
15 this and Dave can help me out here, it has been an issue on
16 the committee as to what kind of separation is required
17 between the NRC's confirmatory research arm and the industry
18 and it is not infrequent for a committee member to raise
19 that point, not only in hardware research but in software
20 research. You know, why do we have to have different
21 families of codes, et cetera, et cetera.

22 So I think that Mr. Simard expresses concern
23 probably a bit more vocally than some of us would have but,
24 at the same time, there is at least on the part of some of
25 the committee members some truth to some of what he was

1 saying.

2 Dr. Morrison, do you agree?

3 DR. MORRISON: Yes, I think it is a fair
4 statement.

5 COMMISSIONER DICUS: Okay.

6 You had mentioned then a couple of the programs in
7 particular. So were the statements, and I guess my next
8 question was whether the statements were generic or really
9 very program specific?

10 DR. BOULETTE: I think more generic than program
11 specific. I am sure that if Ron had been pushed, he might
12 have been able to give some examples, thermal hydraulics,
13 for example. There are some folks in the industry who
14 believe that there is enough progress made in that area.

15 In light of some of the recent issues that we have
16 been facing and some of the new things coming out of high
17 burn-up fuels and what have you, I think some of us would
18 reconsider that position. It was not too long ago that some
19 of us in the industry thought there had been enough research
20 done on steam-generated tube ruptures and with Maine
21 Yankee's recent event a year-and-a-half ago, I think some of
22 us would reconsider that too.

23 COMMISSIONER DICUS: What do you think should be
24 done to try to resolve industry's concerns about the
25 research programs?

1 DR. BOULETTE: This is another issue that Dave and
2 I have talked about and worked on in the last couple years.
3 I think we need to get them more involved with what is
4 actually going on in the research arm of the NRC and we have
5 over the last year-and-a-half or so been trying to get them
6 involved in the light water reactor safety presentations and
7 events that will be happening in October.

8 When the Towers-Perrin report came out about a
9 year ago, I guess it is now, one of the issues that came out
10 of that report -- this was, by the way, in some sort of an
11 industry assessment of the effectiveness of the NRC, et
12 cetera, et cetera, one of these that came out was the real
13 strong lack of understanding on the part of the nuclear
14 power industry as to research, what it does and why it does
15 it. I think a very large number of executives hardly knew
16 that this even existed, let alone what it was about.

17 So that is a big part of what we are trying to do,
18 to make sure that the industry knows more about what's going
19 on so that their judgments may be a bit more sound.

20 CHAIRMAN JACKSON: It would be fair to ask
21 Dr. Morrison for his comments.

22 DR. BOULETTE: I think so.

23 DR. MORRISON: I'll try to keep my comments in a
24 positive vein.

25 I think there has been considerable progress since

1 the Towers-Perrin report has come out and that was almost
2 two years ago, October of '94 that that report was
3 published. One of the efforts, certainly, that is under way
4 is the periodic meeting that Mr. Taylor convenes with the
5 senior management staff of the NRC and the NEI also comes in
6 with their senior management. And research is a topic of
7 discussion at each of those meetings, so it is on the
8 agenda, at least it is brought up periodically to them.

9 The same thing happened in a meeting at INPO a
10 couple weeks ago. We have periodic meetings again with
11 NRC's senior management and INPO's senior management.
12 Research was on the topic there, so at least two major arms
13 of industry that are involved in topics that are of
14 relevance to our research program are being at least made
15 aware of these activities on a regular basis.

16 I think that most of the presentation that NEI
17 made at the NSRC meeting had its basis in the Towers-Perrin
18 report and in the reports from the Inspector General that
19 date back several years on the research program. So I would
20 say he was building his comments on outdated information. I
21 wouldn't go so far as to say we have corrected all of those
22 deficiencies but we are moving in the direction of doing
23 that.

24 I believe that our outreach program is starting to
25 have some success. It is -- as Dr. Boulette mentioned, last

1 year, I think, was the first year in many years we had had
2 utility participation in a water reactor safety meeting and
3 you, Chairman Jackson, in that introductory address, were
4 followed by two utility executives that were there talking
5 about the annealing program.

6 This year, we have asked Commissioner Rogers to
7 give the keynote address and participate in a panel again
8 with two senior utility executives dealing with the role of
9 research and performance-based regulation, so I think that
10 is starting to set the ball moving.

11 There will be a second plenary session where we
12 are trying to deal with the role of research in a regulatory
13 agency. I have asked for support from NEI in that session
14 and we are still trying to identify the right individual
15 within NEI, so that will be moving along.

16 It has been a disappointment that our showcase for
17 research has been that meeting and there has been very
18 limited utility participation over, I would say, the last
19 five to ten years in it. So they received the invitations
20 but they don't take them -- or avail themselves of the
21 opportunity for two or three days to see what's immediately
22 going on and rather date back into some earlier published
23 information.

24 COMMISSIONER DICUS: One more question and a real
25 quick comment.

1 The other question has to do with are there some
2 areas of research that you think the NRC should be involved
3 in which we are currently not doing?

4 DR. BOULETTE: We have looked to that question for
5 a good year-and-a-half now fairly deliberately and I think
6 the answer, straight answer is, no. There may be some areas
7 where we can reshape it so that some issues can be closed,
8 et cetera. But I think the committees we have put together
9 were put together with the intent of trying to cover the
10 entire scope of research and make sure everything was done
11 so nothing really stands out. I'm speaking for the
12 committee.

13 COMMISSIONER DICUS: Good. And a final comment, I
14 would encourage communication, dialogue between your
15 committee and the ACRS. I think that would be very
16 important. You seem to have consistent concerns and I think
17 it would be useful.

18 DR. BOULETTE: Thank you, we agree.

19 CHAIRMAN JACKSON: Commissioner Diaz.

20 COMMISSIONER DIAZ: It seemed to me like it was
21 such a long time ago that I was doing research on radiation
22 damage that I probably was in kindergarten if I tell you how
23 long ago it was.

24 Is there -- and maybe you both can answer this --
25 is there an updated database that shows time-dependent,

1 dose-dependent experiments data, you know, radiation damage
2 and safety significant systems that we can access in
3 determining what is missing or what has been done, because I
4 haven't seen it?

5 DR. MORRISON: Well, there is a database relating
6 to the components that are in the primary system and
7 particularly the pressure vessel and the internal
8 components. It is hard to tell exactly from that what is
9 missing or what more needs to be acquired.

10 It would seem that over the years, as our
11 understanding of the problem grows, the understanding of the
12 uncertainty also grows. One can look at the Russian data,
13 for example, on reactor pressure vessels and you find out
14 that the composition of material has a large amount of
15 phosphorous, which is -- seems to be a major factor
16 determining the performance of those vessels. Within the
17 U.S. vessels, it gets down into the copper and nickel
18 concentration with lack of phosphorous so you've got two
19 databases, not necessarily the same, obviously complementary
20 in terms of trying to understand the mechanisms of the
21 radiation damage.

22 COMMISSIONER DIAZ: Are we also talking of
23 instrumentation when we are talking about the materials?
24 You know, are we talking of qualifying instrumentation for
25 radiation damage?

1 DR. MORRISON: Well, we are initiating a program
2 that was stimulated by Chairman Jackson's request to
3 determine is there a nondestructive evaluation technique
4 through which one can measure the material's properties
5 directly rather than indirectly as the measurements made now
6 through surveillance samples? And so we are initiating that
7 program. In fact, sometime later this fall we are inviting
8 anyone who has a technique to come, use that technique to
9 measure the materials properties of a suite of irradiated
10 materials and well-characterized materials that we have from
11 vessels.

12 COMMISSIONER DIAZ: Yes, it might be a good idea
13 to prepare a matrix that shows what is it that we actually
14 know, because that certainly will be a guidance document for
15 the future.

16 DR. MORRISON: Fine. We will be pleased to get
17 additional information on that for you.

18 CHAIRMAN JACKSON: Well, I thank you very much
19 Doctors Boulette and Morrison for a very informative
20 briefing. I don't need to tell you that our research
21 program must provide and is designed to provide a strong,
22 independent technical capability for our regulatory programs
23 and so the Commission appreciates the committee's efforts in
24 this regard.

25 I would encourage you and your committee to

1 continue to work with the staff to push for resolution of
2 these issues and concerns that you've raised. I also note
3 that we appreciate the timeliness of recent briefings as
4 opposed to the long delays that we have seen and sometimes
5 experienced in the past.

6 In further closing, let me just reiterate a few of
7 the points that commissioners have made. I think the issue
8 of ACRS, NSRRC interaction and complementarily is an
9 important one because you are obviously dealing with similar
10 issues and that is a way to ensure consistency of how these
11 issues are viewed.

12 Secondly, Commissioner Rogers raised the issue of
13 what aspects of human factors can be factored -- can be
14 tackled within a PRA context and that, I think, in and of
15 itself, is an important question but I think it actually
16 leads in a derivative fashion to the following kind of issue
17 and that is I think with a committee like yours made up with
18 the kind of expertise that it has, there is an opportunity
19 to perhaps address these things or help the staff address
20 them with a higher degree of specificity because there is a
21 lot of discussion, for instance, in the human factors area
22 about difficulties.

23 But in the end, the human factors, aspects of
24 plant operations are there. They are probably predominant
25 in a certain sense. But the issue becomes, how does one

1 make progress and in this case within a PRA context? And so
2 unless one can begin to break off pieces and illuminate or
3 help the staff illuminate what aspects can be really dealt
4 with realistically and what can't, it's very difficult to
5 make progress.

6 So I encourage you, not only with respect to this
7 particular question but with respect to all of the kinds of
8 issues that you raised in the various areas to try to help
9 in that regard. I think particularly in the PRA area where,
10 at least, my perception is that there is some struggling
11 going on.

12 And I think you raised a good issue which the
13 Commission is already beginning to discuss having to do with
14 site-specific application of safety goals, both from a
15 public policy point of view, but it also is going to be
16 informed by the status of the development of PRA methodology
17 and so it is important to try to come to some understanding
18 of what the current limitations are or what fundamental
19 limitations would have to be overcome in the application of
20 PRA methodology to having site-specific safety goals.

21 So, again, it is that kind of thing in terms of
22 not just discussing it at large but really where one can
23 make progress on the regulatory front and I thank you again.

24 If my fellow commissioners have no further
25 comments, then we are adjourned.

1 [Whereupon, at 2:53 p.m., the meeting was
2 concluded.]
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CERTIFICATE

This is to certify that the attached description of a meeting of the U.S. Nuclear Regulatory Commission entitled:

TITLE OF MEETING: MEETING WITH CHAIRMAN OF NUCLEAR
SAFETY RESEARCH REVIEW COMMITTEE
(NSRRC) - PUBLIC MEETING

PLACE OF MEETING: Rockville, Maryland

DATE OF MEETING: Monday, August 26, 1996

was held as herein appears, is a true and accurate record of the meeting, and that this is the original transcript thereof taken stenographically by me, thereafter reduced to typewriting by me or under the direction of the court reporting company

Transcriber: Christopher Cutchall

Reporter: Mark Mahoney



**REPORT ON NSRRC MEETING
JUNE 27-28, 1996**

**E. Thomas Boulette
Chairman, Nuclear Safety Research Review Committee**

**David L. Morrison
Director, Office of Nuclear Regulatory Research**

August 26, 1996

NSRRC MEETING SCHEDULE

- **NSRRC Full Committee Meeting**
 - June 27-28, 1996
 - Committee members present included: Boulette (Chairman), Bankoff, Golay, Hatcher, Mayo, Mitchell, Molz, Taylor, Vogel, and Yukawa
- **NSRRC Subcommittee on PRA**
 - May 13, 1996
 - Subcommittee members present included: Golay (Chair), Bankoff, and Mitchell
- **NSRRC Subcommittee on Instrumentation and Controls and Human Factors**
 - May 14-15, 1996
 - Subcommittee members present included: Mayo (Chair), Golay, and Mitchell
- **NSRRC Subcommittee on Accident Analysis**
 - May 16-17, 1996
 - Subcommittee members present included: Mayo (Acting Chair), Bankoff, and Vogel
- **NSRRC Subcommittee on Materials and Engineering**
 - June 26, 1996
 - Subcommittee members present included: Yukawa (Chair), Hatcher and Taylor

PROBABILISTIC RISK ASSESSMENT

- **RES efforts appear to be well integrated into the use of PRA for regulatory decision making.**
- **The Standard Review Plan and the corresponding Regulatory Guides being prepared should reflect the requirements of risk-informed, performance-based regulations. Additional guidance from the Commission may be needed as these requirements become better clarified.**
- **Additional effort is needed to establish the PRA infrastructure. This includes:**
 - **Formulation of policies**
 - **Preparation of capabilities for standardized PRA modeling**
 - **Development of standardized treatments of data needed by PRA**
 - **Development of standardized treatments of uncertainties associated with risk analyses**
- **Vigorous pursuit of the difficult efforts listed above in parallel with the current activities would reduce the risks of failure in the risk-informed, performance-based regulatory concept.**

SEVERE ACCIDENTS

- **Continuation of NRC participation in OECD NEA activities will facilitate the high degree of cooperative research and international information sharing that exists in the severe accident research program.**
- **Progress is being made in the identification and evaluation of cladding failure modes and effects for high burnup fuel and in the understanding of experimental parameters.**
- **NSRRC supports consolidation of thermal hydraulic codes as a means to reduce costs of code use and maintenance. Care should be taken to assure that new problems do not arise through consolidation.**
- **Maintaining capability to run and update the suite of severe accident codes is important and requirements for establishing this capability within NRC should be determined.**
- **The NSRRC concurs with the closure of the XR series of core melt experiments.**

INSTRUMENTATION AND CONTROLS (I&C) AND HUMAN FACTORS

- **NSRRC endorses continuation of control room staffing studies and task network modeling investigations at the Halden Project.**
- **Research on hybrid control room - operator performance is proceeding and should result in issue prioritization and guidance in 1997. NSRRC has some concern that emphasis on operator performance during design basis challenges with functioning equipment may not fully address operator performance during challenges initiated by hybrid system failure modes and effects.**
- **As computer and display technologies change, review guidelines on human-system design may also need to be changed.**
- **NRC should evaluate the possibilities for establishing the capability for control room performance research in the United States.**
- **A structured and demonstrated process for total system reliability analysis with clear linkages between hazards, risk mitigation, and system criteria may assist the NRC in more efficient reviews of digital I&C systems.**

MATERIALS AND ENGINEERING

- **NSRRC has concerns regarding the long term availability of suitable radiation damage test facilities.**
- **NSRRC suggests a coordinated effort to determine the requirements of an adequate database for PRA and PTS events.**
- **Additional geotechnical/geologic analyses could be required if present plant sites for spent fuel interim retrievable storage were to be enlarged or regional storage sites were to be considered.**