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UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

DATE: Wednesday, February 7, 1990

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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ACRS SUBCOMMITTEE MEETING ON

THE SAFETY RESEARCH PROGRAM

Nuclear Regulatory Commission

Conference Room, P-110

7920 Norfolk Avenue

Bethesda, Maryland

Wednesday, February 7, 1990

The above-entitled proceedings commenced at 8:34 o'clock a.m., pursuant to notice, Chester Siess, subcommittee chairman, presiding.

PARTICIPANTS:

CHESTER SIESS, ACRS Subcommittee Member

JAMES C. CARROLL, ACRS Member

IVAN CATTON, ACRS Member

WILLIAM KERR, ACRS Member

CARLYLE MICHELSON, ACRS Member
DAVID A. WARD, ACRS Member
CHARLES J. WYLIE, ACRS Member
SAM DURAISWAMY, Cognizant ACRS Staff Engineer
JAMES TAYLOR, NRC/EPO
ERIC BECKJORD, NRC/RES
TOM MURLEY, NRC/NRR
FRANK GILLESPIE, NRC/NRR
WARREN MINNERS, NRC/RES
ALOIS J. BURDA, NRC/RES
BRIAN SHERON, NRC/RES
DEAN HOUSTON, ACRS Staff
LARRY SHAO, NRC/RES

PROCEEDINGS

[8:34 a.m.]

MR. SIESS: The meeting will come to order. This is a meeting of the ACRS subcommittee on the safety research program. I'm Chester Siess, chairman of the subcommittee for the next eight hours. The other ACRS members in attendance starting on my right, Charles Wylie, Ivan Catton, James Carroll, William Kerr, Carlyle Michelson, and David Ward.

The purpose of the meeting is to discuss the ongoing and proposed NRC safety research program and budget, the impact of the budget reductions on the continuing and proposed program elements and other matters related to the research program.

The cognizant ACRS staff engineer for the meeting is Sam Duraiswamy who's sitting on my right. The rules for participation at today's meeting were announced as part of the notice in the Federal Register on Friday, January 26th. We received no written comments or requests to make oral statements from members of the public.

As usual, a transcript of the meeting is being kept and will be made available as stated in the Federal Register. I don't think I have to remind people again that in order to be on the transcript, it's necessary to use the microphones.

We have an agenda prepared. I think the members of the subcommittee have seen it some time now and I assume the participants from staff have seen it. Does the staff have any

problems with the order of presentation? We've got the EDO on first thing this morning until about 9:30, then research from then until sometime after lunch and then NRR coming in after lunch until we adjourn. Does that give anybody any problem?

[No response.]

MR. SIESS: I don't hear any. NRR representative here at all? Not yet? There's nobody here. We've got the EDO and the representatives from research.

I don't think I need a lot of introduction. I don't remember when we last had a meeting like this. Some of you will recall that for a number of years, we prepared a report to Congress on the research program and had meetings like this and more than once trying to pull everything together for that report. We haven't written that report now for several years but some members of the committee, new members and members with short memories with built in tendencies for masochism have brought up the idea of writing that report again.

It is not the intention of this subcommittee meeting to prepare us to write a report this year but some people may be thinking about writing one next year. That however is something that ACRS will have to decide. There has been some interest expressed in the committee in preparing some sort of a letter to the Commissioners commenting on the trends in the research budget which have been downward consistently for a number of years, sometimes less precipitously than others but

nevertheless downward and one thing we've asked Research to talk about was the trends in the budget, the funds for research as opposed to what I'll call non-research. That would be what we used to call standards of generic issues, things that have been passed on to research.

Since money tends to be available for those things for which you get the greatest use and the greatest results, we have made a point at this meeting of asking the EDO to come in and comment on the research program as a part of the overall activities of the NRC. We've asked a representative of NRR to come in and talk about their perception of the uses that have been made of the research and how it meets their needs. After all, research doesn't exist for its own self. It exists only to serve the rest of the organization.

That constitutes my introduction. Are there any of the members of the subcommittee who have anything they want to say at the beginning?

[No response.]

MR. SIESS: Okay. In that case, Mr. Taylor, the executive director for operations, it's nice to have you back with us. I'll turn it over to you.

MR. TAYLOR: Thank you, Dr. Siess. I appreciate being here although in my time in the Agency, I haven't had the pleasure of serving in the Office of Research. I have been very cognizant of the many important contributions that it has

made and continues to make to the process of nuclear safety and my first points that I'd like to make, that it's the opinion of myself, I think that was shared also by my predecessor and I think certainly by a majority of the Commission that a good and solid research program is invaluable and absolutely necessary for carrying out our public health and safety mission.

We are concerned --

MR. SIESS: Excuse me, Jim. You used two adjectives there. Solid was one. What was the other one?

MR. TAYLOR: It just slipped out of my head -- solid and continuing.

MR. SIESS: I think that was right.

MR. TAYLOR: But the problems of budget and fiscal situation in the Federal Government have been continuing and I'll get into that a little more because I think that's an important element that we should talk about but the problems of the reducing size of the budget means that we lose expertise through the years and it's a problem which I think the senior management of the agency feels needs to be arrested and corrected.

The Office of Research has been -- and it's role in NRC has been and still remains an important world leader in the nuclear safety arena. You know the office has had numbers of various where it stands out for the expertise in the word that has been and is being done -- thermal hydraulics, severe

accidents, enclosure of these severe accident risks, pressure vessel integrity, vessel and vessel support safety against radiation embrittlement, development and application of probabilistic risk assessment methods -- very important strides there -- and the technology and methodology for the analyses and designs to protect reactors against external events.

It's clear to us that as the budget has shrunk, the role of the office as a leader and a world leader has diminished just as a result of the funds reductions. Our experimental facilities in the U.S. are no longer the strength they once were. Large scale facilities through international cooperation bilaterals are now international in nature and not exclusively ours but that's been a way to help keep some of them going.

Smaller scale and separate effects facilities are the U.S. norm but even these are reducing due to budgetary pressure. There's been this general deterioration of expertise and it is an inevitable outcome of what has happened through these past years in the research budget. It is our view that we'd like to see some revitalization and the only way we can do that is through budget action.

It is a difficult issue with regard to budget and it is an issue of trying to convince Congress in our oversight committees, the committees that authorize and appropriate the funds for the NRC of the importance of research and it is my

view that the ACRS role is very important to continue to point out where we should concentration our research with the dollars we have but just as importantly to help explain to those responsible to fund us as an agency, the importance of research and the results of research. I think that latter statement is very important because we frequently put out enormous technical reports but not perhaps the right encapsulation of the results and the importance of the results to our continuing understanding of this technology.

If I might have the next slide, please?

[Slide.]

MR. TAYLOR: I believe that it is important to recognize, in terms of NRC's overall budget, that we do have a budget that has a large segment that is essentially non-discretionary. Those are the base costs for people, for rent and support that are necessary to keep the agency running.

Indeed, the costs that may be attendant even with this Committee, come out of our non-discretionary pocket. In fiscal year '91, we have a budget of $475 million. I might as well tell you at this time, how difficult it was to get that budget approved to be submitted to the Congress, and we still have the Congress ahead of us.

We went in with a budget of $527 million. Frankly, a large chunk of what was above this amount was intended to be directed into the Office of Research and those numbers are

available. There were other programs, too, but they had a significant portion of that requested increase.

The budget this year at OMB -- our budget goes through them. We were down there a number of times to talk about our budget. They wanted to cut us back to the area of about $430 million, which would have topped out and taken another $45 million out of the budget and would have had drastic effects, even at the research level we're currently projecting at $475 million.

OMB's position was maintained at the highest levels of OMB and we managed to -- OMB used an approach this year for major agencies like Defense and the Department of Energy that the final discussions on the budget would, quote, "be done at the White House." For smaller agencies such as the NRC, OMB took the posture that you will agree with our cuts or you may also be required to talk about the budget at the level of the White House.

I must say that for several days, we continued in that confrontation mode, and our Chairman -- we met and went in with a position recognizing the overall pressure on the administration and in control of the total federal budget. A $475 million with a $45 FTE increase was the absolute minimum.

OMB did not want to accept that. The Chairman then took the basic position that he was ready to go to the White House. I have to credit Chairman Carr for standing tall in the

budget arguments and OMB decided at about 8:30 or 9:00 when I was called on a Friday night, that they would not further act in their capacity to recommend a further reduction on the NRC budget from the numbers that we had last put on the table which is the current $475 million.

It is not due to lack of what I will call within the NRC, a very strong position to try to continue. We said, if that happened, we knew that it would further wreck the elements of research that we have been managing to preserve. So, this chart -- let me give you some numbers.

About $285 million of the budget, which is the non-discretionary part, pays for payroll, rent, travel, telephones, consolidation, ADP and all the things that make it important for the entire staff for all of us to do our work.

MR. KERR: I apologize for my lack of knowledge of terminology, but what is consolidation?

MR. TAYLOR: Consolidation is our attempt to get White Flint 2, and we carry each year, a certain amount of money. We aren't responsible for the actual construction costs, but as part of the consolidation, we do have costs, so that is several million dollars a year.

The plan is that, of course, as that building goes forward, if we get a contract, we have budgeted each year. In past years, we have had some of that money as carry-over.

MR. SIESS: Non-discretionary, you said, includes

salaries?

MR. TAYLOR: Yes.

MR. SIESS: Why is that non-discretionary? You asked for 25 more FTEs this year.

MR. TAYLOR: 45.

MR. SIESS: Well, that was discretionary to ask for 45; wasn't it?

MR. TAYLOR: Yes, it was, and that is part of the buildup that we plan. There are a number of places that staff will go, but part of it is to reconstitute some of the losses in NRR.

MR. SIESS: But the point is, it is discretionary. If they cut your $475 million by $25 million, you can take some of that out of the FTEs.

MR. TAYLOR: I could, right. Now, that's exactly right. Every FTE costs us something.

MR. SIESS: I'll be more specific. Somebody once raised this question; why can't we fire 86 resident inspectors and take that money and use it for research?

MR. TAYLOR: You could do it, sure. It's a choice and it is a choice not only between the staff, but also the Commission. The Commission has backed what we call an N+1 program. Are you familiar with that?

MR. SIESS: Yes.

MR. TAYLOR: A number of units plus one, so a three

unit site would have four residents; a two unit site would have three.

MR. SIESS: At what point do some of these decisions -- let's put it this way: a decision on personnel versus research funds; at what point does the Commission see those decisions?

MR. TAYLOR: They see that in the staff submission of the budget to the Commission.

MR. SIESS: One issue that the Committee or some members of the Committee expressed a concern about is; as the budget decreases, the decreases in the research program support have been disproportionate and consistently disproportionate.

MR. TAYLOR: I could give you -- part of the issue is -- you are right, any increase of FTE there shows up as non-discretionary because we have no choice. We have to pay those salaries. But you can reduce FTE.

Usually we do that without what we call a reduction in force. We do both attrition and reassignment as far as possible within the agency. If you shrink a government agency by very much, you have a problem. It's not easy.

MR. SIESS: That's what I was going to ask. When we get the next slide where we show a very significant reduction in real dollars; has there been a corresponding reduction in FTEs?

MR. TAYLOR: No. I can get you those numbers, but

through they years, we haven't grown very much. We did shrink several years ago in FTEs as a result of really pressure on the fact that the license application really reduced, and I can give you all those numbers. I didn't bring them with me. If it's of interest to the Committee, I'll get those. I can give that to you and you can see it.

Your point is right, but once you have the people, you end up paying them.

MR. SIESS: As you pointed out, I think most government agencies don't reduce the number of people.

MR. TAYLOR: Well, you can't do that very rapidly. The various criteria for reducing numbers --

MR. SIESS: You can't fire people.

MR. TAYLOR: It's difficult. We have on occasion, but it's difficult.

MR. SHERON: What is the attrition rate?

MR. TAYLOR: The attrition rate is quite low right now. I'll check this number with Paul, but the number is about five percent. It's been higher, but right now it's quite low. Comparatively across the government, we're quite low.

I was talking about this sort of pie and the money that is non-discretionary falls into basically several other bins; about $62 million for NRR, NMSS, AEOD and major programs support monies; about $94 for the Office of Research and about 7 percent for other programs within the agency which stretch

across numbers of offices.

This, though, is intended to continue to emphasize that a good part of our budget is non-discretionary. That can be whittled at, but not reduced drastically; otherwise, we won't have our basic support.

MR. WARD: That's not quite right, it seems to me. You know, I acknowledge the difficulty of reducing force, but certainly as a long term vision for the agency, you, the Commission and the management of the agency seem to have made the explicit decision -- well, I don't know how explicit it is, but they seem to have made the decision of reducing the efforts on research and devoting resources to inspections.

Now, that -- forgive me, but it's a little bit of a red herring to talk about the confrontation with OMB. I agree that's very difficult and beyond my paygrade to comprehend all the difficulties involved, but still, the Commission is making a decision to split the overall pie the way it's being split.

MR. TAYLOR: You're right; that is right.

MR. WARD: I think that's what we're interested in.

MR. TAYLOR: You could say we should have the inspection force and the force dedicated to inspection in the NRC. You get a lot of arguments about that.

MR. WARD: I don't know whether that's the right thing to do, but you've made the decision that it's not the right thing to do.

MR. TAYLOR: That's basically right. The current FTE increase, as I mentioned, is planning for a buildup of special review groups for license extension. That's the number one thing for throwing people in support into the evolutionary reactor review as an example.

But you're correct; we could say, reduce activities int this specific area. I can tell you that there's been expansion in NMSS because the Commission and staff feel that there were many areas in that office -- I'll stay out of the waste areas -- but basically in materials applications that cried for attention.

There is a lot of discussion about tnat right now, including work at hospitals and inspections. That's a very strong subject with a number of the Commissioners. They feel that this areas, in earlier years, had not gotten the attention it deserved.

As a result, some of the FTE increase in that $45 is going to the office of NMSS.

MR. WARD: All right.

MR. TAYLOR: So it is not just reactor, and you should recognize that, LSS, the Licensing Support System for the waste repository -- so there are bits and pieces about where FTE go, but the Commission and I both have control on that number.

[Slide.]

MR. TAYLOR: I would now like to say that Dr. Siess was ahead of me. One of the things one has to recognize is where are we in terms of the inflationary effects that we all live with day by day, and we use this next slide in many of our arguments about our total budget, not just the segments of the budget about the NRC. And, you can see that -- and this chart has been checked numbers of times, but by basically 1975 dollars, this agency has not grown a great deal, even though the budget numbers, of course, continue to go up, and money just doesn't go, as far as it use to, which is an obvious situation.

I wanted to next go on to the Research budget itself --

MR. SIESS: But Jim, if I look at that slide, you're operating now with 50 percent of the dollars, and if you get the same number of people all of that cut -- that means that the reduction in technical support funds and dollars for outside research have been cut tremendously.

MR. TAYLOR: That's right.

MR. SIESS: Because you've got the same number of people with half the number of '75 dollars.

MR. TAYLOR: You're looking at the proportions. You're looking at the proportions. That comes out in the next slide, which shows the --

[Slide.]

MR. TAYLOR: I think I should point out that you all know that the Resident Program did not exist back in 1980. It was just beginning. It was in its early stages. I think it got started just before TMI, but really took off after TMI. In light of our field growth in terms of people took place in those years. As you mentioned, inspection, but here is the net effect in dollars for where we are in the Research budget.

MR. KERR: You mentioned the field growth. That was a accompanied by some decrease in the people that were doing licensing reviews. I have no idea how the two compare. Is the number of residence inspectors larger than the cut you've had in people that do licensing reviews?

MR. TAYLOR: I have to get those numbers for you. We will.

MR. KERR: I don't -- I thought maybe there was some sort of feel for it.

MR. TAYLOR: You're right. The shift of people as the licensing reviews drop, NRR dropped in size --

MR. KERR: Yes.

MR. TAYLOR: -- and there was a commensurate -- it wasn't exactly equal. We weren't trying to do it that way. It was where the growth was needed, we directed that to the field. So there was a growth in the field.

MR. KERR: Okay.

MR. TAYLOR: And I mentioned specifically the

Resident Program.

MR. SIESS: Jim, I look at that chart of numbers you've got up there and they are misleading because '80 was not the peak year. The peak year was '82 with $203 million, of course of which $43 million was LOFT.

MR. TAYLOR: Right.

MR. SIESS: Let's face it. I, some time ago, plotted '82 through' 87, if you can see that plot. Extrapolated, I hit zero in '91. Now, fortunately we leveled out somewhere in there.

MR. TAYLOR: Yes, we did.

MR. SIESS: And now we're -- I'm not quite sure where we are, but I think we're on a new slope heading down again. But, see, '82 was $203 million, and now if you start with 203 and work down, there is a tremendous drop until you get down to that '89 level, and that's where it stops going down.

MR. TAYLOR: That's where it's levelled out. Yes, we've levelled.

MR. SIESS: Eighty-eight/'89.

MR. TAYLOR: That's exactly right.

MR. SIESS: And I looked at this trend about 3 years ago and tried to figure where it was going.

Let me put a strange question to you, and you can skip it now if you want to. But suppose tomorrow somebody, the President or OMB backed by the President, or vice versa, cut

your budget $100 million. What would the strategy of NRC be? Where would Research come out there verses people?

MR. TAYLOR: Well, I --

MR. SIESS: I mean, you know, that sounds horrible but that's what happened.

MR. TAYLOR: If we went down to $375 million --

MR. SIESS: Yes, but, you see, I say $100 million -- that's a big cut.

MR. TAYLOR: That is a big cut.

MR. SIESS: But when I look at the previous slide, it's just what happened over a period of time.

MR. TAYLOR: If they did that on the Hill now, I would predict the $94 million in research would be cut at least 50 percent, wouldn't you, Eric?.

MR. SIESS: And you'd find another place for the other $47.

MR. TAYLOR: I'd have to try.

MR. SIESS: But you see, this is what's been happening over a period of time.

MR. TAYLOR: You're going to hear from the Director of NRR, who is a strong proponent for continuing the Research program. When this last cut came we tried to -- each office, it was my direction -- I didn't want to hear it. I wanted the cut pretty well proportionally taken across the offices. Of course, proportionally meant NRR programs got cut some, NMSS

programs got cut, but the proportion ends up being a cut in research, and the actual value runs up much higher.

If we got a $100 million cut, I think we'd be in terrible shape, because the part that you've been talking about, which is the non-discretionary, is not easily shrunk. I can't -- I've got leases; I've got -- our telephone costs are phenomenal. Those are bills that have to be paid. So I tell you, that part of the budget is very, very difficult to compress in any fast way without putting part of us out of business.

MR. SIESS: But, Jim, if I look at this plot, you had a $100 million cut, except it wasn't in 1 year.

MR. TAYLOR: Right.

MR. SIESS: And the things you did about it were done gradually, --

MR. TAYLOR: Yes.

MR. SIESS: -- but, in effect, it's the same thing you say you'd do if it was done tomorrow: take about half of it out of Research and squeeze the rest of it out of somebody else, which is what has been going on for the past few years.

MR. TAYLOR: I agree with you.

MR. SIESS: Okay. I was just trying to dramatize it by doing it --

MR. TAYLOR: Yes, you dramatized it.

MR. SIESS: It's no less painful for having done it

over a 10-year period, I think. It's like cutting all your fingers off one by one.

MR. TAYLOR: This is really forced, and it's been -- it's gotten us down in the research area to bare bones. And it hasn't -- I know you're going to hear from Murray. As we have struggled through these exercises of adjusting the budget, he's tried to reach across, and, of course, I think has done a good job. His staff was trying to really keep the bones in the place.

MR. SIESS: Does OMB look at the breakdowns or just look at the total?

MR. TAYLOR: They get talked to, and I think they look at it. How well they understand it -- we've asked their examiner to go out a couple of trips by the summer. I hope she gets to Sandia. I think that's planned. We'd like her to get out and see some of the stuff that goes on out there, and many of you have been out there.

MR. KERR: I hope that's not a mistake. There's another facet of this reduction, and it hasn't been mentioned, but it seems to me it's important. That is, I think we're talking about the budget for the Office of Research rather than the research budget.

MR. TAYLOR: Right.

MR. KERR: And a significant amount of activity has been moved into that office that isn't research.

MR. TAYLOR: Yes.

MR. KERR: It certainly needs to work closely with research, but it isn't supportive research. So that the cut in actual research support has been greater than the cut in the office with the budget of research.

MR. TAYLOR: Because there are standards, so-called standards that have to go on. In fact, we --

MR. KERR: I am simply pointing out the choices that have been made, and the choice that has been made is cut research support even more than these budget figures show.

MR. TAYLOR: Right.

MR. SIESS: I think we have some figures that show the so-called standards, generic items effort. It has either been holding constant or going up. It's in one of these sheets.

MR. TAYLOR: Yes. I think it's there. I don't have that in front of me.

MR. SIESS: Of course, the amount that's in there is -- Eric sent us some stuff, and it's about 20 percent of the technical support dollars are in the non-research area.

MR. TAYLOR: Both from a managerial and funding standpoint, that's an area that is not going to diminish. It's the lifeblood of a lot of the decisions in the regulatory process that we have ahead of us; as an example, in license renewal, where there is a great deal of effort and attention,

as you know, and I believe you have a Subcommittee that will be working on it, and I hope you can help us a lot on that subject.

MR. SIESS: It's just a little hard for us to figure, sometimes, why it has to be in the Office of Research.

MR. TAYLOR: I understand.

Eric has done -- and the staff have, I think, as -- and I have gotten deeper into these programs just in the last year and a half or so, when Vic assigned me to spend more time with this office. I have to credit -- I've tried to help the office, both in getting the user office support, getting the focus of their programs, and I believe that the staff that you have here from the office has done a very fine job, in the face of this issue, of trying to continue the bones, and I think they are at the bones, to support the decision process for the agency.

MR. KERR: What is that all saying about rape being -- what to do when rape is inevitable?

MR. TAYLOR: Well, that's what one -- one learns to accommodate, I suppose, and to a degree, that's been the role. It hurts. In fact, Eric and I -- because of that diminishing, you do lose people. We lose experts. We'd like to keep the broad spectrum. People do retire and leave, and we lose expertise, and I'm hoping -- that bothers me a lot. We've talked about -- one of the things that -- trying to do is to

look at -- I have a certain -- I have responsibility to control the agency FTE, and I have a little bit of leverage in that amount, but it's not much.

If I go over, I not only affect the budget, I catch it on controlling agency size. People outside watch that. But we do -- depending on time of hiring, you have a certain factor that you can play with, and one of the things that Eric and I just began discussing was that if I have -- we did have some FTE cuts in the past couple of years, and we've come down some. Now, if Congress acts on this '91 request, and if they don't cut our budget drastically, we will have an increase in FTE.

I am hoping to be able -- I actually controlled all hiring this year, in my office level, all the basic hiring decisions, because we're in very tight FTE bind. We're a little bit better shape right now, but if we do get these FTE increases, to get to my point, I hope that we can begin some recruiting in a small way, at the entry level, at some of the more prestigious universities, to try to entice some entries into our Office of Research. That's something I'd like to see.

MR. KERR: The other thing, of course, and I'm sure you're aware of this: If the appearance is that the Office of Research is the one that always gets cut, this is going to affect your ability to recruit good people.

MR. TAYLOR: Right. If we don't keep a good program going, they're not going to be interested.

Well, needless to say, the contributions in aging, the future, and advanced reactor concepts, the issues that face us in high-level waste disposal, the IPE program and the part that research plays in that, assessing the operational issues as they may be generic issues will be a continuing job, and the human factors, other severe-accident research, are all very basic and, I think, absolutely vital to continue.

As we proceed in the budget treatment, I intend to do my best to keep research at least at a breathing level. If we were to get drastic cuts, we would look across the board, but again, some of the reductions cannot be taken very fast.

I appreciate what the ACRS and this group are doing, because I think your advice and counsel to the Commission and, of course, to the staff is important, but also your position with regard to this situation, where many of you have had broad experience, is particularly important to us, and if out of a result of the discussions, you can help us to make a stronger argument, I'd be most appreciative.

That concludes the remarks that I had. I appreciate your asking me to come down.

MR. SIESS: I don't know why I have so much trouble getting numbers together, but I have got something that shows that there was an increase in the research budget between '88 and '89. Is that right, Harry?

MR. TAYLOR: That's correct.

MR. SIESS: That's the first time there has been an increase since --

MR. TAYLOR: That's the first increase.

MR. SIESS: Now, are you projecting an increase for '90 and '91?

MR. TAYLOR: For '90, our budget -- the Gramm-Rudman effect came in. Our budget was subjected to the Gramm-Rudman imposition, and then there was a reconciliation of the budget. The total funds -- I think we came in at $445 million. The actual available money is a little bit more, because we have some carryover, but in '90, approximately $88 million was a drop, but we're back up again this year to try to regain.

What I think Eric did is he had to tighten up and extend work, I think is the basic tactic in fiscal year '90. We reduced the pace of some of the projects.

MR. CATTON: So, you are allowed to carry money over.

MR. TAYLOR: Yes, some.

MR. CATTON: That's a new concept to me.

MR. TAYLOR: As long as you account for it. Scroggins is the fellow that goes to jail if we don't do it right. Each year there is an amount. That has to be reconciled, and in fact, the current submission of this green book to the Congress recognizes the adjustment. We ended up with -- between the Gramm-Rudman and other adjustments, with the number slightly different from 445, but that's after the

budget is approved that we make all those reconciliations.

MR. BECKJORD: We can carry over money that we haven't spent -- not in all accounts, but in most accounts. There are a few where there are some other restrictions.

MR. CATTON: New concept today.

MR. SIESS: Any other questions for Mr. Taylor?

MR. KERR: I don't know whether you have dealt with the hypothetical question of how low you would go before you'd decide you didn't have a viable program, and I'm not sure it's worth dealing with, but my guess, from what I'm seeing, is that is must be about where we now are.

MR. TAYLOR: Yes. I have to watch how I say where do I give up, because some people would like to see you actually move to that, fiscally.

Eric, I think we're at the bones. Would you say that?

MR. BECKJORD: My answer to that would be: Last fall, we wound up with $88 million. We were looking at a cut that could have taken us to $72 million, and then just overnight, that disappeared. I think we would have gone over the edge at $72 million, because in fact -- some of the reasons have been touched on already by Jim.

If you have to cut back expenditures, you can't just do it by dropping work. There are costs to be paid, severance and that type of thing, so that if we had gone to a level of

$72 million, the result of that would have been the following: About $12 million, which is for the problem resolution, the generic issues, and that type of thing -- that, again, probably would not have been touched very much, not affected, so that what would have remained for research would have been on the order of $60 million, and of that money, we would have been into drastic cuts, and there would have been additional -- I mean there would be money that we would have to pay which wouldn't produce anything in the way of research results. So, we would have been down to a level of somewhere between $50 million and $55 million.

MR. SIESS: That's still a lot of money.

MR. BECKJORD: Yes, it's still a lot of money, but --

MR. SIESS: And you know, this cost of getting out, we heard that on LOFT, but eventually, we did get out of LOFT, and we're very fortunate we did, because if we had LOFT still operating at $43 million, when it was stopped, it would be $60 million to $70 million. You wouldn't have any money for research.

MR. BECKJORD: No, but I don't think -- I mean I think the main results were accomplished, and it was appropriate to cut that effort out.

MR. SIESS: We heard a lot of arguments to the contrary. It was a real effort to stop LOFT.

MR. BECKJORD: Well, there comes a time when the

important results have been gained in any project. I mean we look, year to year, at what the cost of additional work is and what the value of additional results would be, and there comes a time to cut efforts back.

MR. SIESS: We had an awful lot of arguments about LOFT.

MR. BECKJORD: Well, I know, but I look back, and I wasn't personally involved in that, but to me, it was certainly the right decision.

MR. SIESS: Oh, yes. A lot of us thought so, but it took 3 or 4 years to get it done. I suspect there are some things now that might be in the same category. It'd be awful hard to convince somebody, but 10 years from now, it would be obvious.

MR. BECKJORD: The scale is much smaller. The two big pieces are reactor pressure vessel research, severe accident research. And I don't think we are at the comparable stage in either of those areas, relative to where LOFT was.

MR. CARROLL: You are describing those in the context of severance costs?

MR. BECKJORD: No, the scope. The scope.

MR. SIESS: But LOFT amounted to about 20 percent of the budget. And there are other things that amount to 20. But you mentioned the whole area. Reactor pressure vessel is several areas.

MR. BECKJORD: There is nothing in the budget now which is comparable to what LOFT was in the budget, because it was a big reactor experiment.

There are a lot of smaller programs. And we have made some significant changes. We're going to get into it later. But we've reduced, very significantly reduced thermohydraulics. And it is coming down to the level which was described in the plan, which we reviewed with you earlier last year. And that is an example, I think, of a program that's time had come.

MR. TAYLOR: We looked on that as responsible management.

MR. BECKJORD: But I don't think we are ready to do that in pressure vessels or severe accident research. That's my point.

MR. SIESS: But there is a difference in reducing the effort and reducing the results, or reducing the significance. Some things are more efficient or effective than others.

MR. BECKJORD: The point was made, yes, I agree, $50 million is still a lot of money. But relative to where we are, there is no escaping very drastic cuts in reduction or loss of experience, and the whole works. And a cut down to that level would no longer mean just delay. Since I've been here, we've been delaying projects. There is no way you could kid yourself that we would be delaying, you would just be shutting

it off.

MR. TAYLOR: No. I think you would shut down major areas.

MR. SIESS: Some of the delay hasn't worked, anyway, because the budget has been going down, down, down, and they never got caught up on it. Saying that things would be delayed was sort of a hope that you could get away with it. Sometimes you didn't.

Do you think you and NRR could agree on what to do with only $50 million?

MR. BECKJORD: Well, finally, I think we probably would agree there might be some pretty hard decisions.

MR. SIESS: If I asked you what you would cut to get down to 50 and I asked NRR what they would cut, on the first round you don't think there would be much agreement, or not complete agreement, anyway?

MR. BECKJORD: Well, that's a hypothetical question. Based on past experience, I would say there would be a lot of hard discussions. I don't think we would agree at first.

MR. SIESS: It's a hypothetical question as of this minute. But if I spread it over ten years, it isn't hypothetical. It is something that has already happened.

MR. BECKJORD: Tom Murley has been very supportive. I mean, I don't mean to imply, by my comment, that he hasn't been. He has been extremely supportive. And I think you are

going to hear that this afternoon.

MR. SIESS: Good.

Any other questions for Mr. Taylor?

[No response.]

MR. SIESS: Well, we appreciate your coming.

MR. TAYLOR: Thank you for asking us.

MR. SIESS: We appreciate your comments. Thank you. We will understand if you don't stick around.

How would you like a break, before we go to the next item? I think they would.

[Brief recess.]

MR. SIESS: The meeting will reconvene. We will now continue with the presentations from the Office of Nuclear Regulatory Research. Eric, you have the floor or the table.

MR. BECKJORD: Yes. Thank you, Mr. Chairman. If we can go to the first slide, please.

[Slide.]

MR. BECKJORD: This is just a recap of the budget trends, and it should be points, of course. Nineteen-eighty-six, it was about 109; 1987, right around 100; and '88 went down, too; '89; and then perspectively, up to 94 million in Fiscal '91. But, of course, I note that that's the number that's going to Congress, and ever since I've been here, there's been a substantial cut by the time Congress finally acted on it. So, unless something turns out to be different

this year, I would expect to see a substantial reduction from that in the final number.

MR. SIESS: Starting that in '85 makes it look a lot better.

MR. BECKJORD: Well, we started, really, from '85/'86. That's recent history. That's the history I can testify to. The dollars are shown from -- those are '75 reference dollars down below. I just point out that I've taken 1986 as the reference, and from there, the dollar -- what you can get for the dollar has gone down 15 percent between -- or will have gone down 15 percent from Fiscal '86 to Fiscal '91. So I just -- the reference here from '75 shows a much bigger drop. We really should be showing the entire history back to '75, but I think you've already covered that, and you have it in the slide that Mr. Taylor showed.

If I could go to the next, please.

[Slide.]

MR. BECKJORD: Funding the FTEs, I think, are in a later slide, but I'll tell you, across that same time span -- '85 to '90 -- the FTEs have also reduced significantly.

Fiscal 1985, to make a comparison of oranges and oranges, because there was a major change in the organization in --

MR. KERR: I want the record to show that this subcommittee does not object to comparing apples and oranges.

[Laughter.]

MR. BECKJORD: I see. Well, I prefer to compare like things. In order to make a true comparison, it's necessary to include the division in NRR that was then under Dr. Speis, the Division of Safety Review and Oversight, which moved to Research in the Spring of 1987, midway through Fiscal Year of 1987, including Dr. Sheron and 30 or 35 people.

MR. SIESS: Eric, let me interrupt. Since '75 is a base figure on there for whatever it's worth, I've got data going back to '75. I know you can see it, but in 1975, the total research budget was about $65 million in 1975 dollars, which included, it looks from this plot, about $4 million for standards work, and $22 million for LOFT. Now, if I took LOFT and standards out, I had a little under $40 million in 1975 dollars.

MR. BECKJORD: That's just about where we would be in '91.

MR. SIESS: Yes.

MR. BECKJORD: In '75 dollars.

MR. SIESS: But you see, that's a lot more dramatic.

MR. BECKJORD: Yes.

MR. SHAO: But the research budget really went up from '75 to '80.

MR. SIESS: In '81, '82 --

MR. BECKJORD: It peaked in '81.

MR. SIESS: -- the budget in '82 was $203 million, of which $43 million was LOFT, and how much was standards was still negligible. That didn't jump until you put generic issues in in '87, you know, that other component. The standards work was always small in terms of dollars. In '81/'82, not counting LOFT, you had $160 million.

MR. BECKJORD: Yes. That's probably the better comparison to make, is to take the cost of running the reactor out.

MR. SIESS: Yes. And then you take that and start going down.

MR. BECKJORD: Yes.

MR. SIESS: That's the curve I extrapolated to zero in '91. That's how fast it was going.

MR. BECKJORD: Yes. Well, let me come back to that. Just to finish on the FTEs, the FTEs that were involved in the functions that are now underway in the Office of Research in Fiscal 1985 were about -- they were between 300 and 335, and the allowance now, the total that we have, is 238 plus one.

[Slide.]

MR. BECKJORD: That's 239 compared to something between 330 and 335. So there's been a significant reduction in personnel.

MR. SIESS: The one figure we've looked at at one time was essentially a million dollars per man is what dollar

value of research one man was managing on the average.

MR. BECKJORD: Most of the greater part of the research is in the two divisions: Division of Engineering and Division of Systems Research. So we really should be looking at those two divisions to --

MR. SIESS: Well, if I look at that, I've got 78 people --

MR. BECKJORD: It would be less than a million on that basis.

MR. SIESS: Yes. I don't know what -- Paul Shewman and I got into an argument once because he worked at NSF, and he thought at NSF they could have handled a lot more dollars per man.

MR. BECKJORD: If I break it down further in the reactor vessel area, that's a small group. I think the money there per person would be over --

MR. SHAO: Over $3 million.

MR. BECKJORD: Yes.

MR. SIESS: They have managers. A lot depends on who your middle man is. Maybe one contractor at Sandi is letting them do all the subcontracting. One person can handle a lot more.

MR. BECKJORD: That's right. That's right. So it varies quite a lot. And the places where -- probably the other extreme is in the human factors work, which is managed in Brian

Sheron's division, and there are quite a number of small contractors and universities there involved. So those amounts that per person manage would be much smaller there, and it's a different kind of thing; it's software and thinking, and not any laboratory expense, anyway.

Well, I was going to just comment --

MR. CARROLL: What accounts, Eric, for the reduction you just described, the 335 and 239? Where did those people go?

MR. BECKJORD: Most of them have retired by attrition. If you have --

MR. CARROLL: But I mean what work were they doing that isn't being done today?

MR. BECKJORD: It is hard for me to speak to that because this happened right after I came, and I was given these numbers and given the reorganization plan. You can speak to the safety issue, you or Warren.

MR. SHAO: Maybe I can say something. Many years ago, there were two offices, one was the Office of Research and Office of Standards, and then these two offices combined. Somehow, a lot of functions were merged together. So a lot of functions require less people.

Before 1980, there was Office of Research and Office of Standards. When they combined, somehow maybe some people are handling the research and standard together rather than

just doing research alone or working on standard alone.

MR. CARROLL: So you're saying the workload hasn't appreciably changed, but you're doing it more efficiently?

MR. SHAO: More efficiently.

MR. BECKJORD: I think I can speak for the Office as a whole. Everyone --

MR. KERR: I find that explanation of Mr. Shao somewhat oversimplified. I think you meant it to be oversimplified.

MR. SHAO: Oh, yes. I meant it to be oversimplified, I'm pretty sure.

MR. BECKJORD: I think the office is hardpressed now. We are, we have been able to pick up a couple of people in several critical areas in research. And as Jim Taylor said, he told me the other day that we had the possibility of being able to get an increase, small increase, in FTE, which would be very helpful, because some of these groups are running very thin, and it is a very thin line.

And in the rules and regulations area, under Dr. Morris, he has a nice bar chart, which shows the change, the annual change in the requests for revisions of rules, new rules and revisions of old rules. And it is up about a third in three years. And we just can't handle it. We are, what we are working on in that area now is the things that, the rules and the changes, things like license renewal, that the Commission

has put very high priority on. And it isn't a buyer's market now. It was three or four years ago, somebody could come in and ask for a rule change and there were people to go to work on it. And now there just isn't. So there are things that are being deferred on a year-to-year basis for that reason in that area.

MR. KERR: Eric, I thought Mr. Taylor said that he hoped to bring in some people at the entry level in research. And I don't know whether that means fresh Ph.Ds or not. But if it does, it seems to me you are not going to strengthen your research management a great deal with fresh Ph.Ds. I mean, maybe that is the only choice with the power structure you have, you bring them in and let them stick around a while.

MR. BECKJORD: I think our greatest need is to bring some new young blood into the organization, because if you look, the population is aging. The average age now for professionals in the agency is over 50. It is about 54, I think.

MR. KERR: But you can still bring in people who are 35 years old.

MR. BECKJORD: Yes. I guess 35 gets younger every year, from my perspective.

MR. SIESS: But for research management, it seems to me you want wisdom. These aren't people doing research. They are managing research. They are the people that should know

what the questions are and how to ask questions and how to answer questions. And that is different from the guy out there doing it. You want the brilliant, bold youthful person out there doing the research that's got new ideas on how to get answers. But he is not necessarily the best guy to decide what questions need to be answered.

MR. KERR: Mr. Sheron is distressed by this.

MR. SHERON: I would just point out that it is, when I have talked to students about possibly working for the Government. And what I find out is we can't compete with the salaries, either. To ask someone to come and work in the Washington, D.C. area, with the housing prices the way they are, versus, say, in a laboratory, like Idaho, or something, where you can probably live a lot better on the same kind of salary --

MR. CARROLL: But they pay them competitively, too, at Idaho.

MR. SHERON: Yes. And so that is one of the big difficulties I have experienced. I have been to some universities and actually talked to the deans, the professors, about if they had any students that might be interested, and I kind of get shrugged shoulders, because most of them are getting offers for salaries that are substantially higher starting.

MR. KERR: What is your entry-level salary, roughly?

MR. SHERON: For a Ph.D., I believe, it's at a GS-12, with no experience. The highest we can bring someone in from the outside is at a 14 level.

MR. KERR: I don't know what salaries are associated with the levels.

MR. SHERON: 14 I think is $45,000.00. 12, entry-level 12 is around probably what, $30,000.00?

MR. KERR: I don't believe many fresh Ph.Ds are getting 48K.

MR. SHERON: It would be at a 12 level for an entry Ph.D.

MR. KERR: And that would be about 30? They're getting more than that.

MR. SIESS: If you want those people, you let Idaho hire them and you pay for them. That's what we've been doing for years. That's why we use the National Lab so much, because they can go out and hire the people we can't.

MR. SHERON: But I would also point out that I think, with no disrespect, I think one of the things this committee had commented many times about research was that you encouraged strong leadership in management from the Office of Research, and not to have the laboratories dictating to us.

MR. SIESS: Right. I agree with you.

MR. SHERON: And that has been the problem. If the laboratories have the strong technical people, because they

have the salary structures that can hire them --

MR. SIESS: But what I guess isn't clear tome is how many of those wise, strong managers you need per $1 million of research. I'm not sure you need one wise manager for every million. It may be every 10 or 15 million.

MR. KERR: You certainly need some.

MR. SIESS: You need some. You need people like Brian.

MR. KERR: I think, as Eric was pointing out, the attrition has been such that a lot of the people who formerly had this background have left.

MR. SIESS: Yes.

MR. BECKJORD: Just to put this in perspective, the numbers, what Jim Taylor was talking about was a few. I mean, maybe this year I could get two slots or something like that. And my feeling is that we would go for professionals who are close to the beginning of their career than midway or at the very senior level.

For reasons that have already been touched on, it is very difficult to bring anybody to Washington. I've covered that with you. Salary, by the way, was not the only reason. There were maybe four or five major reasons for not being able to bring people. Salary was certainly an important consideration, but by no means the only one.

I think that if the President approves the pay raise

next year, then at the senior level, there will have been a substantial change, and the salaries will be much more attractive than they are now, if the pay raise is approved.

Let's see. I'll just get back briefly to the thrust of the programs here. They are listed. Severe accident policy, including the completion of the individual plant examination and the containment performance improvement program. We have reviewed, I think, both of those with you. I probably don't have to say much more about it.

On the containment performance, the main thing of course that we reviewed with you is the Mark-I recommendations and as you are aware, the Commission decided that it would be most appropriate to complete the containment performance program as part of the individual plant examination. And so that is what we're doing.

License renewal, that is the very top of the Commission's list of priorities. We are working on the rule development on the one hand. That is under Mr. Minners. And we are working on the aging research under Mr. Shao on the other hand.

We are going to go into those numbers a little in more detail. The aging research has been growing. In Fiscal '91 as shown it is about close to $7.5 million. It has been going up every year slowly. Not up as much as we would like. But it has been going up.

That program will be peaking over the next few years, if we get the funding that is needed for it. And I think that the major part of it, we will have been over the hump of the major part in about five years time.

MR. MICHELSON: Eric, when you talk about aging research, do you mean the research required to support the plant license extension work? Or is it something, is there more than just aging involved in the plant life extension?

MR. BECKJORD: It is the research part that is related to the identification of aging mechanisms to working on methods of inspection and surveillance, methods of extrapolating what residual life might be forward for. There is a whole list. There is a list of more than 20 systems.

MR. MICHELSON: But that is what you are calling aging?

MR. BECKJORD: That's the aging, right. The license extension rule is another matter.

MR. MICHELSON: Not the rule, although you are doing some work on the rule also.

MR. SHAO: The aging research supports license renewal, and also supports opening reactors before 40 years. So it is for problems before 40 years and after 40 years.

MR. MICHELSON: Okay.

MR. BECKJORD: But it is the technical base for both those.

MR. SIESS: Is the aging research aimed at asking questions or answering questions or some combination of the two?

MR. SHAO: Both, I think.

MR. BECKJORD: I think it's primarily at asking questions, determining, identifying and characterizing.

MR. SHAO: Identity all the aging mechanisms, what kind of issue they can have and how do we resolve these aging issues; so, asking questions and answering some questions.

MR. SIESS: Are you answering the same questions you ask, or are you going to leave it up to the industry to answer some of the questions?

MR. BECKJORD: Well, the industry is -- the basic effort is being done on that now. The utilities, with NUMARC coordinating them, are in the process of preparing a bunch of technical documents. There are ten technical documents, including a document on screening which they're preparing.

We could talk about that, if you wish, but they relate to -- on the two reactor types, the pressure vessel, the internals, the primary pressure boundary of the two systems, the -- let's see, what else? Class one containment and cables in containment which are common to both. I've left a couple out.

MR. SHAO: Mostly they have 10 topical report covering the primary pressure boundaries, reactor internals,

containments and some electrical cables, both for BWRs and PWRs.

MR. BECKJORD: They're going to tell us what they think is the situation and we're going to be reviewing that, and it's too soon to know how close or how far apart we will be on that. There have been generally, I think, discussions on the technical.

MR. SHAO: We're meeting sometime tomorrow with NUMARC on this technical report for license renewal.

MR. MICHELSON: Let me ask one more question. Where is the lead organization in the agency for license extension?

MR. SHAO: In Research.

MR. MICHELSON: Is Research the lead now?

MR. SHAO: Yes. The division is that we're doing the rule. We're doing the research on license extension. We are both working on the -- we will both be working on the review of the documents. NRR will have the lead on the review of the documents and we'll be supporting them on that.

When the applications come in, NRR will be reviewing the individual applications.

MR. MICHELSON: Who in Research is the pinpoint for this activity? In other words, who do we contact?

MR. SHAO: Warren Minners.

MR. MICHELSON: We are forming a subcommittee for plant license renewal, and he's the man to contact?

MR. SHAO: On license renewal; that's right.

MR. MICHELSON: Okay, thank you. We're doing the research --

MR. BECKJORD: On the aging research, it's Larry Shao.

MR. SHAO: I'm doing the aging research. Warren Minners is in charge of rules and overall coordination. We are thinking of forming a special branch to review other license renewal.

MR. MICHELSON: You haven't formed that yet.

MR. SHAO: We are going to form a special branch to review license renewal submittals.

MR. MICHELSON: When will that happen?

MR. SHAO: In the next few months, I hope.

MR. MICHELSON: Right now, we work with you?

MR. SHAO: Right.

MR. BECKJORD: That branch is going to be --

MR. SHAO: NRR, I said, NRR.

MR. MICHELSON: NRR is going to have it. Eventually, will that branch then be the branch in NRR that represents your customer for Research?

MR. SHAO: Yes, but we'll be helping that branch to review a lot of technical reports and things like that.

MR. MICHELSON: They'll call the shots?

MR. SHAO: They will call the shots, but we'll

support them.

MR. MICHELSON: The ball will kind of pass on to NRR.

MR. SHAO: That's right; as the applications come in, they will really have the lead on that.

MR. MICHELSON: I think we've got the picture; thank you.

MR. BECKJORD: The severe accident research program, accident management, human factors, those three are very important activities. Severe accident work is ongoing. The accident management is something that we have emphasized in the last couple of years. It had start some years ago.

We really renewed that effort and redefined it and it's well underway now. Accident management is part of the individual plant examination program; that is to say, it's a requirement that each plant come up with the accident management strategy that's particular to that plant.

What we are doing on it is general; identifying the strategies for various situations and disseminating this information. Then the plants will take this into consideration in the course of their IPE.

MR. SIESS: You say that severe accident research is very important, but I find it interesting that there are a number of countries throughout the world that don't share that opinion with the NRC about the importance of severe accident research.

There are people that figure that they're down on low probability events and the residual risk range and they don't need to know all this stuff. Is this a luxury that we can afford? Is it a real technical difference of opinion or a philosophical difference? The Japanese just don't worry about severe accidents.

MR. BECKJORD: Well, let's look behind that a little bit. I'll tell you my own experience. Most of the contacts that I have on the severe accident work are through individuals like Birkhofer. We talked to the British about it, and then the meetings at the CSNI in part of the OECD NEA organization.

We also have contacts, extensive contacts with the Japanese. What you say is true on one level. I think if you talk with the people on the utilities side in Japan, that is clearly the message that comes across.

But when you talk with the people who are doing safety research -- and there are these two groups; the one on the MITI side which is MITI supports the NUPEC, you know, the power testing organization. Then on the scientific side, there are disagreements between those groups on philosophy and strategy and so forth.

In both of them, they're interested in our work on severe accidents, and in fact, even the NUPEC side is interested and has approached us about doing severe accident experiments in United States, and in particular, at Sandia.

There are a couple of things they want to do there.

MR. SIESS: They're interested in paying for them, you mean?

MR. BECKJORD: Yes, they want to -- on the hydrogen question, the very high temperature reactions of hydrogen, they want to do a big experiment. I don't know; how many meetings have you had with them since last summer?

MR. SHERON: Several.

MR. BECKJORD: Two meetings and they've got some money in their budget next year, and they want to roll with it. They want to start next year.

MR. SIESS: It's interesting; they thought of something we're not doing on severe accidents that they'd like to do; is that right?

MR. BECKJORD: We have a -- yes, they want to do more work in hydrogen, and if we can agree on the program, I think it's a good idea. It's an augmentation or our effort.

MR. SIESS: What about the French and the Germans?

MR. BECKJORD: Just to finish the Japanese, as you know, we've also been very interested in containment work, following the reinforced concrete containment model, six scale model at Sandia. We are cooperating with the British on their experiment, but as you know, the experiment that the CEGB built of a pre-stressed small scale vessel, did not include a liner inside, and --

MR. SIESS: That was an absolutely horrible test.

MR. SHAO: Yes.

MR. SIESS: I'll commend the NRC for trying to get them to do better, but we sure didn't exceed, and I hope we never put another penny into that thing. It was a waste of their money.

MR. BECKJORD: Considering what the alternatives were, I think we got the $200,000 that we put into it.

MR. SIESS: Oh, yes. I think we got our money's worth out of it, but I sure wouldn't encourage them to spend any.

MR. BECKJORD: Without getting into that in detail, the point is that the Japanese have in mind, MITI through NUPEC, of doing a scale-model test of a post-tension containment structure here in this country, probably at Sandia, and that's the other thing we were discussing.

So, what you say is true at one level, but when you look behind it, you find, in fact, (a) they're interested in what we're doing, and (b) they are willing to spend some other money on some other aspects that are related.

So, that's one side of it.

The Germans are intensely interested in severe-accident research. They're doing a fair amount on their own. We cooperate with them.

We are planning to do a molten-core experiment at

ISPRA through the European Community work. That's planning now. I think that's pretty well agreed, and we have the money to do it. So, I think that will proceed.

The French took us -- I think you are aware, because I think we have discussed this with you, of their PHEBUS experiment, and beginning -- well, beginning some years ago, they had discussions with us to get our interest in the PHEBUS project, and we have done -- we have reviewed it on several occasions.

They came back again a year or a year and a half ago with another proposal, which we reviewed and gave them comments, and they have, I would say, significantly modified the experiment in a number of ways, including improved instrumentation, including going further into the melting phase of the experiment, and that's as a result of the comments that we gave them, and we did participate with them in what they called Phase 1 of the experiment, which was we have and are providing them with a half a million dollars over a 2-year period of services out of the U.S. from our people and our labs, relating to the things that they need to complete the preparation for the experiment. Mostly, it's instrumentation and some computer work, some computer studies.

They want us to come into the second phase, and they came last fall, and the proposal that they put on the table that time was we will join your -- the proposal was like this:

We want to join your severe fuel damage program, which they stayed out of from the very beginning, 8 or 9 years. This is a very significant change, and they have -- they offered to come in at --

MR. SIESS: You said "severe fuel damage"?

MR. BECKJORD: It's called the "severe fuel damage". It's the international cooperation on our severe-accident research program. I called it "severe fuel damage", because that's, in fact, what the name of the program is.

MR. MICHELSON: Is that part of NEA, too?

MR. BECKJORD: No. That's ours, but there are foreign partners, and we have been getting between $3 million and $4 million a year to augment our program.

Up until now, they have refused to come in. They said we want to join your program. We'll put in a million dollars over -- half a million over 3 years.

MR. SIESS: How much are we putting into it? Eighteen million?

MR. BECKJORD: Yes. Well, let's see, we have -- it's in two parts. We'll get into those numbers.

At the same time, they said we want you to join PHEBUS, and it turned out they really linked the two proposals, that they will join our program if we will join theirs, and we have agreed, in principle, to join the PHEBUS. We haven't finally agreed on the money yet and the details. We're still

discussing that.

But I mention that because it's a very significant change in the attitude of the French, and I think it's a simple fact we can state, that they are very interested in the severe-accident research program, and I think they recognize that they have a great deal to learn and to gain from this association with us.

So, at the level of the ISPN, the Institute of Safety and Protection of the CEA, they are very interested in it.

I think, as time goes on, we are also going to have cooperation with them on the accident-management aspect. I think the French -- the Swedes and the French, from somewhat different viewpoints, kind of took the lead on accident management, and they put in some very practical procedures. I think we are moving beyond that, and I think as we make progress, I think they are going to be very interested in following it.

So, I think, in fact, they are interested in what's going on.

MR. KERR: Incidentally, is there something underway which might eliminate this artificial distinction of accident management for design-basis accidents and accident management for beyond-design-basis accidents?

MR. BECKJORD: I think so. Do you want to comment?

MR. SHERON: I'm not really sure what you mean by an

"artificial distinction". We have always used the term "emergency operating procedures" to refer to the guidance an operator has for managing within the design basis, or actually, even up, now, to inadequate core cooling.

Beyond this inadequate core cooling, where you actually get into core melting and so forth, that's the area we have returned to as "accident management". Actually, the real term is "severe accident" management.

MR. KERR: It's this artificial, to me, distinction to which I refer.

MR. SHERON: No, it's not, because we think that there is a logical transition. The operators --

MR. KERR: What do you mean by "a logical transition"? You're going to tell me what you mean.

MR. SHERON: Right now, operators have procedures to manage -- symptom-based procedures to handle events that occur. These procedures will provide them with guidance on trying to mitigate an event, up to the point of inadequate core cooling, where the core starts to really degrade. They don't carry the operator further into, for example, containment management or into the severe accident itself.

MR. CARROLL: I don't think I agree, necessarily.

MR. SHERON: Not in all plants, but --

MR. CARROLL: Certainly, the BWRs.

MR. SHERON: The BWRs, I agree, they have gone

further with their latest version, but mind you, that was not at any insistence of the NRC. Okay? After TMI, the TMI action plan only called for providing symptom-based procedures up to degraded core cooling.

MR. KERR: You're giving the history.

MR. SHERON: Now, what we expect utilities to do, and we've told them that, is that, as for accident management, beyond the EOPs, it is not necessarily required that the operators have procedures; that, in fact, the accident-management procedures, if you want to call them that, could, in fact, just be guidance notebooks that are kept in the technical-support center, and remembering that, for most severe accidents, it takes several hours before you get into a real core-damage state, the technical-support center would be staffed, and the --

MR. KERR: That's right, and indeed, previous experience would indicate that operators don't know when they're in a severe-damage state. They didn't, certainly, at TMI-2, and it's for this reason that it seems to me one ought to have a couple set of activities, procedures, whatever you want to require, which would assist, insofar as feasible, an operator whenever, and to have one set that takes care of design-basis accidents, which all recognize as being artificial and not necessarily representative of what may happen in a --

MR. SHERON: It doesn't take care of design basis. I

don't want to make that distinction.

MR. KERR: You just did.

MR. SHERON: When I say "design basis", these are events, basically, that do not lead to core melt, but they're not necessarily the stylized design-basis events. Okay?

The symptom-based procedures are designed to handle a complete spectrum of accidents.

MR. KERR: I think I understand, sort of, the existing system, and I think it is very artificial and ought to be changed. I am not convincing you, so I won't try to use this forum any further to convince you, but I am concerned, because I think it's extremely artificial.

It's as if one had two power plants, one of which was a design-basis power plant and one of which was a severe-accident power plant, and never the twain shall meet.

There is only one plant!

MR. CARROLL: I don't think I agree with you, Bill. I am familiar with both GE and Westinghouse EOPs and little bit of the other ones.

I don't think it's fair to characterize them as just dealing with design basis.

MR. KERR: I'm not talking about what GE and Westinghouse are doing. I'm talking about what the staff is doing.

MR. CARROLL: I think the staff is building on what

the existing ones are.

MR. SHERON: I'm not sure, when you say "what the staff" -- because I don't know what we're doing that is -- I mean we're not developing procedures.

MR. MINNERS: I don't think there is a distinction. We just had some people who went down to Chattanooga to do that. They went on the simulators, to see how far they could push the simulators into the multiple-failure and severe-accident areas, which is not very far. So, I don't think the staff is making an artificial distinction.

I think there are procedures now in place and there are simulators now in place for doing things up to and including inadequate core cooling, and beyond that, there isn't much direction. So, obviously, the staff is working on the part which needs to be worked on.

We have already done, mostly as part of TMI, procedures and guidance on the inadequate cooling part. So, what's left is what's being done, but we're not just ignoring what has gone before.

MR. KERR: I thought and we talked in the subcommittee yesterday. We talked both about station blackout and about hydrogen rule. The statement was, well that only goes up to design basis accidents. We haven't done anything about beyond design basis accidents or we're working on something, which would indicate to me that much of what has

been done on for example, resolution of unresolved safety issues has gone sort of up to the design basis accident stage, no further.

MR. MINNERS: Most of the committee and we have a difference of opinion about how to regulate the industry. I understand you would like to have an issue such as hydrogen completely taken care of.

MR. KERR: I'm not talking about regulating the industry. I'm talking about these programs that are responsible for operating a plant. It seems to me that's important too.

MR. MINNERS: That's when I say regulating -- that's all we can do is regulate the industry. We have no authority beyond that, okay? We are limited to sending out pieces of paper to the industry.

MR. KERR: You are not going to regulate the industry at all or give them any assistance in the severe accident area because that's outside the regulations; is that what I'm hearing?

MR. MINNERS: No, sir. That is not what I said. I said all that we can do is send out pieces of paper to the industry. We cannot go out there and run the plants for them. Okay, because of that situation --

MR. KERR: You apparently can do that up to the design basis accident.

MR. MINNERS: And we're doing it beyond the design basis accident.

MR. BECKJORD: I wonder if I could step in here a minute. I think if we're going to discuss this, we probably out to get a couple of people.

MR. KERR: I agree. I will say no more.

MR. BECKJORD: I think what I would characterize the work that we're doing is to develop a technical basis for accident management based on what we know now from the research program and what we are hoping to learn from it by reason of the experiments that we're going to do to deal with things like direct containment heating and it is our expectation that we are going to bring in and apply this knowledge and to develop improved accident management procedures but it's a very complex issue and there are -- it makes many people very nervous because obviously when you get into extreme situations, you contemplate extreme actions and some of these actions might violate procedures.

So it's a very difficult topic.

MR. KERR: It also seems to me that we heard a presentation not too long ago from Shotkin and his group that accident management was being defined to include prevention of core damage. I think that's the case.

MR. SHERON: Yes, it is. There are parts of it that are.

MR. KERR: So it's not just after core damage has occurred.

MR. SHERON: Please try to draw a distinction between accident management from the procedural or guidance standpoint versus accident management from the PRA insight standpoint and preventive measures that could be taken. What we're doing is --

MR. SIESS: What are those two distinctions? Do you want to go over that again?

MR. SHERON: One would be from the procedural aspect of dealing with the degraded core, okay, versus the accident management aspect of gaining insights from PRAs on ways that one can prevent or significantly mitigate a severe accident through prior actions.

MR. SIESS: One is thinking about it and the other's doing it?

MR. SHERON: No, no, no.

MR. SIESS: I don't get your distinction. Keep trying.

MR. SHERON: Let me give you an example. If one goes through a PRA or gets insights from a PRA that says that one can substantially reduce risk by -- their classic example is, for example, finding a way to put fire water into the steam generators through having hose bibs there and say a fire hose that's conveniently located and procedures in place so an

operator knows how to do it and what the steps are to hook that up. That's a way to prevent a severe accident because you can now get cooling to the core.

We define that as an accident management step or an accident management strategy, something that you learn that you can do that will help prevent your ever reaching a degraded core condition.

MR. SIESS: Why do you have to have a PRA to do this?

MR. SHERON: I'm just using it as an example. A PRA would be something that would uncover --

MR. SIESS: You might be smart enough to figure it out without a PRA like a lot of people do on the SEB program.

MR. SHERON: I apologize. I'm not trying to say that PRAs are the only thing but there are actions that we have learned from, vulnerabilities in plants that have been uncovered by PRAs for which the utilities themselves have identified these corrective actions. These were what we called these A strategies that we uncovered and we said, these are things that utilities have learned through doing PRAs and have made corrective actions in their plant because they thought it was a smart thing to do and all we're doing is we're assimilating, summarizing them and sending them out so everybody can have the benefit of that knowledge.

We're basically a clearinghouse for the industry in terms of PRAs. We're about the only place that I know that

knows what everyone has done in the way of a PRA.

MR. CARROLL: But to help Bill's problem, you would have no problem with a utility or an owner's group saying, hey, let's put into our EOPs this step of hooking up the fire water to the steam generators. That could be part of the --

MR. BECKJORD: We encourage that.

MR. CARROLL: At another level, beyond that, where you really get into never, never land, you may have what you call guidance notebooks or something like that that the smart guys in the tech support center would have access to that -- to invent other strategies as a real accident occurred and the operators ought to know that. They ought to know there's some smart guys back there thinking about things that go beyond the EOPs but the EOPs can't go on forever.

MR. SHERON: No, and as a matter of fact, we said a long time ago when we first got into this that it may be detrimental to clutter an operator's mind with a lot of procedure memorization and the like for dealing with an accident they most likely will never have to deal with at the detriment of being able to handle accidents they most likely will see.

What we've asked the industry to do and we've encouraged them is we've said, you tell us how you feel best you can manage severe accidents, whether it involves extending the EOPs, whether it involves a transition to a tech support

center staff and a support center director that gives guidance to the operators. The operators become a conduit. They tell the tech support center what's going on in the plant, what the conditions are. The tech support center assesses it, provides back guidance to the operators on what they should be doing and that's what we expect the industry to do, is to tell us how they think it can best be handled.

They know their operators best. We don't. They know best how the operators can respond and what the operators can do.

MR. SIESS: When they tell you, what do you do with that information?

MR. SHERON: I'm sorry?

MR. SIESS: When they tell you that, what do you do with the information? All you expect them to do is to tell you what they're going to do and then what do you do?

MR. SHERON: We want to understand the basis upon which they make their decision.

MR. SIESS: You don't have to approve it?

MR. SHERON: No, this is not -- again, the whole IPE is not a regulatory requirement. It's a 5054 letter, if you remember.

MR. SIESS: You want them to tell you so that you'll be smarter?

MR. SHERON: No, we want to be able to tell the

Commission that we think the industry has responsibly followed their guidance for conducting an IPE and putting in place an accident management program.

MR. SIESS: Now let me go back to another question on emergency operating procedures. Are they within the framework of tech specs? Can you go into emergency operating procedures without violating tech specs?

MR. SHERON: I believe there's a regulation that allows operators to violate tech specs in an emergency, yes.

MR. SIESS: I know that but that's not the question. Do the emergency operating procedures that are written out and in a book or in a flow chart stay within the tech spec limits or do they actually officially move out of tech specs?

MR. CARROLL: I can tell you one example that comes to mind very quickly and that is that the GE ones say open up the containment -- violate containment integrity.

MR. SIESS: That's an EOP?

MR. CARROLL: Yes.

MR. SIESS: So that does violate tech specs?

MR. CARROLL: Yeah. There's probably other examples where you would violate it too.

MR. SIESS: That's not the division between EOPs and the books over in the tech support center.

MR. SHARON: No, not at all.

MR. BECKJORD: Shall we go on?

MR. SIESS: All right.

MR. BECKJORD: There are a lot of interesting things that are going on in research, of which this is one.

MR. SIESS: Most of which should be explored by other subcommittees. It's a little hard once you get all these guys around the table.

MR. CARROLL: We get bored with head counts and dollars.

MR. BECKJORD: Let me move on. Human factors -- that program -- you've seen the program plan. I think it's moving very well. We had a meeting with our research review committee on that subject in November, a 2-day meeting in which we went through the entire program on human factors research with them and I was very pleased myself to see the progress that had been made since the development of the plan and the committee was very enthusiastic and gave a lot of encouragement.

I guess the one message that I got, as one man put it, you know, I think you guys are really ontc something here. I caution you to -- not to oversell it, he said. I think you need to get some reviews, peer review the work, validate it, but he said I sure think it looks interesting. So I am very hopeful about that.

MR. KERR: Eric, do you get written reports from that group?

MR. BECKJORD: Yes.

MR. KERR: Is there some way we could see those?

MR. BECKJORD: You get them.

MR. KERR: Oh, we do?

MR. BECKJORD: You see, the way they are operating, the subcommittees can't write a report.

MR. KERR: No, I'm not suggesting that we get reports that can't be written but only those that are. Apparently we already get them. I didn't realize that.

MR. BECKJORD: The report of the fall subcommittee meetings is not out yet. They're working on it and it goes to the entire committee and then when they approve it, there will probably be a letter coming out after -- there's a subcommittee meeting next week. Then there will be a report coming out on all of those, probably in March.

MR. KERR: Thank you.

MR. BECKJORD: The generic issues -- I'm going to ask -- I beg pardon?

MR. SIESS: Is that research?

MR. BECKJORD: No. I'm just giving you our agenda of major programs.

MR. SIESS: It says, major thrust of research programs. We've been spending a lot of time trying to separate out the research from the other stuff.

MR. BECKJORD: It's a Research Office program for which the research provides the technical base in many cases.

MR. SIESS: No more than at NRR?

MR. BECKJORD: That's true. Or shall I pass on? I'll pass on.

MR. SIESS: Yes, I would.

MR. WARD: Let me ask a question of the committee, your Research Oversight Committee. Does it pay attention to your non-research programs, or just strictly to the research programs?

MR. BECKJORD: They've had discussions on that at the meeting last May and at a couple of subcommittee meetings, and particular the one on severe accidents, where we had a long and hard discussion about the Mark I containment issue.

They decided that they would stay out of the regulatory issues and the rules, but they want to know the research that is feeding in in impacts these days.

MR. SIESS: That's true of anything.

MR. BECKJORD: They decided that given their time, the time that they had to spend, that it would be far more productive if they stayed with the research agenda, but they're interested in the application.

MR. WARD: Yes.

MR. BECKJORD: And at the meeting next week, which is a subcommittee meeting, I would say it's turning out to be almost a committee at the whole because most of the members are coming, and Chairman Carr will be there. They're going to

discuss -- it's a mix of things. Part of it will be a discussion between the committee and the chairman as to what their own agendas are and what their interests are.

Then we are going to review some specific research topics and results on a couple of programs, but I know that they're going to touch on this question of the regulatory issues, and I think they're going to give their position on it and discuss it with the chairman.

MR. WARD: Who is chairing that committee now? Todreas still?

MR. BECKJORD: Todreas is the chairman. He will be -- I believe that he will remain on the committee but step down. He feels that the chairmanship ought to turn over, and we're about to start the second year. So the terms on this committee are two-year terms.

What I want to achieve is kind of an equilibrium situation so that every year, we have a few, maybe three or four, people coming on so there will be continuity over time. So we've had three resignations for various reasons. There are two new people who have come on, and there's another that we're proposing now. So there will probably be a couple of changes coming the next annual meeting in May. There are twelve members total.

MR. SIESS: Two years? Only a two-year term for members?

MR. BECKJORD: My recommendation was three.

MR. SIESS: Yes.

MR. BECKJORD: The Commission changed it to two, but they did say that members could be reappointed.

MR. SIESS: Two years is hardly enough time to find out what's going on.

MR. BECKJORD: Well, that was the reason I recommended longer, but, anyway, it may -- with the freedom to reappoint people, I think that we will find quite a number will stay on for four years.

We are doing work. We got back into the health effects research. It's a small program, but I think it's a good program. Then we are doing waste management research. It's now divided between the high level and the low level, totalling about $5 million a year.

MR. KERR: Health effects means radiation-related health effects?

MR. BECKJORD: Radiation, yes.

MR. KERR: Thank you.

MR. BECKJORD: Finally, we are supporting development of licensing criteria for advanced reactors. We are not doing any advanced-reactor research, and when we've come to the end of the discussion, that's something I want to come back to.

In the present budget, there's on room for doing research on advanced reactors. I think we're getting at the

point in the next year or so, with the development of the concepts, both in light water and in the other -- the liquid metal and the gas reactors, particularly the gas, where we need to think about some confirmatory research.

MR. SIESS: Is this something that comes down through the Commission, because I've gotten the impression that the Commission has decided that their major concern had to be operating reactors.

MR. BECKJORD: That's true.

MR. SIESS: After all, they are the only ones that have much effect on the health and safety of the public.

MR. BECKJORD: That's true.

MR. SIESS: And that the future was up to DOE. That's overstated --

MR. BECKJORD: Well, the development future is clearly up to DOE, and that's --

MR. SIESS: When I look at an organization chart and I see a branch headed "Advanced Reactors and Generic Issues," I say, "Gee, they don't even think advanced reactors deserves a branch all by itself."

MR. BECKJORD: Well, the greater part of their effort is devoted to the safety review of the advanced reactors. They also have the prioritization responsibility. But most of the effort and the dollars are being spent on review of the DOE reactors.

MR. SIESS: And by advanced reactors, now we're talking simply the DOE advanced reactors?

MR. BECKJORD: These are the DOE reactors.

MR. SIESS: But what about the future reactors in general?

MR. BECKJORD: Well, the review of the evolutionary types, as you know, in safety review is in NRR. For example, the ABWR --

MR. SIESS: Which is where it ought to be.

MR. BECKJORD: Yes. And the review of the --

MR. SIESS: In fact, if I had my way, the review of the advanced reactors would be in NRR, too.

MR. BECKJORD: There was a plan last year, early last year, to initiate work on CANDU reactors. That is no longer -- there is no plan for that now. That was essentially cancelled. And there was shown in the plan some funding for research on CANDU reactors, but that also dropped out.

The only thing on the table now in the advanced water reactors for Research to do is the PIUS. The developers of the PIUS design want a safety review; not certification of the design, but they want safety review. They have approached this a number of times. They've got a request into the Commission.

I don't know what's going to happen on that. I guess my own view is that that will probably not make the priority list, and that will be dropped.

MR. WARD: Is that something different from what AECL has asked for?

MR. BECKJORD: The AECL wants to certify their design for that 600-megawatt CANDU.

MR. WARD: Okay.

MR. BECKJORD: Right now, they're asking for a --

MR. WARD: So the PIUS people are asking for something that would be presumably a lesser effort?

MR. BECKJORD: Yes. And the Canadians had a two-step process in doing it. First, the safety review, and then they were talking about certification. And the reason for our working the PIUS is that it is substantially different in many ways from a conventional water reactor, no control rods, and so on and so forth.

But I guess my point about research on the advanced reactors, which I'll come back to at the end, I think it's the time now when we need to be thinking about that and planning for it, and I'm talking about research on the water reactors of the US design, which, frankly, I would expect, when reactors are built in this country again, if they are, that it'll be those reactors.

There are some very interesting concepts that are on the table now, and I think there is a need to do some work, some research work.

MR. WARD: So you're talking about the --

MR. BECKJORD: Natural circulations.

MR. WARD: -- 600-megawatt size reactors?

MR. BECKJORD: Yes. Right. The natural circulations have gravity peak systems, that type of thing.

MR. WARD: Well, did I understand that that's in the budget, or that's a hope for the future, something you'd like?

MR. BECKJORD: No, it's not in the budget. I think it's a necessity for the future.

MR. WARD: Yes.

MR. BECKJORD: But I want to come back to that at the end. At the end, you asked us to talk about research over the next five years. In looking forward to a meeting five years from now, I hope that the Research Director will be reporting to you on work actually accomplished in this advanced.

MR. WARD: Okay. I understand.

MR. BECKJORD: But to do that, we have to get funding for it.

[Slide.]

MR. BECKJORD: You asked what is the division between research and technical assistance in dollars and in people.

MR. SIESS: Did we actually ask those words?

MR. BECKJORD: Yes.

MR. SIESS: Because that was a mistake, I think. The response we got back from Taylor talked about the distinction between research and nonresearch. That is broken down pretty

well in this memo we got from Taylor.

MR. BECKJORD: These are the same numbers here. Let's see. The definition was up.

MR. SIESS: All we were trying to do was separate out what is being spent for research, in the Office of Nuclear Regulatory Research, and what is being spent for something else.

MR. BECKJORD: I think these figures do that.

MR. SIESS: And you can almost look at resolving safety issues and developing regulations as being the nonresearch part, irrespective of whether it went for technical assistance or research.

[Slide.]

MR. BECKJORD: Well, there are small amounts of monies which are spent in very direct support of licensing questions. And they are shown on that, you know, it is running --

MR. SIESS: Well, this table that he sent, you see, let me explain why. We've always looked at the so-called program support budget, which was dollars. And for a long time you could, for all practical purposes, say all of that went for research. The amount that went for tech. assistance was relatively small.

Now, as the program support budget shrinks, the question was, is the tech. support becoming more and more

important?

MR. BECKJORD: Well, yes, I was going to comment on that later, or comment on it now. What is happening in these budget reductions is that the technical support is, you know, to a good approximation, staying pretty steady.

MR. SIESS: Yes. Now, I look at this table, and I find that --

MR. BECKJORD: That's unaffected, so far unaffected.

MR. SIESS: -- the total technical support, most of the tech support money is in the non-research area.

MR. BECKJORD: Yes.

MR. SIESS: And if I look only at the research areas, the amount that is technical support is only a couple million dollars.

MR. BECKJORD: Right.

MR. SIESS: It turns out in this case that if I take the total technical support, it is 15.7; if I take the total nonresearch, it is also 15.6. But that is coincidence.

MR. BECKJORD: Well, yes, that is right. And these numbers, as we go into budget cuts, the part that has been devoted, this $15 million, tends to stay constant. It's maintained.

MR. SIESS: Yes. It's like half your people.

MR. BECKJORD: But there is another effect, which I was going to mention later. I will mention it now. When we

see these, when we have to make these reductions in the research effort, you find that the longer range things tends to be moved out, and so you are concentrating, as the budget goes down, what is called research, it is still research, but it is nearer and nearer term, devoted to the user needs.

Now, I have been trying over the last couple of years to maintain the long-range effort at 25 percent of the total research budget.

We're not there now. We fell down this year by a small amount. I could give you the number. I prefer to give it to you than guess at it. But with the reduction to the level that we are at this year of, we took about $6 million; is that right? Yes. Down to 88. I think it was 94 to 88. That affected the long-range research effort.

MR. SIESS: Now, the long-range research effort is still based on user need, isn't it?

MR. BECKJORD: It is. But the users of the research are, the big users are first NRR, secondly NMSS, and Research is also through the generic issue division. Warren Minners is also a user of research, and they define programs.

Then, the longer-range effort is the responsibility of the office and the two research divisions. And I look to Brian and to Larry to see to the future and come up with the programs that they think have a, you know, they will be the things that we will be interested in from a user point of view,

five and ten years from now.

But that judgment is made in the Research office. But we don't get second-guessed on that, on the outside. But it is expected, the expectation is that this work will be devoted to the important future questions.

MR. SIESS: Now, you said at 25 percent level over the past several years. Do you ever look back and see how good you were at predicting that this was something you would be needing in the future?

MR. BECKJORD: Well, I think, I guess what I've done is look back and see what are the efforts that were in this category in the past, you know, five, ten, 15 years ago, that would be exploratory, and what has been useful.

Well, there has been, I think that the thermal hydraulics effort in support of the large pipe breaks and emergency core cooling is certainly in that category. And with the product of Appendix K, I think that there is tremendous value. I think there is value for expenditure in that area.

MR. SIESS: But that work was very issue-oriented from the beginning. The whole program was set up to satisfy the ECCS hearing committee. That wasn t really long-range, was it?

MR. BECKJORD: Well, I think the code developments took a long time.

MR. SIESS: A long time. But it was clearly mission-

oriented right from day one.

MR. BECKJORD: But I think it developed, subsequent to the hearings, it developed a long-range component which we see now. And well, yes, I hadn't mentioned, I was going to come to that. Brian is reminding me about the pressurized thermal shock, which is a combination of the thermal hydraulics effort and the materials research, which is, I was thinking of that as a second category, which has turned out to be extremely valuable in terms of continued operation of a vessel. I think those are the two big examples. There are certainly many others.

MR. SIESS: When those were set up, they weren't set up as futuristic, non-user-need type things. There was a clear need for the HHST work from year one.

MR. BECKJORD: But I guess maybe I didn't -- What you say is true. I also think it is true that some of the talent that went to work in those areas was looking pretty far ahead, and they had the freedom to develop on some paths that might have been considered somewhat risky at the time, and they did and they were successful and it paid off.

MR. SIESS: Okay. I see your point.

MR. BECKJORD: So I think that is a good example. And I think you have to have both elements in an effective program. You have to be devoted. If you can't satisfy the users today, you are not going to have the money to work on

tomorrow's problems. I mean, that is really what it comes down to. And if you don't work on tomorrow's problems, then the day after tomorrow, you are going to -- If you aren't working on the problems that are beyond tomorrow, these are going to be out of luck.

MR. SIESS: It is awfully nice to have the answer already there when the problem comes up.

MR. BECKJORD: Yes.

MR. SIESS: And that was clearly a case with PTS.

And there have been other cases where the HHST stuff paid off --

MR. BECKJORD: That's right.

MR. SIESS: -- in having the answers ready when we needed them. And the only problem is that it is awful hard for me to find examples other than HHST where that has been the case.

MR. SHERON: Well, I think those are the big and dramatic examples.

MR. SHERON: I think there may be some more coming down the pike. You know, these new passive reactors that you are seeing are basically benefitting from the results of knowledge that has been gained over the years. Difficulties with ECCS systems and the like, the risk assessments that we've done, have highlighted where vulnerabilities are. And what you are seeing in these new designs now are attempts to try and

correct these areas that were not considered defects a long time ago.

MR. SIESS: That is not what we were talking about. That is simply taking our knowledge and applying it for the future.

I was talking about new problems that come in in the future for which we already have answers, because we have done the basic work. That is not the same as extending new designs to solve old problems with the knowledge that we got from the old plants.

Sure, the ABWR tried to take every outstanding issue and solve it, in a new design. But not with taking old research and using it to solve new problems. It is a different process.

MR. BECKJORD: If I could just summarize the point I'm trying to make.

MR. SIESS: That's part of the problem.

MR. BECKJORD: There's an effect that you don't see in the numbers that are presented here, which is, as the budget is cut, we have to pay attention to the near term uses and needs. So, long term work tends to get cut.

MR. SIESS: Always true.

MR. BECKJORD: Given a budget cut, the long term work tends to be cut more than the short term work. That's just the way that it happens.

MR. SIESS: We tend to work on what's more urgent, rather than on what's important.

MR. BECKJORD: There comes an end to that.

MR. SIESS: Sometimes it's nice that urgent and important are the same, or at least somebody thinks they are.

MR. KERR: I think, in connection with what we're discussing, on page IV-4 of the Nuclear Safety Research Mission Area document, there are a number of things --

MR. BECKJORD: Isn't that a five year plan?

MR. KERR: Yes. There are a number of things that are listed as guideline on how best to obtain the knowledge that research should provide. Number 6 talks about research for the purpose of identifying or resolving unanticipated problems.

Does that mean that once an anticipated problem has occurred, you do research to try to understand it, or does it mean that you try to do research, even though you don't know what the problem is going to be, because you're pretty sure if you do enough research, you will somehow envelope the problems. It wasn't clear to me what that meant.

MR. BECKJORD: I wrote the words, and what I meant by it was, you want a cadre of very bright people who are looking for trouble which is so far undiscovered.

MR. TAYLOR: Isn't there another part of that, too? You want to be looking for the tools that that cadre is going

to need. That's research.

MR. KERR: It's not that a problem has occurred which was unanticipated and I want to solve it. Rather, you want to look out there and try --

MR. BECKJORD: To see if there are any out there that we haven't come across yet.

MR. KERR: It wasn't clear to me which you had in mind.

MR. BECKJORD: That's a very good example.

MR. KERR: Now, was that thought up by people in research, or was that thought up by people doing research that need to keep their jobs and need money.

MR. SHERON: It was actually thought up by the industry.

MR. KERR: It was thought up by Bob Hendrie, I though.

MR. SHERON: Indian Point.

MR. TAYLOR: They didn't call it DCH and he didn't recognize it.

MR. SIESS: It was your containment loads working group.

MR. SHERON: They thought DCH was very good for you because it dispersed the fuel rather than -- after our contractors started looking at it, they realized that dispersing fuel caused a whole new set of problems. But

originally, it was touted by the industry as being a mechanism that would prevent this extensive core concrete interaction from taking place. We uncovered a whole new set of problems by dispersing it.

Research is showing us right now that our original perceptions of the DCH problem are changing. Originally, it was thought to be a heat transfer issues, and now it's turning out to be a hydrogen issue, a chemical reaction issue. It's not just the heat transfer, and we're finding out that it's very dependent upon cavity geometry.

Research has shed a lot of light on --

MR. SIESS: It's also dependent on how big the hole is in the vessel; isn't it?

MR. SHERON: Yes.

MR. SIESS: If you don't get it out through a small enough hole with pressure, the whole thing goes away; doesn't it?

MR. SHERON: No.

MR. SIESS: You could just pour it out on the floor and you will still have DCH?

MR. SHERON: A part of DCH is the pressure.

MR. WARD: We are kind of digressing in the detailed discussion of DCH, but --

MR. BECKJORD: Speaking of vessels, there is one --

MR. SIESS: I'm not digressing. I'm trying to talk

about researching the proper features and trying to research to get solutions to problems rather than new problems.

MR. WARD: I would like to ask a question about this. How much -- I guess I call this turning over rocks. I think this is a very appropriate function of the Research Office, but how much support do you have for that; for spending research resources on that within, let's say, the Commission; within your oversight committee, within the NRR?

MR. BECKJORD: There is a lot of support for it. The Commission approved the statement.

MR. WARD: Yes, but that could be just --

MR. KERR: I think when he says support, he means dollars.

MR. WARD: How much enthusiasm do you have?

MR. BECKJORD: The Commission approved the statement. We have had discussions at various time on and around that subject at the Commission table, as to what's the right number. I guess what I've heard Commissioners say is that I don't have full support fo that 25 percent number.

I mean, they agree in principle, but they have different ideas as to what that number ought to be. The Todreas Committee is very strong on the issue and on the number, and that's one of the things I believe they're going to talk with the Chairman about next week.

They think 25 percent is what it ought to be, and

that's what they want to discuss. The Chairman is thinking about how to hold this committee together. He doesn't want to antagonize anybody.

MR. SIESS: I've got a problem with people sitting around and debating whether it should be 25 percent or some other number and suddenly you find out that nobody has really defined what the 25 percent is supposed to consist of. One person is thinking about --

MR. BECKJORD: The best definition I can give you is the one that Dave just read.

MR. SIESS: Yes, and that was the one Bill Kerr had a problem with, and Brian and I don't agree. I think the conception on what research for the future is, or basic research is, is one that has always bothered people.

Instead of getting that straightened out, it's much easier for everybody to get together and decide it ought to be 25 percent.

MR. WARD: It seems to me that the NRC has a unique responsibility in this area, different from perhaps other government organizations or other research organizations in that you've got a regulated industry where there are a lot of sensitivities to risk. The industry is going to tend to not going to want to turn over rocks of certain sorts.

There's going to be some reluctance on that, and so if there is a function of NRC research, it seems to me that

it's not to do the things that industry is likely to do, but to poke into the areas that the industry is not likely to poke into.

MR. BECKJORD: What you say is true, David. It's also very interesting, as you go into -- you know, you look into any one of these specific matters that we're dealing with, like in the PRAs or in the vessel work. One of the advantages of the system is that there are a lot of people who are involved in it, both in the industry and on the research side.

There's fairly good communication, fairly frequent communication at meetings, and the issues come out on the table. It's surprising what happens at times. For example, in the expert opinion groups on PRA, I know of two cases where there was a divergence of opinion, a significant divergence of opinion on an issue.

The people who came up with the problem were from industry, okay? So, you can't really generalize about that. As a result of one of those things, a large utility in this country is making an expensive modification to a power plant.

MR. KERR: If you want to turn over rocks, you can get help.

MR. BECKJORD: I have really be remiss. I wanted to tell you something and it just came to mind a minute ago. We've been focusing hard on these issues. We have the first sample from the TMI vessel. It came out at 6:00 yesterday

morning. It's a good, clean sample and what do you think it's radiation level is from detectors nearby? Is it high or low?

MR. SIESS: This is the bottom half?

MR. BECKJORD: Yes.

MR. SIESS: If it's clean, I wouldn't expect it to be too high.

MR. BECKJORD: No, it isn't high. It's a hundred MR per hour. There's a second sample which was almost cut through which they can work out with some tools, so we'll have a second one.

They had a lot of trouble getting that. Everything went wrong with the electrical supply and the air supply and the water supply and the cooler which are bone tired, but I think they'll be back at it again today. Hopefully, they will have been able to work the bugs out.

I would say that that effort, I would put in this category of exploratory. I think it was a very high risk project to undertake in terms of; would we get a sample? The sample cost in three days came from infinite to $8 million a sample to $4 million a sample.

MR. SIESS: Considering the amount of money we're spending on research and on codes to predict what happens, it doesn't seem to me that that's too large a price to pay to get one point for confirmation.

MR. BECKJORD: Well, I'd like about 50.

MR. SIESS: Well, you've got other points, if we ever get them. Let me get back to Dave Ward's turning over rocks, and this isn't a facetious comment. There are people out there who would be glad to help you turn over rocks -- Steve Sholley, HMB. These are not ignorant people and they are interested in turning over rocks.

MR. BECKJORD: We've got good comments, particularly the ones I've seen from Sholley.

MR. SIESS: For that aspect, there's other sources available.

[Slide.]

MR. BECKJORD: Yes. The next one shows the division of people. We had a long discussion on that. The numbers are shown here in a way that includes the division managers and their deputy, myself and Speis and Ross and Houston as overhead. I guess I take a little personal issue with that.

MR. SIESS: You're all the way down to branch chiefs for overhead according to that.

MR. BECKJORD: I don't regard myself as overhead on that project.

MR. SIESS: That's down to branch chiefs as overhead.

MR. BECKJORD: Yes. That's right.

MR. SIESS: That just leaves these people.

MR. BECKJORD: Yes. All I'm saying is that the numbers are -- I think the management plays a significant role

in the technical program as well, so I would probably change those numbers by about -- I'd take twelve out of one column an put them into another column.

MR. KERR: Have you thought about taking a vote of all the staff to see --

[Laughter.]

MR. BECKJORD: No, I haven't.

MR. SIESS: I wouldn't have done that, either.

MR. BECKJORD: Is there anything to discuss on that?

MR. SIESS: No, I don't think so. I think there is some stuff that we'd like to pick up later, not at this meeting -- breakdowns like that one going back somewhat farther.

[Slide.]

MR. BECKJORD: Okay. Let us go to the -- you are interested in where the money goes. The figures '88 and '89 are actual. Ninety is very close to what actual will be as shown, except for the undesignated column up at the top of "Other."

MR. SIESS: Which is likely to get distributed pretty much like what is already there.

MR. BECKJORD: Well, not necessarily. There is a large part of that undesignated in Fiscal '90 which is supposed to go to other than National Laboratory contractors. In the undesignated 9.3 million for Fiscal '90, there is a $5 million severe accident effort which we do not intend to give to the

Laboratories.

MR. SIESS: What does "Industrials" include? This is like the combustion engineering on the --

MR. BECKJORD: Well, there are small pieces out. For example, Westinghouse is doing some work on natural circulation in a pressurized water reactant coolant system under accident conditions to find out -- it's to test the hypothesis that the system would fail at the search line.

MR. SIESS: Is Battelle an Industrial?

MR. BECKJORD: Battelle is a -- let's see. They're a not-for-profit --

MR. BURDI: If we contract directly with Battelle, if we contracted through them through Pacific Northwest Laboratories, they wouldn't be.

MR. SIESS: Okay.

MR. BECKJORD: So it's not in the not-for-profit category?

MR. BURDI: Yes, they might be.

MR. BECKJORD: I think they would be in the not-for-profit.

MR. BURDI: But Industrials really are just commercial contracts.

MR. BECKJORD: Yes. Battelle Columbus competes for work, but Pacific Northwest, at least two-thirds of it, is a National Laboratory.

The goal for Fiscal '90 is that we will be spending about 20 percent at other than National Labs, including universities, grants, the not-for-profits.

MR. KERR: Do you have any difficulty spending the money allocated to what are called education contracts and education grants?

MR. BECKJORD: Up to this $5 million number I mentioned, no, we have not. What has been spent -- I mean what has been shown on the chart, we've been able to do. There are some concerns about that severe accident work. There are not as many proposals as we would have liked to have seen.

MR. SIESS: Are those education all direct? These are direct contracts from NRC to an educational institution?

MR. BECKJORD: Yes. Not grants.

MR. SIESS: I mean, if it's Brookhaven or the University of Maryland?

MR. BECKJORD: These are direct.

MR. SHERON: These are direct.

MR. SIESS: Okay.

MR. BECKJORD: This does not show a subcontract.

MR. SIESS: How much the National Lab subcontracts.

MR. BECKJORD: Yes. We, in fact, got that maybe a year or two ago. I don't keep that -- you know, I haven't been compiling that information regularly. We do not direct contracting through the National Labs. I guess you could argue

it either way, that it should be shown or it shouldn't be shown, but it is not shown here.

Okay. Shall we go on?

MR. SIESS: What's "Other Government," for example?

MR. BECKJORD: Well, the --

MR. SIESS: USGS?

MR. BECKJORD: NIST, National Institute of Standards is one. I think that may be the major one.

[Slide.]

MR. BECKJORD: Okay. The next one, I think, is the request versus appropriation. So as we get into impacts, there are really -- there are two ways -- I guess one of the things to be thinking about is we go ahead to answer the impact question. There are two ways to discuss impacts. One is relative to the actual appropriation relative to the President's budget or relative to the agency request to OMB within a given year. The other way to look at it is from year to year in the same account, what, you know, was the trend fo Research. As we go through those, I will attempt to comment both ways on that.

Obviously, impacts are very large if you compare appropriation to the request to OMB. In some cases, if you compare Fiscal '89 last year to Fiscal '90 this year for the account, impact is not as big.

A major factor here is the bow wave that we have been

pushing off, deferring work from year to year. That's probably the major thing that that shows.

MR. SIESS: Now, the request to OMB actually has a breakout of Research.

MR. BECKJORD: Yes.

MR. SIESS: And that's an indication, then, of the Commission's. I guess the President's budget still has a breakout of Research, although OMB doesn't necessarily do it.

MR. BECKJORD: Yes.

MR. SIESS: They let you break it out, right?

MR. BECKJORD: Yes. The President's budget is the green book.

MR. SIESS: Yes. Now, Congress doesn't really break out Research, do they?

MR. BECKJORD: No. No, they do not.

MR. SIESS: So, in effect, how much Research gets depends, one, on what the total budget is, and then, two, on how NRC decides to allocate it within the total budget.

MR. BECKJORD: The allocation is presented to the Budget Subcommittee.

MR. SIESS: Yes.

MR. BECKJORD: The Bevill Subcommittee. So they are aware.

MR. SIESS: Yes, but as I remember, for years, when we wrote them recommendations, they never did anything about

the Research as such.

MR. BECKJORD: On a couple of years, there have been good words in there. I remember one year, they cut $30 million, and they said, "We're very concerned about safety Research."

MR. SIESS: But now, the point is that the -- how much Research ends up with depends on how much NRC gets --

MR. BECKJORD: Right.

MR. SIESS: -- and how much they decide Research should get?

MR. BECKJORD: Right.

MR. SIESS: Putting it in the other incremental basis, how much NRC is cut and how much of that cut they decide Research should take, and that's where we were earlier. NRC always ends up taking most of the cut because there are not other places it can be put. That's what Jim Taylor told us.

MR. KERR: You mean Research ends up taking --

MR. SIESS: Research ends up taking. The program support funds are cut $90 million; Research is going to lose more than half of it. When I asked Jim if they got cut $90 million, he said Research would probably take 50 of it, didn't he, 50 out of 100? But the next 100, it wouldn't come out 50 out of 100.

MR. BECKJORD: Well, the deeper the cut, the more is going to come out of Research.

MR. SIESS: That's right. Yes.

MR. KERR: So if the last two years establish a precedent, appropriation will be about 74 million for Research program support?

MR. BECKJORD: Yes, if the past is any indication.

MR. SIESS: One of our concerns has been whether the Commission, in making those cuts that way -- obviously, they say, "I've been cut so many million, and, you know, it's got to come out of Research. There's no other place to take it." That's what it looks like, if you just look at it. But do they really look at it and say, "Now, we're really cutting the Research budget to the bone. Are we sure there's no other place to take it if it's only going to have to be reallocation among program support funds?" But does the Commission, does EDO ever sit down and really ask themselves, "Could I reduce FTE somewhere and take that cut so that Research didn't bear a bigger chunk of it?"

Someone asked Jim Taylor could they not have some of the resident inspectors and use that money for research. I know it wouldn't amount to that much.

MR. BECKFORD: I don't know. I suppose that has been discussed. When we have met on occasion, the Office Directors and the EDO, when a budget cut comes in, I mean everybody comes in with their problems. I tell them what's going to happen to research. Tom Murley talks about his people problems and so,

you know, my job is research and I feel it's important to tell what the consequences are and that's what I attempt to do.

I make the best argument I can.

MR. SIESS: But somebody's got a job to look at the whole picture.

MR. KERR: It would seem to me that if you get a precipitous, a large cut this year, say, probably the only place it can come from is some place like research, but if you are going to do something about that you have to start planning at that point, it seems to me, saying by next year we are going to have something or other down to the point where we can allocate more to research. The danger of that of course is if Congress sees that you're going in that direction they'll say well, they don't need all this money but on a one year basis that's probably the only place where there is much flexibility.

MR. SIESS: It's getting to where that isn't even true either because cutting research isn't easy. You've got commitments that can't be cut. You've got things that could be stretched out but at some point as you go down that line you are not going to be able to do it. You are going to have to default on a contract or something to get the money out.

I have seen where it gets cut.

MR. BECKFORD: What happens is that the costs that you will incur will actually drive productivity way down, severance and that type of thing. You'll be cutting programs.

You'll be putting less money out but you'll be getting far less in the way of results.

MR. SIESS: Well, you know, the Commission, EDO, whoever pays lip service to research -- research is a good thing, we ought to have research, we ought to spend money, we shouldn't cut to zero -- but I am not sure they really mean it. At this point and some point down the line how are they going to learn that if they don't have research there is going to be problems?

Right now I think research is nice but at what point do they say, gee, we can't operate without research. If we don't have somebody out there to answer questions for us, we're going to have a real problem.

Do they ever look that far?

MR. TAYLOR: What are your severance commitments to the national labs? Are they on a year to year basis?

MR. BECKFORD: Yes. I would say they would be negotiated on a case by case basis.

MR. TAYLOR: But if you have to truncate next year, are there severance costs associated with that?

MR. BECKFORD: Well, it depends on a bunch of factors. In a place like Sandia, Sandia is very busy now but sometimes the program directors can readily shift people from one thing to another and in that event you may not have very much effect.

In other cases, for example I think at Oak Ridge on our pressure vessel program we would have probably significant phase-out costs if we ever backed out of that.

I have never discussed it with them because I think in fact that is probably the last thing we would do but I think it is really case by case.

If a laboratory had to let people go as a result, they didn't have some other project to transfer them to, then I am sure we would --

MR. TAYLOR: It becomes your responsibility. So it is not year to year?

MR. BECKFORD: Well, I'm saying it would happen within a year. I mean the costs would be incurred in that year. There wouldn't be costs that would extend beyond.

MR. TAYLOR: That is not what I meant. Usually you contract to have something done.

MR. BECKFORD: Right.

MR. TAYLOR: If you do it on a year to year basis, the following year you could say there is nothing and there is no cost to you, but it sounds to me as if that is not the case.

MR. BECKFORD: That wasn't implied. We have a five year plan and when we get down to the program plans --

MR. TAYLOR: I am just trying to get a measure of how hamstrung you are by this question of the cost of termination.

MR. BECKFORD: I think the best answer I can give you

is that if we have people and facilities who are dedicated to a program and we just drop it like that, why the laboratory is going to have costs and they are going to come back and say, you know, this is what it costs.

MR. TAYLOR: But that means it is not on a year to year basis. If you have these sort of long term residual costs associated with stopping a project, you are really hamstrung.

You wouldn't have that with private industry. You would say here's your contract for the year. At the end of the year it's over -- or we may continue it.

MR. BECKFORD: I guess there is another aspect of this, which is that our budget is appropriated year to year and you can't spend money that the Congress hasn't appropriated.

MR. TAYLOR: I understand that and I also am familiar with how a lot of the agencies treat the private contractors and it is not the same.

You work on a year to year basis and it is your business to figure out how to do it and if you can't, don't deal with that agency. It's just that simple, and that goes for the universities too. There is no mercy when the end of the year comes if there's no funds.

MR. BURDA: But if you have multi-year contracts with private industry --

MR. TAYLOR: Multi-year contracts, that's different.

MR. BURDA: -- and most of our contracts are multi-

year contracts, if we have to cancel those contracts we are subject to severance pay and we may have to pay off.

As a matter of fact I think last year, Eric, when we were faced possibly with that large budget cut we did try to look into what it would cost to back out of a lot of things and that included shutting things down and it was going to cost us several million dollars, after checking with the laboratories and so forth, and our Division of Contracts.

MR. SHERON: Can I just make one quick point? Some experience we've had in this -- we prioritize our research so we know that when a budget cut comes where to cut, which programs get cut first.

What we found out is that the laboratories that say are involved with those contracts, there's difficulty. They won't put the best people on them and if DOE has some work to do, for example, they'll pull the people right off and delay our programs. We no longer become their top priority. They don't look at us as a stable source of funding, as a source of continued money, okay, that in other words we're not people that needed to be pleased as much as before.

That is one of the first difficulties that we always see.

MR. TAYLOR: You already are facing that. That's been happening.

MR. SHERON: Yes. The other area that we get stuck

in is we have a lot of international commitments, like for example we'll have the PHEBUS program perhaps. We'll have the CORA facility -- I'm sorry, we're not paying for that -- but the ISDPRA work over in Italy with the large scale core melt. That will be a commitment of dollars. UPTF was a commitment of dollars.

International commitments are very, very hard to break. In other words, you know, if you stop funding or you reduce your funding you may just lose everything you have ever put into it.

They represent a constant drain. In other words, that's a constant amount of dollars that have to go out every year.

MR. SIESS: Is that an argument against international agreements?

MR. BECKFORD: No.

MR. SHERON: No, it's not at all, but it's just a consideration that affects our budget planning.

MR. SIESS: As budgets get smaller and smaller, should we be a lot more cautious about international agreements, because we might end committed to them and not do something else that we think is more important?

MR. SHERON: I take that into consideration now when we look at international agreements that are being proposed.

One coming up right now is the follow-on program for

the UPTF facility. I think there's quite honesty a difference of opinion between what Germany would like us to pay versus what I think we feel comfortable with.

MR. SIESS: Eric, are we into the next slide?

MR. BECKFORD: Yes.

MR. SIESS: We'll put it up there.

(Slide.)

MR. BECKFORD: I want to either give you -- I want to modify the slide or I'd like to give you some comments that I have on it.

I think the major headings here, the delays in meeting established milestones, we can certainly document those, the important ones over the past couple of years.

With regard to loss of expertise, we have had some loss of expertise in several programs but I think it is largely prospective. That is to say that at this point now if we took a big cut next year then I think this would be a very significant factor.

I think the loss of leverage is prospective. I certainly -- I don't feel that we have had a major loss of leverage to date with our foreign partners because they are well aware of our budget problems because whenever we talk about a new agreement I have to explain to them about the appropriation process, and so they all understand that.

I think that we by virtue of the efforts which have

gone before, we are still the leaders in water reactor safety research around the world. We are being consulted now -- the Germans would like to consult now on some very important questions related to reactors in East Germany.

MR. SIESS: That's nice but I don't think that carries a heck of a lot of weight with Congress.

I think what is of concern to me is what we can do to convince the Congress that they should appropriate money for research.

If I look at that, it's only that first item that is important. The loss of expertise affects your ability to do the things that are in the first one and the loss of leverage may affect your ability, so you come up to that first item, where you ought to be able to go to the Congress and say if we don't have research here is a conservative assumption we have to make that may not let a plant operate or may not let a new plant get designed or something or, you know, those are the things that can impact the economy, the industry, things that Congress can understand.

The other two just affect that -- affect your ability to do research and get answers to questions, so you said you could list things under that first item.

Can you actually list things you could take to the Congress and say, look, this is supposed to be costing the country ten times what you are saving.

MR. BECKFORD: Examples that come to mind are the pressurized thermal shock experiments.

MR. SIESS: That's already done. Let's take the case of the future.

MR. BECKFORD: Yes -- three and four. We're delaying, Larry, what is it? Three and four, isn't it?

MR. SHAO: Three to four years it is going to be delayed. Pressurized thermal shock, three years to look at the effect of cladding material on the reactor vessel and pressurized thermal shock four experiment is to look at the low upper shelf material.

MR. SIESS: But if I were the Congress when I could say well, that's really an industry problem. It's a matter of getting information. It's not a question of making conservative assumptions.

MR. SHAO: Yes, but --

MR. SIESS: We'll make the industry go out and do that work and submit it.

MR. SHAO: The industry just quotes the regulations, and we think it is conservative, but, really, we do not know whether it is conservative or not conservative.

MR. SIESS: But you think, with some research, you decide that?

MR. SHAO: I think with some research, maybe we can change it.

MR. SIESS: Tell the industry what research it takes to convince you?

MR. SHAO: What we want to do is, from the research, maybe we want to change the regulation. Maybe we want to change the 54-pound toughness.

MR. SIESS: Okay. Well, tell the industry to bring you enough information to do it. I'm a Congressman now. We're saying why do you need this research? You can always shut the plants down, but are you going to shut them down, and are you going to shut one down in my district? I don't know. But what does it take to convince the Congress?

MR. BECKJORD: Well, in its wisdom, Congress included the words in the enacting legislation -- there is a very short sentence in there about -- it says a couple of things. There shall be a research office to do confirmatory research, and it says something in there about independent results. I'd have to go back and check the wording.

MR. SIESS: Nobody ever defined "confirmatory". We've all tried to at one time or another.

MR. BECKJORD: Well, I think the way progress has been made in safety areas, in my opinion, there has always been a tension between the industrial side and the regulatory side.

MR. SIESS: Is it necessary?

MR. BECKJORD: Is it necessary? I don't know. I can conceive of -- well, I know of some other systems where there

is a different mode of operation, which seems to get the job done. I guess maybe this is a national cultural thing.

MR. SIESS: Somebody is always citing the aviation industry, which we don't like to cite, because their safety record isn't all that great, not as good as ours.

What does it take to convince the Congress that they need to give you another $40 million or $50 million?

MR. BECKJORD: Well, personally, I wouldn't have any difficulty making an argument. You have a set of industrial facilities now, which are turning out 20 percent of the Nation's electricity. It represents a very big investment. It has security and strategic significance, and it also, if something goes wrong with it, particular accidents, severe accidents, you have got -- I mean I don't have to spell it out. There are big potential consequences.

MR. SIESS: What's the role of research in keeping those plants operating?

MR. BECKJORD: I think we can make -- document the case that there have been very significant results from this research budget.

MR. SIESS: Can you document the case that says if you don't get that extra $50 million, these plants are going to have to be shut down, or one of them is going to have an accident?

MR. BECKJORD: We can document what is past. You

know, it's very difficult to document what's --

MR. SIESS: And what's past usually comes down to PTS and Appendix K revision, which doesn't add up to very much for a couple of billion dollars. This is what bothers me. We always come back to a couple of those examples.

MR. BECKJORD: If you shut some of those reactors down for want of the PTS information, that's a big impact. I mean that's coming in at the rate of a couple of million a day.

MR. SIESS: Yes, but the PTS research was a relatively modest part of the research program, and now we go -- give me another example. I'm trying to justify $100 million or $150 million for research.

MR. SHAO: The aging research can be very important.

MR. BECKJORD: Well, I think a severe accident -- that can't be documented on the past. I think we have made -- we have got part of the way through it on the containment evaluations that have been completed now. I don't think we're finally done with it until we're done with the IPE, but those plants are demonstrably safer from the record, from the precursor events, and we haven't really talked about a PRA. The PRA was developed --

MR. SIESS: They're safer because of the research or in spite of it?

MR. BECKJORD: They are safer because of the --

MR. SIESS: The PRAs indicated most of the plants met

the safety goals with margins.

MR. BECKJORD: Well, the PRAs, if you go back and look at them 15 years ago, you're looking at 10 to the minus 3 per reactor year as a core-damage frequency.

MR. SIESS: It still meets the safety goal. There is no safety goal on core damage.

MR. TAYLOR: But probably if research wasn't active in the PRA area, the industry wouldn't be either.

MR. BECKJORD: That's right.

MR. TAYLOR: So, maybe it's more by example than anything.

MR. BECKJORD: The industry has latched onto it. I mean they are convinced.

MR. SIESS: And you think PRAs have made plants safer?

MR. TAYLOR: In some cases.

MR. BECKJORD: That can be documented, yes, Sir. That can be documented on 1150.

MR. SIESS: Only by making another PRA to show that the PRA --

MR. TAYLOR: I think the changes that result in the plant as a result of their going through a PRA.

MR. SIESS: Yes, but isn't that circular? Because those are thing that were considered in the PRA, so you fixed it, and now, you go back to PRA, it's better.

MR. TAYLOR: That's right.

MR. SIESS: But if the PRA ignored something that was 10 times that contributor to risk, it didn't get fixed, and it hadn't been changed a bit.

MR. TAYLOR: Certainly true.

MR. SIESS: You only changed it because you changed the input to what you came out of. I think you're kidding yourself by saying that the PRA leads to improvements that the PRA shows are improvements. That's circular.

MR. BECKJORD: Well, we could discuss that. I don't agree with that. I think the changes in a couple of plants in the fire-water connections for emergency purpose, you know, I think that's clear.

MR. SIESS: We did many things very similar to that in the SEP program, without the benefit of very complete PRAs, just sort of common sense. There isn't much room for common sense in this.

MR. KERR: Well, Eric, again, it seems to me that what would be helpful to you and to us is that if we could anticipate some things, research programs that are now underway, that would keep plants from being shut down or would obviously make them safer or something -- maybe all we can say is that some of the past work has, it turns out, made plants safer, and therefore, research in the future is also going to make them safer. Is that all we can say? Maybe it is.

MR. BECKJORD: Well, I think that's a premise, a fundamental premise of the program.

MR. KERR: That might be all you can say.

MR. SIESS: It hasn't kept the budget from going down. I'm looking for something that will keep the budget from going down.

MR. KERR: You know, if there were something out there that said if we don't really get this information, in 4 or 5 years, we may have to shut down a large number of plants -- maybe it has to do with licensing of -- you know, extended-life activities. Maybe you could say that. I don't know.

It seems to me that sort of thing -- of course, it's also going to maybe not --

MR. BECKJORD: I think we can go through every one of our programs and justify it on the basis of the issue being addressed and make the case that it's safety related.

MR. KERR: But you can't make the case that you're going to have to shut down plants if it isn't solved. I'm asking that as a question.

MR. BECKJORD: I think that question comes up in the case of pressure vessels.

MR. KERR: The question comes up, but we're operating the plants, and presumably, they are safe, in the view of the Commission, or they wouldn't be operating.

Now, what's going to get worse that will convince

somebody that they shouldn't be operating, which research would prevent?

And I realize you are in sort of Catch 22 situation, maybe, but let's say we are. How can we sell research as something that is really going to save the country money or make people obviously safer or feel safer?

MR. BECKJORD: I think that part of the problem today is that I don't think there's a basic question today as to whether research contributes to it. I don't think that that question would be seriously debated in Congress. I think the question is that there are a lot of people there who feel, you know, that nuclear power is on the way out.

Now, I think that's beginning to change.

MR. SIESS: They just don't want it to go out with a bang; that's the trouble.

MR. KERR: Even if they want to continue, the Commission tells the Congress that these plants are safe. They tell them that by letting them operate, so the Congressman says, what's the fuss? You guys think these plants are safe or they wouldn't be operating.

MR. SHAO: But the plants are getting older, and for instance, the -- problem, you have 17 plants that will reach this PTS level before the end of their life. Now, the question is, can they run for forty years?

MR. KERR: Yes, but can you demonstrate that a

specific research program will permit them to run for 20 more years or less?

MR. SHAO: Yes, the vessel problem --

MR. BECKJORD: You can show them that the information that is expected to come out of the research program is going to provide the answer to the question. You don't know what the answer is.

MR. KERR: You can demonstrate that it will provide the answer to the question. That's the unfortunate thing about research. You cannot demonstrate beforehand that it's going to provide an answer.

MR. BECKJORD: There's some risk in the program, but if it's successful, you'll get the information.

MR. SHAO: In relation to the vessel program, in order to run for another 20 years, maybe we need to do some flux reduction. You have to do it now. You shouldn't do it ten years later. You have to do it now, and maybe the vessel can last another ten years longer or 20 years longer.

MR. KERR: I am simply asking; can you demonstrate with a high confidence that that research will permit something to happen that is not now happening or not now possible. It may turn out that the research will demonstrate that the plants need to be -- that something needs to be done to them right now.

MR. SHAO: Right; that's possible.

MR. SHERON: What research does is research puts pressure on the industry to self-examine themselves. When we do research programs, what I find normally is that the industry plays catch-up. They can't afford for us to be smarter than they are in an area. We put emphasis, for example, on accident management.

The industry was very reluctant to touch accident management during the IPE stage. They bad-mouthed it; we don't need that; we have enough complications, et cetera. We pushed forward on it, okay? We said, look, we're going to do research in this area and we're going to find out really how good accident management is.

The industry is coming along. They're now taking the lead and I just had a discussion this morning with Lou Shotkin, and he told me, these guys are really going gung-ho now. Now, I can't tell you that this is ultimately going to pay off, but the best I can say is that we don't know, for example, how many accidents have been prevented because of actions a utility took that ultimately came out of research.

For example, how many times a PRA may have -- the fact that the NRC was doing a PRA forced an industry to do its PRA which in turn identified some deficiency in the plant which they fixed which then, that deficiency didn't ever occur. In other words, that failure didn't occur which led to a core melt. I don't know.

MR. KERR: Are you saying that you drive the industry and let's just hope that what you're driving them to is the right thing? I think it takes an awful lot of self confidence to be sure that all the things that we're doing which are making the industry do all the things that they're doing, are really the best thing for this country.

MR. SHERON: I can't say that with any great confidence.

MR. KERR: You just said it with a lot of confidence.

MR. SHERON: I said that's what happens, I think.

MR. BECKJORD: There's a lot of exchange and communication on this.

MR. WARD: Certainly we should have some confidence that that's the case.

MR. KERR: Well, I saw a submittal from Yankee Row that said they've been doing accident management and studying it and developing procedures since day one. Brad doesn't think they'd do anything without the NRC pushing them.

MR. WARD: He didn't say that.

MR. BECKJORD: I don't think he said that.

MR. KERR: Well, he said industry. Anyway --

MR. BECKJORD: I don't feel we're getting anywhere.

MR. KERR: Brian, could you list maybe five or six things like that? I think that's a good example, the accident management. Are there some others?

MR. BECKJORD: There are lots of others. There's the containment test. I mean --

MR. KERR: I'm simply saying, can you in a few sentences, give us a list of five or six of these that we could use?

MR. SHERON: Yes, sir, we could do that.

MR. BECKJORD: The containment testing --

MR. KERR: We're trying to be -- we're not trying to fight you guys.

MR. BECKJORD: Well, that's I'm getting at.

MR. KERR: We're trying to be helpful.

MR. WARD: You might ask why the ACRS can't come up with that list.

MR. KERR: They wouldn't do anything like that.

MR. WARD: No, because they're polite.

MR. SIESS: Where do we stand on our agenda, Eric? We're getting to the point of looking at the impact of funding on the programs, right?

MR. BECKJORD: Yes.

MR. SIESS: Now, I'm going to break for lunch before we get into that, the impacts on the 1990, that's the current fiscal year; you presented at the October meeting of the Subcommittee, and I don't think those have changed significantly; have they?

MR. BECKJORD: What was the date on that?

MR. SIESS: You went into the Gramm-Rudman sequester.

MR. BECKJORD: I guess the numbers we presented to you are the --

MR. SIESS: Yes, but my point is that I think a detailed look at the numbers and the programs and what's going to be done about them, is not appropriate to this meeting. If people want to take a detailed look at the effects on particular programs, that should be done by the appropriate subcommittees.

I think the best thing to do would be to concentrate on the 1991, the next stage ahead, and use it primarily as a follow on to the kind of discussion we've been having on what the relation is between the amount of money you have or you don't have or the research that gets done or doesn't get done and its impact on the public health and safety, et cetera.

We can go through the list of '91 things with that in mind, and I think we'll get maybe some useful discussions. Is that agreeable with you?

MR. BECKJORD: Yes.

MR. SIESS: So, we'll come back after lunch and pick up on the '90 listing and the '91 stuff.

MR. KERR: Do you anticipate that we will be at a point in which we can begin at 1:45?

MR. SIESS: No, we'll be a little late, but we'd be coming in at about 3-C on page 3.

MR. KERR: If we stop now, we can come back at 1:00, rather than 1:15, can't we?

MR. SIESS: We'll come back at 1:00.

MR. KERR: So we're here from 1:15 to what?

MR. SIESS: To about 2:00. I think we can do it in about an hour.

MR. MICHELSON: Before we break for lunch, just so I can understand where a question I have might be; I'm interested in what finally happened to fire-related research. Is it buried in here somewhere? Is it zeroed out? Is it going way up or way down or what? I can't find it.

MR. SIESS: We'll take that up after lunch.

[Whereupon, at 12:00 p.m., the Committee recessed for luncheon, to reconvene this same date at 1:00 p.m.]

AFTERNOON SESSION

[1:05 p.m.]

MR. SIESS: We will reconvene.

Mr. Michelson had a question. Do you have the answer for him?

MR. BECKJORD: On the fire research?

MR. SIESS: Yes. Why don't we take whatever time is needed to do that while Carl is here, even if the others are not?

MR. SHERON: I'm not sure what the number is. I explained to Dr. Michelson that at least in my division we had initiated a research program, which was principally at the suggestion of the ACRS, on thermal sciences. And the area that we are studying is the smoke propagation and basically how smoke would travel through a nuclear power plant, and the like.

The first stage of that research is obviously more exploratory in terms of finding out what has been done in the past, what computer codes are available, how well they have been verified against what kind of experiments. We are not restricting ourselves to nuclear, but to any technical industry that might experience similar type of fires or so forth.

That is, at least from our standpoint, we said we would come down and give you a briefing once we think we have finished up this scoping study, and give you an idea of where we think we are going to go with this.

MR. SIESS: Is this all that you are doing on fire?

MR. SHERON: This is my division. I would have to --

MR. SIESS: Carl's question was where will you look to find fire research.

MR. SHAO: In our state, there should not be any fire research until we do the IPE. We have an IPE on fire. On the IPE study, maybe there is some vulnerability, and then we should decide to do research.

MR. SIESS: After all the plants do their IPEs?

MR. SHAO: Eventually they have to do IPE on fire, too.

MR. MICHELSON: What tools are you going to use in doing your IPE?

MR. SHAO: They have to address the Sandia scoping study, like smoke.

MR. MICHELSON: That didn't give you any tools. It just told you what all the problems might be. But it didn't give you any tools with which to do the analysis.

MR. SHAO: Industry is supposed to come up with some tools.

MR. MICHELSON: Industry is going to come up with the tools.

MR. SIESS: How about a walkdown as a tool?

MR. SHAO: Industry is writing a methodology on fire, including some tool on how to address the Sandia scoping study

issues.

MR. MICHELSON: Have you looked at what has been done on LaSalle for the 1150? It is reported to be state-of-the-art.

MR. SHAO: Yes. I understand at LaSalle, fire is one of the major risks in that.

MR. MICHELSON: Yes. But that is done with so-called state-of-the-art techniques. I have not seen it yet. It is not out yet. But I assume the staff is watching it. I would think it would be the starting point from which you would look for calculational tools or to see what people are doing. Start first of all with people who say I'm doing state-of-the-art, and then I would check it by going around and asking --

MR. SIESS: Is that good?

MR. MICHELSON: Beg your pardon?

MR. SIESS: Is state-of-the-art good?

MR. MICHELSON: I don't know. I haven't seen it. It is purported to be good. But I haven't seen it.

MR. SIESS: I thought I heard that at LaSalle they found a transformer with two electrical cabinets, one on each side of it, and that made it the big risk. Is that right?

That wasn't LaSalle, that was somewhere else?

MR. MICHELSON: You don't need many tools to find that sort of thing. I am assuming that we have gotten rid of all the obvious problems and we are now looking a little more

carefully to make sure that the next generation of plants at least are done right. And I am just wondering what are the tools by which we do the looking? Clearly we do have to know how heat and smoke move around or how we can confine it. We have to know how good fire barriers are from the viewpoint of penetration of heat and smoke, because they were not designed for being impermeable.

MR. SIESS: Let's don't go into this that far.

MR. MICHELSON: Okay. They've heard of it many times.

MR. SIESS: Yes.

MR. MICHELSON: But eventually, we will have to get right down to asking what are you going to do about it. That will come when you do the ABWR portion of the design.

MR. SIESS: They are going to end up with a computer program, and that is going to solve all our problems. All we are going to have to do is convince the smoke to be able to use that computer program, so it will know where to go.

MR. MICHELSON: Now, on the same lines as smoke and heat are one of the issues. There were several issues in the scoping study. For instance, water migration and so forth.

What are you doing along those lines? Inadvertent actuation of fire protection was one; water from fire protection hoses going down to the lower floors, and all this sort of thing. But what kind of criteria or what kind of, what

happens when water gets in a cabinet? Do you know?

MR. SIESS: I think those are questions for NRR.

MR. MICHELSON: I thought this was going to have to be researched.

MR. SIESS: Nonetheless, NRR asked them.

MR. MICHELSON: Unless you've done some testing, you don't know what happens.

MR. SHAO: I think the ACRS should ask NRR.

MR. MICHELSON: They don't provide a target at the moment.

MR. SIESS: Okay. Let's get back to Eric.

Do you wan to start with this slide?

[Slide.]

MR. BECKJORD: Yes. This shows the three budget levels, the request to OMB, the President's budget, and the appropriation.

I want you to keep that in mind, because these impacts on the '91 cuts are with reference to the request to OMB.

MR. SIESS: Okay. The '91 is what? The cuts you got are the 125 versus 94, or the 94 versus 125?

MR. BECKJORD: That's right. Yes. That's right.

MR. SIESS: Okay.

[Slide.]

MR. BECKJORD: And the next slide shows the year-to-

year for each of the areas. The first one we will talk about will be the reactor component integrity, and so year-to-year the number if 27.6 to 29. So it is actually a year-to-year increase in the component area.

And so what the difference --

MR. SIESS: Wait. Oh. Okay.

MR. BECKJORD: Fiscal '90 is --

MR. SIESS: It is really three levels, then. One is the '90 level, which is what you've got now.

MR. BECKJORD: That's right.

MR. SIESS: The other is where you wanted to go for '91.

MR. BECKJORD: Yes. That was the request.

MR. SIESS: And then the other is where you are right now for '91. Which is 94 beta.

MR. BECKJORD: That is right.

MR. SIESS: So here you are comparing --

MR. BECKJORD: The request in one year to the mark that we have before Congress.

Okay. Now, what I want to say before we get into the detail, in effect what you are seeing, as we go into the reactor component -- Let me just put the next slide on, please.

[Slide.]

MR. BECKJORD: Larry is going to speak to the reduction from the request level to the level as we currently

know it. And in effect what that is is the bow wave that I was talking about earlier.

MR. SIESS: Yes. So what we've got to try to visualize, looking at, is it you are here now, you wanted to be here next year, and you're not going to be there next year, you're going to be here?

MR. BECKJORD: That's right.

MR. SIESS: So you are going to talk about that change, and to try to figure out what that means in relation to where you are now, we can't yet.

MR. BECKJORD: It is essentially the bow wave of things that have to be pushed out. It is a bow wave; I mean, this isn't the first year. Some of these things, if we had gone back through the last couple of years, you would find many of the same things on the list.

So with that, Larry, do you want to go into this?

MR. SHAO: Okay. The first one is, we tried to extend the PTS analysis methods and irradiation effect from 40 years to 60 years. And that effort will be delayed for one year.

The second item is a program on mitigating effects of fatigue and corrosion for major light water reactor components. That will be delayed.

The third item is a testing of a stress corrosion cracking --

MR. SIESS: Now, wait a minute. Delayed is what? The starting of it will be delayed, or the finishing of it will be delayed?

MR. SHAO: Finishing will be delayed.

MR. SIESS: Finishing will be delayed.

MR. SHAO: The third item, the testing of stress corrosion cracking of irradiated materials in the reactor internals. That will be delayed, maybe even cancelled. We haven't started this one. That will be either delayed or cancelled.

The fourth item is the -- The fatigue curve in Section 3 was based on virgin material and did not take into account environmental effects. We would like to do some testing on fatigue crack initiation in order to update the ASME curves. Now this can be very important to license renewal, because there will be more cycles and more fatigue. The fifth item is the development --

MR. SIESS: That deals with what? Vessel type material?

MR. SHAO: It can be vessel and piping.

MR. SIESS: Piping can be replaced if it ages.

MR. SHAO: But sometimes they don't want to replace, they want to do a fatigue analysis to show the piping is okay, but if they use the wrong curve even though the paper says it is okay, but may be they already reached the life but it can be

vessel impacting.

MR. KERR: You mean there isn't any experimental data on fatigue cracking?

MR. SHAO: The ASME curve there is fatigue curve the ASME curve. But the trouble with ASME curve is they base it on virgin material, that is, new material to do fatigue testing. They do not take into account certain the environmental effects -- the water is on it, different temperatures on it, and so on.

But what they do is they use virgin material for certain -- two on stress, twenty on cycles -- but in some cases these margins are okay, but in some cases the margins are not sufficient. We would like to do some fatigue testing to show how the environment effect can effect the fatigue curve.

MR. SIESS: These are environmental effects on fatigue cracking?

MR. SHAO: Yes.

MR. KERR: Are you sure this can be done?

MR. SHAO: It can be done, yes.

MR. KERR: I know you can do the tests, but how do you take into account all the variety of environments?

MR. SHAO: We use like a temperature effect that we take into account. We can test the fatigue at different temperatures.

MR. KERR: The ASME has never done that?

MR. SHAO: Never done that.

MR. WARD: Is Section 3 only nuclear components?

MR. SHAO: Nuclear components, right.

MR. SIESS: Do you mean the pressure vessel industry -- the process plants -- have never looked at fatigue at elevated temperatures?

MR. SHAO: They do it at room temperature and virgin material. After that they put a margin. They put a 2 on stress and 20 on cycles.

MR. SIESS: And just assume that will take care of all of it?

MR. WARD: And you can't do that.

MR. SHAO: We feel it is okay for forty years. When you go to sixty years maybe it is something else.

MR. WARD: There is an example of a penalty of not doing research right there.

MR. SHAO: Yes. The ASME could realize this. We are trying to do some research to go with the ASME.

MR. SIESS: After we get it all fixed they will still put a factor of two on it.

MR. MICHELSON: Why do you feel that it is good for forty years?

MR. SHAO: For forty years -- usually for forty years -- the cycle -- everything -- usually material, unless you have a big temperature differential, like 200 degrees. If you have

50 degrees, 100 degrees differential, usually metal is good for forty years. The number of cycles is usually 7,000 cycles. If they have more cycles, it is a different story.

MR. MICHELSON: You are talking about differential for inch of thickness?

MR. SHAO: For instance, ASME had three different classes: They have Class 1, Class 2, and Class 3. Only Class 1 requires fatigue analysis. For Class 2 and Class 3 they don't even require fatigue analysis, because they feel the number of cycles is low enough to be okay. But when you talking about 60 years, it is a different ball game. It has 50% more life.

MR. MICHELSON: It is just a question of how far out you are confident.

MR. SHAO: The longer the life, the less the confidence.

MR. SIESS: I have noticed that myself.

MR. SHAO: The next item is the development of a performance demonstration requirement for pressure vessel inspections. That would be delayed for one year.

But the next item is very interesting -- it is Region I and NRR suggests research to provide testing of the tubes with crack and degradations and then shipping it to the sites and test the licensee's ability to identify and characterize the cracks and degradations. We know that the tube has some

cracks or some degradation. We let the licensee test the inspection ability to see if they can find these cracks or measure how deep the crack is. That had to be delayed.

MR. SIESS: Does that have any relation to what they did with the steam generator they shipped out to Batelle?

MR. SHAO: No.

MR. SIESS: What did they ever do --

MR. SHAO: With that we were looking at something different. This isn't the tubes. There were some cracks and some degradation. We shipped it to North Anna and asked North Anna to do the inspection to see if they could find these cracks. If they could find it, that would mean their inspection techniques are very good.

MR. SIESS: This is with any current testing?

MR. SHAO: Any current testing. Right.

MR. SIESS: Is that sensitive to --

MR. SHAO: It can be very sensitive. Usually it depends on the frequency or multiple frequency, the different types of techniques. Some people are good at it, some people are not good at it.

MR. SIESS: Maybe we ought to license those people.

MR. SHAO: It would be the inspector level.

MR. SIESS: Aren't there licensing for Level 1 and 2 inspectors? Qualifications probably are in the concrete area.

MR. SHAO: There is some qualification testing there

to do.

MR. KERR: What research is involved in this?

MR. SHAO: The research mainly is we were given, we were providing them some tubes we already tested with certain technique. We already know with certain techniques that certain cracks and we give to them --

MR. KERR: It doesn't seem to me it takes a research project to do this. It is just --

MR. SHAO: This is partly research, partly technical.

MR. SIESS: It isn't research, but nobody else could do it.

MR. SHAO: Nobody else can do it.

MR. SIESS: I don't know what other agency within the NRC you could get to handle this sort of thing, that is set up for it.

MR. KERR: Why couldn't you get some commercial organization to provide you with cracks and do the testing? There must be people who know how to do this. That is probably what they will do.

MR. SIESS: You don't think Larry going to do it?

MR. KERR: I don't know who is going to do it.

MR. SHAO: I think Region 1 will do it.

MR. KERR: Who is going to do this. You are going to contract it to somebody?

MR. SHAO: We will contract it to somebody to do.

MR. KERR: That is what they are going to do. Why can't NRR do this as technical assistance?

MR. SHAO: I think they need some technical people to work with them.

MR. SIESS: If NRR can ask RES to spend their money to do it and RES will spend their money to do it, why should NRR do it?

MR. KERR: I am trying to understand why this is such a serious impact on research if they have to give this up.

MR. SIESS: Good question.

MR. KERR: If you don't have the money to do this --

MR. SIESS: If NRR thinks it is important why don't they spend their money to do it?

MR. SHAO: They may be willing to give us some money too. They want us to do it because they --

MR. SIESS: They don't have to give it to you.

MR. SHAO: But they may give us $100,000. As a matter of fact I talked to them a few weeks ago. They may give us some technical assistance money to do this. But they want us to do it because we have been doing a lot of wcrk in this area.

MR. SIESS: Okay.

MR. SHAO: The next item is -- the other two issues are related to development of modification to ASME code. There a different area. The ASME code is all right, but it needs

modification. The last issue is the Eastern Seismicity Hazard curve. I am not sure if you are familiar with it.

MR. SIESS: Closure of the Eastern Seismicity --

MR. SHAO: Hazard curve. The Livermore curve versus EPRI curve.

MR. SIESS: Take the average.

MR. SHAO: There is an issue -- Livermore, NRC, through Livermore, developed the hazard curve for 70 sites in the United States. EPRI developed some hazard curves on their own.

MR. SIESS: How much difference does it make?

MR. SHAO: It depends on the site.

MR. SIESS: How do you measure the difference? In terms of core melt frequency?

MR. SHAO: There are two orders of magnitude difference.

MR. KERR: I was at a subcommittee meeting last week in which I though Mr. Murphy said the staff had accepted the EPRI curves for licensing.

MR. SHAO: No.

MR. KERR: I am sure he said that. He may have been mistaken.

MR. SHAO: We never said that.

MR. SIESS: How do you propose to resolve this? These are just two separate approaches. One is move

conservative. The NRC assembled a group of people that have the regulatory bias in one direction and the industry people on the other

MR. SHAO: To me you go with the largest margin. The second way, if they want to do the PRA, we don't believe in a bottom-line number. We want them to use both curves. Mainly, we want them to look at so-called dominant sequences and dominant components and look at them that way. We don't believe the Livermore curve or EPRI curve. We don't want so-called bottom-line numbers. We want them to look at the trend.

MR. SIESS: Okay. You want them to do it both ways?

MR. SHAO: Both ways, both paths. If both fail, it is easy to. If one path, one fails, then we look at the so-called dominant sequence and dominant components.

MR. SIESS: Let's just hope somebody doesn't come up with a third one.

And you really think that is going to close this eastern seismicity issue or just that part of it?

MR. SHAO: Actually, the eastern seismicity issue we are going to piggyback on RPEEE now.

MR. SIESS: Okay.

MR. BECKJORD: We are going to pursue the question of eastern seismicity. But it is not something which is going to get settled this year.

MR. SIESS: Because actually, what Larry is talking

about is not the eastern seismicity, it is the results of the eastern seismicity issue. The eastern seismicity issue will be resolved if it is ever resolved, by seismologists and geologists. And that isn't going to happen.

MR. BECKJORD: Right. Okay.

MR. SIESS: Okay.

MR. BECKJORD: Let's go on to the core damage.

MR. SIESS: Just to help me a little bit, I always get confused by the fact that these categories that we use, that you use, like preventing damage to reactor cores and so forth, I can't see a relation between them and the divisions in the office.

Now, I know Larry is speaking for Engineering Division. Is preventing damage to reactor core all in one division?

MR. BECKJORD: Yes. The research on that is in Brian Sheron's division.

MR. SIESS: Okay.

MR. BECKJORD: And also, he has work principally in two areas.

MR. SIESS: Reactor containment performance?

MR. BECKJORD: Yes.

MR. SIESS: That is in Brian's?

MR. BECKJORD: The loading zone of containments. Not the containment. The structural work is under Larry Shao on

containments.

MR. SIESS: Okay.

MR. BECKJORD: But the parts of the severe accident research, the phenomena that developed the loads on the containments --

MR. SIESS: But one of them I noticed was under a different area, was containment integrity.

MR. SHAO: Containment integrity is in the containment performance.

MR. SIESS: That is in containment performance.

MR. SHAO: Right.

MR. SIESS: But that is different from structural --

MR. SHAO: Yes. Structural integrity is in Brian Sheron's unit.

MR. SIESS: Okay. Onward. Can I judge by who is speaking as to which division it is in?

MR. BECKJORD: Yes.

MR. SIESS: Okay.

[Slide.]

MR. SHERON: The first thing you want to notice under preventing damage to reactor cores is that the human factors work comes under this heading. And you will note that there are no cuts, significant cuts, in human factors work, and recognize, I think, that that says what we think about the value of human factors research right now. That is, we think

it is a very important area, and are not proposing any big cuts in it.

MR. SIESS: Brian, to go back a minute, $16.3 million is essentially where you are right now, for '90?

MR. SHERON: Yes.

MR. SIESS: And of course, if there is any escalation, 16.3 is a little less than the 16 you've got now?

MR. SHERON: Yes.

MR. SIESS: So of the things, the $5 million you are cutting out, could all be things that you had added in between '90 and '91, or they could be things where you added something in, left it in and took something else out.

Have we any way of telling that? If I were comparing '90 with '91, would I see the same list here as I see on the '91 wish list minus '91 real life?

MR. SHERON: No. Basically, what you are seeing here is a combination of some new initiatives that we just said we will defer or we won't do, and some existing programs which we are just going to terminate early.

MR. SIESS: Okay.

MR. SHERON: In other words, we wouldn't be carrying them over.

MR. SIESS: That's helpful. But there was nothing that you thought was so important that you should go ahead and do it in '91 and take something else out in place of it?

MR. SHERON: Yes. I mean, that is the whole basis of prioritizing.

MR. SIESS: Could you give me an example? You got the same amount of money in '91 as you had in '90.

MR. SHERON: Yes.

MR. SIESS: And yet this list accounts for $5 million difference.

Now, that could simply be cut everything back to the '90 level. It says don't start anything new. Or, it could be that there was something you proposed to start in '91 that was so important that you are still going to start it in '91 and you are going to solve the $5 million somewhere else.

MR. SHERON: Yes. Let me see if I can think of an example here. Accident management is probably the most obvious thing that comes to mind. It is starting some of the work on the strategy assessments. This is work we thought was high priority, and we want to go forward with it.

MR. SIESS: I see. That is a minus item, but it must still be in somewhere. See, this doesn't tell me what is in there.

MR. SHERON: No. I would have to go back and get you the details on it.

MR. SIESS: Okay.

MR. SHERON: I don't have this with me. I apologize.

MR. SIESS: That is good enough for now. But I think

if I were looking at this in detail, I would want to see '90 versus '91 as well as '90 plus proposed '91 to see what went up, what went down, what stayed and what didn't, to get feel for it.

MR. SHERON: Yes. And I will be quite honest. These things, they represent an assessment at this time, okay?

MR. SIESS: Oh, yes. I know.

MR. SHERON: And obviously, if NRR says they need more emphasis here, or for example, we just got a user need letter form NRR for some assistance. And I am going to have to, you know, for it to meet that need I may have to shuffle money in order to accommodate them.

MR. MICHELSON: What is the meaning of the last bullet?

MR. SHERON: Oh. Basically it means that we were, one of the things we had anticipated doing, and this is coupled in with the thermal hydraulic research program itself, and the question of how does one maintain a viable expertise in thermal hydraulics, given that we don't have a very aggressive, active code development program like we used to.

What we wanted to do to maintain the expertise, we were trying to "kill two birds with one stone." One is maintain expertise. And we thought we could do that by having these thermal hydraulic experts analyze the advanced designs that were being proposed.

MR. MICHELSON: By advanced, you mean not the improved light water, but the --

MR. SIESS: Brian, you are about three feet too far away from the microphone.

MR. SHERON: Oh. I'm sorry. I apologize.

MR. SIESS: You have to get really close.

MR. MICHELSON: So these are the passive plants that you were going to have analyzed?

MR. SIESS: Is that what you mean by "advanced"?

MR. SHERON: Yes.

MR. MICHELSON: Not the evolutionary?

MR. SHERON: No. Well, actually, I think we were planning on doing both, depending upon a lot of factors here. One is that we really didn't want to go gung ho and start to do analyses on some of the passive designs, for example, until the Commission made a more firm commitment on which ones they were going to really --

MR. MICHELSON: What was the reason to even want to do this? Just to keep the experts tuned up?

MR. SHERON: That was one reason. In order to keep a viable thermal hydraulic capability in the agency, one needs to keep experts employed, and they are not going to stay employed if they don't have interesting work to do.

I certainly didn't advocate just giving them busy work. And I had long discussions with, for example, Paul

North, at EG&G about what kind of work would keep the analysts interested and wanting ot stay in this area. And we both agreed that doing this work on these advanced designs would be both interesting and challenging and it would keep the capability alive.

MR. MICHELSON: In the case of the advanced boiling water reactor, which was the evolutionary machine, whether or not this work was done would have no effect on certification, would it?

MR. SHERON: Not that I know of, no. It is more again, it is looking under rocks.

MR. MICHELSON: Yes. Okay. Thank you.

MR. SHERON: Analyzing and seeing if there is any strange performance behavior that we should know more about.

The areas here, one of the things we wanted to do was to take the B&W plant data that we had gotten from the MIST facility and apply it to Novak Zuber's CSAU method, and try and get a handle on uncertainty, which is something that we are not going to do now.

I apologize. I don't think I wanted to say here we can't apply it to regulatory issues. You can use the data for regulatory issues. What you won't have is a quantified uncertainty assessment.

MR. WARD: And this was going to be the demonstration of the CSAU for small breaks, I guess, too?

MR. SHERON: I think the small break assessment is going on. But that is for a Westinghouse design.

MR. WARD: Oh, that was a different effort.

MR. SHERON: Yes. This is an effort, since the B&W plants are very different in terms of their primary system configuration.

One of the things we were planning on doing is finishing up, you know, as you know, we have been working with the Japanese on the ROSA IV facility, which is basically the last remaining large-scale thermal-hydraulic facility in the world, basically. I think it is a what, 10-scale or something, of a Westinghouse-type design. It is a small-break facility.

We have been fortunate the Japanese have let us come in, basically, at any funding level that we want, and what we provide is analysis. And we are going to be cutting back on the amount of analysis we are going to be able to do to analyze the ROSA-IV results. Also, on assessments of TRAC and RELAP, and the ICAP program, we do some assessments as well as the foreigners, so there will be a scaleback in that area.

And then an area that we are working on right now is, which came out of the LaSalle event, is looking at the instabilities in BWRs; and what we've been focusing in is the principal concern from a risk or safety standpoint is how might they affect an ATWS event, where you are tripping the recirc. pumps, lowering water level and kind of setting yourself up for

an unstable type of condition.

This is going to affect the amount of money we can spend on the analysis of that.

Again, this might be an example of what we were talking about this morning, where we have been doing work in this area, and we have been sort of pushing the industry to come along. We have had a number of meetings. And by us doing this work, us examining this stability and the like, GE has had to pay "catchup ball" you might say.

So scale this back, and you might expect the industry would scale back their efforts.

In the accident management area, one of the questions was would analysis aids substantially improve operators' ability to respond to severe accidents. At one point we had a program where we were going to try and develop some examples and maybe some guidance documents with regard to the development of analysis aids, what is a good aid, what isn't, try and learn that. And we are going to be eliminating, I think, doing some of the work of developing examples. We are going to still look at some of the work towards guides, if there is some money available. But it will be a scaled-back effort.

We were supposed to, in the accident management area, take a look at what this agency would need in order to audit accident management programs that are developed by the

industry.

With regard to accident management, what we are going to be doing is deferring or scaling back our efforts to develop these audit requirements. It is hard to say what the impact is today, since we don't really have an IPE finished and an accident management program would follow after an IPE.

The best I can say is that whatever we had planned to do, it is not going to be as good at that given time, because we are just deferring some of the work, and then as we just talked about, defer some of our thermal-hydraulic analysis on the advanced BWRs. And we will presume that the old analysis methods are still viable.

MR. WARD: Can we go back to that second one again? With regard to the BWR, LaSalle instability thing. The ACRS I think is taking a position that we thought the only really important part of the whole issue is this. And I mean, there are sort of three things. Are you terminating or reducing, and is GE going to do anything here?

MR. SHERON: Well, GE is doing some work in this area still. And what we are going to be doing is most likely terminating the work earlier. In other words, you know, a lot of times you do the work, you come up with basic answers and everything, but you want to do some more confirmatory work, kind of clean up the loose ends, make sure you really understand it.

I think this is the area that we are going to be scaling back on. We are just not going to do that more extensive finishing work, you might call it.

MR. WARD: Well, I guess, Ivan, we are probably going to want to hear about this at some point, huh? Ivan, he just cut the heart out of one of your favorite programs.

MR. CARROLL: That's okay.

MR. SHERON: That was just to wake him up, right?

[Slide.]

MR. SHERON: Okay. The reactor containment performance, this is almost a $10 million cut.

MR. SIESS: From your request?

MR. SHERON: From our request, yes.

MR. SIESS: How much of a cut is it from 1990?

MR. SHERON: Let me see.

MR. SIESS: It's a $1.5 million increase; am I right? $2.5 million.

MR. SHERON: I think under reactor containment performance of '90 --

MR. SIESS: 22.3 to 24.8.

MR. SHERON: 22.3 to 24.8. So it is still about a $2.5 million increase.

MR. SIESS: That's what I said.

MR. SHERON: Okay.

MR. SIESS: Using your numbers.

MR. SHERON: Well, the major impact here is that it is going to slow down the pace of hopefully the resolution of some of the more important items in core melt and RCS failure.

Core melt progression, as you know, was one of the biggest uncertainties that guides the severe accident uncertainty.

If you don't know what is in the bottom of the vessel, what its composition is, what its superheat is, at the time of vessel failure. Then everything else is uncertain.

We have tried to put a lot of emphasis on understanding the core melt progression, in particular the understanding the late phase, which essentially is what gets in the lower head of the vessel, what is its composition, what is its superheat, and then also on the reactor coolant system failure mechanisms, which is how does the vessel fail; is it going to be through a penetration or is there going to be a gross creep rupture failure?

DCH, which is one of our high priority areas, since this is one of the issues for PWRs that would fail containment early, is something that we may have to defer. We would try to put more effort in this area to try and better quantify what the mechanisms are for containment failure. We have been thinking about possibly what kind of new test we can do that will shed light on the fragmentation issue, which seems to now be the driving question.

Once the melt gets in the lower cavity, the question is when the steam comes out of the vessel, how does entrain the melt; how does it fragment; and what interactions then would take place? The melt fragmentation and entrainment rate determines how it interacts with the containment.

MR. SIESS: These are the things you won't be doing?

MR. SHERON: These are the things we will be slowing down.

MR. SIESS: What will you be doing for your $25 million?

MR. SHERON: Well, we will be continuing to work on the DCH issue. We do have a number of experimental programs that are in place. As you know, SURTSEY is undergoing sort of a re-evaluation, so we will be hopefully starting up some more testing in that facility.

MR. SIESS: What does SURTSEY cost us a year?

MR. SHERON: I think it is a little over a million.

MR. SIESS: For how many tests?

MR. SHERON: I think it is about maybe two a year. But I would have to check that.

MR. SIESS: So the other $24 million?

MR. SHERON: Oh. Okay. Well, not all of it is mine. Larry, how much is your containment part of that, do you know?

MR. SHAO: $1.8 million.

MR. SHERON: Okay. So you are talking about $20

million, then. I don't have the sheets in front of me. I could probably go through these. Here, here they are.

MR. SIESS: I guess, you know, you are talking about reactor containment performance. I thought somebody decided a long time ago that it was only early containment failures that were likely to contribute much to risk. And that is DCH.

MR. TAYLOR: And hydrogen.

MR. SIESS: Well, hydrogen we decided wasn't much of a problem for large drys, and it is not a problem for Mark-Is and Mark-IIs. And that only leaves a few ice condensers and a few Mark-IIIs, doesn't it?

And we are looking at $25 million. And I am just trying to see what containment performance issues we are spending $25 million a year on, and yet some of the important issues are being deferred. I mean, the list of what is up there looks pretty important.

MR. SHERON: Actually, if you look at what we are spending, most of it is on the early containment failure mechanisms. That was the whole objective of the revised research plan.

MR. SIESS: Let's go ahead.

MR. SHERON: I was just going to point out, though, that if you look at the numbers, I see we have like for FY-'91, $7.9 million on core melt and RCS failure; $5 million on core melt progression; natural circulation in the RCS, again which

affects direct containment heating is $1 million; fuel-coolant interactions.

MR. SIESS: That's not under preventing damage. That is after damage occurs, right?

MR. SHERON: Yes. I'm in reactor containment performance right now.

MR. SIESS: Okay.

MR. SHERON: Okay?

MR. SIESS: Okay. That covers everything after the core melts, then.

MR. SHERON: Yes.

MR. SIESS: Before it gets into containment?

MR. SHERON: Before it gets into containment, right.

MR. SIESS: Seems like it is a bad name for that.

MR. SHERON: Direct containment heating is $2.2 million. Hydrogen transport and combustion, we have 800K. The computer codes, which are basically our tools to predict this for the large plant, is $4 million.

MR. SIESS: The word "containment" here doesn't mean containment, doesn't mean containment structure.

MR. KERR: Well, Chet it is pretty important to get the information he needs in order to get the boundary conditions that one needs to start the containment.

MR. SIESS: I'm just trying to find out, does containment mean like the pressure vessel now is part of the

containment?

MR. SHERON: No.

MR. KERR: You need the condition of the melt as it enters containment in order to calculate containment performance. And the only way to get that is to know what is happening ot it in the vessel.

MR. SIESS: I guess that I am just confused. We have containment performance working group and there was a clear distinction between the loading and the performance, but now containment performance now includes everything that was previously under containment loading also.

MR. SHERON: I basically come up with the temperature and the pressure histories on the containment. Larry determines at what point the containment lets go and how it lets go.

MR. SIESS: That at one time was containment loading.

MR. SHERON: Okay.

MR. SIESS: So now when I see containment performance --

MR. BECKJORD: That is why I called it containment loading. Larry does the structural part.

MR. SIESS: This is still one of your major categories. With that label on it I guess it was confusing. Okay.

MR. KERR: Brian, what are the codes to which

reference is made?

MR. SHERON: These are primarily are a MELCOR code. We are doing an assessment I think of RELAP SCADP. Also, the contain code and then there is the hydrogen codes, which is HMS burn and so forth.

MR. KERR: So MELCOR is at a point where it needs validation. It an okay code, but it hasn't yet been validated.

MR. SHERON: As a matter of fact we are right now starting to put in place a peer review of the code.

MR. KERR: Without validation.

MR. SHERON: Well, I mean it is validated as much as --

MR. KERR: I assumed validation meant comparison with the experiment. It doesn't mean that?

MR. SHERON: It means that, okay? The code has been -- MELCOR structured it -- it takes pieces of other codes which have been validated.

MR. KERR: This is deferred validation, which just tells me -- and I asked which coded were being referred to.

MR. SHERON: That would probably the MELCOR code it contained.

MR. KERR: So it is going to be a peer review before it has been validated.

MR. SHERON: Yes. Well, it has been partially validated. It says where deferring validation.

MR. KERR: I do not see how someone partially validates something.

MR. SIESS: You never heard of level of confidence, Bill?

MR. SHERON: MELCOR is made up of very different parts and they have to some extent been validated. Some of the sub-codes came out of the old source term code package. They have been validated.

MR. TAYLOR: Maybe that is why there is some concern.

MR. SHERON: As you know, we don't have an interval core melt test that is going to provide the same level of validation that we got for any ECCS code. The only way we can really validate these codes is against the small scale experiments. One of the questions we keep scratching our head on is how to extrapolate that validation.

MR. KERR: So the validation might be deferred even if you had money, since you don't how to do it.

MR. SHERON: When I say we will defer it, it means we have data. It just means that we are not going to be validating as much money is spent on validation.

The other areas are natural circulation and the RCS and the core/concrete interaction work. These are the principal areas that will be slowed down or deferred.

MR. SIESS: How long have we been working on core/concrete interaction? And how much have we spent?

MR. SHERON: Since 1984.

MR. SIESS: 1984. And we still haven't got answers? Are you sure we are ever going to get answers to that subject. Being completely ignorant, I look at a subject that is moderately narrow, we have been working on for six years and complaining that we ought to be working on it more. Are we making progress?

MR. SHERON: Yes.

MR. SIESS: Have we learned enough? How close are we to knowing all we need to know? Do we have any idea what is all we need to know? What do we know and what don't we know? Is that something you can tell me in a few sentences?

MR. SHERON: The most difficult areas we have been having trouble with -- obviously, if we knew the answer to that we could have answered the Mark I issue on whether or not one fails the liner. If we knew the details of not only core/concrete interaction, but the effects of an overlying pool of water.

MR. SIESS: Are these new questions or were these questions in 1984?

MR. SHERON: They are new. These are fairly new.

MR. SIESS: You mean that means for six years we have been working on our things?

MR. SHERON: No. It means that when we started working on this area, you start working on it based on your

perception of the phenomena that you expect to see.

MR. SIESS: Wait a minute. I don't buy that. But go ahead, if that is the way you operate.

MR. SHERON: I am saying, when you move into an area that is new and you ask yourself, "Where do I start to do research?" You do it in the areas that, based on what you think you know at that time. As you do the experiments, you learn.

MR. SIESS: I wish you would use the first person when you say that. Don't tell me that I would do it that way. I don't agree with you.

MR. TAYLOR: Chet, initially they were looking at the interaction for the large drys and different phenomena governed that process. Then this issue of the --

MR. SIESS: Has that been settled?

MR. TAYLOR: In my view it has. I am not sure you would agree. The comparisons with the beta tests in Germany look pretty good to me.

MR. SIESS: At least good enough.

MR. TAYLOR: For safety.

MR. SIESS: Has anybody defined good enough? That is an old problem.

MR. TAYLOR: I guess that is in the eyes of the beholder.

MR. SIESS: Some people will never want to stop.

MR. TAYLOR: The Mark I questions is a new one.

MR. SIESS: No Congressman is going to ask you these questions, but if they did, and you got these answers, they don't sound very good. That you have been working on that simple a problem for six years and have been working wrong parts of it, or you got started on it before you knew what you were looking for.

Well, I am putting words in your mouth, but they are the kind of answers people -- the kind of deductions people would make about why we are still working on a problem after six years. I bet you have got in the budget it for the next five.

MR. SHERON: No.

MR. SIESS: No?

MR. SHERON: No, but there are --

MR. SIESS: We have got this going up ten percent a year for the next five.

MR. BECKJORD: We think we are very nearly done with the Mark I question. There are some important areas here. The hydrogen generation is one of them The core/concrete interaction. Aerosol.

MR. SIESS: I agree they are important, but I keep wondering why we spent so much money and aren't closer to solutions than we seem to be now.

MR. BECKJORD: Well, I think we are close to

solutions. And your plan is --

MR. SHERON: The real question is how well can the code --

MR. BECKJORD: In two to three years more, we can close that issue up.

MR. SHERON: The real question we have to answer is how well are the codes able now to predict the phenomena.

MR. SIESS: How well do you want them to?

MR. SHERON: If you remember --

MR. SIESS: Do you have criteria that tell you that you will know how good is good enough?

MR. SHERON: If you remember when I came down and talked to you about the revised research program, there were five elements. The question of how good is good enough was one of the five elements.

MR. SIESS: That was a year ago. Do you have the answer?

MR. SHERON: Not yet.

MR. SIESS: It is in your program?

MR. SHERON: Yes.

MR. SIESS: Okay. Let's go ahead.

MR. TAYLOR: I think the MCCI is an excellent example of why the study of basic processes, which is missing from your program should be incorporated. One of the more recent questions is crust formation. Crust formation has been a

question near as I can tell for five or six years. Yet for one reason or another, it has never really been addressed.

I think if the basic processes at the outset are investigated you wind up by the time you do your interval test, you have the package to put together. I think you should do that instead of writing these codes first, then trying to find experiments to corroborate them. Turn the process around.

MR. SHERON: If you remember, that was --

MR. TAYLOR: You know that is what is coming out of this DCH thing that Zuber is doing. It sort of redirects you on where you should be. You almost need to do that first, then you can point specifically to the questions.

MR. SHERON: I agree with you 100 percent. If you remember that again, one of the elements in the revised research program, was to slow down the code development and to take a look at where we are and not just blindly go forward and think we are making these codes better just because somebody dreams up an improved way to do something.

Let's step back and see what do we have in the way of research information or data that we can use to validate what we have, and understand where the code is deficient before we just go blindly forward and improve it.

If you will note, we have stopped development of MELCOR and we are sitting back and taking a hard look at it with a peer review.

MR. TAYLOR: Should MELCOR, or at least what you tried to do with it, guide you at to where you are to be looking at fundamental phenomena.

MR. SHERON: Yes.

MR. TAYLOR: Then we should be seeing somewhere here the programs that will address those questions or else write them off for some reason.

MR. SHERON: The program is in here. What you are looking at is the programs that are being deferred, not the programs that are going on.

MR. TAYLOR: I understand.

MR. SIESS: That's what I was trying to get at is what have you done rather than what haven't you done. But let's go on.

[Slide.]

MR. BECKJORD: Shall we go to the last two, then, the continuing concerns?

MR. SIESS: Yes. I think so. I think we need to keep that fairly brief, if we can, since we have the other group out there waiting.

MR. BECKJORD: Yes. I think that we are going to pursue the individual plant examination and the containment performance, and that is going to, that will be completed in the next three, three-and-a-half years.

There may be some new issues that will come out of

that on severe accident research. I don't think that we foresee any major new issues coming up, but it is possible.

I think that the severe accident program will be peaking out and will be on the downslope at the end of five years.

I think the work on reactor aging, the expenditures have been growing. I think in the next five years, you are going to see the peak and I think that program will at that time move down to a lower level, but I think there will be ongoing work in aging.

Larry has a bunch of things that he has talked about. You may want to, I don't know if you want to hear about those.

MR. SIESS: It looks like B through K are all what I call time-related items, or aging-related items.

MR. SHERON: Yes.

MR. KERR: What is meant by continuing concerns of NUREG 1150?

MR. BECKJORD: Well, I think there are a couple of issues that, that M and the N, I guess I look at those together, are the two major questions which aren't really settled in 1150. One of them is the question that came up in the seismic review. We are going, as Larry has indicated, we are going to pursue that for the individual plant examination by means of the seismic margin method.

However, I think we are going to continue to pursue

the seismic hazard question. We've met with the National Academy Committee on that subject and I don't see an early resolution to that, but it is something we are going to continue to work on.

The second one is the direct containment heating issue. We think that the scaling methodology which you already asked about is going to help significantly in that area, and it may provide a shortcut, suggesting some experiments which will enable us to finish the work there as well.

MR. KERR: So the continuing concerns are not all on 1150 but things that 1150 did not treat.

MR. BECKJORD: Particular issues. That's right. I think particularly the issues in which we used expert opinion as the best way that we had of proceeding a the time, we are going to continue to attempt to get at the basic phenomena involved.

[Slide.]

MR. BECKJORD: Accident management. Human factors. I think that is an ongoing program. I think that is just getting underway.

Interfacing LOCA systems. There has been a lot of discussion. I don't think I need to say more about that.

There may be some different questions for new reactors. I don't know. I'm not sure about that.

Source term, we are getting back to the source term

via its definition in consideration for advanced reactors. I think there is going to be some more work in that area.

I think, looking at the rest of the list, I see of course high-level waste is not of direct concern right now. I think that is going to be a growing program. And as I said earlier, we are not doing research on advanced reactors. And I think that is the big agenda item for the future, depending on exactly what the designs are that are put on the table for licensing.

MR. SIESS: Is it just coincidence that you have 26 items or did you just stop when you got to Z?

MR. BECKJORD: I think that was coincidental.

MR. WARD: Eric, what does it mean that Item U is on this list, containment performance improvement program? Yesterday we talked with the office people, and that seems to be wrapping up.

Why is that listed as a continuing concern?

MR. BECKJORD: Well, I think it is there because I don't think we can say finally that it is finished until we finish the individual plant examination.

MR. WARD: That's what you mean.

MR. BECKJORD: Yes.

MR. WARD: Okay.

MR. BECKJORD: I don't see any big, new problems coming out. I see, you know, rather specific questions that

arise. And they may be just individual plant questions.

MR. WARD: All right.

MR. SIESS: Well, I think that concludes it, Eric. Thank you very much, you and Brian and Larry.

As usual, it has been enlightening.

MR. KERR: And I sure hope you can settle that concrete interaction problem soon.

MR. SIESS: What do you want to do with the concrete interaction?

MR. BECKJORD: I hear you.

MR. KERR: I think Professor Siess feels bad to discover that concrete can be dissolved in hot metal.

MR. SIESS: In fact, Professor Siess pointed out, about 18 years ago, that concrete didn't have to be made with limestone, either. At that time, nobody recognized any difference between getting CO2 out of concrete that didn't have any C in it.

MR. BECKJORD: There are big differences.

MR. SIESS: Yes. Well, it turns out there are some other things that come out of the other concrete.

MR. BECKJORD: We appreciate the opportunity to present this to you. I think it has been a useful discussion.

I certainly continue to be hopeful that coming out of this there will be some kind of letter to the authorities giving your views on the status and importance of safety

research.

MR. SIESS: Okay. Thank you very much.

Yes, sir. Welcome. Find a comfortable chair in front of a microphone. If you brought any help with you, find a place for Mr. Gillespie, too. We miss you, Frank. We miss you. If you still worked for Research, you would have been here all morning.

MR. TAYLOR: Some things change for the better.

[Laughter.]

MR. SIESS: Tom, before you get started, how are you coming on your most regulatory impact survey? I ask, because I had the pleasure of reading the 1981 one, and I wondered if anything had changed.

MR. MURLEY: Yes. What has changed is we don't have a crisis now, at least the industry doesn't feel it is a crisis. They told us that. My sense is it is not a crisis. There are some things that we have to look at, on how we are doing business, particularly on our interactions with the industry.

Also, the focus has changed, I would say, more from Headquarters, and out to the regions.

MR. SIESS: I was going to say, in '81, we didn't have the regions, did we?

MR. MURLEY: Oh, sure, sure.

MR. SIESS: You mean we had the I&E?

MR. MURLEY: You had an I&E.

MR. SIESS: I&E region or something, but not the --

MR. CARROLL: You didn't have the extent of decentralization you have now.

MR. MURLEY: But they were not regional administrators reporting to the executive director.

MR. CARROLL: Yes.

MR. MURLEY: That is correct.

MR. SIESS: Have you looked back at that survey?

MR. MURLEY: Sure have.

MR. CARROLL: If you had implemented all those things, you wouldn't have had to do one.

MR. SIESS: That survey prompted CRGR, didn't it?

MR. MURLEY: Yes. And the backfit rule. We are still pulling together. The trouble is, the people who were involved also have other duties to do. It is going to be a report that is about 100 pages thick, I think. And we are still pulling it together and putting some contexting material in a preface and then also we are trying to, before we go to the Commission, we want to have some idea of what we are going to do to look at how we go.

So I think we are still a month away or so from having a report to the Commission.

MR. SIESS: Okay. Thank you. You know what we want to talk about, I think.

MR. MURLEY: Yes, I do. And we've got the topics that you want to hear from. I think there is a chance, good chance, that we might not hit exactly on target.

MR. SIESS: That's all right.

MR. MURLEY: So let us, I would like to talk a little philosophy, to lead off.

MR. SIESS: If you don't, we'll tell you to.

MR. MURLEY: Well, that is what I figured. Perhaps we'll get at what you want, probably through questions and answers.

Frank Gillespie is prepared to talk in specific about the questions that you did have.

My own view is that I am a strong supporter for research in NRC. I have always supported research. I support research for its own sake, even if there is not a well-defined user need in the classical sense.

We are a technical agency. It is extremely important, I think, for our credibility, that we maintain our technical excellence. And that means, to me, that we have a strong research program. And so wherever I can, I take the opportunity to support the Office of Research and the research program. That is not to say we don't have our differences and we don't sometimes see eye to eye on things.

MR. SIESS: You used the word "technical expertise."

MR. MURLEY: Yes.

MR. SIESS: NRC doesn't do research, it contracts research. The expertise stays out with the contractor. The knowledge comes into the NRC. And I didn't know whether you were equating the technical knowledge with technical expertise.

MR. MURLEY: Well, yes.

MR. SIESS: That's the point I'm making.

MR. MURLEY: I don't mean research expertise so much as I mean the knowledge, strong technical knowledge and technical basis for what we do.

And I think that keeps us all relatively, although it is hard to say that we in NRC are technical experts in any sense. Compared with our compatriots around the world, we are. I can take staff of mine and sit down with any technical agency counterpart in the world and we can talk rings around them in terms of our knowledge of issues and things. That doesn't make us technical hands-on experts. We've long since left the laboratory and university. But I still think we maintain our understanding and capability, and a good part of doing that, I think, is the research program.

I mention one example, that will probably, if you are not reviewing it now, you probably will be. It is a report by Professor Theo Fanous on the Mark-I liner failure probability. It is a very, very good report. And I even find some time to read it, because it is interesting to me.

Now, one can say well, that issue is behind us now.

But in a sense it is not. I think we still have to put the technical arguments, still work on those.

I know one of the questions you asked Eric was the containment performance improvement program. And to a large extent, we have found a way to deal with that in a regulatory sense. But there is still the underlying technical issues that won't necessarily go away.

[Slide.]

MR. MURLEY: I have a slide that I used a few months ago with Neil Todreas's group that was looking at research. And let's see, somebody is making copies, so we will have some copies for you. But I will go ahead and read it.

It was some thoughts that I put down on why we need research in the NRC.

These are all, they overlap a bit, but I view them as slightly different facets of the answer.

MR. SIESS: What is the headline on that?

MR. MURLEY: "Regulatory Needs for NRC Research."

MR. SIESS: Okay.

MR. MURLEY: These are Tom Murley's views. I don't know that I speak for the whole agency of course, but this is what I think.

First of all, we need to confirm margins, safety margins. This is the classical confirmatory research, I think, that got started back in the '60s, even, when LOFT and Semi-

Scale, some of those facilities, were laid out. And I think it is still valid. We have to make decisions all the time that are on the edge of or beyond the edge of firm engineering knowledge. So what we do is pad those decisions with conservatisms and margins, and I think it is necessary to come back behind those decisions and confirm the magnitude of the margins.

The second area is to maintain the state-of-the-art technical ability to deal with safety issues. And I've only listed an illustrative example here, the pressure vessel integrity program, for fracture mechanics. I think it is almost self-evident that we've got to, as long as there is an NRC, I think have a pressure vessel research program, because of the crucial importance of the vessel and piping for that matter, primary piping.

I mentioned the Theo Fanous report. It is an extremely good piece of work, from my reading of it. And it is important that we maintain this ability to deal with safety issues and be, I think, the world leader in resolving a safety issue, and then not have to follow.

MR. SIESS: Was that report from a research project through Research or was it technical support through NRR?

MR. MURLEY: No. It is a Research project. It came from the Office of Research. I presume it is available.

MR. SIESS: Okay. And you feel that Theo's knowledge

and background that enabled him to write that kind of report resulted from the support he had gotten from NRC in doing research on nuclear power plants?

MR. MURLEY: Yes, yes. I think so.

MR. SIESS: Okay.

MR. MURLEY: And the fact that we have people like that in -- well, I mean, you all know Theo extremely well. But the fact that we have people like that that we can call on and that we can support is important. Because there are going to be issues that we can't even dream of now that will come up.

MR. CARROLL: Let me go back to two. Why do you say that a necessity would always be a pressure vessel integrity research program?

MR. MURLEY: Because there is always the potential of a safety issue arising due to aging and embrittlement that we just had not anticipated.

MR. CARROLL: You find new flaws.

MR. MURLEY: Yes. And we are, all the time. We are finding flaws out there.

But I can remember when the --

MR. CARROLL: I'm not saying pragmatically that I disagree with you, but I guess logically I would say that at some point I could have sufficient knowledge that I could say gee, there's nothing more I really need to know about pressure vessels. I don't think we are there yet.

MR. MURLEY: Well, I grant you that it is conceivable. I feel very strongly we are not there yet, because two surprises we've had in the last what, 15 years, which is, I think, a relatively short time.

One is the impact of copper content on welds. So then we drafted the Reg. Guide 199 curves on embrittlement versus fluence. And as time went on, and we started collecting data, we found that phosphorous, which was in the original equation, is no longer as important as nickel. And I would bet that there is probably other impurities that we are going to find from time to time in weld material that has the same kinds of impact.

So I think it is for surprises like that that I said I think we are going to have to have such a program.

MR. CARROLL: All right.

MR. MURLEY: The third item was to help provide the technical basis to resolve generic safety issues. This is slightly different from the first two but it's another thing that we do. I've listed here the loss of residual heat removal in pressurized water reactors. It could have equally well been station blackout or any of the other tough generic issues that we and NRR can't deal with immediately.

MR. SIESS: What's the research tool that we use to define that PRA? In both of those cases, I think you could cover it with PRAs in the sense of reliability analysis of

risks.

MR. MURLEY: Yes, we used PRA as part of the tools.

MR. SIESS: What else did we have on either RHR station blackout or research?

MR. MURLEY: What other tools for station blackout and loss of RHR? It's hard to say. I would guess it was mostly PRA but certainly some knowledge of thermal hydraulics and some knowledge of ways that you can get into problems in -- I'm also thinking in terms of the loss of shutdown cooling but it's mostly PRA and analysis.

MR. SIESS: All right.

MR. MURLEY: That gets us into the fourth bullet which is to develop these new methods of safety analysis that allow us to analyze issues. I'll mention one here that I'm sure is close to your heart, Chet, and that is the SSMRP, the Seismic Safety Margin Research Program. I dreamed that program up. I don't know if you recall, but it was back in about 1977 or 1978 when these issues started to arise. It was clear to me that we didn't have a comprehensive methodology and Larry Shao had just come over to work for me at that time and Jim Richardson was there and we got to kicking it around and it was clear that we had to develop that. I don't take any great credit for the technical insights that went into it but insofar as the need to have a methodology like that stemmed from an analogy with the PRA, the WASH-1400.

MR. SIESS: That's an interesting example because I think we ended up at a fairly good location in terms of seismic margins but a lot of what Livermore did was a dead end. They had the typical approach, we're going to write codes and you're going to plug in stuff at one end of the code and the seismic margins are going to come out of the other and the codes got more and more and more elaborate and finally they got junked and now we're doing walk-downs and fragility curves and things like that when we don't need all those fancy codes.

We ended up at the right place.

MR. SHAO: All the seismic PRA methodology is a takeoff on SSMRP.

MR. SIESS: Some of it throws it out. It got started there.

MR. MURLEY: The fifth item that I have marked here is to maintain a cadre of contractor experts for regulatory support. This item, it's a practical one for us. I'm sure it's going to be hard to sell in this town here but whenever we get into trouble, technically who do we turn to, and we frequently turn to the laboratories, to our contractors, for help. I've listed here one area where we routinely use almost half contractor resources and that is to give operator licensing exams.

MR. SIESS: Are people out of research organizations given the operator license exam?

MR. MURLEY: Yes, they're out of INEL and PNEL.

MR. SIESS: Do they have licenses themselves?

MR. MURLEY: Many do, yes. Yes. In fact, when a lot of the facilities at INEL were shutdown like LOFT, several of those -- they were not licensed by the NRC but they were formal naval operators, for example. They went into this program and they take -- at least they did -- take an equivalency kind of exam. We send them to our courses and simulators and then examine them ourselves before they're allowed to give exams, but, without a research program, there is no cadre to fall back on when you get into trouble.

God forbid there should be another TMI but after that accident, we had to rely very much on a lot of the analyses, a lot of the capability that existed in our contractors.

MR. SIESS: I thought it was our job not to rely on God to prevent another TMI.

MR. MURLEY: Yes, that's my job. That's right, really. Sometimes we need a little help.

So that one's I think a little bit off the beaten path from the normal reasons for needs for research but I see it very clearly.

MR. KERR: I think No. 5 is a good reason. I'm puzzled at that example because it seems to me there are other examples that would be much more defensible.

MR. MURLEY: I think there are. I only put it down

because I remember back in about 1981 when I was in NRR at that time working for Harold Denton and Steve Hanauer had the job of cranking up very quickly an operator licensing program and much bigger than it was at the time and we had to turn to Idaho for help to do it.

I think there are better examples where we do call on our contractors for regulatory support.

MR. SIESS: HSST program and PTS -- that was almost that type of thing. There wasn't a lot of research had to be done. It was already there, much of it.

MR. MURLEY: That's true. Yes.

MR. SIESS: Some of that knowledge really resided at Oakridge and some of it was already out in the public domain but certainly from your point of view, it was a lot easier to go to Oak Ridge and say help us work this thing out. They knew where all the things were.

MR. WARD: Do you see five and two as different?

MR. MURLEY: Yes.

MR. WARD: I'm trying to figure out what you mean. Two is maintaining the ability within agency staff and five is specifically with contractors? Is that what you mean?

MR. MURLEY: No, not so much. It could be --

MR. SIESS: I just gave the example that put them alike.

MR. MURLEY: Let me draw a distinction because I

think -- in my mind they may be the same kinds of people but they're used for different things. The use in No. 2 is when a very tough regulatory issue arises, we have to be able to deal with it so we don't have to shut all the reactors down for some reason. That means a very capable technical cadre in our contractor's shop but it also means we have to maintain our technical knowledge to stay up with it. Item No. 5 is more of a regulatory use of that support, for example fire inspections.

MR. SIESS: Those experts are not necessarily research experts in 5. You say contractor experts and the examples you gave on license examiners, were those people out of research or just good operating people from LOFT and things like that?

MR. MURLEY: I think of the term you're using it, they came from the research program clearly.

MR. SIESS: Yes, but they weren't necessarily experts in research.

MR. MURLEY: That's right. No.

MR. SIESS: I think that's one of the distinctions you're making.

MR. CARROLL: They wouldn't have been there if you hadn't been funding research.

MR. SIESS: They worked on research projects but their expertise was not as researchers but as technical people working on research projects.

MR. MURLEY: That's right. They may be good solid engineers that are there to support a research facility.

MR. SIESS: That to me would distinguish between five and two.

MR. MURLEY: Partly, yes. Finally then, on six, a slightly different facet to this is to develop an international consensus on safety issues and I put here plant aging because it turns out, we just had our plant aging conference a year ago here in Bethesda and that was a remarkable instance, I think, of us taking the lead to kind of forge an international view on aging plants.

MR. SIESS: I'm surprised why that's under research. Issues to me are things that you resolve through research. They can also be questions that are raised by research. We generally hope that research will answer questions rather than simply raise them and if in the process of doing research, you raise a question, I hope that you go ahead and answer it before you do something about it.

The consensus on safety issues you could get through any international organization whether it involved research or not. A group of regulators can get together and decide on issues.

MR. TAYLOR: Maybe not correctly.

MR. SIESS: They might be better than the research men at it.

MR. MURLEY: Here's how I view the aging issue.

We know that we're going to be asked to license these plants, to take them into a regime that they were not designed for, that is beyond 40-year life. Now maybe some components were and some aspects but as a general proposition, these plants weren't designed. So I look to Eric and his program to help map out that mine field that we're entering into, look for the problems. So that's No. 1. I look for them to define the problems and then solve them.

MR. SIESS: You could look within your own licensing organization to see which parts of the plant were claimed to be designed for 40-year life.

MR. MURLEY: Yes.

MR. SIESS: There are a lot of parts of the plant where the 40 years were just tacked on for economic reasons and sure, we don't expect that pump to last 40 years. We go replace it at the end of 20 and who was it just had some check valves fail that had been in the plant for 20 years. They went in and looked at them and they were all failed. They said, oh, they just wore out. It didn't take research program to find that out.

MR. MURLEY: That's true.

MR. SIESS: Again, their several issues aging shouldn't all come from research.

MR. MURLEY: No, and I didn't mean to imply that

we're going to take hands off. We, from our own reviews and our own knowledge can identify many issues in this, embrittlement.

MR. SIESS: Take valve operation, the only way that's going to improve with time. It couldn't get any worse.

MR. MURLEY: Yes, but there are some issues though like electrical cables and that sort of thing where I think we do need a research program to probe for us what the limits are if there are.

MR. SIESS: That's a solution. The issue is there. Electrical cables age. That's the issue. The question is how long. That's a question for research. I'm trying to get the distinction between issues and answers to issues.

MR. MICHELSON: There's also the issue relative to cables of how they burn. Fire retardants do not necessarily stay there the life of the cable and at 40 years, they may even be getting reasonably flammable. At 60 years, they may be getting even moreso. Aging includes that.

MR. WARD: Tom, this morning we talked about one that isn't -- with Eric and staff -- about one that isn't on your list which I guess was variously referred to as exploratory research or turning over rocks or asking questions about safety issues that might not be asked in any other way. Do you see that sort of thing as an appropriate function of NRC research?

MR. MURLEY: Absolutely, yes.

That's the conclusion of my opening philosophy.

MR. KERR: Would we conclude then that you're in favor of the NRC having a research program?

MR. MURLEY: A vigorous research program. Unfortunately, I suppose --

MR. WARD: As long as we don't get quantitative about that.

MR. MURLEY: I think it's close to being on the margin. If it takes any more serious cuts and we had to go through an exercise a few months ago on whether we were going to take big Gramm Rudman cuts in addition to all the other cuts we've taken and as Eric will verify, I strongly supported that don't come out of research.

MR. KERR: The Office of Research is in favor of a research program. NRR, at least its director, is in favor of a research program. Which offices in the Commission staff are against one?

MR. MURLEY: I'm not aware that there are any.

MR. KERR: Then why does research always take the biggest cuts when the budget is cut?

MR. SIESS: You didn't hear Tom say he offered to give up 50 people and $2 million; did he? You said don't take it out of research but did you tell him to take it out of NRR?

MR. MURLEY: First or all, these were very private conversations between me, the EDO, and Eric to some extent. I

told him exactly where I thought he should take it and they did ultimately. They gave money back to research. I was prepared to give up some of my pet projects in NRR if it would come to that. We don't have a lot of discretionary money and that's unfortunately --

MR. SIESS: Not in terms of program support money but you have in terms of FTEs.

MR. MURLEY: Yes, but see, we weren't being attacked in FTEs. We're being attacked in dollars.

MR. SIESS: I know, but that's one of the questions that at least some people on the ACRS have raised. When we looked at budget cuts in the past and we looked only at money, it's obvious that if the agency gets cut $100 million, a big chunk of that's going to come from research because that's where the money is.

MR. MURLEY: The discretionary money, yes.

MR. SIESS: That's where the dollars are other than FTEs, not telephone bills and rent on White Flint. You've got to pay that, sure, but the question was raised, you know, why can't we just drop the resident inspector program and take that money and put it in research? That was an example somebody used. I can pick something else which was a trade-off between people and money and we wondered whether the Commission even thinks in those lines or whether everybody just looks at dollars and says everything else is untouchable.

MR. MURLEY: I would have to say in all honestly, I don't think we think in terms of trading off staff, NRC staff, for research dollars, no.

MR. WARD: But see, if you don't think in those terms, then the budget process seems to inevitably drive you to reduce research as time goes on. So you're sort of driven. The decisions being made by the process rather than explicitly by the leadership of the agency making the decision as to what's needed and I think that's basically what's bothering us.

MR. SIESS: I'll ask you what I asked Jim Taylor. I said what if Congress cut you another $90 million, which is what research has right now in dollars, not FTEs, what would you do? Well, would you consider saving $50 million for research and taking it somewhere else out of people, because that's what's happened over the last several years.

Research has been cut $90 million and I'm trying to do it all at one time to think about it but what would you do if they came and said, we're going to take $90 million out.

MR. MURLEY: I think we would clearly have to find ways to share that cut. I would have to take some cut, no question, certainly in the program support dollars. Staff, you know, no one wants to give up staff because it's the regulatory staff that makes the decisions and I just can't see giving that up but there are some --

MR. SIESS: You certainly don't have the knowledge

from research to make those decisions.

MR. MURLEY: I think it would be terrible if such a thing happened. I think over the years, the technical capability of this agency would shrivel but in the short term, we could make it up by forcing -- somehow finding a way to force the industry or someone or DOE to compensate. I think we're still going to need the basic knowledge.

MR. SIESS: But you see, this is exactly what has happened only it's happened gradually. Now if they whacked away $20 million for several years, it might slow it down but if over the next five years, they whack off $10 million a year, in a while this mounts up and you get down to zero. You can't tolerate it. At what level would you, I mean we got the research budget down to about 70 some odd million dollars in research. I'm not talking about the office now, 15 million of that's going for non-research, going for generic issues and the stuff that got moved out of NRR a few years ago and got moved out of standards before that.

So you're down to something like $70 million or so of actual research money. At 40 would you have a problem?

MR. MURLEY: Oh, yes. Yes. As I mentioned, I think at 70 million for research, we're on the edge of the viability of some of these programs. If you're asking me where do we throw up our hands and say we can't regulate anymore, I'm not sure. I think as a practical matter we would do our best.

MR. SIESS: Well, there's an alternative that we've been exploring a little bit, and that is, if we think it's getting intolerable, then what arguments can we take to the Congress to get more money for research. Can we convince the Congress that every time they cut the budget, two thirds of it comes out of research. Therefore, in effect, whether they say it or not, they're cutting research and we don't think they should. What are the arguments we can take to Congress? Can you go to Congress? Do you think the arguments you presented to us would sell it to them?

MR. MURLEY: No, and this is the -- well, it would help and I'm perfectly willing to do that but I can't show that if we cut another $10 million that the core melt frequency won't go up by one times ten to the minus five, average, or something like that. I can't show that if you cut $10 million that a certain number of licenses are going to be delayed by two or three months. There has always been that problem of connecting cause and effect.

MR. TAYLOR: Part of it's because of the way we do it.

MR. SIESS: Can we look back?

MR. TAYLOR: What if you said you had to surround the uncertainties rather than just argue them away like DCH. You have to deal with it or do the research to eliminate it.

Now, we kind of can't do anything while you do

the research and hope that it will come out okay. I can think of some other examples of the same sort of thing. The Mark-I is another example, that you can sort of put on a back burner until somebody develops proper arguments for it. What if you said at the outset, hey, we can't answer that question; deal with it? Then you need the research. The way it is being treated now, you really don't need it.

MR. SIESS: If you look at industry, and the large corporations that are famous for research programs, maybe DuPont, 3M, AT&T -- although Barry says it was different at DuPont at one time -- but basically they don't go in and try to justify, like you said, if we don't have it, this will happen. They look back and say, over the past ten years our research programs have paid off. They have led to information and new products. Or, in NRC they have led to increased safety or they have avoided this.

So instead of saying what would happen with a $10 million cut, can we go back and say look what we've done with the previous thing?

Now, can you think of arguments there that we could use?

MR. MURLEY: Is that a good lead-in, Frank, for your discussion?

MR. GILLESPIE: Yes. That was the second half of my discussion.

MR. SIESS: Okay. We'll wait.

MR. MURLEY: Yes. We're prepared to give some examples of how we've --

MR. SIESS: They've got to be examples that add up to a considerable portion of that money that's been invested to convince somebody to continue to invest it.

MR. WARD: Well, I don't know about that, Chet. I think that is the difference. You know, I think a lot of institutions have had major research programs. They certainly want the overall program to pay off --

MR. SIESS: Right.

MR. WARD: -- the total cost of the program.

MR. SIESS: That is easier to do in the industry than it is here.

MR. WARD: Yes. But you aren't necessarily looking for every piece of the program to provide payoff. So you can't predict that.

MR. SIESS: I said it would account for a significant portion.

MR. WARD: Okay. All right.

MR. SIESS: In terms of results, changes, improvements.

MR. CARROLL: I think the other question that needs to be answered that you touched on, Chet, is, you know, to what extent should or could industry be doing some of these things?

MR. SIESS: We worked on that one a long time, and I think there was a lot of progress made on that. The amount of cooperative work with industry or simply telling industry to do it changed a lot over a period of time.

MR. WARD: What about DOE? Tom, I think, made an interesting point. He thinks, he said that he thinks maybe the agency could get by with only staff, because then at least they would have the capability to try to get industry or DOE to do supporting research.

MR. SIESS: I hate to think of DOE doing it.

MR. WARD: Well, I know.

MR. SIESS: I know.

MR. WARD: But sometimes you look at those DOE budgets.

MR. SIESS: I know.

MR. WARD: And they're tremendous for activities that are really related to the NRC's business. And I don't know what's coming out of some of those.

MR. MURLEY: The argument that we would have to use, I think, is along the following lines, that would sell with Congress and with the public. And that is, we have an investment of about $100 billion, capital investment in this energy resource. We were looking just recently at the license renewal for 20 years, and in that 20-year period of this 100,000 megawatts have is equivalent to about twice the North

Slope Alaska oil field, that is starting to run down. So that puts it in perspective. There are enormous stakes for this country in this $100 billion resource. And the research program is a means of protecting that investment.

MR. SIESS: I hate to go to Congress, because that's the same Congressman that doesn't want to take oil off the North Slope, either.

MR. MURLEY: They do like electricity, though.

MR. SIESS: It's like the DOE. You know, we came that close to not having research in NRC. If Dixie Lee Ray had not set up the Division of Reactor Safety Research, and took it away from RDT, set it up as a separate research organization, if that had not been set up in the old AEC, NRC wouldn't have any research organization.

MR. MURLEY: That is probably correct.

MR. SIESS: Because they moved divisions in toto, into NRC. And they did not move RDT, which was where all the research was before.

MR. MURLEY: Yes. That's where I was. What's your point, though, Chet?

MR. SIESS: Well, we're talking about if you didn't have it maybe DOE would be doing it, that was the point. We came within an inch of not having it. And we've never had to look back at what would happen if we didn't have it, you see.

MR. MURLEY: I think if there were enlightened

leadership in DOE, if such things happened, they would realize the need to protect this investment, I think, and protect this source of energy.

I hope we don't ever come to that. It was a hypothetical question. But I said if we were forced to get by without research, we'd have to --

MR. SIESS: My point is, we could very well have been there from the beginning.

MR. MURLEY: It would not have worked anywhere near as well as it has worked the way it is.

MR. SIESS: No, I agree with you.

MR. MURLEY: Research is very responsive. They are an integral part of NRR. I used to work in Research. Many of the people there now used to work in NRR. So we are basically working together on common problems.

Should I go on?

MR. SIESS: Yes.

MR. MURLEY: Frank Gillespie, then. I'm going to have to excuse myself. I've got another meeting at White Flint, if there are no further questions.

MR. MICHELSON: I wonder, before you leave, Tom, if you would give me a brief explanation of why it appears that NRR is not interested in sponsoring any further fire research. Is there some reason for that?

MR. MURLEY: Our thought was that a lot of the

regulatory issues, at least for current, plants, have been resolved. We do, at least we don't object to research going on in the area of fire risk. But it is hard for my staff to stand up and say they need the research. That's another problem. But it has always been there. It is very difficult to get a regulator to stand up and say he needs this research to make a decision. And so they don't do it. And I think there is some of that feeling in the staff. I can't remember exactly what we said.

MR. GILLESPIE: I personally wrote the letter we sent back to Research on this. Because of the problem we have inherent with the staff is exactly what Tom describes, that once a report is published, the staff tends to forget where it came from. And a lot of it is coming from Research. And when we wrote back, what we wrote back was, well, we didn't see the need for a program as extensive as the multi-million program that had been there. We fully supported research continuing to do some exploratory work in that area, and that we recognize the need to maintain some expertise, particularly in the analysis area of the fire area.

MR. MICHELSON: Did that represent a user request then or just no objection?

MR. GILLESPIE: I would say in general that represents, to a degree, a user request. And I think we, at least I don't have this debarkation that if NRR hasn't written

down a specific request for a specific contract that means we are against it. In fact, we are working very closely with research. I think the Research Review Groups that are now set up are in fact working, and at every group meeting there is a Division Director, and a Cognizant Branch Chief, and the technical staff from NRR.

And although we haven't written down, we endorse FIN this at Sandia on fire.

MR. MICHELSON: Well there isn't any course, so you can't very weil endorse it.

MR. GILLESPIE: But if there was --

MR. MICHELSON: You haven't asked that any be done.

MR. GILLESPIE: We haven't asked specifically that any be done. But we endorse Research, if they put together something, we would endorse them doing it.1

MR. MICHELSON: But the correspondence I have read in the past was to the effect that you didn't think any more was needed. And of course, that is a little different than I think I am hearing now.

MR. GILLESPIE: It is definitely different, and I will be quite honest, it is different than if you asked the Branch Chief in NRR what his position was. It is somewhat different. And we sat down and had a long discussion over it. And Frank Miraglia got involved.

MR. MICHELSON: Does this mean it is changed, then?

MR. GILLESPIE: It is exactly as I said it, and we can get you a copy of the letter that we sent over to Research, if you'd like.

MR. MICHELSON: So it is up to Research, then, to start proposing what is needed, if anything? They have the ball?

MR. GILLESPIE: That's how we left it, yes.

MR. MICHELSON: Okay.

MR. MURLEY: There are some other areas like that, Carl, I probably should mention that, where my staff does not want to say and will not say that they need Research to make this or that regulatory decision.

In the past, years past, it used to be they were put in the position of either having to justify a research program or come down negative on it. And this last year I said I don't want to do that. I don't want to have to pick apart the research program, because there could very well be reasons that we don't see for the research. So that is why it is not a copout, at least I don't view it that way.

I said there ought to be two areas: those programs that we clearly support because we need it and we are going to use the results; but then there are those areas where we don't have a strong, obvious regulatory need for it, but nonetheless, I don't want to object to it, because it could be very good research that may turn out in the future to support.

MR. MICHELSON: How much research can Research sponsor without having NRR as a sponsor? Is there some discretionary fraction of that they can initiate themselves?

Generally, if you ask Research, they tell you well, NRR doesn't have any requests, user requests for it, so we can't do it.

What you are saying is they ought to be doing it anyway, to an extent.

MR. MURLEY: Yes.

MR. MICHELSON: So it is a little bit of a mixed signal.

MR. MURLEY: Frank is going to be able to talk to that.

MR. GILLESPIE: What you've just been given is a copy of a report that we put together based on Research's own prioritization report last year. We're updating it this year with specific endorsements which reflects what Tom had just said and what I just said about how we're approaching it.

In fact, Research is doing everything we asked of them and, in fact, I think that you would find that NRR, in thinking long term and what their long term needs are as an office, -- when I say that most of the real technical meat has to come up from the trenches; is very short-sighted. There's a recognition that we're short-sighted.

So, what we've attempted to do in that report is that

in each of the areas that Research had divided up their program into, is put a short term and long term few sentences together which, although they don't relate to FINs because we don't want to get into FIN numbers and is it $150,000 or $200. In fact, there's sentences in there that the Research people can see, this is my program and I've got at least partial endorsement here.

I think a good example is plant aging. In NRR, we have the responsibility by June of having a standard review plan drafted together for staff review for plant life extension. One of the basic topics that that standard review plan is going to have to address is individual components; what they're made out of; what environment they're operated in; whether they're active or passive; what is the flaw most likely that they will see, from what kind of degradation, and now what's the NRC's acceptance criteria.

In between February and June, I couldn't even approach that project if Research hadn't had a very, very broad based aging research program in place for years. Now, if I asked the people in NRR three years ago -- and they were asked, because I remember being down here -- no one supported NDE. We were told to dump SAFUT because the industry should be doing that and there were some other things that we went round and round about. I remember being on the other side with the Committee.

MR. KERR: It's interesting to me that you're asking that question, which I think is a very good question for plant extension, and apparently, it has not been asked for existing plants.

MR. GILLESPIE: I think what you will find is that in the regulatory sense, in the structure of things, the need to look at issuing a new license has forced the regulatory side of the house to ask that question.

MR. KERR: I'm just puzzled. You know, it's a very legitimate question for operating plants, because it gives you some idea of when you need to replace equipment.

MR. GILLESPIE: I'm not disagreeing with you, Bill. This is part of what I'm going to call the "short-sighted regulator." He doesn't -- he knows he has a set of criteria in there today and it's very difficult for someone down in the Materials Group to want to challenge ISI requirements, although they will all tell you that they don't think they're quite the way they should be; they're not good enough; the test techniques are not as good as represented, and they need improvement.

Yet, it took a catalyst like plant life extension saying, we're going to have to issue a specific finding that says what is being done now is good enough, and here's the increment more you have to do to get the regulatory arm to focus on it. That's, I think, a good example where the past

years of research building on themselves, is going to be our saving grace.

Larry Shao told me the other day to create the document that I just said, would not be that difficult to a large degree, because they've got a lot of the information there. It's going to be a massive job to try to sort it into usable acceptance criteria, but that's the kind of thing that -- the 1150 process; let me not focus on the 1150 document, but the 1150 process.

The need for a hardened vent was first identified through the process of 1150 in about 1984. I think Joe Murphy is the only guy besides me that would go back that far with it because there's been such a turnover. But the first thing we did when we started looking at it was, we sent some people up to Peach Bottom and said, if they vent, what happens?

Well, it might have taken from '84 to 1990 for this Agency to move out on the question and it was fought through, but if the Office of Research had not initiated that, the technical basis wouldn't have been there. Also, I think that you'll find that the successful of the Limerick license was probably 80 percent dependent on settling the severe accident mitigation device question on the specific background that came out of the Sandia work on severe accident mitigation devices.

That's what was built upon to get Limerick licensed to get them something out quickly. Also, the Limerick PRA was

reviewed by Research. I was in charge of that program in Research at the time and I remember NRR telling me why they didn't need all that work on a continuing basis.

MR. KERR: So that Limerick issue rose not in connection with safety but environmental issues.

MR. GILLESPIE: But NEPA, have you considered all the alternatives? So, it came out of a wierd place, but the fact is, if we had not had that information developed, this Agency would have been in a hell of bind trying to go on some crash program. In fact, the same kind of information was recently used for Comanche Peak and there was a similar package put together for Comanche Peak.

If we look back, as Chet said, to the lessons of the past, the lessons of the past tell me that Comanche Peak would have no chance at all of being licensed if we had to go through this in NEPA's place. Limerick would still not be licensed. In particular, plant life extension would be totally a dream in someone's eye because the first thing we do is go to the industry and say, once you do this thing -- and somehow we define what it is -- that Research had done over four or five years, then come see us. Otherwise, your plant shuts down in 40 years.

That's a gross way of throwing the burden on the industry and in this case, the industry is a hundred letters going to a hundred plants and we'd sit back and watch them

fumble around on how to pull it together. EPRI doesn't have a budget big enough to cover that in a reasonable amount of time. Now, none of the reasons this information was used were basically the reason the research was initiated.

By god, those people picked the right areas back then, and if they hadn't picked those areas, we'd be in a heck of a mess today. I think --

MR. MICHELSON: I think what we're now dealing with is picking new areas. Can I ask you, on your letter that was handed out of July 17th from you to Beckjord, the last paragraph indicated that you were also working on another list and will forward it to you shortly. Can we get a copy of that?

MR. GILLESPIE: Okay, we'll get a copy of that. Yes, what happened is that Research did their report and then they hit us with Revision 1 which had an addition on to it.

MR. MICHELSON: The second one, at least that I'm interested in, is where you put the fire protection discussion.

MR. GILLESPIE: They had come up with some --

MR. MICHELSON: Can we get that today, or is that going to have to be another day?

MR. GILLESPIE: Well, let's give it a shot. We'll give a call and see. If this was in White Flint, it would be easy. I could automatically say yes.

MR. SIESS: Do we have a Subcommittee on fire protection?

MR. MICHELSON: Yes, but they don't meet all that often.

MR. SIESS: But they ought to meet often enough to discuss the research program.

MR. MICHELSON: There isn't anything to discuss, unfortunately, Chet.

MR. SIESS: The point I'm trying to make is that we're doing just what we used to do. We've taken advantage of this meeting to do what should have been done in a subcommittee. The subcommittee has never showed any interest in research until it came time to write a report, and then everybody wanted to get answers to all their questions at the same time.

MR. MICHELSON: Go back and look at our letters. We repeatedly put in our letters that we were waiting until we got the final from Research.

MR. SIESS: My point is, --

MR. MICHELSON: I think we've got the final judgment today; that there will be --

MR. SIESS: I wouldn't take anything that comes out of this meeting as being that definitive.

MR. MICHELSON: I don't know of anything else. That's why I want to see the letter.

MR. GILLESPIE: Fine. I have no problem with giving you the letter. In fact, I think Conrad McCracken probably

comes down with some very strong views on the necessity of fire protection being nothing.

MR. MICHELSON: Yes, I realize that.

MR. GILLESPIE: My discussion with Conrad was; are you so sure that absolutely nothing else needs to be looked at that you want to go on record saying, from here into the future, we know everything we need to know. When I posed it to him that way, he said, well, maybe not really. I said, then we should leave the people who have the expertise in trying to look into the future, the option to at least being able to explore, is there anything we missed?

With that, he conceded that the office shouldn't quite take such a stern position.

MR. MICHELSON: What's the absence of endorsement mean then? You weren't willing to even endorse any activity which you're going to tell in a minute from your slides.

MR. GILLESPIE: Yes, the absence of endorsement only means that -- as I said, in our short-sighted field of vision which tends to be only about a year away, we couldn't say that we had a specific document that was going to end up in REG guide or a rule or we had a licensing case. So, the lack of specific endorsement is not necessarily a negative.

Negatives; we write negatives. If we don't like something, we'll tell them.

MR. SIESS: You weren't here when Eric Beckjord

talked about the 25 percent long term and somebody used the expression of turning over rocks and so forth. In effect, you're saying that you don't have any immediate use and need for the fire research, but you have no objection to NRR -- to Research digging into it and see if they can find any rocks to turn over.

MR. GILLESPIE: That's true; that's right.

MR. KERR: I think we really ought to explore this in the subcommittee.

MR. SIESS: I think that you've got to get the various staffs together and explore their reasoning because they do have the money.

MR. KERR: Okay, what's next?

MR. GILLESPIE: If I could, just to give you --

MR. KERR: There are a lot of handouts here. Which ones?

[Slide.]

MR. GILLESPIE: I'm not going to use them all. Just to give you a snapshot of the NRR budget because it's drastically different than a while ago.

MR. SIESS: Is that on something we got because I can't read it.

MR. GILLESPIE: Let me just read it off.

MR. SIESS: Even with a telescope I couldn't read it.

MR. GILLESPIE: Okay, Chet, this is a little bigger.

I'll read them off.

MR. SIESS: If I knew what the total was, it would help.

MR. GILLESPIE: The total is $28 million and I've got a breakdown of how it looks in a typical area. In licensing actions which I have a little more detailed breakdown on, we have about $7 million and when I mean licensing actions, I tend to mean things that are only about 10 to $50,000 per --

MR. SIESS: We're talking money, not budget.

MR. GILLESPIE: This is money.

MR. SIESS: This is dollar, program support money.

MR. GILLESPIE: This is money, how we spend our money.

MR. SIESS: Not people.

MR. GILLESPIE: No, strictly money.

MR. SIESS: Okay.

MR. GILLESPIE: These tend to be very much smaller actions. Let me skip the "Other" right now and go down to operator licensing. We spend about 6 million out of 28 on operator licensing. This is absolutely only examiners. We buy $6 million worth of examiners a year.

Regional support is $3 million and this is specialists for inspections -- electrical specialists, the human factors people who went on the emergency operating procedure inspections.

MR. SIESS: What's a man year?

MR. GILLESPIE: A man year's about $155,000 for us right now.

MR. SIESS: So that's 20 man years?

MR. GILLESPIE: Yep.

State programs, there's 1.1 million which strictly goes to States who have basically TLD programs. Special projects, particularly TVA, and a lot of that is inspection reports and TVA is a little misleading. We have at any one time at Comanche Peak almost full-time anywhere from six to 10 contractors. It is really special projects.

MR. MICHELSON: What are they doing, you know, like at Comanche Peak?

MR. GILLESPIE: System walkdowns, observations of training on simulators, this is several hundred allegations.

MR. SIESS: They're providing you with the confidence to license the plant.

MR. GILLESPIE: Yes.

MR. SIESS: Are they making the plant any safer? Are they just providing you with the confidence that it's safe enough to license.

MR. GILLESPIE: They're providing us with the confidence to license the plant.

MR. SIESS: You don't know whether it's any safer or not because they're there.

MR. GILLESPIE: In another sense, they're not allowed to make up requirements, Chet, and if they can't make up requirements, they can't make it safer. They can only ensure that the licensees are meeting the requirements that are on them.

MR. CARROLL: But they are in a sense, staff augmentation.

MR. GILLESPIE: They are in a sense staff augmentation.

MR. CARROLL: And build up your own bodies if you have them.

MR. GILLESPIE: If we had them.

Operating licensing's the same way. We have about 47 people between headquarters and the regions and we actually hire in almost 60. So we count on those people to get the program done.

MR. WARD: So your operator licensing budget is really about twice that.

MR. GILLESPIE: Yes. If I throw the people in there, our people. Yeah, yeah. It's about a 50/50 split and in fact, the teams really reflect the percentage. Right now, operating licensing teams tend to be four people -- two contractors, two NRC people. NLR led, excuse the misspelling, I didn't proofread this before I got here, inspections. This is the special inspection group under Brian Grimes, tends to be SSFIs,

design reconstitution type inspections. Fitness for duty -- now we're all of a sudden down into a little smaller kind of numbers. PRA related work tends to be on the inspection program. Vendor inspections and safeguards of the RERs, the regulatory effectiveness reviews. This 6 million up here under "Other" is the piece that isn't quite just staff augmentation, if you would.

In all the other areas, we're buying licensing reviewers here and that's clearly what it is. In here, we tend to be buying things like people who are working with us as part of the team of people working with research on things like the maintenance rule or maintenance policy statement or the Reg Guide to support it.

We've got money going into TMI II and our monitoring of it. Nonpower reactors -- we've got a new inspection module being put together there and they're hiring I believe some expertise from nonpower reactors to try to get an independent perspective, or perspective from people who deal with that on the complaint that we're looking at things that aren't safety-related relative to them.

So this tends to be a lot of cats and dogs spread through the whole program.

MR. WARD: So these are dollars in $7 million and these do not include the FTEs, then.

MR. GILLESPIE: No. This is strictly $28 million in

program support.

MR. SIESS: What's your total budget -- NRR?

MR. GILLESPIE: Oh, counting people?

MR. SIESS: Dollars to run NRR.

MR. GILLESPIE: I'd have to look it up. I can't do the conversion in my head.

MR. SIESS: Roughly? Twice this? Three times this?

MR. GILLESPIE: Oh, considerably -- because we've got 600 -- counting the regions, we've got about 1,500 people. Fifteen hundred times about $80,000 a person.

MR. WARD: Plus this 28 million?

MR. GILLESPIE: Plus this 28. That would give you about the total budget.

MR. SIESS: Fifteen hundred times 80.

MR. GILLESPIE: Times about $80,000 a person.

MR. SIESS: It's 120 million plus the 28.

MR. GILLESPIE: It's $179 million for 1990 -- $175 million for 1990.

MR. SIESS: Now if you gave 10 percent of that to research, it would help a lot.

MR. GILLESPIE: I don't know if it would because now you've got to understand the Commission's priorities.

MR. SIESS: That's what we're trying to do, Frank, is to understand the Commission's priorities. Why every time the budget is cut, research takes all of it.

MR. GILLESPIE: Here's the long-term versus the short-term view. If you look at this year's budget, the 1991 budget that went to Congress, the only growth that there is in the NRR budget is all keyed to plant life extension and standard plant reviews. If you would want to take those people away, that's okay. We just won't do plant life extension and standard plant reviews.

MR. SIESS: You said "the only growth." Yeah, but everybody -- the budget -- the NRC budget isn't growing. It's cutting. It's decreasing and you don't want to take any decrease in NRR.

MR. GILLESPIE: The operating half of our house is decreasing for the growth in plant life extension and standard plant reviews. Now on the other side, the Commission hits us over the head for not getting licensing actions completed.

MR. SIESS: Right. On that basis, they should divert all the money to licensing action and none to research. What are the Commission's priorities?

MR. GILLESPIE: We're right now breaking even quite honestly on licensing actions. So we weren't looking for any growth there. We're about where we need to be.

MR. SIESS: Does the Commission have priorities or is it just trying to treat everybody even-handed?

MR. GILLESPIE: I wouldn't want -- I can't really respond for the Commission. We get warned about that a lot.

I'm not the NRC. I'm only the staff.

MR. SIESS: Go ahead.

MR. GILLESPIE: Yes. The Commission from the staff's perspective has certain priorities. Now, they have not ranked them for us in order. They have said do this, this, this and this, and we're doing the best we can to try to do that and that and that.

MR. WARD: You assume they have priorities.

MR. GILLESPIE: Well, we assume that when they say something is very important that they mean it's very important. On the other side, if they remain silent on something and you've got some give and take, whatever they remain silent on tends to be what gets taken from.

This is just some typical task order sizes. As you can see, our average kind of contract tends to be about $30K -- in the $10 to $50K range. I use this only to illustrate that I think any competition that use to exist in the past, and there was some, between what's technical assistance in NRR and what's in research is virtually nonexistent. We have become entirely dependent for any big-ticket items on research, to the point where our staff, to a degree, sometimes thinks it's kind of scary.

MR. SIESS: What you are trying to do now is to tell us why NRR hasn't got any money to give to research. Is that right?

MR. GILLESPIE: No.

MR. SIESS: I mean you're not addressing any of these other questions here. You asked for technical assistance program -- okay. Okay. I see.

MR. GILLESPIE: Now, to a degree, what I am saying is if we are going to give money to research, here are the major categories it's going to come from, and in each case --

MR. SIESS: I'll give you an option. You either give money to research or you help me come up with arguments that will get money out of the Commission or out of Congress.

Now, what about the latter? Can you come up with some good arguments for research?

Tom says that he thinks research is very important, that we'd be in very bad shape without it, but that argument isn't going to get you any money.

MR. GILLESPIE: In looking back, the argument -- let me build on something else Tom said, and that was in the short term, your argument looks very flimsy, because it's a long-term argument. In fact, because research has been there and developed a base of data, all of which we have, to date, not, in fact, used, but we are starting to use it, we would struggle along for a couple of years. We could get out a standard review plan in support of a rule for plant life extension, addressing most material questions.

MR. SIESS: Good. You address the questions and let

somebody else come up with the answers.

MR. KERR: Frank, you mentioned two things which I think are useful, could be useful in writing a letter to Congress.

One was the fact that the research done on plant aging, on aging of components, permits you, without a lot of additional research, to specify what needs to be done for plant life extension. I think that's important. I think Congress could understand it.

MR. SIESS: They simply may cut all the funds except that, though.

MR. KERR: But if we ask for examples of things that have occurred in the past in research --

MR. SIESS: The past. That's a future one.

MR. KERR: The research was done in the past, Chet.

MR. SIESS: On plant life extension?

MR. GILLESPIE: Oh, yes. Years of work, I think concentrating, probably, in the last 4 years, starting in '85. So, in 5 years -- research tends to build on itself, and they started with basic metallurgy, questions on flaws, flaw growth, detection, NDE, and now, they have built a sufficient base. We feel we can move out in regulatory space as users.

MR. SIESS: But if some smart Congressman says if they have done all that, why do they still need more?

MR. KERR: Let me finish.

MR. SIESS: Go ahead, Bill.

MR. KERR: The second one was the Limerick license, and I think you must be absolutely right about that, that although it was NEPA question, the work that you did in connection with 1150, or that Sandia did, enabled you to assemble an answer to the question that had been raised in very short tact, and it seems to me, both of these are real, they are understandable, and, I think, very important. If we have maybe four or five more like that, and they probably exist somewhere --

MR. GILLESPIE: I think they do, and again, Comanche Peak, we put a similar package to Limerick together, knowing that we were going to have to do it, and also, we are now putting together, intend to put together, a generic package, because the question can be made on almost any major amendment at any facility.

MR. SIESS: This is the SAMDA thing?

MR. GILLESPIE: Yes.

MR. SIESS: Okay.

MR. GILLESPIE: Also, we were committed, in plant life extension space, to putting together a change to Part 51, which in fact is intended to generically handle the severe-accident mitigation device question across the board. So, that's not scheduled to get out until 1992, and I think what clearly happens is information that was starting to be

developed in 1980 will actually come to fruition and full usage in 1992, and it's kind of an extreme, but that's what -- we depend on the Research Office to have that much foresight, and when they have that much foresight, there is going to be a lot of miscues. They are going to miss some turns. It means they are going to do some programs that, 5 years from now, no one really is going to want, but that's part of research.

But I think their record, in the area sense, saying we're going to need to continue to work the materials area, we're going to need to -- in a sense, we are accused of beating severe accidents to death. We don't know how, exactly, someone is going to use it, but this is going to come up in the future, we're going to need this, and now, some of those things are actually coming true.

And we have built that cadre of people out there. Believe me, I couldn't go to someone on advanced reactors to discuss hydrogen in advanced reactors on the ABWR and get a technical expert for $30,000 out of the blue. If research hadn't, in fact, had those people trained, cognizant of our point of view, and cognizant of all the work, I couldn't get a library search done in that area, probably, for $30,000.

So, we have a tremendous dependence on them picking certain areas to do work on, and we do have some influence over what those areas are.

That's not a dictatorial, we want a FIN to do this

work. It's clearly more of a trust in a programmatic, say we support work in this area if you guys also agree that it's an area for further exploration.

MR. WARD: Is PTS an example?

MR. GILLESPIE: Yes, but it gets overused. That's why I didn't use that one.

Yes, heavy-section steel --

MR. KERR: Now, what about problems that have come up and you haven't had the information, but research has been able to provide it with a specific program? Are there examples like that in those areas?

And I am not suggesting that you could give them within the next 5 minutes, but is it possible?

MR. GILLESPIE: Yes, MOVs, and in fact, we have got a research request that research hasn't got yet, I don't think -- I signed it yesterday -- on MOVs, and this could be a criticism of the regulatory process. When I started getting into it, I was kind of dismayed.

We sent out a Generic Letter, 89-10, asked people to do a lot of things, send in schedules for doing things, and when I was quizzing the staff, why are we putting a research request out? If we got the point of writing a Generic Letter, don't we have some criteria, so when people say here is the alternate test techniques we're going to use we can say whether it's all right or not? And the answer was no, let's hope they

don't write in too soon. And I said well, you gave them a 5-year schedule, and they said clearly, this is an important question. It's going to take probably more than 5 years to settle.

Now, I was kind of upset.

MR. CARROLL: There is a NUMARC letter you ought to read on this subject.

MR. GILLESPIE: I was kind of upset as a late-comer in the front office into the whole process, but we got it all hung out, hoping research can come up with the right answer on the substitution or alternative techniques for insitu testing of valves, which, as I understand it, is nearly impossible on BWRs and all the valves of interest.

MR. SIESS: You need somebody to design new valves.

MR. GILLESPIE: That is not a feasible alternative.

MR. KERR: What you're saying is that research developed an MOV problem. Was it an acceptable method of testing research?

MR. GILLESPIE: In looking at the Generic Issue 87 question -- hopefully, in closing it out -- had developed a real safety concern on the blowdown tests relative to the design of the valve itself.

Well, the question was actually bigger than that, because although they came up with a technical solution, the insitu testing, or an acceptable alternative, is the solution

to the original GSI-87 scope. It kind of left us cold, because then they also came up with saying but the manufacturing tolerance difference alone, of a qualified valve, could be sufficient that the friction factors say you can't take prototypical testing and necessarily directly apply it.

So, while they technically closed it out, I'll probably never forgive them for not having developed the acceptance criteria along with it.

So, we have gone back, and we don't have the money to do it. We think it's a major program.

Along with looking at the blowdown problem on the initial design criteria for the valve, we are in desperate need of acceptance criteria and very fast turnaround basis.

Now, they have got people in place to do the program, and I can only hope that these people are good enough, fast enough, and smart enough to beat 5 years. I didn't get a lot of optimism out of my staff when I met with the engineers.

MR. CARROLL: There is a long story.

MR. GILLESPIE: I know there is a long story, but --

MR. SIESS: You're looking for what acceptance criteria?

MR. GILLESPIE: On the alternative test techniques, in particular, for BWRs. You know, I'm hit with, well, prototypical testing is not acceptable. Then the common technique of taking a valve that was manufactured on the same

run, etcetera, or is built to the same criteria, now I'm told, well, gee, that might not cut it.

MR. SIESS: You're looking for some kind of a test to tell you whether these motor-operated valves will work or not.

MR. GILLESPIE: Yes.

MR. SIESS: I'm trying to get out of the regulatory -

-

MR. GILLESPIE: Yes. That's what we need.

MR. TAYLOR: A one-of-a-kind valve sitting insitu somewhere.

MR. GILLESPIE: And it's a one-of-a-kind valve sitting insitu, and the licensee is going to put the best program he can together, working with NUMARC, etcetera, and he is going to come in say here is how I am going to solve the question.

MR. SIESS: And you're trying to come up with a better -- tell him if he does that, you'll accept it.

MR. GILLESPIE: I am trying to come up with -- I need some guidelines to know what that acceptable thing is, because the typical sense of prototypical testing, we have come to the conclusion, is possibly not acceptable. So, what our intuition says would have been a nice way to do it, we're being told by the people who work on the details of this, it's not acceptable.

So, now, I can't trust our intuition anymore. So, I

really need --

MR. SIESS: You don't know how to do it, and you don't think the licensees know how to do it.

MR. MICHELSON: Well, they know how to do it. It just has to be done on every valve. It's kind of hard.

MR. SIESS: Well, I know, but there is a difference between not knowing and knowing something is going to be difficult to do.

MR. GILLESPIE: We know that the valves need to be tested. Every indication is that the actual valve itself needs to be tested, but the circumstances of the geometry of a plant may, in fact, prohibit those valves from being tested.

MR. SIESS: And you're trying to figure a way to keep the plants operating in view of that.

MR. GILLESPIE: We'd like to know what are the other acceptable techniques that someone is going to come in with, because I don't believe a licensee, if he has --

MR. CARROLL: Realistically, what happened was that everybody agrees there's a problem.

MR. GILLESPIE: Yes.

MR. CARROLL: I don't think Research knew how to handle it any better than ACRS knew how to advise them to handle it or anybody else. The letter went out. I think you're into a bring-me-a-rock kind of regulation.

MR. GILLESPIE: Yes. We'd really like to --

MR. CARROLL: I think you're going to have to see what these rocks look like before you know what the acceptance criteria is going to be.

MR. GILLESPIE: I think we need to work on the acceptance criteria a little bit at the same time. If nothing else, I think in this case, we need some real test data. We probably need a certain preponderance of test data on different types of valves and configurations.

MR. MICHELSON: A lot more than you've got so far.

MR. GILLESPIE: Yes. I know I need more than I have so far, and I also have -- thank goodness Research has the people out there to gather it. So, again, the MOV problem is very dependent on a cadre of people having been in place when the problem really hit.

MR. MICHELSON: The real advantage you have is the industry is already well-tuned to the problem, as well.

MR. GILLESPIE: Yes.

MR. MICHELSON: Now it's just a matter of commiserating over it and getting it done.

MR. GILLESPIE: But on any individual issue like that, if it's the Mark I hardened vent MOVs, they all have very similar aspects in drawing on work that had been done to lead us into what hopefully will be the solution. And they're all in different phases.

MR. MICHELSON: That work has been going on three or

four years now very nicely and we've been monitoring it and quite satisfied with the status. I think the generic letter did what had to be done as soon as possible.

MR. GILLESPIE: It brought it to a head.

MR. MICHELSON: Yes. But now, clearly, you've got a lot of work left yet.

MR. GILLESPIE: So any one of these issues is in a different phase. In the Mark I case, with a hardened vent, we're in an absolute implementation phase. In the MOV, we're kind of in the middle. In plant aging as applied to plant life extension, we're in the beginning of implementation. We're still trying to figure out what it is we need to mold it into to be usable for us.

MR. SIESS: Did you answer Question B, the impact of the continually dwindling research budget on research?

MR. GILLESPIE: No. I didn't answer that one yet.

MR. SIESS: Over the past eight years, the research budget has probably been reduced in real dollars by a factor of two-thirds. What's been the impact on your ability to regulate?

MR. GILLESPIE: Until it got down to probably about the $90 million level, the cuts were coincidence with a lot of programs that were very, very expensive on an individual basis and which were coming to conclusion.

Now, I don't know whether foreseeing the cuts

necessarily caused the conclusions or it was totally a technical decision that we had gotten as much as we could out of LOFT, out of Semi-Scale, support for MIST and FIST, PBF. But I remember having that division one time and we were putting -- even at the end, we were putting $12 million a year into PBF. I remember donating --

MR. SIESS: We told you that several times.

MR. GILLESPIE: I know. I was there during the start of the decline. Fortunately, I got out of there in the middle and didn't have to go through the misery.

MR. SIESS: Those were easy cuts. Those you just wiped out programs.

MR. GILLESPIE: In those cases, total programs were wiped out. Because of where they had gotten, the development of -- basically the source term code package was the culmination of most of that experimental work with all the support codes, SCADP being refined down and I guess they tried to tag RELAP 5 under the back of SCADP and make it a whole package.

That work is done and I don't think we see necessarily a need to go on with that work to support a facility based on an exploratory nature to that level of the program. We don't have ECCS hearings breathing down our necks. Appendix K is there. The next thing we're looking at now is going to draw on a lot of that information and that's

disconnecting, if you would, the siting rule from Part 50, and that's not an easy disconnection to do.

We don't have anything looming over us to cause something big like that, but I would not be surprised and I thin we'd end up supporting research in the next generation, if you would, of plants if they needed some kind of loop or some insights into the passive plants, the natural circulation concepts.

MR. SIESS: You mentioned the $90 million level. I'm not sure what --

MR. GILLESPIE: Well, I add the $15 back in because, clearly, from our point of view, resolving GSIs is their job. So when we look to them, they do that for a living.

MR. SIESS: At the time it first hit $90 million, that wasn't in there, I don't think. But that's beside the point. But you're saying that at the level research is now, you think your needs are being met.

MR. GILLESPIE: Just.

MR. SIESS: Just.

MR. GILLESPIE: Just. And we've had at least one sticky point that research is rethinking, and that was some support for our NDE van. It's not a lot of money. It's a couple of hundred thousand dollars. But it shows me --

MR. SIESS: Support for what?

MR. GILLESPIE: The NDE van in Region I. They were

preparing some standards and it was kind of an add-on. It was an additional request from us of them. I think the threshold has now been reached.

It's gotten down that when we go over with a request and it's only a couple of hundred thousand dollars, there is some real give and take.

MR. SIESS: When they said okay, fine, with a $200,000 request, the budget must have been pretty good.

MR. GILLESPIE: Yes. And when they start quibbling and saying but you wanted us to do this over here and forcing me to make the tradeoff decisions, them I know they've gotten to where they're almost to the point they can't fill all the needs we have. And we consider one of our needs them continuing to do some exploratory work.

In balance, what I see is we've gotten to the point where we're starting to fight over issues where the tradcoffs become very hard for us because we're starting to say, but doing that is probably just as important as doing this.

MR. SIESS: The so-called exploratory or the long range of the 25 percent that Eric was talking about.

MR. GILLESPIE: Yes.

MR. SIESS: Do you think that's desirable because you know, in the past, it's come up with interesting things that were helpful and useful?

MR. GILLESPIE: I don't know that I'd put a

percentage on it, but 25 percent is not an overwhelming part of the whole thing and I think yes, we would support that.

MR. SIESS: And you have cited and could cite further cases where that exploratory research is, in your mind, paid off in improved safety or improved regulation, assuming they're not the same thing.

MR. GILLESPIE: I believe they're pretty close to being the same thing.

MR. SIESS: I don't think this is the place to argue that point.

MR. SIESS: We should strive to make them the same thing.

MR. SIESS: Fine. I'll buy that.

[Slide.]

MR. GILLESPIE: This is just kind of a list. I could develop a page or two on every one of these.

MR. MICHELSON: List of what, now?

MR. GILLESPIE: This is kind of a list of those kinds of examples, when I was thinking of coming down here.

MR. SIESS: Do we have that list?

MR. GILLESPIE: No. Yes. It's in that package of stuff that Walt gave out. He's giving it out now. But I get very frustrated, since I was involved with inventing 1150. The process of 1150 and where it got was more valuable, far more valuable than the end document itself probably will ever be.

The pulling together of the work, the attempt to explore how to deal with these very, very, very uncertain issues has led to a consolidation. We know where to go to get that backup information now.

In fact, people are using that backup information off the shelf, not even realizing they're using the process that got them to 1150. And although they've never read 1150 and will never acknowledge using it, they're, in fact, using information gathered for that.

MR. MICHELSON: What are the SAMDA issues?

MR. CARROLL: We talked about it at the last meeting, Carl.

MR. GILLESPIE: Mitigation devices.

MR. CARROLL: Do you remember that letter?

MR. GILLESPIE: In a glimpse sense, it's core catchers, it's mitigation devices in the pure sense of mitigation devices.

MR. MICHELSON: I know now what it is.

MR. GILLESPIE: NEPA says you've got to explore all viable alternatives.

Containment performance improvement. The Mark I vent is the easy example. But on the negative side, in a confirmatory way, the fact that the Commission paper -- and I don't know if they've been briefed on this. The general conclusion on the other containment types was that things don't

have to be done.

Well, the fact that the conclusion that things don't have to be done came out of it and that we feel technically comfortable in supporting that is a positive conclusion for the research program.

MR. SIESS: It didn't say things don't have to be done. It says we can't find anything that's cost effective, but you keep looking in the IPE.

MR. GILLESPIE: That could be viewed on one side of the Hill as saying, "Well, hell, all you did was prove what was out there was okay," but there's a certain importance to that in some corners.

A lot of the source term stuff that's gone on for years is going to be now part of -- we are attempting to disconnect, particularly for Part 52 and standard plants, how do you deal with establishing the siting envelope and the plant design envelope, so that when you pick a site with no idea what the plant is that's going to be on it, you'll have a set of criteria that will match one for one for the people who are designing the plants?

MR. SIESS: Why does it have to match one for one? It just has to match one greater than the other.

MR. GILLESPIE: One greater than the other.

MR. SIESS: Yes.

MR. GILLESPIE: But if I'm designing a plant, I

really don't want to too much over-design it, I don't think.

MR. SIESS: But that's what we do in -- aren't we already doing that? Isn't that what the standard plants are?

MR. GILLESPIE: No.

MR. MICHELSON: They're not over-designed.

MR. SIESS: No, but I mean aren't they being designed irrespective of the site? The ECCS, the containment --

MR. GILLESPIE: Yes. It's interesting, if someone came in with a site, the way our rules are set up, we're not necessarily clearly set up to deal with the banking of sites because the site issue is -- and I'm not an expert on this -- is closely connected with large releases, and large releases then get connected with the plant design.

MR. SIESS. Assumed large releases.

MR. GILLESPIE: Assumed.

MR. MICHELSON: We have to assume plant design is suitable for the site. You know, they aren't divorced.

MR. GILLESPIE: They aren't divorced from each other. And right now, the part --

MR. MICHELSON: So, suitably, you don't put it there.

MR. GILLESPIE: The Part 100 criteria for large release is also reflected in Part 50 references.

MR. SIESS: Okay. Really, you're talking about site approval in advance?

MR. GILLESPIE: Yes.

MR. SIESS: Okay. Go ahead.

MR. GILLESPIE: Yes.

MR. MICHELSON: Then you have to show the plant is suitable for the site.

MR. GILLESPIE: You only show the plant is suitable for the site.

MR. MICHELSON: Yes.

MR. GILLESPIE: And hopefully, if you've design the acceptance criteria for the site well and the acceptance criteria for the plant well, that that showing is an obvious one.

MR. MICHELSON: It's supposed to be that way.

MR. GILLESPIE: You are hard-pressed to do it today, I think.

MR. CARROLL: Well, let me chase you on a couple of these.

MR. GILLESPIE: Okay.

MR. CARROLL: When I was still in industry and Surry happened, EPRI took a lead on the part of industry to really look into the erosion/corrosion problem. Why did the NRC have to get involved in that? It was obvious industry was very concerned about it. They were going to take care of it. I mean, I can see a very minimal research program to, you know, keep the industry honest, to be as smart as they are. Let them

do all the work and spend the money. It's the same with the BWR pipe-cracking problem.

MR. CATTON: It is not a balance of plant concern.

MR. GILLESPIE: Let me take erosion/corrosion first. In erosion/corrosion --

MR. SHAO: We spent very little money on erosion/corrosion.

MR. CARROLL: You did spend very little money on that?

MR. SHAO: Yes.

MR. CARROLL: Relative to what EPRI has spent?

MR. SHAO: Oh, yes.

MR. CARROLL: Okay.

MR. SHAO: We spent very little money on erosion/corrosion. Mainly, we followed the EPRI program.

MR. CARROLL: All right. That's fair.

MR. GILLESPIE: When we made this list up in the last couple of days, we weren't trying to weight it by meaning a lot of money was spent in any one particular area. So we could develop, you know, a page or two on each of these areas, Bill, if it --

MR. SIESS: You don't have to apologize for using research that didn't cost much.

MR. GILLESPIE: Well, no. There's a perception if it doesn't cost a lot, it isn't important, and that's not

necessarily true.

MR. CARROLL: Is the same true of stress/corrosion/cracking in boilers?

MR. SHAO: I think EPRI and GE spent a lot of money on stress/corrosion/cracking in boiling water. We mainly look at sensitive areas like well overlay. You know, examination of well overlay is sort of a key issue that we have some disagreement with in industry.

MR. GILLESPIE: But take it back one step from exactly that. How did Larry have the people and the resource, the intellectual resource to go to to even do what he did if he didn't have a strong materials program already in place? So I take that next step back. That justifies why he was looking at it before we were worried about the cracks.

When you take that step, it goes back to what Tom said. Yes, we could probably muddle along for two or three years if they took the research away, but, boy, after two or three years, whatever we had would be it, and the next problem that came up that was slightly different, we'll put an RFP out in the street, and we'll see who bites at it. That process alone could take us six months.

So, again, it's the exploratory nature that gives us that basis.

MR. KERR: If you guys keep on, you're going to convince yourselves that you should give the Research people

more money.

[Laughter.]

MR. GILLESPIE: Well, you know, I'll put my slide up again on why we need all we've got.

[Laughter.]

MR. SIESS: Okay. Are there any things we asked you to talk about that you haven't?

MR. GILLESPIE: Thermal hydraulics.

MR. SIESS: I thought you covered that a few minutes ago when you said that the reduction from 200 million down to 90 million take care of all of that; you're very happy with it.

MR. KERR: I thought he did, too.

MR. SIESS: I thought he covered it clearly.

MR. KERR: I thought he covered thermal hydraulics very well.

MR. SIESS: I mean, did you mean -- isn't that what you said?

MR. CARROLL: Well, he's got a viewgraph on the subject.

MR. GILLESPIE: No. There is a minimal level, and I think thermal hydraulics is probably down to that minimal level, but let me build it up.

MR. SIESS: Put the viewgraph on, then, if you want.

MR. GILLESPIE: Well, I can talk from it, but I don't need it. The viewgraph basically mimics what Research is

already doing, so you've heard that part before. But there's a base-line program. If I discount 2D/3D and some of the things that are coming to conclusion, the base-line program in thermal hydraulics is about $3.5 million. There's about a million dollars, I think, in there that's for university kind of work and loops.

In fact, there's going to be some need, when you look at the -- and I'll go back to something I didn't finish earlier -- you look at the need to start an examination of the phenomena. Although we all believe in gravity, how high a driving head do you need in a total natural circulation passive plant where the industry is going to come in, or we've an indication they're going to come in and say, "We don't need any pumps, we don't need any diesel." It's a difference in philosophy. To be in a position not to reject it, to be open to it, how high is high enough for the thermal head? That's --

MR. SIESS: You need to educate me. Every once in a while, I read a report where a plant tripped, and the report -- this would be coming out in the daily reports, and it says, "The plant was operating on natural circulation after it tripped." That doesn't prove anything?

MR. CATTON: That's just the loop.

MR. GILLESPIE: It wasn't pumping out 600 megawatts of energy on natural circulation.

MR. CATTON: And it had steam generators or

something?

MR. GILLESPIE: And your generators are steam generators.

MR. SIESS: Six-hundred megawatts specifically about the boiler right?

MR. CARROLL: Humboldt ran. We could have run that sucker up to the 300 --

MR. SIESS: Where is the 600 megawatts coming from?

MR. GILLESPIE: The general size of the --

MR. SIESS: That's decay heat after how long?

MR. GILLESPIE: No. No, no.

MR. CARROLL: This is the advanced small boiling water reactor.

MR. GILLESPIE: Water reactor.

MR. CARROLL: It simplifies --

MR. SIESS: Oh. I thought you were talking about --

MR. GILLESPIE: No pumps? No, I'm not sure that all the questions are all emergency questions.

MR. SIESS: I missed the fact that we were on advanced reactors. I'm sorry. Go ahead.

MR. GILLESPIE: But just the basic day-to-day operation, and how close that operation is to what kind of transient, how competent are we on it. I'm not sure that there are not some basic questions there that --

MR. SIESS: So, really, on the 600-megawatt passive

reactor, you'd like to see a prototype?

MR. GILLESPIE: This is where I have to differentiate between --

MR. SIESS: Somebody has already said we got to have prototypes on other advanced reactors.

MR. GILLESPIE: I'm not sure that we have to see a prototype on it.

MR. CARROLL: We already have one at Humboldt.

MR. GILLESPIE: Or the Narwhal. The Navy built one out in Idaho.

MR. SIESS: Wouldn't that be the best way to satisfy you on the natural circulation?

MR. CARROLL: An awful lot of thermal hydraulics was done.

MR. GILLESPIE: Yes.

MR. KERR: But what he's saying is he's not sure what will happen in severe transients, and you may not want to make --

MR. GILLESPIE: I don't want to make the decision --

MR. KERR: -- one of these things go through a severe transient.

MR. SIESS: I see.

MR. GILLESPIE: If I have the power of striking and humming along at one hundred percent power, what happens? I'm not sure. Compared to the safety systems that are intended to

be installed --

MR. SIESS: Are you sure about it on Point Beach or Hadem Neck, Crystal River or any of the other plants?

MR. GILLESPIE: I think - - yes.

MR. SIESS: You are?

MR. GILLESPIE: As sure as we need to be. Things like station blackout have attempted to address the need.

MR. SIESS: You're sure, based on what experience?

MR. GILLESPIE: Past research.

MR. SIESS: Codes?

MR. GILLESPIE: And experience.

MR. SIESS: Codes?

MR. GILLESPIE: Generally, codes, but research and experimental data always ends up in being either articulated as a table, graph or code.

MR. SIESS: Yes, but that doesn't follow the other way around; that the codes always agree with the experimental data.

MR. GILLESPIE: Well, it's one of the reasons for having a baseline program, because you're always going to be tweaking codes. You're always going to get anomalies you're trying to explain.

MR. SIESS: What you're saying is that the existing codes may not work for these existing plants.

MR. GILLESPIE: We're confident they'll work.

They're complicated enough to be applied.

MR. CARROLL: The question is; is the answer going to be any good?

MR. GILLESPIE: I'm confident that they could applied.

MR. SIESS: What I mean by "work" is give the right answer.

MR. GILLESPIE: I'm not a thermal hydraulic expert. I don't personally have a warm feeling.

MR. SIESS: Talk to me; I'm not either.

MR. GILLESPIE: Okay, so I can express an opinion. I don't know and I don't know the answer to; is a prototype needed? In a national perspective, if you will, are demonstration plants from the 50's. They had significant government involvement in them in one way, shape or form.

MR. SIESS: Certainly a lot of them did.

MR. GILLESPIE: A number of them did. Where at a point in the history of this government and its fiscal condition where I don't know where I would see DOE or their funding design work -- they haven't raised their hand, necessarily, to build a new demonstration project.

So, now, we're going to have a tough decision in the national energy perspective, balanced against safety. I think we owe the country to be responsible in our safety decision, and I'm not personally sure that everyone would agree that the

codes are totally applicable, as they are, off-the-shelf.

MR. KERR: I'm not sure anyone has agreed to that.

MR. SIESS: But you are satisfied with the level of effort, at least for the time being?

MR. GILLESPIE: For the time being. If it gets a whole lot lower, I have to depend on research getting away from the dollars. It's the number of people and the type of people that you have to keep in that area, and you have to challenge them. There has to be sufficient work now to challenged them, and you can't challenge a code person unless you give them some new, real data.

It means some experimentation at some -- that may be an assumption, Chet.

MR. SIESS: Give them a bigger computer.

MR. GILLESPIE: That about finishes --

MR. WARD: We were told today that Research isn't going to do any more with regard to the BWR instability in the face of ATWS' problem -- issue; I don't know whether it's a problem. Are you comfortable with that? Is NRR comfortable with that? Do you think you know enough about that one?

MR. GILLESPIE: Right now, the NRR staff will say they're comfortable with it. We're not yelling for more. We're in agreement with them. If they came up and said, we think that there's something else to look at, you wouldn't find us in disagreement with it either.

I'm being honest. You see it, and you see it more today than probably five or six years when Themie had a group of people who were thinking far broader generic issues. We've transferred those people out and we have caused the organization, by design, to be focused on operation of today's plants with today's problems.

In some cases the staff will say, okay, we've fixed the problem today on oscillations, and unless someone goes out and develops new information, they're not going to raise their hands to be necessarily sponsors of that. There's some down sides to that.

We have become dependent on Research to be the person to say we need to look into this more.

MR. MICHELSON: I thought you had a responsibility for the evolutionary plants as well as today's plants? How do you view these problems on the evolutionary plants? Where are you going to get the tools to do them with even? It's the same question as on the ABWR.

MR. GILLESPIE: I have to look to the people on the ABWR to come to the technical resolution of that.

MR. MICHELSON: They don't have any better means than they had before. I don't know how they're going to do it, but we'll have to wait and see.

MR. SIESS: You mean the ABWR-2; the codes don't work for?

MR. GILLESPIE: No, I didn't say that.

MR. SIESS: Are we off the subject of codes?

MR. GILLESPIE: Carl raised the question. In ABWR you have similar questions. It's primarily a modified BWR-6.

MR. SIESS: Yes.

MR. GILLESPIE: The same questions that exist on a BWR-6 really need to be discussed on the ABWR. I can only say that from my perspective, I'm not that much in the details of it.

MR. SIESS: Does it need research to review the BWR-6?

MR. MICHELSON: There are many areas where I think you're going to need it or you're going to fly by the seat of your pants.

MR. GILLESPIE: I think you find us -- and we have in the past -- gone to Research and asked them to do specific calculations and some sensitivity studies, so it may not be viewed as Research-research and exploratory in nature.

MR. SIESS: All these codes we're talking about; only Research knows how to run them? These aren't regulatory tools yet? These are just research tools?

MR. GILLESPIE: No, they're regulatory tools. We all use the same people to run the same codes, but I think what you're seeing in our budget is that running significant codes, we most of the time now will go to Research to get it done.

MR. SIESS: Because they have the expertise or because they have the money?

MR. GILLESPIE: They've got both.

MR. SIESS: I know they've got both, but are they the only ones that have both?

MR. GILLESPIE: No, I don't think they're the only ones who have both, but we've got our people tied up on other things.

MR. SIESS: Okay. It's just convenient.

MR. TAYLOR: It's also healthier.

MR. MICHELSON: You gave us a handout today called PMAS Evaluation Criteria?

MR. GILLESPIE: That's some of the things we use, yes.

MR. MICHELSON: You didn't discuss it at all, though really; did you?

MR. GILLESPIE: That's backup material on how we got to the booklet that was handed out earlier.

MR. MICHELSON: That's open then for questions?

MR. GILLESPIE: Sure.

MR. MICHELSON: In the category that you indicate here for activities that are not endorsed -- those were the ones --

MR. SIESS: Could you identify what you're looking at?

MR. MICHELSON: I'm looking at page 3 of a handout called PMAS Evaluation Criteria.

MR. SIESS: Can someone tell me what PMAS is?

MR. GILLESPIE: It's me.

MR. MICHELSON: What do you mean, it's you?

MR. SIESS: It's the name of his organization.

MR. MICHELSON: On page 3, you indicate endorsing, fully endorsing, partially endorsing or not endorsing. In not endorsing, there's some criteria here and maybe you could explain them to me. For instance, not backfit-able regulatory product; what does that mean?

MR. GILLESPIE: This is actually a description of how people down in the staff would view it. If it's not going to result in their view already in something you can superimpose on a current operating plant, we probably were not able to get a whole lot of interest.

MR. MICHELSON: Do you mean that if you thought it was something that -- in other words, you looked at only the current operating plant when you exercised this criteria and not the future plants?

MR. GILLESPIE: We asked the people involved in the future plants also. There are semicolons in there although they didn't come up very well.

MR. MICHELSON: Backfitable doesn't quite fit the future plants. You don't backfit future plants you haven't

even designed, certified or anything yet.

MR. GILLESPIE: Right.

MR. SIESS: I know, but unless the regulations can be backfit. The future plants are being licensed according to the regulations; aren't they?

MR. MICHELSON: It depends on who you read.

MR. SIESS: Which future plants are you talking about?

MR. GILLESPIE: They're beyond the regulations. They're beyond the regulations by Commission policy.

MR. MICHELSON: Yes, by Commission policy, it goes beyond the regulations.

MR. SIESS: Okay, I see what you're getting at.

MR. GILLESPIE: This is a string. It also says current regulatory basis adequate. No current regulatory need or product identified. That would apply to a Part 52 plant.

MR. MICHELSON: What does the middle one apply to first? You skipped over it. You read it.

MR. GILLESPIE: Current regulatory basis is adequate?

MR. MICHELSON: Yes. What does that mean? Particularly for future plants, what does that mean?

MR. GILLESPIE: Well, you -- is the current Part 52 good enough to do what we need to do.

MR. MICHELSON: Current Part 52.

MR. SIESS: That's not the only thing you use. Use

Part 50, Appendix A.

MR. GILLESPIE: No, but I'm only talking to this phrase now.

MR. SIESS: With the regulatory basis, doesn't that include Part 50, Appendix A?

MR. GILLESPIE: Not for Part 52 plants. Part 52 is licensing by rulemaking. The only rule that applies to Part 52 plants is Part 52. Everything else is by comparison.

MR. MICHELSON: But you've got to do a PDA before you get to licensing.

MR. GILLESPIE: That's right.

MR. MICHELSON: When you do your PDA, are you using current regulatory basis there?

MR. GILLESPIE: No.

MR. MICHELSON: You said you were using it.

MR. GILLESPIE: There is no rule. I mean the standard plants are going to be certified by rulemaking.

MR. MICHELSON: Then there will be a rule.

MR. GILLESPIE: The rulemaking that will apply to each standard design doesn't exist.

MR. MICHELSON: I think I understand the process all right. That's right.

Now, what does this mean now for future plants -- nothing at all?

MR. GILLESPIE: The last one will apply to future

plants. Is there a current regulatory need or product identified.

MR. MICHELSON: Okay.

MR. GILLESPIE: That one's going to apply to future plants.

MR. MICHELSON: How do you imply that? What does it mean?

MR. GILLESPIE: It's asking a question. An example given earlier is a good one. Is "oscillations" a question on a future plant? If the answer to that question is "yes," then we would have put an endorsement under the thermohydraulics heading that had that. If it was not "yes," the fact that we didn't have an endorsement coming up from the staff should not be taken that we don't think the work may still need to be done there because the overriding philosophy we went into this thing with and is that we also agreed with Research's prioritization of their work.

If you remember, our report is based -- this is kind of an outline of the report they did last year which looked kind of like Consumer Reports with the zeros, the "O's," and they were half colored in and half not colored in. So for convenience, we used those topics to go through.

MR. MICHELSON: Let me get to the point a little bit quicker. I was looking at this from the viewpoint of fire protection of course. Clearly, future plants will have to do

something besides Appendix R. So current regulatory requirements are not an adequate basis. We don't know what the basis will be. We've got to do some thinking and development or whatever on what a good fire protection system ought to consist of and I think as the Commission said yes, it must have improved fire protection.

Apparently, you think you must have the tools and everything you need because you aren't giving any -- it's a --

MR. GILLESPIE: We do not have, yes.

MR. MICHELSON: You're going to do the review though. Research is not going to do the review.

MR. GILLESPIE: Research is not going to do the review.

MR. MICHELSON: You're going to do the review. So you think you've got the tools, whatever you need to do review of fire protection for future plants; is that the answer?

MR. GILLESPIE: Yes. That's a fair conclusion.

MR. MICHELSON: When we get to talking about it, don't come back and tell us you don't know how to do it.

MR. GILLESPIE: That's also a fair statement. You know, if it comes out that we don't know how to do it and we have to do more work, we have to do more work but at some point, you have to stand up and say -- state an opinion and take action on it.

MR. MICHELSON: Fair enough.

MR. GILLESPIE: But again, so there's kind of a dichotomy between the staff and the 12th floor and NRR and we're not so sure on the 12th floor when we look at an area that we're so --

MR. SIESS: What's on the 12th floor?

MR. GILLESPIE: Yeah. The front office.

MR. SIESS: Of what? NRR?

MR. GILLESPIE: Yes.

MR. SIESS: I've never been that high. What's on the 13th floor?

MR. GILLESPIE: Part of NRR. We go up to the 15th.

MR. SIESS: Head office is at the lower level?

MR. GILLESPIE: In the middle.

MR. CARROLL: That's the meat in the sandwich.

MR. GILLESPIE: Yes.

So I think you'd see -- it would not be surprising to us but I think you'd find people who are not technically articulate in the area have to trust the people who are who work for them and we're trusting them and supporting them in their opinion but indeed, we would not go so far as to make the statement "we know all that we need to know" if a second group and this is a sense of checks and balances.

If the research people and our people both agree nothing needs to get done and nothing needs to get done, there's a certain higher level of confidence then if you've got

one saying something needs to be done and one saying something doesn't need to be done. We'd probably say, maybe we should just look into that because there's some smart people on this side of the argument also.

MR. MICHELSON: I guess you're saying there's a unanimous opinion supporting this?

MR. GILLESPIE: Right now there appears to be a unanimous opinion supporting this across the staff.

MR. MICHELSON: Before we leave, did you get a copy of that Part 2?

MR. GILLESPIE: Did we get the second half of that?

MR. MICHELSON: We'll get it tomorrow then.

MR. SIESS: Anything else that was on that list that you don't think you've covered, Frank?

MR. GILLESPIE: I think that was the last one. Thermohydraulics, our program, our research reviews.

MR. SIESS: Any of the committee that think we haven't covered?

MR. CARROLL: I think we heard from Frank some good examples in our sort of discussion point of what would you tell Congress this has been useful for. I think I got the impression you said you'd go back and dream up a few more?

MR. GILLESPIE: We can put together like a page on each of a half a dozen with some examples. That's easy enough to do. Surely.

MR. SIESS: Now obviously the Commission -- I don't want it. I mean I don't have the slightest use for it.

MR. GILLESPIE: I think when you think --

MR. SIESS: There's some people that have been asking questions at this meeting that suggest to me that they would like to write a letter to the Congress giving some arguments for continuing funding of research. I did not have that in mind, frankly, although now that I put additional remarks on such a letter, I haven't though much about the mechanism. I was hoping that maybe the Commission would make arguments for more research.

MR. KERR: We sometimes write letters to the Commission.

MR. SIESS: Yeah, well, we used to write letters to the Commission at one point in time about the budget and then if they didn't pay any attention to us, we wrote a letter to the Congress about the budget and if they didn't pay any attention to us, the next year we wrote a letter to the Commission and you know, we went through the cycle and nobody seemed to be paying any attention.

We did not in those letters -- after the first one -- make very strong arguments for "a research program of a certain magnitude." We always asked for an increase because the office was asking for an increase and only in a few instances did we ever say this is lousy, they ought to quit it although we did.

LOFT we said it a few times and PBF and a few other things like that but we never made the case at the level we're talking here of research is essential and these are the reasons why. We never gave them good reasons. I didn't think so. Obviously they didn't think so.

MR. WARD: Maybe we should now.

MR. SIESS: Well, that's going to be up -- that's up to the Committee and to my successor as chairman of this committee. This is my last hour of function, maybe the last 10 minutes as function as chairman of the research committee.

MR. WARD: Except for drafting a letter.

MR. SIESS: No. I did not agree -- Sam and I have drafted the letter to the Congress. If you don't like that one, you can write a substitute but we drafted a letter to the Congress just like we did the last three or four years.

MR. WARD: Do you mean one of those say nothing letters?

MR. SIESS: Well, if you want to call it that. That's what the committee agreed to.

MR. CARROLL: I guess the question is what should he provide to us.

MR. SIESS: What would we do with it? That's my question.

MR. CARROLL: Well, if we write the Commission, for example, it would at least be ACRS' examples that they could

use.

MR. TAYLOR: I'd just like to see it.

MR. WARD: You heard the Research Office Director ask for a letter or give his opinion. He thought it would be helpful.

MR. SIESS: I hope everybody heard it. I'm not going to write it.

MR. GILLESPIE: I'm not anxious to take on extra work that's unnecessary, but --

MR. CARROLL: Are you going to write it?

MR. GILLESPIE: No, but I think --

MR. SIESS: The inspiration for this meeting was that there were people that wanted to go to the Commission and ask why is it that whenever the budget is cut, Research takes the brunt of it. That was the way I heard it.

I agreed to having this meeting so that we could explore that issue, we could collect some information on just how Research has fared in budget cuts and so forth. The idea was that if people wanted to go to the Commission and say why do you keep doing this, they would have facts to deal with.

That's what I would like to see. Now, how much money they should have and why they shouldn't cut the budget, we've heard reasons. The Commission presumably has heard similar reasons. I don't know whether anybody has ever gone to the Commission and said you shouldn't cut the Research budget

because of this and this and this.

Maybe to the EDO. As Tom said, he sat down with EDO and said don't cut the Research budget. If push comes to shove, I'll even give you some money. But that's not our job to talk to the EDO about how he makes his allegations and I thought people wanted the idea of going to the Commission.

I could have misinterpreted what the Committee's desire was. It wouldn't be the first time and it wouldn't necessarily be through ignorance that I misinterpreted.

MR. KERR: Why don't we agree to help Mr. Gillespie; that we do not need to have him do any more work. If an emergency we need it, he will provide it.

MR. SIESS: I think if Frank could give us some examples, it would be great. We've never gotten any good ones in the past, never gotten a good collection in the past, and he's presented orally some very good --

THE WITNESS: I think it would be useful. Don't bother writing a page on each one, though.

MR. GILLESPIE: We can put a bullet down and a sentence explanation under a few.

MR. SIESS: Because I think you've got to do it by saying look, over the last ten years, these are the things we've gotten out of Research and we think are important.

Now, NRR is going to have a problem. NRR can't go to anybody and say look, we've got to know this or we shut the

plants down. You can't do that. You could cite cases in the past where this has avoided shutdowns, but you can't say, my God, I've got to have this research and if I don't have it, we can't license anything. That's not the way you operate.

MR. GILLESPIE: By the shear forward-looking aspect of research, it shouldn't be.

MR. SIESS: That puts you in a position of convincing somebody that if things change in the future, the Research budget gets any smaller, things are going to change. And that's not good. It's better to point to the positive things that happened in the past rather than the negative things that might happen in the future.

But as you said, if they cut the Research budget to zero, it would take three years before it would have an obvious impact. Sure; you would know there was an impact coming. You would feel it now, but people outside wouldn't see it till about three years. That's when it would start effecting the industry and a few other things.

So talking about the dire things that will happen if the budget is cut doesn't really get us anywhere. We have to point to what's been good in the past and have faith that it will be good in the future. That's not a difficult faith.

MR. GILLESPIE: Any other questions? I don't get down here very often anymore.

MR. KERR: I guess I should ask if one needs

additional research in order to support the maintenance rule, but I won't.

MR. GILLESPIE: Remember, I'm a person who has been accused by 300 people in the industry of writing a maintenance rule in plant life extension.

MR. SIESS: Well, I don't see how you can separate maintenance from aging.

MR. GILLESPIE: If you see the strawman rule that we have in what went down, you see a criteria written in there for what an acceptable program is for not having to do anything, and it talks about --

MR. SIESS: The life extension, it seems to me, starts out as a legal issue because the 40 year life was not based on how long we thought these plants would last. Let's face it.

MR. GILLESPIE: It's, first, procedural and, second, technical.

MR. CARROLL: I get a little disturbed when I hear people tell me that power plants are designed for 40 years. That's what a utility is required to tell the Public Utilities Commission.

MR. SIESS: There are only two things that can't be replaced in that plant, and I'm not sure about one of them. I was going to say the reactor vessel and I think it could be replaced. The containment, I think would be very difficult to

replace.

MR. GILLESPIE: But the data we have to date, including what the Japanese have, say the containments could last a long time.

MR. SIESS: They could. So can vessels. But if you can replace a steam generator, I think can replace a vessel.

MR. GILLESPIE: Surely. The difference in size --

MR. CARROLL: No, no. I think the difference is the radiation level.

MR. SIESS: I think it might be the radiation level. Yes.

MR. KERR: Do we want all of this priceless conversation?

MR. SIESS: Yes, sir. Absolutely. I want to be able to read this next year.

MR. WARD: What I want to know, then, is Ivan going to draft the letter?

MR. CARROLL: We've heard they've already drafted one. Maybe that's our --

MR. SIESS: No. All we've done is follow the situation, the same thing we've done in the past, get away from the report to Congress and tell them we're still asking you to relieve us, but, in the meantime, we're doing what we said we were going to do, send you a letter along with a few copies of research letters, period.

MR. WARD: You're doing that this week?

MR. SIESS: It's ready for you.

MR. KERR: Chet is going to draft a letter to the Commission saying we wonder why you aren't allocating more money to research. That's what he said.

MR. SIESS: We don't have a position on that.

MR. KERR: No. But you can draft a letter without a position.

MR. SIESS: No. I don't do that.

MR. WARD: We never have a position until we write a letter.

MR. SIESS: Thank you, gentlemen.

[Whereupon, at 4:15 p.m., the Subcommittee was adjourned.]

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

in the matter of:

NAME OF PROCEEDING: ACRS Subcommittee Meeting on The Safety Research Program

DOCKET NUMBER:

PLACE OF PROCEEDING: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Marilynn N. Nations

MARILYNN NATIONS
Official Reporter
Ann Riley & Associates, Ltd.

REGULATORY NEEDS FOR NRC RESEARCH

1. TO CONFIRM THE SAFETY MARGINS ASSUMED WHEN MAKING REGULATORY DECISIONS
   - LOCA/ECCS

2. TO MAINTAIN STATE-OF-THE-ART TECHNICAL ABILITY TO DEAL WITH SAFETY ISSUES
   - PRESSURE VESSEL INTEGRITY

3. TO HELP PROVIDE THE TECHNICAL BASIS TO RESOLVE GENERIC SAFETY ISSUES
   - LOSS OF RHR IN PWRs

4. TO DEVELOP NEW METHODS OF SAFETY ANALYSIS
   - PRA

5. TO MAINTAIN A CADRE OF CONTRACTOR EXPERTS FOR REGULATORY SUPPORT
   - OPERATOR LICENSING EXAMS

6. TO DEVELOP AN INTERNATIONAL CONSENSUS ON SAFETY ISSUES
   - PLANT AGING ISSUES

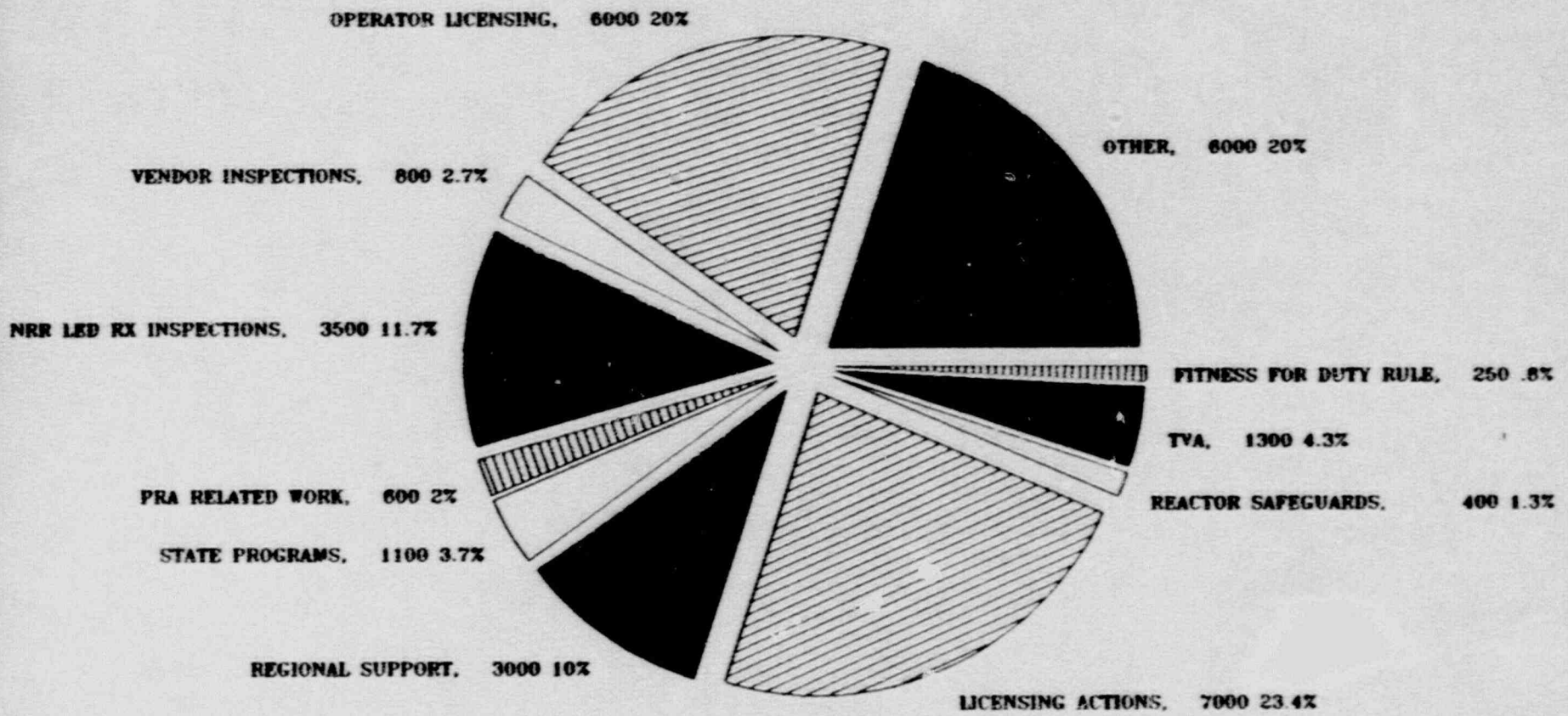
Insert K

NRR FY90 BUDGET - BY PROGRAM AREA

FEBRUARY 1990

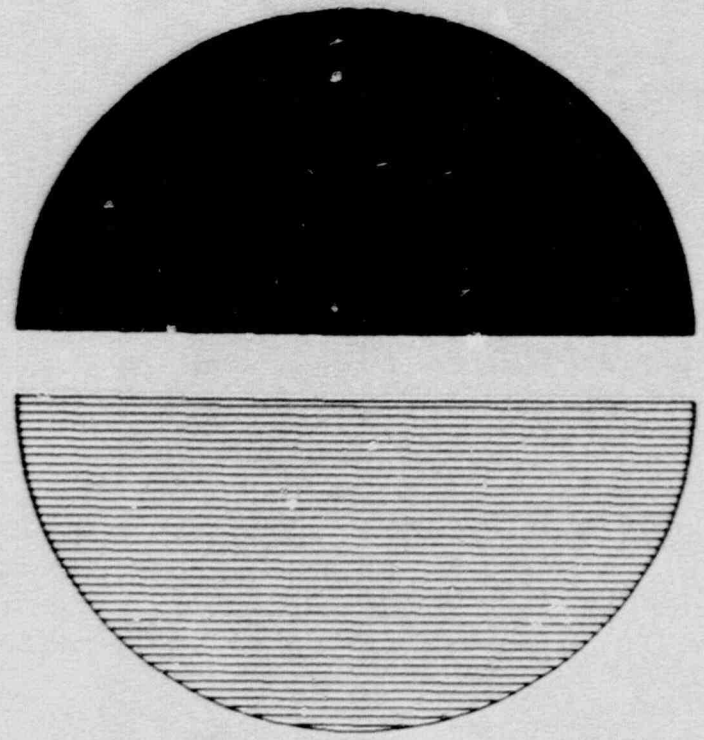
LICENSING ACTION	7,000
OTHER	6,000
Severe Accident Management	
Advanced RX Reactor	
TMI-2	
Non Power Reactor, ETC.	
OPERATOR LICENSING	6,000
REGIONAL SUPPORT	3,000
STATE PROGRAMS	1,100
TVA	1,300
NRR LED RX INSPECTIONS	3,500
FITNESS FOR DUTY RULE	250
PRA RELATED WORK	600
VENDOR INSPECTIONS	800
REACTOR SAFEGUARDS	400

NRR FY90 BUDGET - BY PROGRAM
FEBRUARY 1990



NRR FY90 TECHNICAL ASSISTANCE BUDGET BY CONTRACTOR

FEBRUARY 1990



BUDGET $29,952

Number of Task Orders Issued - FY89	214
(Avg 17 per month)	

Examples of Task Orders Issued	Cost
Operator Licensing Examination Work Assignments	30k
Emergency Prepardness Exercises	10k
Inspections	
Vendor	30k
Maintenance	45k
Emergency Operating Procedures (EOP)	30k
Safety System Functional (SSFI)	40k
Safety System Outage Modification (SSOMI)	45k
Regional	35k
Operating Reactors Review of Technical Issues	30k
TVA Assistance	
Watts Bar Licensing Action	30k
Browns Ferry Licensing Action	35k

Avg Cost Per Task	30k
(Range 10 - 50k)	

Insert 7

PMAS EVALUATION CRITIERIA

(USED FOR ENDORSEMENT DECISION
ON RES ACTIVITIES)

- ENHANCED SAFETY

- DECISION MAKING ON FUTURE MATTERS
  (LIFE EXTENSION, FUTURE PLANTS)

- REDUCED REGULATORY BURDEN

- PRIORITIES CONSIDERED
  - COMMISSION
  - EDO
  - NRR
  - RES

  - PROGRAM, ELEMENTS AND ACTIVITIES BASED ON NUREG-1319 "A PRIORITIZATION OF RESEARCH ACTIVITIES," AND NUREG-1260, VOL 2. "A REPORT TO CONGRESS ON NUCLEAR REGULATORY RESEARCH".

RESEARCH PROGRAM STRUCTURE

THE "PROGRAM" IS THE MAJOR CATAGORY FOR RESEARCH

- EACH PROGRAM IS DIVIDED INTO ELEMENTS.
- EACH ELEMENT IS DIVIDED INTO ACTIVITIES.
- EACH ACTIVITY IS MADE OF A NUMBER OF FINS.

PROGRAM (04)
ELEMENT (18)
ACTIVITY (57)*
FINS **

* The focus of this evaluation is on Activities.
** Not reviewed.

ACTIVITIES

FULLY ENDORSED	PARTIALLY ENDORSED	NOT ENDORSED
16	28	10

ENDORSEMENT LEVEL	ONE OR MORE OF THE FOLLOWING MAY APPLY:
FULLY ENDORSED	- SCOPE IS CONSISTIENT WITH NRR OBJECTIVES, EXPECTATIONS, OR REQUIREMENTS
PARTIALLY ENDORSED	- PORTIONS OF ACTIVITY NOT ENDORSED; PROGRAM REVIEW AND OBJECTIVE IDENTIFICATION RECOMMENDED; NRR REQUIREMENTS EXIST, BUT THE SCOPE OF ACTIVITY IS BEYOND OBJECTIVES OR NEEDS
NOT ENDORSED	- NO BACKFITABLE REGULATORY PRODUCT; CURRENT REGULATORY BASIS ADEQUATE; NO CURRENT REGULATORY NEED OR PRODUCT IDENTIFIED;

CURRENT RESEARCH PROGRAMS

(Through December 1988)

	ACTIVITIES		
	# TOTAL	# FULLY ENDORSED	#PARTIALLY ENDORSED
REACTOR COMPONENTS	12	04	06
PREVENT DAMAGE TO CORES	14	02	08
RX PERFORMANCE AND PUBLIC PROT FROM RAD	19	05	12
RESOLVING SAFETY ISSUES AND DEVELOP REG GUIDES	09	05	02
MISCELLANEOUS	03	03	
TOTALS	57	19	28

REACTOR COMPONENTS (Program)

VESSEL & PIPING INTEGRITY (Element)

#	ACTIVITIES:	ENDORSEMENT LEVEL
1	PRESS VESSEL INTEGRITY	F
2	PIPE INTEGRITY	
3	INSPECT PROCEDURES & TECH	P
5	CHEMICAL EFFECTS	P

F = Full endorsement
P = Partial endorsement
BLANK = Absences of endorsement

REACTOR COMPONENTS (Program)

AGING (Element)

#	ACTIVITIES:	ENDORSEMENT LEVEL
4	AGING RESEARCH	P

F = Full endorsement.
P = Partial endorsement.
Blank = absences of endorsement.

REACTOR COMPONENTS

REACTOR EQUIPMENT QUALIFICATION

#	ACTIVITIES:	ENDORSEMENT LEVEL
6	EQUIP QUALIFICATION METHODS	P
7	STANDARDS DEVELOPMENT	P

REACTOR COMPONENTS

SEISMIC RES & FIRE PROT

#	ACTIVITIES:	ENDORSEMENT LEVEL
8	EARTH SCIENCES	F
9	COMP RESPONSE TO EQ	F
10	VALID OF EQ ANALYSIS	F
11	SEISMIC DESIGN MARGINS	F
11A	FIRE PROTECTION	

PREVENT DAMAGE TO CORES

PLANT PERFORMANCE

#	ACTIVITIES:	ENDORSEMENT LEVEL
12	MIST (B & W TESTING)	P
13	2D/3D (PWR LB LOCA TESTING)	
14	FOREIGN EXP. SUPPORT (PWR LB LOCAT TESTING)	
15	ONCE THRU STM GEN (BW)	P
16	BASIC STUDIES (OTHER EXPERIMENTAL PRO.)	P
17	DEVELOPMENT & ASSESSMENT OF CODES	P
18	CODE UNCERTAINTY (MODELING)	P

PREVENT DAMAGE TO CORES

REACTOR APPLICATIONS

#	ACTIVITIES:	ENDORSEMENT LEVEL
19	TECH INTEG. CENTER	F

PREVENT DAMAGE TO CORES

HUMAN PERFORMANCE

#	ACTIVITIES:	ENDORSEMENT LEVEL
20	HUMAN FACTORS RES	P
21	HUMAN ERROR DATA COLLECTION/ANALYSES	P

PREVENT DAMAGE TO CORES

RELIABILITY OF REACTOR SYSTEMS

#	ACTIVITIES:	ENDORSEMENT LEVEL
22	PERFORMANCE INDICATORS	
23	PLANT & SYS RISK & RELIAB.	F
24	DEPENDENT FAILURE ANALYSES	

PREVENT DAMAGE TO CORES

ACCIDENT MANAGEMENT

#	ACTIVITIES:	ENDORSEMENT LEVEL
26	INDIVID. PLANT EXAMS	F

REACTOR PERFORMANCE AND PUBLIC PROTECTION AGAINST RADIATION

CORE MELT AND RCS FAILURE

#	ACTIVITIES:	ENDORSEMENT LEVEL
27	FISSION PRODUCT BEHAVIOR AND CHEMICAL FORM	P
28	NAT CIR IN RX COOL SYS	P
30	CORE MELT PROGRESSION AND HYD GENERATION	P

REACTOR PERFORMANCE AND PUBLIC PROTECTION AGAINST RADIATION

REACTOR CONTAINMENT SAFETY

#	ACTIVITIES:	ENDORSEMENT LEVEL
29	STRUCTURAL TEST	P
31	CORE/CONC INTERACTIONS	
32	DIRECT CONT HEATING	P
33	STEAM EXPLOSIONS	
34	CODE MODELS VALID AND ANALYSIS	P
35	HYD BURNING & COMB.	P

REACTOR PERFORMANCE AND PUBLIC PROTECTION AGAINST RADIATION

RX ACCIDENT RISK ANALYSIS

#	ACTIVITIES:	ENDORSEMENT LEVEL
36	REVIEW OF PRA	
37	SEVERE ACCIDENT MANAGEMENT	F
38	RISK MODEL DEV	
39	RISK UNCERT. METH	
40	RISK BASED MANAGEMENT METH. (PRA)	P
41	STATISTICAL TECH RISK ANALYSES	

REACTOR PERFORMANCE AND PUBLIC PROTECTION AGAINST RADIATION

SEVERE ACCIDENT PROG IMPLEMENTATION

#	ACTIVITIES:	ENDORSEMENT LEVEL
42	SEVERE ACC. POLICY IMPLEM.	F

REACTOR PERFORMANCE AND PUBLIC PROTECTION AGAINST RADIATION

RAD PROTECTION & HEALTH EFFECTS

#	ACTIVITIES:	ENDORSEMENT LEVEL
44	REDUCED UNCERT. IN HEALTH RISK ESTIMATES	F
45	HEALTH PHYSICS AND TECH IMPROVEMENTS	P
46	DOSE REDUCTION & STANDARDS DEV	P

RESOLVING SAFETY ISSUES AND DEVELOPING REGULATIONS

GENERIC & UNRESOLVED SAFETY ISSUES

#	ACTIVITIES:	ENDORSEMENT LEVEL
53	ENGINEERING ISSUES	F
54	REACTOR SYS ISSUES	F
55	HUMAN FACTOR ISSUES	F
56	SEVERE ACCIDENT ISSUES	P
57	MANAGEMENT SAFETY	F

ISSUE RESOLUTION

RESOLVING SAFETY ISSUES AND DEVELOPING REGULATIONS

STANDARD AND ADVANCE REACTORS

#	ACTIVITIES:	ENDORSEMENT LEVEL
58	REVIEW OF DOE ADVANCED REACTOR CONCEPTS	F

RESOLVING SAFETY ISSUES AND DEVELOPING REGULATIONS

FC, MATERIALS, SG, RES & STANDARDS DEV

#	ACTIVITIES:	ENDORSEMENT LEVEL
59	MATERIAL SAFETY	

RESOLVING SAFETY OF ISSUES AND DEVELOPING REGS

DEVELOPING AND IMPROVING REGS

#	ACTIVITIES:	ENDORSEMENT LEVEL
60	DEV OR MODIFY REGS TO REDUCE REG BURDEN	
61	REGULATORY ANALYSIS OF REGULATIONS	P

MISCELLANEOUS

THESE ACTIVITIES ARE ASSOCIATED WITH ONE OR MORE OF THE ABOVE ELEMENTS

#	ACTIVITIES:	ENDORSEMENT LEVEL
62	FUEL CYCLE	F
63	TRANSPORTATION	F
64	SAFEGUARDS	F

NRR VIEWS CONCERNING REACTOR-RELATED RESEARCH

PRESENTED FEBRUARY 7, 1990 TO ACRS SUBCOMMITTEE

ON THE SAFETY RESEARCH PROGRAM

BY

FRANK P. GILLESPIE, NRR

MAJOR CONTRIBUTIONS OF NRC REACTOR-RELATED RESEARCH (EXPLORATORY & CONFIRMATORY)

- IDENTIFICATION, PRIORITIZATION AND RESOLUTION OF REGULATORY CONCERNS (SAFETY & REGULATORY BURDEN)
- DEVELOPMENT OF NEW/REVISED REQUIREMENTS AND GUIDANCE
- REGULATION OF FUTURE REACTORS (STANDARD & ADVANCED)

UTILIZATION OF RESEARCH
TO IDENTIFY, PRIORITIZE AND RESOLVE REGULATORY CONCERNS

- UNRESOLVED SAFETY ISSUES (USIs)
- GENERIC SAFETY ISSUES (GSIs)
- ENVIRONMENTAL ISSUES (EIs)
- LICENSING ISSUES (LIs)
- REGULATORY IMPACT ISSUES (RIs)

- STRUCTURAL INTEGRITY OF CONTAINMENTS
- LOW UPPER SHELF WELD
- RADIATION EMBRITTLEMENT OF REACTOR VESSELS
- PLANT AGING
- ENVIRONMENTAL QUALIFICATION OF AGING COMPONENTS
- EROSION & CORROSION IN PIPING AND VESSELS
- DETECTION AND CHARACTERIZATION OF FLAWS IN CRITICAL COMPONENTS
- STEAM GENERATOR DEGRADATION IN PRESSURIZED WATER REACTORS
- CRACKED PIPING IN BOILING WATER REACTORS
- VALVE OPERABILITY
- SEISMIC RESEARCH
- NUREG-1150 (SAMDA ISSUES)
- ACCIDENT MANAGEMENT
- HUMAN FACTORS
- INTERFACING SYSTEMS LOSS OF COOLANT ACCIDENT (ISLOCA)
- SEVERE ACCIDENTS
- INDIVIDUAL PLANT EXAMINATION (IPE)
- SOURCE TERM
- CONTAINMENT PERFORMANCE IMPROVEMENT PROGRAM (MARK I VENT)
- RADIATION EFFECTS ON REACTOR VESSEL SUPPORTS
- LICENSE RENEWAL-REQUIREMENTS AND IMPLEMENTING GUIDANCE

UTILIZATION OF RESEARCH FINDINGS TO CONFIRM, DEVELOP AND IMPLEMENT REGULATORY REQUIREMENTS AND GUIDANCE

- REQUIREMENTS
  - REGULATIONS
  - ORDERS
  - GENERIC LETTERS
  - BULLETINS
- GUIDANCE (INCLUDING ENDORSEMENT OF INDUSTRY INITIATIVES)
  - POLICIES
  - REGULATORY GUIDES
  - LICENSING GUIDANCE
  - INSPECTION GUIDANCE
- INFORMATION NOTICES

DECLINING BUDGET IMPACT ON REACTOR-RELATED RESEARCH

- EMPHASIZING NEAR-TERM NEEDS AT THE COST OF LONGER-TERM NEEDS
- REDUCING SCOPE & DEPTH OF WORK
- RESCHEDULING WORK
- POSTPONING WORK
- TERMINATING WORK

NRR'S VIEW OF THERMAL HYDRAULIC RESEARCH

- OBJECTIVES
  - MAINTAIN CAPABILITY TO ANALYZE OPERATING EVENTS
  - APPLY RESEARCH RESULTS TO RESOLVE CONCERNS IN OPERATING AND FUTURE PLANTS
  - PERFORM NEW RESEARCH WHERE JUSTIFIED

- KEY ASSUMPTIONS
  - CURRENT THERMAL HYDRAULIC CODES ARE SUFFICIENT (MAJOR CODE DEVELOPMENT IS NOT JUSTIFIED)
  - LARGE SCALE EXPERIMENTAL FACILITIES ARE NOT REQUIRED FOR CURRENT OR FUTURE DESIGNS
  - THERMAL HYDRAULIC EXPERTISE SHOULD BE MAINTAINED

- ACTIVITIES OVER NEXT 5 YEARS
  - FINALIZE RELAP & TRAC CODES (FY91)
  - MAINTAIN RAMONA, COBRA, HIPA-BWR, RELAP & TRAC CODES
  - COMPLETE INTERNATIONAL TESTING PROGRAMS (2D/3D, ROSA-IV, & BETSY)
  - INITIATE ADVANCED REACTOR DESIGNS STUDY (AP 600, SBWR, CANDU, PIUS)
  - DEVELOP TESTING LOOPS AT UNIVERSITIES
  - ANALYZE OPERATING EVENTS
  - INITIATE THERMAL SCIENCES STUDIES
  - ASSESS FEASIBILITY OF PC-BASED CODES

NRR ENDORSEMENT OF REACTOR-RELATED RESEARCH

- ANNUAL
  - CURRENT NRR ENDORSEMENT
    (JULY 17, 1989 MEMO GILLESPIE TO BECKJORD)
  - NEXT NRR ENDORSEMENT (MAY 1990)
- JULY 1989 NRR ENDORSEMENT OF RES WORK

PROGRAMS (4)
ELEMENTS (18)
ACTIVITIES (57: 19 FULLY, 28 PARTIALLY, 10 NOT ENDORSED)

F/I

PRESENTATION SCHEDULE

ACRS SUBCOMMITTEE MEETING ON THE
SAFETY RESEARCH PROGRAM
FEBRURY 7, 1990
ROOM P-110, 7920 NORFOLK AVENUE
BETHESDA, MARYLAND

ACRS CONTACT: Sam Duraiswamy
301-492-9522

NOTE:
- Presentation Time should not exceed 50% of the Total Time allocated for a specific item. The remaining 50% of the time is reserved for the Subcommittee questions and answers by the Staff or its consultants/contractors.
- Number of copies of the presentation materials to be submitted to the Subcommittee: 25 copies.

	ITEM	PRESENTER	TOTAL PRESENTATION TIME	ACTUAL TIME
1.	EXECUTIVE SESSION	C. P. Siess	10 min	8:30 - 8:40 am
2.	EDO PRESENTATION			
	a. EDO's Opinion on the Contribution of the NRC Research in Carrying Out the Agency's Mission	James Taylor (EDO)	50 min	8:40 - 9:30 am
	b. Rationale Behind Continually Reducing the NRC Research Program Budget			
	c. Consequences of Continually Dwindling Research Program Budget in Carrying Out the Agency's Mission			

ITEM	PRESENTER	TOTAL PRESENTATION TIME	ACTUAL TIME
3. RES PRESENTATION			
a. Overview of the RES Funding for FY 1988 - FY 1991: • Funding and FTEs for Research Activities • Funding and FTEs for Non-Research Activities • Technical Assistance Program Support • Research Contracts at National Labs • University Grants/ Contracts • Personnel Salaries • Other Expenses	Eric Beckjord	45 min	9:30 - 10:15 am
*** BREAK ***		15 min	10:15 - 10:30 am
b. Impact of the Budget Reduction Imposed by the Congress on the FY 1990 NRC Safety Research Program		45 min	10:30 - 11:15 am

ITEM	PRESENTER	TOTAL PRESENTATION TIME	ACTUAL TIME
3. Continued			
c. Overview of FY 1991 Safety Research Budget: • Request to OMB • OMB Final Mark • Impact of the Reduction Proposed by the OMB		60 min	11:15 - 12:15 pm
*** LUNCH ***		60 min	12:15 - 1:15 pm
d. Research Priorities Over the Next Five Years and the Anticipated Level of Funding		30 min	1:15 - 1:45 pm
4. NRR PRESENTATION			
a. Major Contributions of NRC Research to Reactor Safety in the Past Five Years b. Impact of the Continually Dwindling Research Budget on Research User Offices' Needs c. NRR's Opinion on the Adequacy of the Ongoing and Proposed Research in the Thermal-Hydraulic Area, Especially on Thermal-Hydraulic Codes	Tom Murley/ Frank Gillespie	60 min	1:45 - 2:45 pm

ITEM	PRESENTER	TOTAL PRESENTATION TIME	ACTUAL TIME
4. Continued			
d. Technical Assistance Program Activities Within NRR			
e. Differing Views, if any, Between RES and Research User Offices on the Ongoing and Proposed Research			
5. SUBCOMMITTEE REMARKS		15 min	2:45 - 3:00 pm
*** ADJOURN ***			3:00 pm