NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

PUBLIC MEETING

BUDGET PRESENTATIONS

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Place - Washington, D. C.

Date - Tuesday, 31 July 1979 Pages 1 - 102

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

PUBLIC MEETING

BUDGET PRESENTATIONS

- - -

Room 1130
1717 H Street, N. W.
Washington, D. C.

Tuesday, 31 July 1979

The Commission met, pursuant to notice, at 2:45 p.m.

BEFORE:

DR. JOSEPH M. HENDRIE, Chairman

VICTOR GILINSKY, Commissioner

RICHARD T. KENNEDY, Commissioner

PETER A. BRADFORD, Commissioner

JOHN F. AHEARNE, Commissioner

PRESENT:

Messrs. Barry, Budnitz, Cooper, Engelhardt, Gossick, Levine, Murley, and Smith.

* * *

CHAIRMAN HENDRIE: Why don't we go ahead? The other commissioners will join us at some point, I trust.

Okay, Lee, fire away.

MR. GOSSICK: I sent down yesterday, and I don't know whether you had a chance to look at it or not, the little paper that summarizes the ACRS comments and the NRC comments. I thought it might be helpful to you in seeing how well they are put together, and the areas in which there are some differences.

Ray Smith was the chairman of the panel in this rather sizable effort, and he is back here with members of his panel. And I will turn this over to Saul, with his 99 viewgraphs.

MR. LEVINE: The first thing I have to say is that we're not going to use all 99 viewgraphs. We've whittled it down to about 70. We have some back-ups, however. If you ask questions, we will put up back-ups.

Also, we have no wedges in our budget.

As you know, there are some understandings about reactor safety as a result of the Three Mile Island accident, and these new perceptions have a major impact on the level of our fiscal '80 supplement and our fiscal '80 budget request.

Our fiscal '80 supplement is $29 million for safety and an additional $3 million for waste. And the Three Mile Island part of our '81 budget is about $76 million. I plan

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to present here an overview of the new research directions as perceived by ourselves, and to summarize the ACRS views on the research directions to show a reasonable parallel.

And what I've done is summarize the first part of the ACRS letter to you that reviewed our fiscal '81 supplemental and fiscal '80 budget.

I then will present a summary of our budget indicating its trends over time and the areas in which we will focus. The division directors are prepared to discuss each budget decision unit in detail and to indicate issues.

We can cut the number of viewgraphs down a bit, if we don't have to, to cover every decision unit, but then you will miss some of our program description. And if we're going too long, you just tell us what to cut out.

COMMISSIONER AHEARNE: As you go through, Saul, could you comment when and if appropriate as to what programs you have either reduced or deferred or dropped as a result of this re-evaluation?

MR. LEVINE: I think we can try to do that.

Now last week we sent down SECY-79-486 for your information. And this paper presents the basic logic of our approach to the TMI-related research.

You should note that the ACRS has given endorsement to this approach and level of funding. Of course, some details will change. Viewgraph 1, please.

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(Viewgraph)

This viewgraph is intended to show the area between design basis accidents and core melt accidents, where additional research and understanding of reactor safety is needed. These are accidents that lead to extensive core damage but without core melt.

I guess slide 2 --

(Viewgraph.)

-- shows a view of how to think about that. And the top part of the slide shows the definition of accident sequences prior to TMI, starting from design basis accidents and going through --

COMMISSIONER GILINSKY: Why do you separate the severe core damage accidents from the core melt accidents?

MR. LEVINE: Because -- well, I'm trying to present this from a risk perspective. And the risk perspective, the cores that do not melt do not threaten the containment -- that is, there is not a coupled failure between the core and containment integrity. Whereas, with the core melt, there is a couple there.

So in doing WASH-1400 --

COMMISSIONER GILINSKY: What do you mean, a coupled failure?

MR. LEVINE: Well, if you melt the core, you will surely rupture the containment integrity in one of a number of

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ways. If you don't melt the core, you can fail the containment by leakage, but not as a result of melting the core.

There are physical processes associated with the melted core that can rupture the containment in any one of a number of ways.

So in doing the reactor safety study, we did not pause at the severe core damage area because they didn't threaten risk; whereas, the licensing process has always stopped at design basis accident.

So the idea is that we did not define -- Mullen really has defined accident sequences involving severe core damage. The design basis accident does not and WASH-1400 did not. And by severe core damage, I mean cores that are mechanically disrupted but which fuel has not gotten molten.

COMMISSIONER GILINSKY: You could have an explosion in a containment.

MR. LEVINE: Yes. That is the severe core damage area. We would have said, I think,, virtually all the people I know that if you had a 30 or 40 percent metal-water reaction involving cladding, that the core would have been a molten core. And this is new information, that they can get that large a metal reaction without melting the core, and that's the information we have.

And so what we're proposing after TMI, on the bottom half of this slide is to draw the accident sequences, to

define the accident sequences involving severe core damage, but which stops short of melting the core.

COMMISSIONER GILINSKY: Let me understand. Is the point that you have in some way or another covered the core melt accident?

MR. LEVINE: We have better than -- what I'm trying to say is that if you look at core melt, and worse, and you look at design basis accidents and less, those are all better covered than this area of severe core damage.

We understand less about this middle area than we do about both ends of the spectrum. Not that we don't have to understand more about core melt accidents, but certainly we understand more about them than we do about severe core damage accidents.

COMMISSIONER GILINSKY: Okay.

MR. LEVINE: And, of course, I've listed some of the areas that have to be looked at to define that middle area. We have to look at event trees. We need better understanding of small LOCAs and transient. We need better understanding of enhanced operator capability, better understanding of coolant chemistry. And we need some information from TMI, the post-mortem.

Now I've lotted down on the next several slides -- number 3, please.

(Viewgraph.)

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— lessons that we in research feel that we've learned from TMI. We need that improved understanding of potential accidents involving small LOCAs, transients, and enhanced operator capability.

All these need research attention to enhance our understanding.

COMMISSIONER GILINSKY: Let me pursue this point again. Is the point — it seems to me that if you look at the sequences heading toward core melts, if you covered all of the sequences, you will have covered the severe core damage.

Isn't the point that we have simply not covered certain kinds of sequences?

MR. LEVINE: That is just what I'm saying. In fact, put number-2 back up, please.

(Viewgraph.)

MR. LEVINE: You'll see in that middle area that event tree in the middle area shows some sequences that stop short of core melt, but some will go through to core melt. And so far, we have considered only the ones that go through to core vent, but not the ones that stop short of core melt.

COMMISSIONER GILINSKY: Maybe this is quibbling, but presumably, there are severe core damages pre-TMI.

MR. LEVINE: Yes, and they were not reviewed very well by anyone, and that is what we have to do now. They are still undefined.

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CHAIRMAN HENDRIE: In WASH-1400, typically, when you went along with an event tree and took a path that went past the design basis, you just then drew that without further elaboration.

MR. LEVINE: Our LOCA and transient event trees had two outcomes -- either core melt or no core melt. And the no core melts were all trivial accidents. The ones that could have been stopped before core melt were not considered.

CHAIRMAN HENDRIE: They sort of shot across the area.

MR. BUDNITZ: If you started to have several percent oxidation, WASH-1400 called it a core melt. They just said, okay, that's a core melt.

We now have one very good example where that didn't happen and we realize that there are a plethora.

MR. LEVINE: Well, that's not exactly right. We had a sequence like the B&W sequence, which we said we didn't know whether it would melt or not, but we called it core melt because we were being conservative and that we didn't know enough to define that area, and we simply did not get involved in that area.

But that sequence is in WASH-1400 as a core melt sequence called PWLB. And the footnote says that we are not sure whether this would melt or not. And we gave some logical reasons why, and said, but we're calling it core melt

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for the purpose of this exercise.

MR. BUDNITZ: But the point is that here today in the summer of 1979, there has not been a thorough drawing of event trees in this area at all. It just hasn't been explored.

MR. LEVINE: And this is a very difficult area because to get involved in this area, you have to know much more about fuel behavior than we now know.

As I say, the perception we had that a core with this much metal reaction that melted is clearly wrong and we have to understand that better.

We have to know --

COMMISSIONER GILINSKY: In order to do what? What is the question?

MR. LEVINE: There are two questions -- one to define the risk and to prevent these things from happening, to design preventive mechanisms to help enable operators to cope with them when they do have them.

By "prevent," I mean reduce the likelihood of them because you can never prevent anything. But to make them less likely.

For instance, the bulletins that INE has issued have already made the likelihood of the sequence that happened in the B&W reactor much smaller than it used to be, because you now don't lift that relief valve every time that makes the

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situation much better than it was.

There may be -- the technical consensus is that the TMI accident sequence was a rather unique one in the sense that it was one sequence. There may be dozens of others that we haven't explored yet that could get you into similar troubles.

COMMISSIONER GILINSKY: So it is a matter of looking at the sequences that we haven't looked at.

MR. LEVINE: Yes, exactly.

COMMISSIONER GILINSKY: Rather than have a middle portion of sequences.

MR. BUDNITZ: Some of each.

MR. LEVINE: Mostly what you said.

MR. BUDNITZ: Some of each because sometimes in WASH 1400, it wasn't fleshed out. And as Saul said, to explore them in terms of the real physics and chemistry, requires an understanding of a lot of chemistry that has not been explored.

MR. LEVINE: There have to be experiments to define the behavior of materials, to define the physical phenomena. We have to be able to make models to describe them so we know how to construct the event trees and we have to construct the event trees so the modelers know what to model.

COMMISSIONER KENNEDY: But you're going to be discussing some of that in programatic terms later on.

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MR. LEVINE: Yes. Yes, of course. Okay, going back to slide 3, please.

(Viewgraph.)

MR. LEVINE: We have to enhance our understanding of the small LOCAS and transients. We need a large number of studies to be made of these types of events. And there are many variations and we have to be able to predict plant behavior with greater precision.

We have to develop aids to assist plant operators in coping with the situations.

Next slide, 4.

(Viewgraph.)

MR. LEVINE: We have to develop -- there are two types of computer codes that have to be developed. We have so far been developing a research program, very long running, complex codes as precise as we know how to make them. We are still going to do that and use them as benchmarks for faster running codes.

We have to develop fast running codes which will be less precise to conduct multitudinous studies of plant behavior. And of course we have to do experiments in existing facilities to provide data for modeling and testing codes.

Event trees and other techniques will have to be developed and used to define accident sequences that result in severely damaged cores. Number 5, please.

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(Viewgraph.)

MR. LEVINE: Capability will have to be enhanced. Codes will be used to study requirements for accidents that go beyond DBAs on operating training simulators. I spoke about this this morning.

Requirements needed to be studied for plant instrumentation to follow the course of accidents for improved control room displays of such information and for diagnostic systems to aid operators in telling what is going on. Requirements needed to be developed for improved automatic monitoring of the operatability status of safety systems.

You have an antique system now for deciding whether systems are operable or not, and it requires mountains of paperwork.

It seems to me very easy to implement data processors to do the sort of thing.

COMMISSIONER AHEARNE: Have you looked at the kind of monitoring people who run pipelines?

MR. LEVINE: No. But part of our study will be to -- we know the objective. We will have to start the studies and see what people can do.

COMMISSIONER AHEARNE: You might look at that. They have developed a fairly elaborate automatic monitoring system for all of the relay stations that go down the line.

In some cases, they have as many as 2000 points and

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digital monitoring and use a small processor right at each point.

MR. LEVINE: That is just what we have in mind. Do you know where we can get information on that?

COMMISSIONER AHEARNE: Yes.

MR. LEVINE: And then, of course, we have to look at requirements that need to be developed for plant data transmission to meet external needs.

As one of the people, one of the large number of people who were trying to help the site by doing analyses, we just didn't have enough information about the plant, what was going on. And when we finally got the plots of plant parameters on Monday or Tuesday after the accident, it was clear that if we had had those in time, we would have been able to give advice to the people on the site about what was going on.

And so, we don't plan to build the systems or design them, but really, to define the requirements for data that need to be delivered, and that can then become a regulatory requirement which the industry will have to take.

I think that this information should go to vendors and to the NRC. But that can all be decided later once we define what is needed.

Next slide, please. 5.

(Viewgraph.)

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Plant response under accident conditions. We need improved understanding of coolant chemistry and better sampling methods. We need to know more about hydrogen behavior in coolant and in the containment, especially mixing. We need to know more about the effects of hydrogen burning and explosions -- particularly explosions.

We need to know about the response of plant equipment and structures to accident conditions.

COMMISSIONER GILINSKY: What do you mean by "effects of hydrogen burning and explosion"?

MR. LEVINE: When hydrogen burns, you get a pressure in the containment, depending upon the a priori steam pressure. For instance, if you had a large LOCA and a large steam pressure is existing in the containment each time you get a hydrogen burn, you can rupture the containment.

This was predicted in WASH-1400.

While we probably had a hydrogen burn in Three Mile Island, there was no steam pressure present. There was essentially an ambient pressure. And one has to think this through very carefully and find out what can happen under a variety of conditions.

We did our work, I think, rather crudely in WASH-1400. We ought to take a more precise look at it.

MR. BUCHITZ: There is also the effect upon equipment, as well as the containment itself.

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MR. LEVINE: And then we need to know about the behavior of time components under long-term severe accident conditions of high temperature, pressure, radiation, et cetera, and what requirements should we set up for testing.

Slide 7, please!

(Viewgraph.)

MR. LEVINE: And finally, the post-mortem and plant recovery. I guess we have had several meetings now with DOE, EPRI, and GPU about how to go about getting the data out of TMI.

It's clear that DOE is willing to spend a significant amount of money to manage getting the stuff out of the plant. We will help plan how to to this, along with the other three parties, and we will probably want to look at some of this stuff experimentally to determine its condition.

COMMISSIONER AHEARNE: When you say, DOE is interested in getting the stuff out of the plant --

MR. LEVINE: Paying for getting it out, having the lab get it out.

COMMISSIONER AHEARNE: By "the stuff," what do you mean?

MR. LEVINE: The core components which are damaged and should be examined, cladding, all kinds of things. The dispersion and amount of radioactivity.

COMMISSIONER AHEARNE: Are you saying DOE is

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interested in paying for the movement of the core?

MR. LEVINE: Yes. Whether it is all of it or part of it, all this remains to be worked out. But they have indicated strong interest in participating in this.

CHAIRMAN HENDRIE: I would say that we have solicited their interest in the post-mortem. That does not mean that DOE would assume responsibility, the financial obligation of the recovery operation in any sense.

But only that, as materials are removed both in terms of the way in which they are removed, and what is done in terms of subsequent examination of them, I think there are a number of things that ought to be looked at which, from the licensee's standpoint, in trying to get the plant recovered, are going to be of considerably less interest than they are to us from the standpoint of nuclear safety and regulatory matters.

MR. LEVINE: It could be those funds required to get data as opposed to just getting the plant back in operation.

CHAIRMAN HENDRIE: And we have talked to DOE about it. They are willing to include that in their list of programs associated with their general mandate in lightwater reactor safety, and so on.

And there will be a draft letter around for review that details some of the things that ought to be looked at.

MR. BUDNITZ: We have here a proposal to have just a

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little bit of furds to make sure that we can monitor that for our own important safety purposes.

MR. LEVINES: Slide 8, please.

(Viewgraph.)

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In the letter that the ACRS wrote to you about our budget, they have a long section, the beginning of which is sort of their philosophy about new research directions needed as a result of TMI. And I would like to summarize these for you just to be sure that we understand them together and to show that there is quite a parallelism between the slides I just showed you were very similar to those that I generated for testimony for McCormick's committee.

So the thinking has gone along in parallel.

The first thing they say is you have to consider a broader range of safety issues in research. By this they mean that we should be doing exploratory, as well as confirmatory research, and we should have additional flexibility in our research program over and above what we now have. And they have written a separate letter on this subject.

The research should cover the prevention and mitigation of accidents that result in severely damaged cores. That's what I've been talking about.

COMMISSIONER GILINSKY: Well, let's see if I have it right.

MR. LEVINE: We have to consider multiple failures as opposed to only single failures. And we have already presented to ACRS our reviews about how to study this matter and we will make recommendations to NRR. The ACRS recognizes

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that the research is already underway in many new areas and others can be considered and implemented without delaying the budgetary process.

Of course, priority should continue to be re-examined and we have already done some re-examination as a result of the BRD and the ACRS comments. And of course, we will continue to do this.

Specifically, Slide 9 --

(Viewgraph.)

-- they want a greater emphasis on small LOCAs and anomalous transient. They want analytical studies of a broad spectrum of accidents that go beyond DBAs. They want to study the practicality retaining molten core within the containment or reducing radioactivity in liquid pathways following meltdown.

Some of this work is already in our approved research program to augment ongoing studies of steam explosions for better understanding, more extensive evaluation of liquid pathway consequences for core melt accidents.

Slide 10?

(Viewgraph.)

Identify research needs related to procedures for operation, maintenance, testing and surveillance. Review operating experience to determine problems important to safety.

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Of course, the operation's evaluation function will do this and our little select group will work them, develop fast-running codes for postulated transient and accident sequences to aid improved operator training, diagnostic instrumentation, and computer-aided operator guidance. Develop real time methods for analysis of system disturbances to provide to operators improved diagnostic information about abnormal sequences.

Slide 11?

(Viewgraph.)

Research on systems behavior and interaction to increase insights on operating limits, abnormal transients, and improved design of safety systems.

This is much like the Lewis committee recommendations

COMMISSIONER GILINSKY: How does all this relate to your program?

MR. LEVINE: Well, I gave you what I thought we had to do and there is quite a parallel between all of these viewgraphs and mine. They are not exactly the same.

COMMISSIONER GILINSKY: When are you going to show it?

MR. LEVINE: I am going to show it later. It's hard to understand the logic of a program when it is broken down into decision unit format. I am trying to give the overall logic for the program and to show that we and the ACRS are

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thinking very much alike.

Slide 12, please.

(Viewgraph.)

Budget comments.

COMMISSIONER AHEARNE: But there were, when you get into specifics, they did have some places.

MR. LEVINE: There were some specific differences and these can be worked out.

COMMISSIONER AHEARNE: Will they be mentioned later as you go through?

MR. LEVINE: Yes. Each division director will cover those as we go through.

In regard to our budget, the ACRS supports an additional $30 to $31 million for TMI-related research in Fiscal '80, plus $3 million for waste management.

We have now requested from you $29 million, plus $3 million for waste management. The ACRS generally supports the Fiscal '81 budget, not as strongly as the '80 supplement, but generally very strongly.

And the ACRS support is based on the understanding that some reorientation might be necessary as a result of further study.

Number 14?

(Viewgraph.)

This is an attempt to show you the budget trends and

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to show, starting with '79 -- the top line are the budget requests. The dark line is the budget request that we've asked for in the '78 budget, our '80 budget plus the supplement. And then our '81 budget. And the dashed line shows you that in '79, we reoriented $12 million of funds to TMI. In '80, we're reorienting $34-1/2, in addition to $32 we're already asking for, we're asking for additionally. And in 1981, $76 million of our budget will be TMI-related research.

And while the budget is very large, I should point out that we have in '79 and '80 picked up the operating cost of $25 or $30 million a year.

So that is to be considered.

COMMISSIONER AHEARNE: The $244.6 -- that is neither the EDO, OMB mark or the original request.

MR. LEVINE: That's right. That is in the middle. Number 16 --

(Viewgraph.)

-- will show this better. It shows our Congressional '80 budget, our EDO mark, and our Reclama, I guess the Congressional has --

MR. BUDNITZ: The Congressional is the President's budget.

COMMISSIONER AHEARNE: But it has not been the result of Congressional action.

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MR. BUDNITZ: That's right.

Mr. LEVINE: It is the President's budget. It is not the Congress' action.

MR. BUDNITZ: It was what was sent to Congress.

MR. LEVINE: We are going to be less by about $6 million, roughly.

MR. BARRY: I would say more like $7.

MR. BUDNITZ: There is $6 we're going to have to eat and then $2 in gas.

MR. LEVINE: We are Reclama-ing $4.8 million over and above what the EDO gave us. And that includes the set-aside. The division directors will cover each of these as we go through.

COMMISSIONER AHEARNE: The EDO mark -- it is the mark on the '80 supplement. And so it is the supplement added to $158.

MR. LEVINE: Yes, exactly.

COMMISSIONER AHEARNE: Then your Reclama then is an additional amount over and above that.

MR. LEVINE: Over and above that.

In Fiscal '81, we show the EDO mark with $25 million of set-asides, $25.9. And we are Reclama-ing to a level of $274.4, which is $62 million.

Now I would like to discuss just a few of these items.

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The division directors will cover the rest in detail. In seismic safety —

COMMISSIONER AHEARNE: One question still on this chart. You have a Reclama that the EDO had put in as a set-aside.

MR. LEVINE: We are asking that that be put in the budget.

COMMISSIONER AHEARNE: Although the EDO's comment is, it is the commission decision. It has to decide one way or the other. And what you're doing is reminding us.

MR. LEVINE: My advice to you is that we would like it in the budget.

COMMISSIONER AHEARNE: That is a different character than what EDO has produced before.

MR. LEVINE: Yes. Aside from the set-aside, there is only a $1.4 million difference between us and EDO. Now going on to '81, I would like to talk about seismic.

COMMISSIONER AHEARNE: Just a minute. Your Reclama, if I add your Reclama to the EDO, to what the EDO mark was, it looks like you are essentially Reclama-ing the mark.

Is that right?

MR. LEVINE: That's right.

MR. BUCHIZ: That's exactly right.

COMMISSIONER AHEARNE: Okay.

MR. LEVINE: In '81, I would like to talk about

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seismic engineering safety, where we ask for $19.9 and the EDO gave us $13.9.

I would like to point out that the ACRS recommend a level of about $17 million. And I would also like to point out to You the importance of this area.

We know that there is a lot of difficulty with seismic safety design of nuclear power plants and we have organized an extensive research program to try and help resolve this area to make it more rational than it now is.

Many people think it is overconservative and, in fact, counter to safety in some areas.

We are trying to develop by the use of quantitative risk assessment techniques a more rational basis for safety design. Also, pipe cracks are in here and you know that there are a lot of problems with pipe cracks, items that are very important areas, that will be growing and should be growing, and in which research is needed.

In fast breeders, I guess that we have had some experience that says that we need a significant increase. The $13.7 billion level is sort of below critical mass because the people, the good people in the research program, are leaving it.

And it seems to me that if we look forward to FY , the report will be on the street. And there is some reason to think that the breeder program might be extracted because

of that.

Certainly, we ought to be doing the research needed in advance of the safety issues and licensing reactors, rather than afterwards, it seems to me.

So that your problem is very simple. If you think that there are going to be breeders, then we ought to be doing more work on that. If you think that there aren't going to be breeders, maybe we shouldn't be doing anything.

COMMISSIONER AHEARNE: Independent of when we think there might be breeders?

MR. LEVINE: Almost, because I think that we need a large number of years to resolve some of the safety items. If you're talking about breeders by 1995 or 2000, it is still not too early to be working on those issues.

COMMISSIONER GILINSKY: Who was spurring the breeders?

MR. LEVINE: I think the report is going to say that most countries in the world are going to be building breeder reactors. I think that they're going to be predicting a number which is outrageously high of 50 breeder reactors by the year 2000.

I don't see any way to get there, but it is an indication that most of the countries are going to go ahead with the breeder reactor.

COMMISSIONER GILINSKY: Where does this come from? Is there some draft report on it?

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MR. LEVINE: There are a lot of draft reports which I've not read. But I have talked to the DOE rep and he has given me this information that this is what the report is going to say and the bulk of the countries are going to go ahead with the programs.

The bulk of the countries who are already in the breeder area, will be going ahead with their programs. I suspect this might not be true of Germany. Germany is a very case because of the political situation within that country. We are probably a special case, too. But I think the other countries are going to go ahead.

COMMISSIONER BRADFORD: As far as breeders are concerned, there are probably nothing but special cases.

MR. BARRY: Saul, are we going to wait and build a chain of safety research from foreign countries on their breeders?

MR. LEVINE: We have safety research exchange agreements with those countries. Not all of them, but some of them. In fact, we are trying to add a fast reactor -eement exchange to our current agreement with Germany, and they are refusing to accept the non-proliferation paragraph

They are going to send us a letter to that effect. so I don't know if we will get it or not. But I think it is going to be difficult to get the real information you need because of the highly competitive situation that will exist

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about breeders. The French want to sell breeders. The countries are going to hoard their store of information.

In any event, we have to do some work of our own.

MR. BARRY: I was just wondering, I was suggesting that there's a great potential there.

MR. LEVINE: We're going to try to get as much as we can.

MR. BARRY: They certainly leaned on us. They must be doing safety research on breeders.

COMMISSIONER GILINSKY: Were you implying that after this report, that our own program will crank up?

MR. LEVINE: No, I didn't imply that at all. I should have spoken more carefully.

I think that our program probably will not change after the publication. But I think that the pressures will be in the direction of causing it to change over time.

And as Commissioner Ahearne said, it is hardly too early now on gas advanced converter reactors. I guess we prepared this before we knew what the Senate did, and we were saying, if they are going to make us eat the money, let's not eat it. Let's give us the money in the budget.

And the Senate language has changed what the House did to say, spend as much money as appears to be useful, not what the House told you to spend.

And I don't know what to do about this except I would

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like -- whatever it's going to be, I would like it in my budget, as opposed to having to eat it.

COMMISSIONER AHEARNE: What a terrible challenge -- only spend the money if it appears to be useful.

MR. LEVINE: Going on to risk assessment, I think with the publication of the Lewis Report, we've reached the turning point in risk assessment research and utility to the agency.

If you would show Slide 17, please.

(Viewgraph.)

Here are two slides of recommendations from the Lewis Report, which I won't bother to read. They simply tell us to use quantitative risk assessment techniques to basically reassess the framework of the licensing process on 17 and 18, and I won't spend any more time on those.

But we want to do that. And, in fact, Slide 19 --

(Viewgraph.)

-- is a list of items that we have got up about things that we ought to do to help them make their licensing process more rational, if we can.

The first item, generic safety, we have already completed, and that is the separation of the [illegible] items and whatever the remainder is.

This was done from a quantitative risk assessment viewpoint. We're going to review the standard review plan to see whether it needs diminishing or enhancement in various

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areas.

We are going to review the Category 2, RGC things. We're going to look at the systematic evaluation plan to see if there are things that aren't there that should be, and we're going to look at the content of technical specifications.

Slide 20, which I think is a very interesting slide --

(Viewgraph.)

-- shows you the most recent exercise we conducted as a result of Three Mile Island. We were asked by NRR to review the 24 different, or 25 on this slide. 25 different auxiliary feedwater designs in PWR reactors which would represent all of the operating PWRs. And we did this job in two weeks with two of our people, four from a contractor, six from NRR, and a bunch of industry people to feed in input information.

This work was done in two weeks and we looked at the main feedwater probability of loss on demand, three different conditions. And you can see the wide variability in the reliability of those systems. And you know --

By the way, the upper bound, the high end of the under end is about 10 to the minus 3 and the lower end is about 10 to the minus 2.

And you know from your consideration of trend of

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accident sequences involving the system, they need a highly reliable system.

Action can now be taken to improve the reliability of these systems. And we made the necessary recommendation to NRR about what needs to be done from this exercise.

We found out, for instance, that in some plants, the tech specs allow the operator to operate without any requirement on auxiliary feedwater. You could dismantle the system and remove it from the reactor, or leave it inoperable for a month at a time.

So that is easily fixed by a change in tech specs, but there are other things that have to be done, too. It just shows the power of these techniques.

COMMISSIONER GILINSKY: Say that again.

MR. LEVINE: There are some plants where there are no limiting conditions for operation of auxiliary feedwater as a prerequisite to operating the reactor.

That means that you can dismantle the system or have it down for maintenance for six months and still operate the reactor. And that is not a tolerable situation.

COMMISSIONER BRADFORD: That would actually say having the valves shut off, as they were at T.M.I.

MR. LEVINE: It would not be a violation. You could, in fact, have pumps removed and dismantled.

COMMISSIONER GILINSKY: Are these older plants?

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MR. LEVINE: I don't know which they are. I can get you that information. These have all been communicated to NRR and they are writing a report of some kind. This work was done about a month ago.

COMMISSIONER DILIWSKY: And they are dealing with it now?

MR. LEVINE: Yes.

MR. BUDNITZ: These two trends, and the third one that is very different is kind of a startling thing.

MR. LEVINE: A loss of main feedwater is a highly probable event. On the other hand, on the right-hand column, the loss of all AC power, is a fairly low probability event.

So for that condition, the system need not be as reliable, except you do want it to work. And some of them don't work at all because they are all electrically driven pumps.

Well, these kinds of things just fall right out of this kind of a look that can be done quickly and easily by experienced people.

MR. BUDNITZ: There are two points to this. The first is that the data show a scatter, which is even striking to the eye. And the second is that this analysis was done in a couple of weeks of very hard work by people from not only our place in NRR but contractors. And we were able to mobilize that effort on short notice because we had established

an expertise in this.

COMMISSIONER AHEARNE: Did you end up producing a letter report?

MR. LEVINE: I believe that we have written a memo.

VOICE: A memo was transmitted to DOE with results and recommendations.

MR. LEVINE: This thing — would you like copies?

COMMISSIONER AHEARNE: Yes.

MR. LEVINE: I would just like now to go on to one more slide on this area, improved safety research slide, 21.

(Viewgraph.)

MR. LEVINE: I just want to remind you about the background of this exercise, where we were asked by the Congress to prepare a plan. And this simply indicates how the plant was prepared and how we selected the research topics that had the maximum potential and benefit value impact, that we looked at the degree of support in the technical community, the risk reduction potential, the applicability to number of plants, and the implementation cost and base some judgments about which of 16 areas seemed most reasonable to explore.

And this is a problem now between ourselves and DOE in that OMB gave us less money than we asked for and gave more to DOE. And we're going to have to work something out.

COMMISSIONER AHEARNE: Is this the last thing?

MR. LEVINE: Environmental Quality Labs wrote a

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pretty good report on what kind of improvements need to be made in reactor safety. It is a Cal Tech organization.

COMMISSIONER AHEARNE: Since you raised that OMB-DOE issue, one of the things that I thought the ACRS had raised in their letter to us is that since OMB has said that there ought to be a coordination, they were encouraging us to take some steps to provide that guidance to the DOE.

Have we done that?

MR. LEVINE: Not yet, but I've written you a memo which you approved in the last week, and we are going to do that. However, you should also note the ACRS says that you should fund more work in this area.

COMMISSIONER AHEARNE: I understand that.

CHAIRMAN HENDRIE: But John, with regard to the DOE and NRC split on improved safety research, we went down to visit with our friends in the department the other day & succeeded in pointing out that, while they may have substantial reactor safety or lightwater reactor support in the budget and still a good chunk of that for safety, what we are interested in is that piece down in the corner of the latter category, which was, in effect, cut out of our carefully considered program developed here and with consultation with them and the ACRS and everybody else, cut out by OMB and cut down in DOE.

And what we've said is for that piece. Our

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understanding with OMB when it went over was that we would control the program content. And we've made the point.

So from that standpoint, I think that there will always be a few rough spots in the implementation down the line. But I think in principle, at least, we have that in reasonable shape, considering that the OMB cut continues to stand.

Now think for fiscal '81 that we ought to go back in with what we think is an appropriate level for the improved safety research program. It is here, at $3.6 million; the ACRS thinks it ought to be higher. We can consider that as we come to it, but I think we ought to go in in our budget once again with the full amount rather than sort of prerolling over to a cut.

And I think if, once again, OMB wants to export a piece of that to DOE, why we will have to negotiate an argue as best we can.

MR. LEVINE: Mr. Chairman, we're also asking for an increase in our '80 supplemental, which would then -- if we got that, I think that would free up whatever DOE wants to do for themselves. It is $3.4 million.

CHAIRMAN HENDRIE: As I noticed the '80 supplement, it had an astonishing resemblance to the piece that was exported to DOE.

MR. LEVINE: Some of the emphasis has changed, but the amount of money is the same.

COMMISSIONER GILINSKY: What kind of a program does DOE have in reactor safety?

MR. LEVINE: There are $4 million in '79, $10 million or so in '80, and going much larger in '81, but I don't have the '81 number yet.

COMMISSIONER AHEARNE: The question I would have,

particularly with respect to '81, while I certainly agree that we ought to decide what has to be done or what ought to be done, then the question is where should it be located. And that is why I come back to what extent have we coordinated the development with DOE? Have we had any process of providing guidance to them in what they put in in '81?

MR. LEVINE: We have two DOE members on the Research Review Group that developed our plan. They were in on all the meetings.

Now, beyond this, we have had informal meetings with them. We are now planning to establish a formalized mechanism.

COMMISSIONER AHEARNE: I remember that. What I'm really still trying to push on is that DOE, just like we, are in those stages of pulling their budget together. And they've been spending the summer, just like we, putting together pieces that will come up through their process.

Have we worked with them, given them any guidance in that, in their '81 budget, they ought to have these pieces?

MR. LEVINE: I'm sure we've told them what our ideas are; yes.

COMMISSIONER AHEARNE: But not some explicit --

MR. LEVINE: I think we have been waiting --

CHAIRMAN HENDRIE: Certainly not to the extent of looking at year 2 of the three-year improved safety research program and saying, "Now, DOE, why don't you put items 1 through

7 in your budget, or we won't put it in ours."

I think, clearly -- not that I don't know what they will do, by way of their budget --

MR. LEVINE: I would like to say that I don't share -- in fact, I disagree with DOE's -- or OMB's view of the matter of where the research should be done. I think they have a different view than the reality will be. We do not intend to get involved in conflict of interest situations where we design systems. We are only looking at system concepts enough to generate safety requirements where experiments are needed, except perhaps for the PPCCS, where we will ask them to do it. I think it is a perfectly workable situation.

I think that OMB overreacted.

COMMISSIONER AHEARNE: What did Congress -- where did Congress end up coming out on improved safety?

CHAIRMAN HENDRIE: The Authorization Committee came down the line for us, four square, both the House and Senate. The Appropriations Committee, I believe, followed the OMB.

MR. BARRY: The Appropiration Committee simply supported what we asked for in the budget. We asked for a million, and they gave us a million.

And, as Saul says, they didn't address the issue as to whether there should have been more or less.

COMMISSIONER AHEARNE: Nor then did they address the authorization.

MR. BARRY: That's right. They did not address the issue.

CHAIRMAN HENDRIE: I daresay we will have a good discussion about that next February.

MR. BARRY: You ought to make clear to the Commission, too, that at least in your report to us, in the supplemental for improved safety, the small and direct support of TMI. It relates to TMI.

MR. BUDNITZ: On the other hand, it was generally what was in the report of a year and a half ago. And the Three Mile Island incident just has some sort of different light on that. That stuff was in there. We had operator stuff in there. We had all of these things.

MR. LEVINE: All of these things we talked about to improve operator capability, they were in there.

MR. BARRY: That is a little different cast than you reflected to us.

MR. BUDNITZ: That is not a response to Three Mile Island, but it is in the areas that Three Mile Island told us to work in.

MR. BARRY: You're saying it is essentially the same program?

MR. BUDNITZ: It was there before. It is a little different.

MR. BARRY: That ought to be made clear though. I

don't think that was clear.

MR. BUDNITZ: Is that clear?

CHAIRMAN HENDRIE: I understood it.

MR. LEVINE: Slide 23, please.

(Viewgraph.)

This is the slide that just recaps the personnel requirements which, again, will be covered in detail by the division directors, except for one, the last one on program direction and support, the last line.

We are asking for four more people, and I think the situation that -- is that Bob and I are just totally overloaded because of lack of people to support us. We need two people in our Program Support Branch that works essentially directly for me, and we need a person in Contracts and one in Budget. And we need these people very badly to be responsive to all the requests we get from the Controller and the EDO and to get our contracts out and process our mail.

Slide 24 --

(Viewgraph.)

-- just summarizes the equipment. And again, here this will all be covered by the division directors.

MR. BUDNITZ: Could I make one point? I think it is worth pointing out that NRR has been specially designated to do what they are up to. I&E has just established an office. We did not establish a special task force, and hence we have not

got a Lessons Learned report to give you, except that this is our Lessons Learned report and the Staff report, which embodies in some detail what this is.

What we did, in terms of learning lessons from Three Mile Island, was to reorient, redirect, and where needed, seek more support for areas that are embodied in this budget. It is important that your realize that has been going on in the office -- and, of course, it should be clear since the accident, besides assisting in all the other activities, has been a substantial redirection of the ongoing work. And what we seek here is to do the things we think are still needed.

Now, that's not the only thing that is in here. There is seismic stuff in here, which would have been in here, Three Mile Island or not. There is risk assessment stuff, stuff that would have been in here, Three Mile Island or not. And the Lewis Commission told the Commission and the Staff to do this, but in a very real sense, this is our Lessons Learned, as well as all the other things that are involved.

And the only other point that I need to make is that, to me, I think the other thing that has happened here is this budget takes to heart the Lewis Committee's recommendation that the risk assessment effort be used to assist in the guidance of the whole program in arranging priorities and understanding the safety significance.

Indeed, in the Three Mile Island-related area, that

is, this intermediate area, what is going to be going on is the drawing of these event trees in order to enable the research program to explore those accidents which are found to be of interest or importance and assign them the lower priorities to those that aren't.

The guidance, using the methodology, is something which would not have been possible, say, five years ago, and, in fact, did not underlie the establishment of the large LOCA program which still dominates the budget. It did not underlie that, but it is going to underlie this area. I think that is a major conceptual advance in the way a sizable part of this was put together -- not all of it, because a lot of it isn't of this kind. I think that is a major breakthrough.

COMMISSIONER AHEARNE: Would it be appropriate at some stage to see what would happen to the current budget if you did attempt to underlie it with that kind of approach?

MR. BUDNITZ: Well, what you would find is the FY '79 budget, the budget that our contractors are working with, have less working transients and small LOCAs than the risk assessment techniques tell us they should and had less work in some of the fuel chemistry, fuel behavior areas that, in fact, we are trying to remedy with exactly the new approaches here.

COMMISSIONER AHEARNE: But the same amount of money would have led you to conlude that at least in some areas you had more.

MR. BUDNITZ: Relatively. That is a fair statement.

Now, it is also fair to say that this isn't completely balanced yet, even in '81, because you just can't develop things all at once. You have to begin by developing event trees and a better understanding of these things and then learn whether other research is required, some of which we won't know until we have done the scoping work.

MR. LEVINE: We are going to run out of time pretty soon.

Should we go on to RSR, please?

MR. MURLEY: Could I have C zero, please?

(Slide.)

Just to remind you where we were last year, this is a slide taken from last year's presentation. The LOCA program was trending downward. The fuel program was downward. The site and primary system were upwards, but they were small.

COMMISSIONER AHEARNE: You are including DOE on here. Are the dollars really dominated by DOE?

MR. MURLEY: In the '78 and '79 budgets, there were some LOFT dollars. It makes it smoother.

Now, I might point out that we took this seriously in the sense that I informed the lab and our contractors and DOE that we were going to do this. And, in fact, the Chairman has got some letters from some lab directors asking how come we were doing this.

COMMISSIONER AHEARNE: Well, how come you're doing this? And besides, you've got all these great people trying to do something else.

MR. MURLEY: But we were on that path, as a matter of fact.

Now, could I have C-25?

(Slide.)

This shows the revised program for light water safety on the top, and it reflects two things, but primarily the Three Mile Island-related research that we believe is needed because of safety questions that we weren't addressing in our old program.

What we've done on the lower chart is we are really ramping down the large LOCA program faster than we had planned last year, the small LOCA and transients. We had intended to increase it, but at nowhere near the rate and nowhere near the level that we are doing it, in fact, so that in '79 you see an increase up to about $10 million. That comes about from reorienting already some semi-scale and LOFT research and some code development work.

And then in '81 and '82, these small LOCA and transient work really predominates over large LOCA, what has changed since last year, not only Three Mile Island, but we've got two successful LOFT tests built.

MR. LEVINE: That has changed our whole perception

about the number of large LOCA tests we can use.

MR. MURLEY: That is by way of background. Then, for each program element -- now, we have eight program elements in reactor safety.

I will describe, briefly, what is in each program, and each one has a package: program description, the ACRS comments are behind it. There is a breakdown for each one of how much is ongoing work, how much is TMI-related, and how much is new starts in fiscal '81.

And there is a further breakdown of the Three Mile Island work, and then, finally, for each program element there is a decline -- I won't have time to go into all of these. I will concentrate on the five areas where we are appealing the EDO cuts; and there are two or three major areas where we disagree with the ACRS, and I will concentrate on those as well.

Number 25, please.

(Viewgraph.)

Okay, in the seismic area, as Saul mentioned, we are projecting some large growths here. The EDO --

COMMISSIONER AHEARNE: Just so that I don't lose myself in confusion, your breakdown does or does not track to the way the PRG and EDO folks put it together?

MR. LEVINE: It is slightly out of order.

CHAIRMAN HENDRIE: But is the seismic engineering and safety program -- is that the same?

MR. MURLEY: Yes.

This, I guess, is our biggest appeal. We are asking for $6 million more than the EDO mark, or $19.9 million. This is a new organization last year. It was formed -- if you will recall, last summer it was headed up Larry Shiao. The structural engineering and mechanical engineering are relatively new programs, and they are getting a firm foundation in '79 and '80. And there is some big growth needed, we believe, in '81. That is why you see the large increases.

We think they are able to absorb the growth, primarily because it involves some new experiments and supportive analysis that we're doing in the seismic area, and the piping and structural area.

COMMISSIONER AHEARNE: The PRG has a question of whether you could efficiently handle that size of a program growth.

MR. MURLEY: We think we can, and the reason is it is a fairly broad challenge, broad challenged program. There are a number of small tasks.

MR. ENGLEHARDT: The PRG looked at this particular decision unit in terms of its current program support numbers of $8.4 million and carried it through to their office request of an increase to $19.9, and we felt that that degree of growth over that short period of time would be difficult for them to absorb. So what we did was essentially scale it so that in

fiscal '83 they would be up the requested level. We just didn't see that they could absorb that particular substantial growth during that period of time.

MR. MURLEY: Okay. As I mentioned --

COMMISSIONER AHEARNE: But you think we can?

MR. MURLEY: We think we can, yes.

MR. BUDNITZ: It is for just the reason cited. There are a lot of things going on that have to gone into in much more detail and specificity than we are doing.

MR. MURLEY: I would point two growths that are kind of built into the program. One is in seismic safety -- research program, called SSMRP. It is to assess the margins or lack of margins in seismic design of plants today. We really don't know what they are. And that's why, when we come with an error in the computer codes, we find out we have to shut plants down.

Whereas, in the LOCA research area, we find errors in codes all the time, in the vendor's codes. But we know we've got substantial margins. And they don't have to shut the plants down until they can find out where these errors are.

In my judgment, we are about 10 years behind the LOCA -- ACS codes -- in these size codes, and we at NRC have really no independent capability at all in this area. And there is a large part of the growth in mechanical engineering budget, which is aimed at improving our capability in this area.

Could I have 16, please?

(Slide.)

Briefly, the ACRS supported the program. They suggested a level of about $17 million for fiscal '81. One area that I should mention that they didn't agree with us on is the so-called atmosphere transport and diffusion. It may be a bid of a misunderstanding here.

Let me tell you what we would like to do, what we think is needed. Partly as a result of Three Mile Island, I think we see the plants are probably going to need more radiation monitors. And anticipating this, we believe that there are some tests that are needed to figure out what is the density of monitors and how far out should these monitors go in terms of two miles, five miles, 10 miles. So there are some tests needed, we believe, to look at different terrains, different weather conditions, and what kind of plumes might arise so that we can place the monitors and would not miss the radiation plumes?

Could I have 27, please?

(Slide.)

Here the point is that about $16.5 million is continuation of endorsed programs, and it reflects the fact that this is growth in ongoing programs. 2 million is new; it is Three Mile Island-related. And of the new starts, there is only about $1.4 million.

COMMISSIONER AHEARNE: If one were to go to the 19.9

that you've asked for, does that also then -- the 28.1 and the 32 in the outyears are again what you would be asking?

MR. MURLEY: Yes.

Could I have 28, please?

(Viewgraph.)

This is our Reclama. We're asking for 6 million in program support above the EDO mark. The point -- the key point to make, I think, is that this decision unit, at the 13.9 level, is well below our minimum level we believe, considering that we are starting some work in fiscal '80 as part of the supplemental. So, as a result, at 13.9 -- in fact, I probably would not even start it if that's the only level we could get.

If there are no questions --

COMMISSIONER AHEARNE: You have 18 people now?

MR. MURLEY: We have 19 people, and we are asking for four, primarily in the structural area and seismology. We have a large number of seismology programs, small programs.

29, please.

(Viewgraph.)

The ACRS suggested $17 million. Again, we would as: for the full 19.9, because there is some work that we couldn t get started, even at the 17 million level. The 17 is close to what we would call our current level. And it would not allow starts of these new programs with the ACRS mark.

COMMISSIONER AHEARNE: What is your definition of "current"?

MR. MURLEY: It turns out in this program there are some built-in growths. As I mentioned, the seismic margins program, some of the piping benchmark programs that we intended to start in '80, need to grow to do them properly. It is similar to our LOCA code development. It just takes money to do them right.

COMMISSIONER AHEARNE: I was just trying to get a working definition of what "current" means.

MR. MURLEY: "Current" means no new starts, the ongoing program with inherent growth, planned growth.

MR. BUDNITZ: Whatever was planned two years ago.

MR. MURLEY: Let's turn to systems engineering, 30.

(Viewgraph.)

Generally, here there is a 10 percent overall decrease in fiscal '80. We are phasing out the ECC bypass, for example. That is zero.

You will notice there is almost a $6 million decrease in the 3D flow distribution. The blowdown/reflood heat transfer program is decreased.

There are two issues, one of which we have a disagreement the ACRS on semiscale; and the other is a reclama on operational safety with the EDO.

And let's go to the next viewgraph.

(Viewgraph.)

The ACRS said that the systems, the semiscale

program should not really be viewed as an integral systems test, and that some reduction from our request could be made in this program. Now, we, I guess, disagree with this. We have--we think there is a strong need to understand PWR systems and this is really the only program we can do this in outside of LOFT.

We intend to add some hardware to study secondary system effects. Right now there is no secondary system, so we can't understand things like feedwater transients, the effect of steam generator cooling, and so forth.

COMMISSIONER AHEARNE: Isn't the ACRS question whether or not you can do a valid extrapolation?

MR. LEVINE: Let me tell you what I think it is. That is part of it, but it is slightly different also, I think. Plesset especially thinks we should not be advertising this as an integral system test, because it is so atypical, just so small that it has got to be atypical. And that's fine with us. We I think have made an error in that regard.

In the past we have made a mistake in advertising it as an integral test facility, and I think what we really should say is that this facility has been extremely useful in allowing us to do all kind of experiments with great flexibility that give us insights into phenomena that help us plan our larger-scale programs and our codes.

For instance, the codes that did very well at

predicting LOFT were developed and tested on semiscale and did very well on LOFT. We could not have done that without semiscale. And so I don't care whether you call it an integral facility or a special facility or whatever it is; it has been extremely useful for us. And in the same sense, it will be extremely useful to us in giving us an opportunity to run multitudinous tests with small LOCAs and see the secondary system impacts.

Plus, he said he was very disturbed that the upper head injection test that we tried to do on semiscale did not come out very well. The boards were notified and it created a furor among the boards. And I think if we had not been advertising it as an integral facility, it would not have required --

MR. MURLEY: It was a different test, really. But that's the problem in the kind of goldfish bowl we live in. We did a test where the insulation -- we put new insulation in one of the vessels and it was not as good as we thought. As a result, there was more heat transfer into the coolant than we thought. So we got some anomalous results. And normally in the course of things we sit down and think about these and analyze them, and it takes a month or two.

But in this atmosphere we're in, we had to notify the boards and that caused a lot of confusion, and I think there was -- this caused some people to be upset, because what

are you supposed to do with this if you haven't had time to figure it out? And we would prefer to sit down and think of it ourselves.

But we know its limitations, we think we do, and we think we can compensate for it.

Also, I might add there are some high-risk tests that are being proposed for LOFT that I would not at all be comfortable doing unless we could run some tests on semiscale, like what is called a reflux boiler mode, where we boil in the core and condense in the steam generator. I'm not thrilled at doing that in LOFT.

MR. LEVINE: We're thinking about it, but we certainly want to know more about it than we do now. We might do it, for instance, when a core is near the end of its life.

MR. BUDNITZ: It is not the kind of thing we're that eager to try right away.

MR. MURLEY: Would we skip to 35.

COMMISSIONER AHEARNE: If you could go back to 30 just for a minute. I'm going to ask a question to see if I can understand it.

The '80, including the supplemental, which is 42.3 -- your change is minus 4 from '81. What significance are you asking us to get from that?

MR. MURLEY: Okay. The fiscal '80 President's budget was 34.3. So we're asking about -- I guess it is a

$7.5 million supplement in '80, and then from that the '81 budget is decreased by $4 million.

COMMISSIONER AHEARNE: I wasn't sure whether you were trying to make a point that you were coming down in some areas or what significance to draw from that.

MR. LEVINE: Just a factual report.

MR. MURLEY: You had asked where are some areas where we are cutting work out.

COMMISSIONER AHEARNE: I would not interpret that so much as coming down. If you get the supplement, you will be going substantially up, and then you will be coming back down more to where it is still up above what it would have been without the supplement.

MR. MURLEY: You're right.

Okay, 35, please.

(Viewgraph.)

The -- there is a reclama in fiscal 1980 of $1 million for operational safety, three items we would like to start.

One is valve testing. We think NRR is going to request the industry to do some tests on relief valves and safety valves, and we think and NRR thinks we should jointly participate in that program. So this, in fiscal '80, we would start test planning and specifying instruments and analysis measurements for such tests.

$300,000 is for the post mortem. Here we intend to look at cable connectors and some of the equipment and instruments inside the containment that either failed or didn't fail, and we would like to find out why they did or didn't.

'81 -- could I have 36, please.

(Viewgraph.)

The reclama is more or less a continuation of those same programs, valve testing and a new program of support for I&E and looking at transmission links and emergency response type of requirements.

COMMISSIONER AHEARNE: Now, the ACRS had raised questions about some of that, saying that they didn't think it was going to be done soon enough.

MR. MURLEY: Yes, and we tend to agree that we probably won't be in the containment building pulling stuff out, at least not until late fiscal '80. What this money is for in '80 is to start getting the shipping casks and shipping containers ready to send them, the hot cells, and also getting any hot cells built, because we know it is pretty highly radioactive with cesium. So it is a fairly modest program on post mortem.

MR. BUDNITZ: I guess we felt if we were stuck waiting until '81 we would be a little behind.

MR. MURLEY: Yes.

COMMISSIONER GILINSKY: Could I just take you back

to the semiscale? You were talking about the usefulness of it, and what you want to do is not just to continue it but upgrade the facility in some way.

MR. LEVINE: We want to put a secondary system on it.

COMMISSIONER GILINSKY: Isn't that what is at issue?

MR. LEVINE: I guess it's not that we want to put a secondary system on it; it's the whole question of the utility of the facility per se.

COMMISSIONER GILINSKY: Is the ACRS in effect saying that they don't think it is worth spending money to make this into a more elaborate facility?

MR. BUDNITZ: That is more or less what they are saying.

MR. LEVINE: We don't agree with them. NRR doesn't agree with them and EDO doesn't agree with them.

MR. BUDNITZ: It's even stronger than that. As part of an international effort to understand the kind of transients and small LOCAs that we are now beginning to pursue, there has been an international meeting or two in which all of the several facilities around the world have been looked at to see which each can do. There is a failed facility in Germany and there is a facility in Japan and so on. And it turns out that semiscale has some attributes that are unique that nobody else has, that complement facilities elsewhere around the

world, which, used together, can provide a series of experiments over the next two or three or four years, that would give us a lot of insight into these things. And if semiscale were part of it, the picture would be much more complete.

COMMISSIONER GILINSKY: Semiscale or upgraded semiscale?

MR. BUDNITZ: Upgraded semiscale.

MR. MURLEY: I don't think we disagree with them on the limitations. We know the limitations, they know the limitations. And it is a question of judgment. In spite of those, can we get useful results? And we really think you can. There is a lot to be learned from it.

MR. BUDNITZ: For example, when one goes from semiscale to LOFT, there is a significant scaling effort, and we can't scale up from LOFT in any experimental facility. We can scale down and we can understand some of the volume effects. On the other hand, it's got some serious problems. It is one dimensional.

MR. MURLEY: These are drawn to scale. LOFT and semiscale were both patterned after the Westinghouse PWR. I've got similar components in red and pumps in yellow and so forth. Semiscale is off to the right. You see, it's just one-dimensional. It's a tiny little thing.

But it does have some features, like full height steam generators, full height core, that allow you to do

tests where gravity and size effects are important, like natural circulation and like small LOCAs. So we think there is -- again, to reiterate -- a lot to be learned from this.

Okay, I will move on to LOFT, if that's okay. 43.

(Viewgraph.)

There are no real issues with the LOFT. I just make the point that there is some exciting work going on. It is an excellent group up there and LOFT is more than just a large LOCA facility.

For example, it, as you know, was designed to survive many accidents. As a result, they have put some features into the plant which maybe we could learn from on full-size commercial plants. They have vent valves in the high points of the system to vent condensible gases, for example.

I have started a task out there to look at these kinds of safety features in LOFT to see if there might be some that are exportable to other commercial plants. We have started some work to install a diagnostic computer, diagnostic system in the control room of LOFT, that will be a model, an improvement, and perhaps could be used, if it works out at LOFT, could be used in commercial plants.

There are many more things like this: improved instrumentation we can look at in LOFT, in-service inspection techniques and so forth.

37, please.

COMMISSIONER AHEARNE: What about the budget?

MR. MURLEY: There is no disagreement with the EDO mark on the budget, a $3.1 million increase from fiscal '80 to '81.

MR. LEVINE: This is an area where we accepted the EDO cut, even though the ACRS asked us not to.

MR. MURLEY: Yes, the ACRS supported the $44.9 million. The increase is primarily inflation, plus this diagnostic equipment that I mentioned is about $2 million. And this year and '81, we start up full operation of the hot cells and hot shops, which is $1.5 million. So that accounts for most of the increase.

Okay, I will switch to code development now. That is number 44.

(Viewgraph.)

For system codes and component codes, it is generally level funding, the first two items. But we are shifting away from the LOCA codes to transient codes. Where the big increase is found is in the TRAC assessment and also applying TRAC to operating reactors. We get into a mode of applications -- and I might point out that we are projecting over 16,000 hours of computer time in this budget. That works out to be about over $11 million. And of the 15.2 that is for computation time, we have a breakdown lab by lab.

At INEL, for example, it is 4600 hours at $800 an

hour average. At Los Alamos, it is 6450 hours at about $550 an hour, both of which come up to be about $3.5 million. When you look at our other labs as well, it comes out to be $11 million.

MR. BARRY: Can't you put it all in the cheaper computer, the 500 versus the 800?

MR. MURLEY: No. I wish we could get some more of that $500 an hour time. That is equivalent to about two full-time CDC 7600s.

MR. BUDNITZ: We are totally dependent on our colleagues in the DOE labs for the efficiency of their systems.

MR. MURLEY: 45, please.

(Viewgraph.)

The ACRS, we have kind of a disagreement here with them. It is a minor one, but also with the EDO. And I will talk about it here. And it has to do with the data bank. The ACRS said this data bank could be deferred in favor of some higher priority matters. We disagreed.

Let me tell you briefly what the data bank is. It is a place where we can store and retrieve all of the information needed to make a safety analysis for each operating reactor.

MR. LEVINE: Not a complete safety analysis, but to run the codes.

MR. MURLEY: That's right, a computer analysis.

There are probably a half a dozen codes that we would want to run -- RELAP and TRAC and some of the other system codes. There are two needs for this. One is to do a routine audit calculation in support of NRR. But second is also to be able to respond in emergency situations, like at Three Mile Island. There were some calculations made in the week after the accident on whether we could get into natural circulation or not. It turned out we were lucky. They had done a deck, an input deck of the coding plant which happened to be very, very similar to Three Mile Island.

If they had not had such a deck, we would still be preparing it today. It takes three to six months to prepare an input deck to run a systems code like RELAP, and it's just a massive amount of data, to find out what the steam generator looks like and how the pipes are connected and so forth. We think that should be stored in a data bank for all plants.

MR. BUDNITZ: I don't believe that, either, but I have been told it is so. It just seems you ought to be able to do something.

MR. LEVINE: It is thousands of pieces of data.

COMMISSIONER AHEARNE: You're saying it takes three to six months to prepare the RELAP data bank?

MR. LEVINE: The input deck of cards.

MR. MURLEY: It is about a half a man-year per plant on the average.

COMMISSIONER AHEARNE: When would you expect this to be completed, then?

MR. MURLEY: It wouldn't be completed for a year or two.

MR. LEVINE: We're not going to collect the data. We're going to get questionnaires and ask the industry to provide the data, and we will simply store it in the computer, which will be designed to punch out the decks we need.

COMMISSIONER AHEARNE: When you say it takes half a man-year to prepare that data for one plant, the deck for one plant, you mean half a man-year in Idaho or half a man-year by the company and a tenth of a man-year in Idaho?

MR. MURLEY: It takes about a half a man-year in Idaho and depending upon what type of cooperation he can get from the plant vendor, it takes three to six months to do that.

So once we have done our Westinghouse four-loop plant, for example, the next one is easier. But the first one probably would take six months.

COMMISSIONER AHEARNE: So for all of the plants that we have in either operation or close to getting operating licenses, what is the total amount of man-years required to get that?

MR. BUDNITZ: We have $1.4 million between '80 and '81.

COMMISSIONER AHEARNE: I know, but what I'm really

trying to find out is, do you estimate that is going to end it or whether that would get, say, seven plants?

MR. BUDNITZ: Oh, no. The $1.4 million is supposed to do all of them.

COMMISSIONER AHEARNE: All of the 70 plants?

MR. MURLEY: Let me be careful. It won't have all 70, because some are twins and very, very close.

MR. BUDNITZ: Similar enough.

MR. MURLEY: Like coding at Three Mile Island, we wouldn't necessarily have to do the same deck.

COMMISSIONER AHEARNE: Are you confident the similarities are sufficient?

MR. MURLEY: I can't tell you that now.

MR. LEVINE: It is more than just collecting the data. It is making a program to store it and to print it out.

MR. BUDNITZ: This is not just simply every plant, e-4 the same thing. There is some economy of scale.

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COMMISSIONER AHEARNE: I'm sitting here with the sense that to get all of those plants done, it may be four or five years. So I'm thinking that perhaps there is beyond '91.

MR. MURLEY: There may be. What we've scoped out, Commissioner, in the first two years, '90 and '91, is we're going to look at 7 generic-type of plants to make sure at least We've got a Westinghouse 2-, 3-, and 4-loop plant, the BWRs and the B&W plants and the CEs. That is close enough that we think that e could cover anything in an emergency. But when you get into the secondary system, I'm sure you know you find out that no two plants are alike.

And if that becomes important, then we will have to expand it to put every single plant into the data bank.

MR. BUDNITZ: I guess we thought that for most things you could think of, that it was going to cover it.

Is that a fair statement?

MR. LEVINE: I think it has to be regarded as please with a high likelihood that it will cover the primary part of all plants.

MR. MURLEY: Yes.

MR. LEVINE: What the secondary implications are I'm not sure.

MR. MURLEY: Let's move on to 48, please.

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MR. BUDNITZ: That was taken out of the EOM. Mark, and we think that it is important to do it.

MR. MURLEY: Yes. There is a $2 million Reclama in Fiscal '81 and $400,000 in Fiscal '80.

(Viewgraph.)

It has to do with the data bank and application of the codes. And we're also Reclama-ing one person, mainly to follow the TRAC assessment. 49, please.

(Viewgraph.)

Fuel behavior. There are really no major issues here. The program goes down a little bit in '81, again, as a result of a large increase in '80, I should point out, because of the supplemental.

The President's budget in '80 was $23.1 million. There is $5.6 in supplement. It takes it up to $28.7 and then we're down to $27.9 in '81.

Largely here, the increase is for operational transient fuel tests of the kind that the ACRS requested and we agreed with.

COMMISSIONER AHEARNE: The ACRS had criticized what --

MR. LEVINE: The RIA test. And we had a debate with them and NRR. We and NRR think it is needed, although I think the ACRS view is that since the RIA tests were originally many years ago, plant designs have changed such that the likelihood of occurrence is much smaller than they used to be.

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I think we simply have to throw this out. But by the same token, the ACRS said, whatever you can divert from RIA ought to go into fuel-melting studies.

COMMISSIONER AHEARNE: The ACRS, though, did claim that NRR feels that the information that you're going to get is inadequate, or am I misreading that?

MR. MURLEY: Put on 50. I guess we didn't discuss it much on the Viewgraph.

(Viewgraph.)

MR. MURLEY: Their point is that they don't think the reactivity-initiated accidents are very likely, so why should we be spending all of this time on it?

Now the problem is that the reviewer down at NRR said that it's a design basis accident, as far as he is concerned, and the probability is 1.

So if he's got to review it, he just feels that he needs more information and more data.

It is that simple.

MR. BUDNITZ: So ACRS wrote that NRR should not re-evaluate whether it really needs that data.

Now we and NRR and ACRS are all going to have to talk together in the next several months, I guess.

MR. MURLEY: Skip to 50, please.

(Viewgraph.)

MR. MURLEY: The only decisions we have is in regard to

this one, and I guess that I will use this opportunity to say that we really are hurting for staff. This person that we need here is a coolant chemist, and in Fiscal '80, we really need to get that program started.

And the agency is short. Of the 60 professional staff that I have at branch chief and below positions, 25 percent of those are either on loan to somebody or another, or vacant right now.

So we are struggling along right now trying to manage this $150 million program, and we don't have a lot of depth.

MR. LEVINE: We have a lot of people on loan to the investigation. We have several people on loan to NRR. We have a lot of NRR tasks that we are doing for them. And we are suffering.

MR. MURLEY: Okay. Ed, please.

(Viewgraph.)

MR. MURLEY: Primary system integrity. There are no issues here with either the ADD or the EOR, but there is a sizable growth and I will take just a minute to tell you what that is.

Partly, it comes about as a result of Three Mile Island. There is an item under fractional mechanics called "Unresolved Inertial Shock." We have done thermal shock tests on our heavy section steel program at Oak Ridge, but those were all assuming a large LOCA, where the system depressurizes

and you dump cold water on it.

At Three Mile Island, the system was pressureless and we dumped cold water on it. Fortunately, it was a fresh vessel. It was not irradiated. But we believe that there is some work needed just to reassure that the 30-year old vessel would have held together, as well as the Three Mile Island accident.

There is a program on stress corrosion cracking in piping under operating effects, which is a large growth in Fiscal '81. We are doing essentially no work in this area right now. And we believe, and the ACRS strongly supports us, that we should get started in this area.

COMMISSIONER KENNEDY: There is a lot of work being done on stress corrosion cracking. Isn't EPRI doing something?

MR. MURLEY: EPRI is doing something. The industry is doing something. My understanding is that it's in the multi-million dollars a year.

But what we're proposing here is not to duplicate that. It is to look into areas that they are not, but also to give the agency some independent capability because what happens as a result of the EPRI and the industry program is that they propose a fix for pipe cracking and they come in with this. And the staff, the NRR staff either has to accept it or not, and they have to have some basis for it.

COMMISSIONER KENNEDY: Aren't you in a position to

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review their research, A. the nature of the research itself, and B. the results?

MR. MURLEY: Not without expertise. It is like coolant chemistry, in a way.

MR. BUDNITZ: The answer is not yet.

MR. LEVINE: And generally, not without being a part of the program in some cases where you could influence what ought to be done by contributing some money, as opposed to letting them do what they want to do.

COMMISSIONER KENNEDY: You can evaluate what has been done, whether you had a part in formulating it or not.

MR. MURLEY: Yes.

COMMISSION KENNEDY: You can do that much. And you can demand that of them if they're going to come to you with a proposed fix. As a basis for your conclusion as to whether you accept it, you are going to ask for all the data on which it is based and then evaluate it. But not if you don't have the people to do it.

MR. MURLEY: That's right.

COMMISSIONER AHEARNE: On the system integrity, somewhere here in these many pieces of paper, there was at some point questioning the wisdom of going ahead with destructive examination.

MR. MURLEY: Yes. 35, please.

(Viewgraph.)

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MR. KUHLEY: The ACRS, at this point, said that we ought to limit the steam generator program to the following: namely, just examine the tubes and correlate between the eddy current indications and the actual measurement of tube integrity.

For the time being, I guess, we agree with that now. But in any case, it doesn't affect the Fiscal '81 program. It is a matter of, do we follow on in '82 and '83?

And our position is, we will discuss this with the ACRS over the next year in detail, and if it affects our '82 program, then we will come to you then.

COMMISSIONER AHEARNE: Is part of the program that you had envisioned the destructive --

MR. LEVINE: In the out years.

COMMISSIONER AHEARNE: Is this one of the generators coming out of Surry?

MR. LEVINE: Yes.

MR. KUHLEY: Okay. '83?

This program, by the way, came before the commission last year and was approved. There was a question as to the size of it and whether we would make it a big multi-year thing. And we've got it scoped so we can stop it just after the tube test program and it would be disposed of at the site.

COMMISSIONER AHEARNE: Where is the test program going

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to be held?

MR. KUHLEY: Richland, at the Pacific Northwest Lab. The utility has a vault built right now and they are putting three other steam generators into it. Plus, instead of burying it, we're going to take it and ship it via the canal and so forth, but then we are responsible for it.

CHAIRMAN HENDRIE: We will talk again about whether the program ought to be curtailed and so on. But I will point out that every time we take the view that this is an industry problem and that is an industry problem, they ought to look into it and understand what's going on and then tell us some years down the line.

We start research programs of our own years behind the power curve and struggle frantically to catch up. If the first time that we run into stress corrosion cracking was — I don't know, even as recently as the late '60s. I can remember spending a lot of time in a motel outside Chicago at O'Hare Airport in ACRS meetings on stress corrosion cracking in plants.

And at that time, if we could have convinced the AEC to settle down and get serious about it, about a research program, I think we might be rather better situated than we are.

The industrial companies do their work and that's fine. They ought to do that. They have responsibilities to

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do that.

I think the government commands a range of resources and a point of view of coming at things that we don't get in industrial laboratories.

I would hate to give up on the steam generator thing until I was quite sure that we were never going to have to know more about the phenomenon at that Surry generator; especially once you get the thing out there.

MR. BUDNITZ: That is just what the ACRS was worried about, that once we got it out there, that we would pour money that they didn't want us to pour, at it.

MR. LEVINE: They were afraid we were going to do too much on it, and it is a reasonable viewpoint. We ought to reach agreement.

MR. MURLEY: It is an old design using coolant chemistry that is no longer used and so forth. Harold Etherington said, what are we going to learn from it, and Larry Schiao replied that it may be an old design, but the fact is there is about 20 or 30 plants that have still got that design. And everyone is going to dent and the staff is going to have to decide whether to let the plant operate or not.

And this is to give them a basis for letting them make a decision.

I think it is an important program.

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CHAIRMAN HENDRIE: Onward and onward.

MR. MURLEY: I'm just about done.

So I talked about the need, of whether we need breeder research or not, and that is a policy decision. I would only talk about the level if we do need a program. There are two reasons why I think we need this kind of growth from $13.7 to $22 million.

First of all, as you know, we laid a program out about 4 or 5 years ago and we have cut it back successively. And we are to the point now where we have really cut all the fat and all of the delay out of the facilities that we can.

There are about three or four facilities that are now ready.

COMMISSIONER GILINSKY: What do you mean, all of the delay?

MR. MURLEY: If I can make an analogy. It's like you set out to build a house that is large enough to meet your needs and you run into a few months of a cash flow problem like we've done in this program.

You can cut back deliveries and so forth. But there comes a point when the guy calls up and says, the air conditioner is here. The furnace is here. The refrigerator is here. You've either got to pay for it and so it.

COMMISSIONER GILINSKY: Do you mean we've cut off?

MR. MURLEY: We have cut off large test programs.

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For example, there is a large fuel melt facility that is capable of running 200 kilogram or 500 kilogram fuel meltdowns. It has been built at Sandia. We slowed it down and slowed it down and now it is ready.

But it takes money to operate it.

There is a large aerosol test facility --

MR. LEVINE: That is an area that the ACRS has emphasized to get more and more into fuel meltdowns.

MR. BUDNITZ: We found in the days just after Three Mile Island, that a very large amount of expertise relative to Three Mile Island itself resided in our LMFBR staff and their contractors, which is no surprise since LMFBRs have been working in that for a long period of time.

COMMISSIONER GILINSKY: I'm not sure which way that cuts.

MR. BUDNITZ: It cuts both ways.

MR. MURLEY: That is the reason for a large part of what I call inherent growth. These programs, once you get them started, you expect them to grow. And if they don't, it is best to stop them and let them live alone.

COMMISSIONER AHEARNE: Let me ask a question which relates to what Vic just asked.

If you had to give up $22 million out of your research budget, now the way that the feeling seems to be put together, there was about 15 percent of the research budget

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which was taken out of the mark where the Reclamas are put together, or each individual item are Reclamaed. Rather than saying if you're going to take out that much amount of money, here is a redoing of the whole thing.

Now would I interpret correctly that you would say that if we, for some reason, had to find -- had to get more dollars out of the research budget, it would be just as appropriate as any other way to take this whole thing?

MR. LEVINE: I think that you ought to ask us.

COMMISSIONER GILINSKY: Well, you seem to be saying if you cut back to the $13.7 level, you might as well go all the way. Isn't that what you're saying?

MR. LEVINE: Almost.

MR. MURLEY: The ECO mark was 16. The inherent growth --

COMMISSIONER GILINSKY: What do you mean it's marginal? There are some things that just don't get done between $16 and $22. I don't understand the argument about everything falling apart.

MR. BUDNITZ: It is worse than that. When you have serious morale problems in the contractors' and most of our own staff, and you're having difficulty keeping the program together, and DOE is going ahead with $600 million a year, or whatever, and people are saying, golly, they might not want to continue with ours because each year it is being cut back,

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that is below a minimum number. It is a very serious problem.

COMMISSIONER GILINSKY: But you're saying that that $15 million, is that sort of a number that morale is bad?

MR. LEVINE: Yes.

COMMISSIONER GILINSKY: Do you need another $7 million to cheer them up?

What about my morale?

MR. BUDNITZ: I'm not sure that it is a fair comparison. But I can relate to you an experience that happened in Berkeley about 10 years ago in which one division of the Lawrence Berkeley laboratory went to places in five years. It just fell about. It was the Donner Laboratory?

Why? It came below the critical mass and then it just fell apart. All the good people left.

Now that hasn't happened here yet, but we are seeing various signs that the thing might just fall apart and then we're going to have a hell of a job building it up.

MR. MURLEY: I'm not asking for this to cheer up people in the labs.

MR. BUDNITZ: We're trying to do some quality work for the agency.

MR. MURLEY: There is a coherent body of work that is embodied in these five areas. And they are at the stage now where $13.7 million won't do it.

So I'm going to have to just cut something out. I

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can run a program for $13.7.

COMMISSIONER AHEARNE: That is probably a similar facet of the question I asked, that if you really believe that you had to live with the $13.7 mark, the way it is approached here is a little bit out of here, a little bit out of here, a little bit is Reclama-ed here, and a little bit there; as opposed to what would fit more with the thrust of your remark, that if you're going to take that substantial amount of money out of the research budget, then perhaps there ought to be just a reshifting of the resources.

MR. LEVINE: The purpose of this exercise was to explain to you why we think we need what we're asking for.

MR. MURLEY: There were two reasons. The second reason for the growth is that the ACRS is kind of telling us that we also, in the breeder area, ought to learn some lessons from TMI and look at accidents other than the worst case.

In this case, it is a core disruptive accident. So they want us to broaden our research program.

Now as a rule of thumb, it is about, we think about $13 million is the planned growth in the ongoing program, and the rest, the other $4 million, is about to do what the ACRS tells to do to broaden our program.

COMMISSIONER AHEARNE: You would really see that program on your recommendations as just continuing to grow out through the out-years? Is that correct? Because you had it,

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32, 33.

MR. BUDNITZ: Yes.

MR. MURLEY: That makes some assumptions. That assumes that the country make some decisions in Fiscal '81 to go ahead. If we were going to delay another year, then I think at this level, the $22 billion level, that we could sustain our meaningful program for another year or two.

But there were some assumptions behind that, and that is that the country moves ahead and we have an application about '82 or '83.

MR. LEVINE: I think the emphases of talking about the decision on a prototype plant or something in March of '81 —

COMMISSIONER GILINSKY: Is that what it is?

MR. LEVINE: I think that those are the U.S. plans, a decision by '81.

COMMISSIONER GILINSKY: Oh, a decision by '81.

COMMISSIONER AHEARNE: That is sort of consistent with the philosophy of the Congressional discussion.

MR. MURLEY: That concludes my presentation. The gas program is either a yes or a no. It is $3.4 billion.

CHAIRMAN HENDRIE: On the gas program, let's see. It is $3.7 in '79. Do you know what level you would set in '80, assuming flexibility, but a mandate in the statute to not do it until then?

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MR. MURLEY: Somewhere around a million and a half. I would think, or $2 million.

There is some work that we really ought to keep going at Fort St. Vrain, some graphite oxidation in the lab and some high temperature materials.

COMMISSIONER KENNEDY: You're showing this at about $3.9.

MR. MURLEY: The question was what would be the minimum to get by with in '80?

CHAIRMAN HENDRIE: Because in '80, there are no funds directly appropriated for gas work. The House Appropriations Committee, however, said, do $3.9 or $3.7 worth of research in gas. You're going to have to eat $3.7.

We got the Senate to give us a little flexibility and it just says, do something. But you are not hung at $3.7.

Now, in considering what an '81 level ought to be, considering what kinds of pressures are likely to generate, to maintain some sort of minimum program, I want to know what the '80 level is likely to be in response to the mandate that we know is in the law, or essentially in the law, now. That is, the '81 level of 3.9 might be the right place, but it also might not be the right place.

MR. BUDNITZ: This was developed in the last few days, and if we can get back to you in a few days we might be able to give you some more information.

MR. MURLEY: I think it might be lower.

CHAIRMAN HENDRIE: And once again it may very well get struck by OMB or the authorization committees for something like that and stuck back in as an edict item, by the time all the laws are finally passed for '81.

COMMISSIONER AHEARNE: I notice the ACRS had some study requests in. That tracks closely with what the DOE has been talking about.

CHAIRMAN HENDRIE: All right.

MR. LEVINE: We will start risk assessment now, which is slide 72.

(Viewgraph.)

I don't know how many of you have met Frank Rowsome. He is deputy director of our analysis staff, whom we've hired in the last three weeks.

CHAIRMAN HENDRIE: Welcome to the table.

MR. ROWSOME: I am pleased to meet you all. This is the first time I have met any one of you.

MR. LEVINE: Frank was one of a number of people who testified before the Lewis Committee and gave perhaps one of the most cogent and thoughtful presentations.

MR. ROWSOME: I wish we had more time to discuss the risk assessment and improved safety program in more detail. But in light of the hour, I would go over it very quickly.

Slide 72 shows an outline of the risk assessment program. There are a number of program elements within this and the numbers refer to the requested levels. The methodology development entails the development of the tools for reliability data analysis, system reliability prediction, human reliability prediction, and risk assessment.

The second item, reactor systems and licensing support, entails the analysis and accident sequences, system reliability analysis, and risk assessment as needed for applications for lire office work. This is the program element that includes our efforts to develop a picture of the accident sequences leading to core damage, and it is from this unit, the work on auxiliary feedwater systems work was done that Saul described at first.

It found some apparent safety weak spots. We want to expand that effort, because it is becoming increasingly clear

that the risk picture may vary significantly from plant to plant So, we want to develop models for the whole spectrum of operating plants.

MR. LEVINE: It's also in this area that those five items that I showed you that Harold and I agreed ought to be done.

COMMISSIONER AHEARNE: Just so I don't sit here trying to be more confused than usual, where are the rest of the people? Are they already on board? The FY '80. You've got the supplemental up to 30.

MR. ROWSOME: We are requesting 30.

COMMISSIONER AHEARNE: How many do you now have?

MR. ROWSOME: There are 23 in the '80 congressional budget. There are 26 at the EDO mark, and we are asking for 30. Nuclear fuel cycle risk is perhaps a poor name for the next unit, because the great bulk of the work is involved in waste disposal. The principal elements there are to develop models to determine the key ingredients in waste disposal risks, what factors really govern how much the risk is, to develop a methodology, to evaluate waste repository safety, and to assist in the formulation of regulatory requirements.

This work is being done in close coordination with NMSS and Standards Development.

A small item in this risk assessment decision unit is training. For some years we have been conducting a brief

introductory course for line office personnel in probabilistic system reliability analysis and risk assessment. The ACRS urges us to greatly expand this, to develop a four- to six-week course. It would surprise me if Harold Denton wanted to part with his people for four to six weeks, but we do think this course can be and should be improved, and that is why this element is in here.

The next element is another big one. It is the reliability data analysis. This entails the collection and analysis of data on human error rates, based on LERs, plant logs, interviews, simulator experience, and the like.

CHAIRMAN HENDRIE: I have got a notion that I know why this would go out for contractor management.

MR. ROWSOME: Also, of course, in the data is equipment failure data, and our membership in the UK systems reliability service and data exchange service.

The next item within risk assessment is work upon an acceptable risk criteria.

COMMISSIONER GILINSKY: Can I just take you back to this other one. Where do we stand with this NPRS?

MR. LEVINE: We're not involved in that in the sense of deciding how it should be used. We are analyzing LERs and NPRDS data. We're taking data from all sources to try to analyze it.

COMMISSIONER GILINSKY: And does a decision on that

affect what type of requirements we might put on utilities?

MR. LEVINE: We are simply collecting data and analyzing it to get the data base for risk assessment purposes. Now, I have said in the past and still believe this to be true, that we need one data collection system, and you decide how that has to be designed by deciding what you want to use the output of it for, and then you can decide what kind of data you want to collect. And we have yet to do this.

MR. BUDNITZ: But the operational evaluation function that is going to be established is going to do that as part of their main effort over the next year or so, to figure out whether the data --

MR. LEVINE: To keep the satellite offices out of their way.

MR. BUDNITZ: In fact, the task force that looked into that, of which I was on, in conversations with Lee, we decided that we would think about that function, then figure out what to do with NPDS and LERs.

COMMISSIONER GILINSKY: When does their office get going?

MR. GOSSICK: This month.

COMMISSIONER GILINSKY: That will report to you?

MR. GOSSICK: Yes, sir. If memory serves me, we have committed to the NPRDS's future and rulemaking as well.

MR. BUDNITZ: If that group is going to look into data

collection for their purposes, we're going to have our input for our purposes.

COMMISSIONER GILINSKY: It's amazing how long everything takes.

CHAIRMAN HENDRIE: Well, some things that aren't necessarily such great ideas, you know, slowness to implement bad ideas might be a good policy.

MR. ROWSOME: As you know, the ACRS has recently joined forces with EPA and the industry in requesting that we adopt criteria for acceptable risk. This is a very small budget exercise, as you can see here, to develop the spectrum of possibilities for the basis for such a criterion.

COMMISSIONER BRADFORD: How are the criteria stated? Is it a legal search, a numerical search?

MR. ROWSOME: That is the open issue. What we are hoping to do with this research is to develop essentially an option paper for NRR, the line offices, and you all, that says we could do it this way but there would be advantages and disadvantages or we could do it that way.

There are a whole spectrum of possibilities of how to tackle this.

COMMISSIONER GILINSKY: When is this going to get done?

MR. LEVINE: In the next year or two. The work is already ongoing. What is going to take a while -- we have

joined with the National Science Foundation in trying to sponsor an acceptable risk criteria seminar, where we will have all the people in the country who have been working in this field come and present their ideas, and this will undoubtedly result in submissions for some proposals for research, which they will fund most of it and we will fund some of.

And then, in about a year or so, we will collect all this and put it together.

COMMISSIONER GILINSKY: You must have something very much more elaborate in mind than I would.

MR. LEVINE: There are two ways to go about this: One way is to take a pragmatic approach and say what are the risks in the world already -- and this is fairly easily done, by the way -- and say where should nuclear power fit into those accident risks. That is a pragmatic approach.

COMMISSIONER GILINSKY: How might you express a standard? I wouldn't think this is something that takes a year or two.

MR. LEVINE: If you want to decide what the risk level ought to be independently of almost everything, there is some value, say, in weighing benefits versus risks. That is a very difficult proposition, in fact.

COMMISSIONER GILINSKY: Well, if you're going to have something to use, it's going to have to be a very simple sort of statement.

MR. LEVINE: I think you will find the problem is trying to develop a statement which you feel you can defend technically. That is one approach. Another approach is to take a pragmatic approach and simply try to define something quite simple and publish it for reaction. That would go much faster.

COMMISSIONER GILINSKY: This just seems kind of odd to be having symposia and requests for proposals just to get a statement on risks.

MR. LEVINE: It will be better technically founded.

COMMISSIONER GILINSKY: It's just another way of putting it off forever; that's the way I look at it.

MR. LEVINE: It's your pleasure. If you want it done faster, we can take a pragmatic approach.

COMMISSIONER GILINSKY: I certainly would.

CHAIRMAN HENDRIE: I think if you've got the university community contributing and the National Science Foundation lined up and people at EPA probably interested in this and proferssors writing papers, one good way to sort of develop a peer attitude and a consensus is to give them the chance to have their conferences and talk to each other and see how it all seems to shake down, and a good way to get them all mad as ticks so anything you suggest will be subject to scathing criticism, is to go ahead and plunge on.

I think you ought to go ahead, for $200,000 in '80 and

$300,000 in '81, and sort of go along with this group that seems determined to have their seminars.

COMMISSIONER GILINSKY: Well, you know --

CHAIRMAN HENDRIE: If you would like a quick definition of "acceptable risk," I will refer you to testimony I gave on, what was it, the 27th of February of this year.

COMMISSIONER BRADFORD: That's the problem.

CHAIRMAN HENDRIE: Well, it was fast.

COMMISSIONER GILINSKY: One could put out several alternatives and see what stands up to scathing criticism. Here it is just a way of playing the risk-assessment community and keeping people occupied without ever facing the issue.

I mean, if that's what we want to do --

MR. LEVINE: Well, could I ask just one question? Suppose we publish something pragmatic and simple and the question comes up, "Well, why didn't you try to do an assessment which would weigh the benefits involved in generating electricity by nuclear power versus the risks," how would you answer that question?

I would answer it right now on a judgmental basis that I don't know how to evaluate the benefits quantitatively, and I would like to know whether the community that works in this area believes that or doesn't, before I say that. It's my opinion, but I haven't done enough work to substantiate it.

COMMISSIONER GILINSKY: I would guess that a year from

now you won't be any closer, even with all of these contracts, to resolving any of these questions than you are today.

MR. LEVINE: We could answer more questions about why we didn't take certain courses as opposed to others.

COMMISSIONER GILINSKY: It is just a way of putting off awkward questions -- and they are awkward and they're not easy to deal with; I am not suggesting that they are. But, you know, we deal with a lot of problems that way, and kind of have the labs do some work.

MR. BUDNITZ: If you have any guidance, we would be happy to receive it.

COMMISSIONER BRADFORD: Let me ask it this way: Once one articulates acceptable risk criteria, in order to do anything with them, I assume you have to be prepared to put them into individual licensing.

MR. LEVINE: Or in a rulemaking.

COMMISSIONER BRADFORD: That was what I was interested in. What would be interesting to see is this done in a sort of a process that might lead to a rulemaking.

MR. LEVINE: I would think it would be a rulemaking.

COMMISSIONER BRADFORD: But preferably, it looks as though the way you have it set up, the rulemaking would not be likely to come before the end of FY '81.

MR. LEVINE: Probably a year or so beyond that.

COMMISSIONER BRADFORD: It would seem more interesting

to someone who won't be here much beyond the end of that.

The big question would be developing these criteria as part of a context that would also get them out, at least for the public comment part of the rulemaking, with an eye toward possibly looking toward wrapping the whole process up by the end of '81, instead of just studying it.

MR. ROWSOME: Personally, I think you're quite right. If we want to be responsive to the ACRS, we should stop studying the problem and start hypothesizing solutions to the problem and looking at them. And if that is your consensus, we would be happy to do that.

COMMISSIONER KENNEDY: That's not -- I am not prepared to suggest that is my view. It seems to me we're talking about the philosophic questions that have been with the human race for the last three or four thousand years, and I don't think another year will be all that much to resolve it. And I think it is that kind of question that ought to be taken deliberately, and I think it is a great idea that somebody is finally facing up to try to do it. I am not at all confident it is going to get done.

MR. BUDNITZ: I would suggest maybe we ought to have another meeting just on this, at your pleasure.

COMMISSIONER KENNEDY: I would like to have that meeting after you have done about a year's work and see how you come out.

COMMISSIONER GILINSKY: This reminds me of graduate

school. The first time I came to Cal Tech, I went down to the basement and asked one of the guys working in the low-temperature lab how many years he'd been there. He looked at me and he says he's found that the year is not a practical unit of time.

(Laughter.)

MR. LEVINE: Would you like us to prepare a paper on these proposals?

COMMISSIONER GILINSKY: I would.

MR. LEVINE: We will prepare a paper which we can discuss in another session. But in any event, we will need some money, whichever course we take.

(Laughter.)

CHAIRMAN HENDRIE: Good. Onward.

COMMISSIONER AHEARNE: Could I ask a question? Sol, do I gather correctly that in the risk assessment area, unlike much of your other programs, most or a large part of your work is done by your staff and a smaller amount done by contract?

MR. LEVINE: Oh, no. In fact, it was more that way earlier on where we were doing a lot of the work in-house, but it is getting to be more and more now that we are deliberately trying to get more laboratories and companies and experts.

COMMISSIONER AHEARNE: I am not saying with respect to before. I am saying if you look at this area of your office as opposed to the other.

MR. LEVINE: We're not doing any. We're like

$11 million worth of work in-house.

MR. BUDNITZ: But it is a fair statement. In this area significant work is done in-house, and that's not true in the other areas.

MR. LEVINE: And in fact, mostly in response to NRR urgent needs, we do as much of that -- most of that is done in-house.

COMMISSIONER AHEARNE: So you have more in-house experts in this area.

MR. BUDNITZ: In fact, we have in-house more experts than the rest of the country may have. Not quite more, but we have a sizeable fraction of them.

COMMISSIONER AHEARNE: That would then lead to the question that is perhaps your planned growth rate exceeding the availability of supply and experts outside.

MR. BUDNITZ: We don't think so.

MR. LEVINE: That is just backwards. As a matter of fact, we need more money to develop more expertise outside and more people inside to develop more internal experts. And we would like very much to educate other people in the agency as much as we can, and as our nucleus of experts grows we will be glad to interchange.

MR. BUDNITZ: In fact, that issue was debated at great length with the ACRS who felt that, if anything, this growth rate was insufficient, considering what they thought were your

concerns. And, of course, it's obvious, it almost goes without saying that much of what we are pushing on here is the stuff that the Lewis Committee said was of real urgency.

MR. ROWSOME: I am grabbing the floor back again. If I could look at 73 --

end#6 (Viewgraph.)

This slide concludes the summary overview. There is one other element for PAS, the Probabilistic Analysis Staff, in this budget. That is a very small effort to improve WASH-1400. It is not our desire or intent to do that reactor safety study over again in the near future, but we are on record as promising to incorporate improved data and methods into that study from time to time, and this is the budget item to do that.

That gives a subtotal for research of $8.5 million in program support in fiscal '80, 11.4 in '81.

There is another item in this budget that is not intended for ourselves, and that is an item that is earmarked for the new Operations Evaluation Group that is to report directly to EDO. We wanted to make sure that they got some program support in the '80-'81 budget and we put it in here, but it is not intended that this go to research.

MR. LEVINE: We think the agency needs it, wherever the group will be, and we have an agreement with the controller to put it in our budget so that it wouldn't get lost. When we made the budget for this year, we didn't know where it was going to be.

MR. GOSSICK: Why did the BRG chop it out?

MR. LEVINE: You will have to ask the BRG that question.

MR. ROWSOME: Now let's turn to the reclamas, to

establish the issues here, and then we will come back to the '80 slide, come back to the ACRS comments for additional perspective.

(Viewgraph.)

In 1980 the EDO mark agrees with our requested level on program support, so clearly we have no objection there. There is a difference in personnel and this could become quite a significant problem for us. The EDO gave us an increase of three over the President's budget for '80, all of which is earmarked for the satellite operations evaluation group in research, the group that sustains liaison with the principal operations evaluation group that will report to EDO. Thus the Probabilistic Analysis Staff gets no increase above the initial FY '80 budget, and only one above the '79 number of people, at the same time that TMI concerns have resulted in virtually doubling the program support over 1971, adding again about half as much as the initial '80 budget, at a time when we are getting more requests from the line offices for reliability studies and risk assessment perspective reviews, and at a time when, as we have mentioned before, risk assessment applications are constrained by the number of practitioners.

So that I think we really quite urgently need more personnel in the Probabilistic Analysis Staff in this area, to properly address the program support and the many endeavors we

have going.

Slide 81 is the reclama for 1981.

(Viewgraph.)

There is both a program support issue of $3.6 million, and again the people issue. From my point of view, I think the people issue is the larger of the two. I think it is very important to us that we get those slots to accommodate the work we want to do to understand small LOCAs, transients, develop the models, the reliability models and accident sequences for the operating plants, for the waste isolation studies which are tied -- whose schedule is tied to a coordination with NMSS and their needs and so forth.

Of the $3.6 million, 1.2 is that part earmarked for the Operations Evaluation Group, the parent group. And we are requesting 2.6 for ourselves -- excuse me, 2.4 for ourselves. In the absence of that extra funding, there would be some slippage in the development of the reliability models for the operating plants, not so much because that is one of our lower priorities, but because it is manpower intensive and it is kind of at the end of the line, end of model development and so forth. It is an applications thing which would have to get pushed down the pike if funding came up short.

We do a little trimming in equipment failure data analysis, in the waste isolation studies, some trimming on the acceptable risk criteria in research, and some improvements to

WASH-1400 at the EDO level, if at the EDO level for support personnel we would have to make those cuts.

(Viewgraph.)

Slide 32 summarizes the reclama.

MR. BUDNITZ: There is perhaps only one other point to make here, and that is that a part of the cut that we would sustain in the EDO mark is in the high-level waste area, where in conjunction with NMSS, we are developing a model that's going to be one of the important parts of their overall thing, and we're in there for about 2 million. We have their full endorsement on that thing and we think it is important.

MR. ROWSOME: On a prior slide I won't call, our list of issues -- they are in our ACRS letter to you and in the slide. For the most part we are in complete agreement with ACRS, and the only exception is the one Bob just mentioned, that they endorse the waste disposal work that is suggested as something that could be slipped in a budget pinch, and we are concerned that doing so would interrupt the schedule of the coordinated efforts with Standards Development and NMSS.

We have already discussed improved safety. That came up in the beginning of this meeting. So let's jump directly to the reclama sheet, which is Slide 36.

(Viewgraph.)

This is a set-aside issue based upon CME concerns that the NRC is plunging into research and development that

belongs more properly with the Department of Energy or with the industry. I think this has been an artifact of a failure to communicate on our part, because the program as we envision it really i[illegible]t developmental, it is not engineering. It entails very little experimentation. It is not designing new hardware. It is really the kind of research we would do in any situation in which we were contemplating new regulatory requirements: value impact studies, feasibility studies, what are the implications of the direction in which we think we want to go.

That kind of study is what is involved here, as the other slides in your handout would indicate.

COMMISSIONER AHEARNE: I guess my question, when I was looking through it, was why the $6.6 million. And I recognize I haven't got the background and the battles that have been fought, but it appeared to me to be very small.

MR. ROWSOME: The ACRS commented on that, too. They think it is too little as well. On the other hand, if you recognize that these are really the scoping studies, simply the theoretical --

COMMISSIONER AHEARNE: If I look on your list, are you saying that what you call scoping studies, as a broad general title, and all the rest are really scoping studies?

MR. ROWSOME: Right. This is Slide 33. You are quite right. The scoping studies are in what is listed here

as scoping studies, is a search for avenues and the initial evaluation of other avenues to improve light water reactor safety. Where we have already identified alternative designs or alternative concepts that might improve safety, we are doing the conceptual studies that would say: Are there competing failures that might be made worse if you move in this direction; what kind of value impact are you dealing with; what kind of risk reduction effectiveness does this initiative have? That's the kind of study we're doing in the other program.

MR. LEVINE: I think we may be a little low here. I must say I was the one who principally prepared the plan. I kept the plan as frugal as we possibly could, and we budgeted as frugally as we possibly can. All the estimates have been downside estimates.

CHAIRMAN HENDRIE: The 6.6 is in fact the number which came out of a three-year approved reactor safety program that got worked out last year in connection with the direction from the authorization committees, and our own belief that it was an appropriate way to go. The funding level for the three-year program, which totals out at about -- it runs 4.4, 6.6, and then about 6.7, something like that -- was a sort of a middle ground between doing really very little work other than some brainstorming and then calling up DOE and saying, think about this, on the one hand, and developing a fairly husky program with contractor commitments, ongoing

commitments, on the other, at $4.4 million this first year, and 6 the second and 6 the third.

It is not what I would call trivial efforts. Those are, after all, millions of dollars.

MR. BUDNITZ: There is not much experimental work in it.

CHAIRMAN HENDRIE: It's obviously not a big program, judged on the scale of a $48 million per year LOFT experiment in the research budget. One could argue whether it is high or low, John. I think that is fair. But the 6.6 proposed at least has the merit of having been a previously considered part of a consistent and I think fairly well shaken down plan. I think the way of deciding what ought to be attacked in this program was good.

I think there was a pretty good method of shaking out how far it ought to go, so it didn't go too far, but on the other hand was not just hand-waving. So the 6.6 probably is good, all things considered. It is probably one of the most well considered numbers in our budget.

MR. LEVINE: I would not want to double that number, for instance.

CHAIRMAN HENDRIE: Let me say one more thing about the dollar level. I won't be surprised if OMB once again feels it appropriate to cut our budget number and to export a chunk of this to DOE. In fact, I will be surprised if they

don't. And I guess one of the reasons I perhaps have less enthusiasm for looking at any very substantial increases in it is that it seems to me it only encourages that tendency. On the other hand, there may be some modest increases that ought to be considered.

COMMISSIONER AHEARNE: Or if they are not increases in our budget, perhaps there ought to be some specifics that we ought to be asking DOE to incorporate into their budget.

CHAIRMAN HENDRIE: Okay. Where from here, Frank?

MR. ROWSOME: That covers Probabilistic Analysis.

MR. LEVINE: It is almost 5:30. Would you like to go on?

CHAIRMAN HENDRIE: In view of the hour, I am inclined to meet again. Let's see what would be handy for a return, to pick up safeguards. Why don't you come in at 9:30?

e-7 (Whereupon, at 5:30 p.m., the meeting was adjourned.)

NUCLEAR REGULATORY COMMISSION

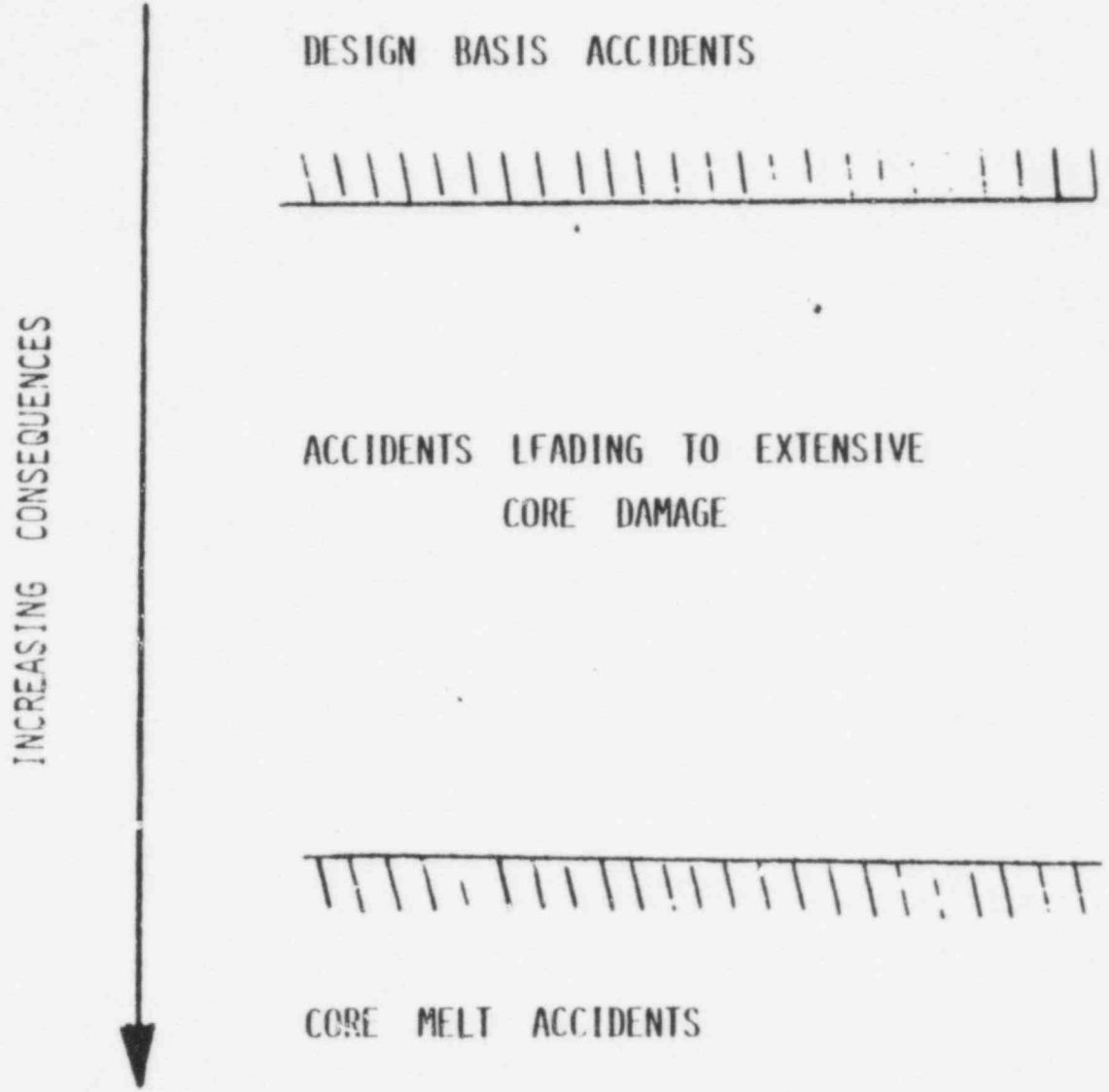
FY 1981 BUDGET REQUEST

OFFICE OF

NUCLEAR REGULATORY RESEARCH

SAUL LEVINE, DIRECTOR

JULY 31, 1979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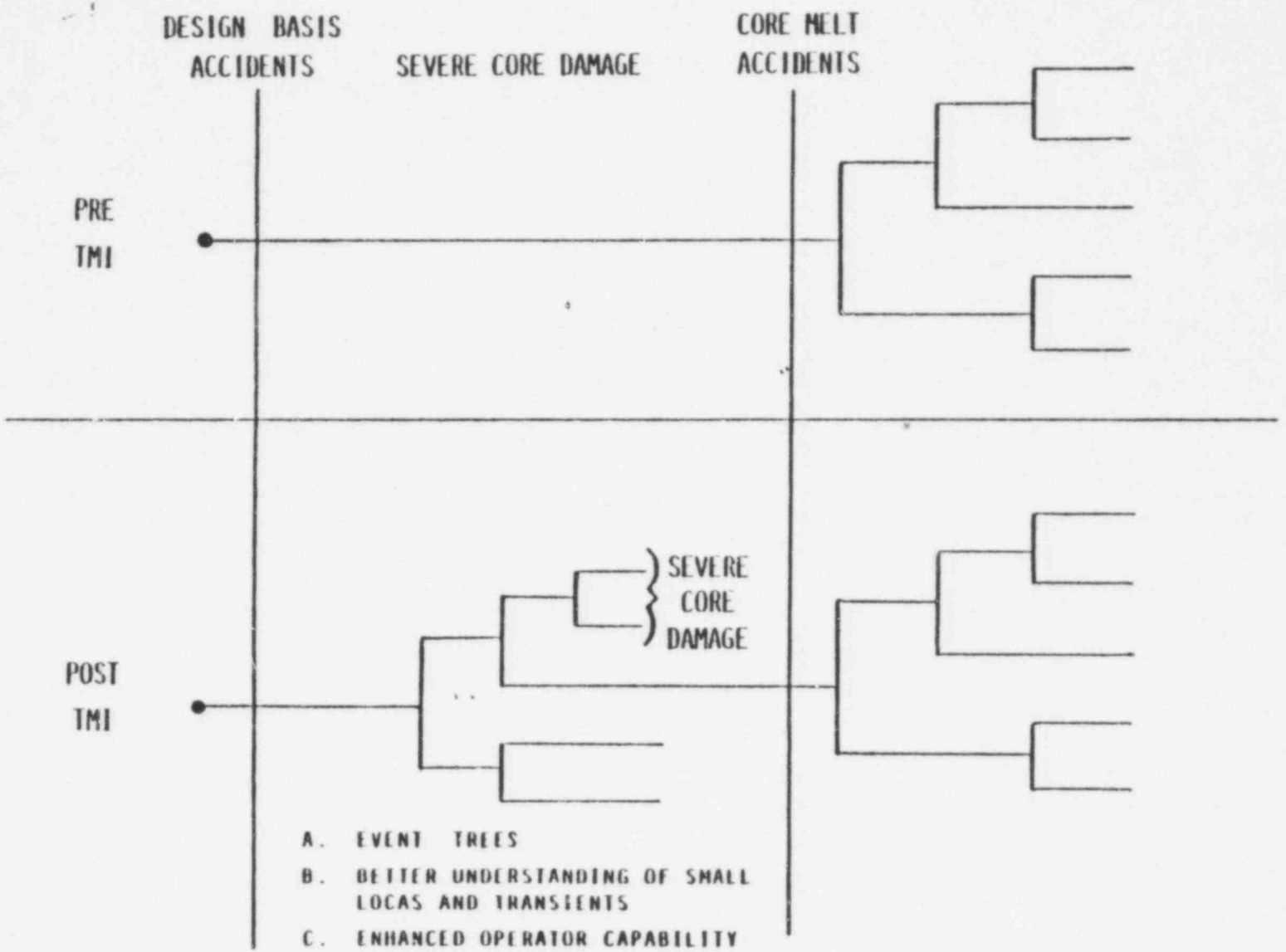
DESIGN BASIS ACCIDENTS
ACCIDENTS LEADING TO EXTENSIVE
CORE DAMAGE
CORE MELT ACCIDENTS


DESIGN BASIS ACCIDENTS
SEVERE CORE DAMAGE
CORE MELT ACCIDENTS
PRE TMI
POST TMI
SEVERE CORE DAMAGE
A. EVENT TREES
B. BETTER UNDERSTANDING OF SMALL LOCAS AND TRANSIENTS
C. ENHANCED OPERATOR CAPABILITY
D. BETTER UNDERSTANDING OF COOLANT CHEMISTRY
E. TMI POST-MORTEM

RESEARCH LESSONS FROM TMI

- IMPROVED UNDERSTANDING OF ACCIDENTS
  - SMALL LOCA, TRANSIENTS, AND ENHANCED OPERATOR CAPABILITY NEED RESEARCH ATTENTION TO:
    - ENHANCE OUR UNDERSTANDING OF ANOMALOUS SMALL LOCAS AND TRANSIENTS.
    - TO ALLOW MANY STUDIES TO BE MADE OF THESE TYPES OF EVENTS AND THEIR MANY VARIATIONS.
    - TO PREDICT PLANT BEHAVIOR WITH GREATER PRECISION.

RESEARCH LESSONS FROM TMI (CONT'D)

- TWO TYPES OF COMPUTER CODES HAVE TO BE DEVELOPED:
  - FAST RUNNING, LESS PRECISE CODES FOR STUDIES OF PLANT BEHAVIOR.
  - PRECISE CODES FOR BENCHMARKING THE FAST RUNNING CODES.
  - EXPERIMENTS IN EXISTING FACILITIES WILL HAVE TO BE PERFORMED TO PROVIDE DATA FOR MODELING AND TESTING CODES.
- EVENT TREES WILL HAVE TO BE DEVELOPED TO DEFINE ACCIDENT SEQUENCES THAT RESULT IN SEVERELY DAMAGED CORES.

RESEARCH LESSONS FROM TMI (CONT'D)

- OPERATOR CAPABILITY WILL HAVE TO BE ENHANCED
  - CODES WILL BE USED TO STUDY REQUIREMENTS FOR ACCIDENTS THAT GO BEYOND DBA'S
    ON OPERATOR TRAINING SIMULATORS.
  - REQUIREMENTS NEEDED FOR PLANT INSTRUMENTATION TO FOLLOW THE COURSE OF ACCIDENTS, FOR IMPROVED CONTROL ROOM DISPLAYS AND FOR DIAGNOSTIC SYSTEMS TO AID OPERATORS
  - REQUIREMENTS NEEDED FOR IMPROVED, AUTOMATIC MONITORING OF THE OPERABILITY STATUS OF SAFETY SYSTEMS
  - REQUIREMENTS NEEDED FOR PLANT DATA TRANSMISSION TO MEET EXTERNAL NEEDS

RESEARCH LESSONS FROM TMI (CONT'D)

- PLANT RESPONSE UNDER ACCIDENT CONDITIONS
  - IMPROVED UNDERSTANDING OF COOLANT CHEMISTRY AND BETTER SAMPLING METHODS
  - HYDROGEN BEHAVIOR IN COOLANT AND CONTAINMENT
  - EFFECTS OF HYDROGEN BURNING AND EXPLOSIONS
  - RESPONSE OF PLANT EQUIPMENT AND STRUCTURES TO ACCIDENT CONDITIONS
  - BEHAVIOR OF PLANT COMPONENTS UNDER LONG TERM SEVERE ACCIDENT CONDITIONS

RESEARCH LESSONS FROM TMI (CONT'D)

- POST MORTEM AND PLANT RECOVERY
  - HELP PLANT DATA COLLECTION AND RECOVERY OPERATIONS
  - DISPERSION AND AMOUNT OF FISSION PRODUCTS IN CONTAINMENT, COOLANT AND REACTOR COOLANT SYSTEM
  - EXAMINE SAMPLES OF DAMAGED FUEL
  - EXAMINE CONDITION OF SAFETY RELATED EQUIPMENT AND ESTABLISH PLANT REQUALIFICATION CRITERIA

SUMMARY OF ACRS COMMENTS ON NEW
RESEARCH DIRECTIONS

1. GENERAL

- o BROADER RANGE OF SAFETY ISSUES NEED TO BE COVERED IN RESEARCH
- o SHOULD COVER PREVENTION AND MITIGATION OF ACCIDENTS THAT RESULT IN SEVERELY DAMAGED CORES
- o CONSIDER MULTIPLE FAILURES AS OPPOSED TO ONLY SINGLE FAILURES
- o ACRS RECOGNIZES THAT RESEARCH IS ALREADY UNDERWAY IN MANY NEW AREAS. OTHERS CAN BE CONSIDERED AND IMPLEMENTED WITHOUT DELAYING BUDGETARY PROCESS. PRIORITIES, LEVEL OF EXPENDITURE AND FOCUS OF RESEARCH SHOULD BE REEVALUATED TO MEET FUTURE REQUIREMENTS.

2. SPECIFIC

- o GREATER EMPHASIS ON SMALL LOCAS AND ANOMALOUS TRANSIENTS
- o ANALYTICAL STUDIES OF A BROAD SPECTRUM OF ACCIDENTS THAT GO BEYOND DBA'S
- o STUDY PRACTICALITY OF RETAINING MOLTEN CORE WITHIN CONTAINMENT OR REDUCING RADIOACTIVITY IN LIQUID PATHWAYS FOLLOWING MELTDOWN
- o AUGMENT ONGOING STUDIES OF STEAM EXPLOSIONS FOR BETTER UNDERSTANDING
- o MORE EXTENSIVE EVALUATION OF LIQUID PATHWAY CONSEQUENCES FOR CORE MELT ACCIDENTS

- IDENTIFY RESEARCH NEEDS RELATED TO PROCEDURES FOR OPERATION, MAINTENANCE, TESTING AND SURVEILLANCE
- REVIEW OPERATING EXPERIENCE TO DETERMINE PROBLEMS IMPORTANT TO SAFETY
- DEVELOP FAST RUNNING CODES FOR POSTULATED TRANSIENT AND ACCIDENT SEQUENCES TO AID IMPROVED OPERATOR TRAINING, DIAGNOSTIC INSTRUMENTATION AND COMPUTER AIDED OPERATOR GUIDANCE
- DEVELOP REAL TIME METHODS FOR ANALYSIS OF SYSTEM DISTURBANCES TO PROVIDE TO OPERATOR IMPROVED DIAGNOSTIC INFORMATION ON ABNORMAL SEQUENCES

- RESEARCH ON SYSTEMS BEHAVIOR AND INTERACTION TO INCREASE INSIGHTS ON OPERATING LIMITS, ABNORMAL TRANSIENTS, AND IMPROVED DESIGN OF SAFETY SYSTEMS
- APPLICATION OF PROBABILISTIC METHODOLOGY TO IMPROVING SINGLE FAILURE CRITERION, TO STUDIES OF ALTERNATE SYSTEM DESIGN APPROACHES, AND TO OPTIMIZATION OF PLANT SAFETY
- DEVELOP WATER CHEMISTRY SPECIFICATIONS; ESTABLISH THE EFFECTS OF ENVIRONMENTAL, FABRICATION AND OPERATING VARIABLES ON CRACK GROWTH RATES

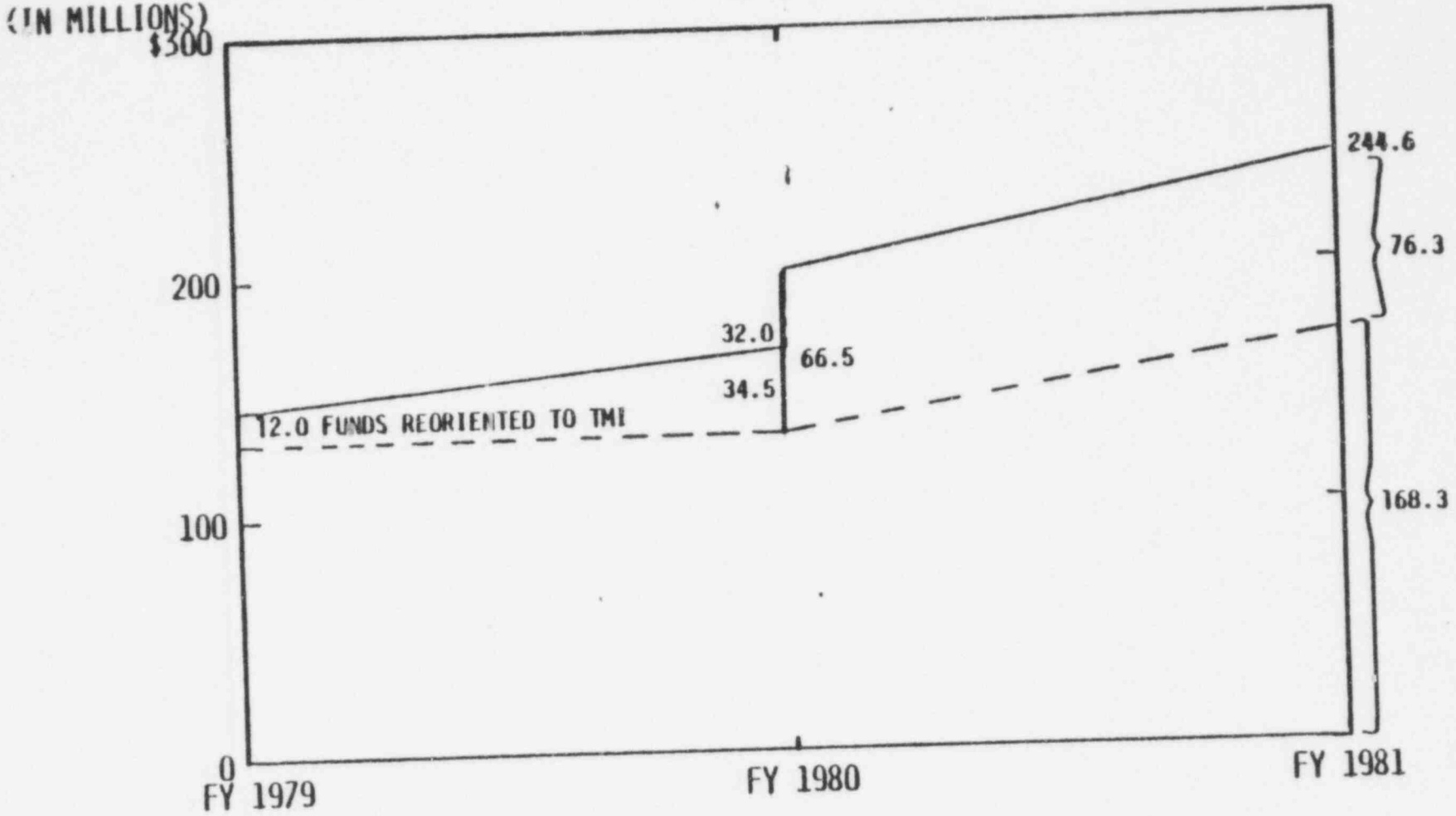
3. BUDGET COMMENTS

- o ACRS SUPPORTS ADDITIONAL $30-31M FOR TMI RESEARCH IN FY 1980 PLUS $3M FOR WASTE MANAGEMENT
- o ACRS GENERALLY SUPPORTS FY 1981 BUDGET
- o ACRS SUPPORT IS BASED ON THE UNDERSTANDING THAT SOME REORIENTATION OF WORK MIGHT BE NECESSARY AS A RESULT OF FURTHER STUDY

FY 80 SUPPLEMENT REQUEST
BUDGET SUMMARY

	($ Million)
Better Understanding of Transient and Small LOCA Accidents	$ 13.4
Enhanced Operator Capability	3.6
Plant Response Under Accident Conditions	5.1
Post Mortem Examination and Plant Recovery	2.1
Improved Risk Assessment	3.1
Improved Reactor Safety	1.7
	$ 29.0
Waste Management	3.0
	$ 32.0

NUCLEAR REGULATORY RESEARCH
PROGRAM SUPPORT



RES - TMI RELATED EFFORTS

($ IN MILLIONS)

	FY 1979	FY 1980			FY 1981
		BASE	SUPPL	TOTAL	
TRANSIENT & SMALL LOCA'S	$10.7	$29.3	$13.4	$42.7	$45.2
ENHANCED OPER CAPABILITY	1.0	0.6	3.6	4.2	6.3
PLANT RESPONSE UNDER ACCIDENT CONDITIONS	0.3	2.0	5.1	7.1	9.2
POST MORTEM EXAM	-0-	-0-	2.1	2.1	4.6
IMPROVED RISK ASSESSMENT	-0-	2.6	3.1	5.7	7.7
IMPROVED REACTOR SAFETY	-0-	-0-	1.7	1.7	3.3
TOTAL	$12.0	$34.5	$29.0	$63.5	$76.3

NUCLEAR REGULATORY RESEARCH
PROGRAM SUPPORT
(IN MILLIONS)

	FY 80			FY 81		
LWR SAFETY RESEARCH	CONG	EDO MARK	RES RECLAMA	EDO MARK	RES REQ	RES RECLAMA
SYSTEMS ENGINEERING	$34.8	$41.3	$1.0	$35.6	$38.0	$2.4
LOFT	42.9	44.9		48.0	48.0	
CODE DEVELOPMENT	8.9	12.0	0.4	13.2	15.2	2.0
FUEL BEHAVIOR	23.1	28.7		27.9	27.9	
PRIMARY SYS. INT.	8.6	9.6	—	15.1	15.1	—
TOTAL LWR	118.3	136.5	1.4	139.8	144.2	4.4
SEISMIC ENG. SAFETY	10.0	12.0		13.9	19.9	6.0
FAST BREEDER REACTORS	13.7	13.7		0/15.0	22.1	22.1
ADV. CONV. REACTORS	-0-	-0-	—	0/3.9	3.9	3.9
TOTAL RSR	142.0	162.2	1.4	153.7/18.9	190.1	36.4
REACTOR ENV.	3.8	4.5		6.2	9.8	3.6
FUEL CYCLE	3.8	3.8		5.0	5.0	
WASTE MANAGEMENT	6.7	9.7		12.9	14.8	1.9
SAFEGUARDS	5.0	5.0		5.3/0.4	5.7	0.4
RISK ASSESSMENT	5.7	9.0		9.0	12.6	3.6
IMPROV. REACTOR SAFETY	1.0	1.0/3.4	3.4	0/6.6	6.6	6.6
TOTAL	$168.0	$195.2/3.4	$4.8	$192.1/25.9	$244.6	$52.5

RECOMMENDATIONS

- RE-EVALUATE NRC'S INSPECTION AND QUALITY ASSURANCE SYSTEM AND LICENSING CRITERIA TO DETERMINE EXTENT TO WHICH THEY INCORPORATE THINGS LEARNED FROM RSS AND OTHER RELEVANT LITERATURE.

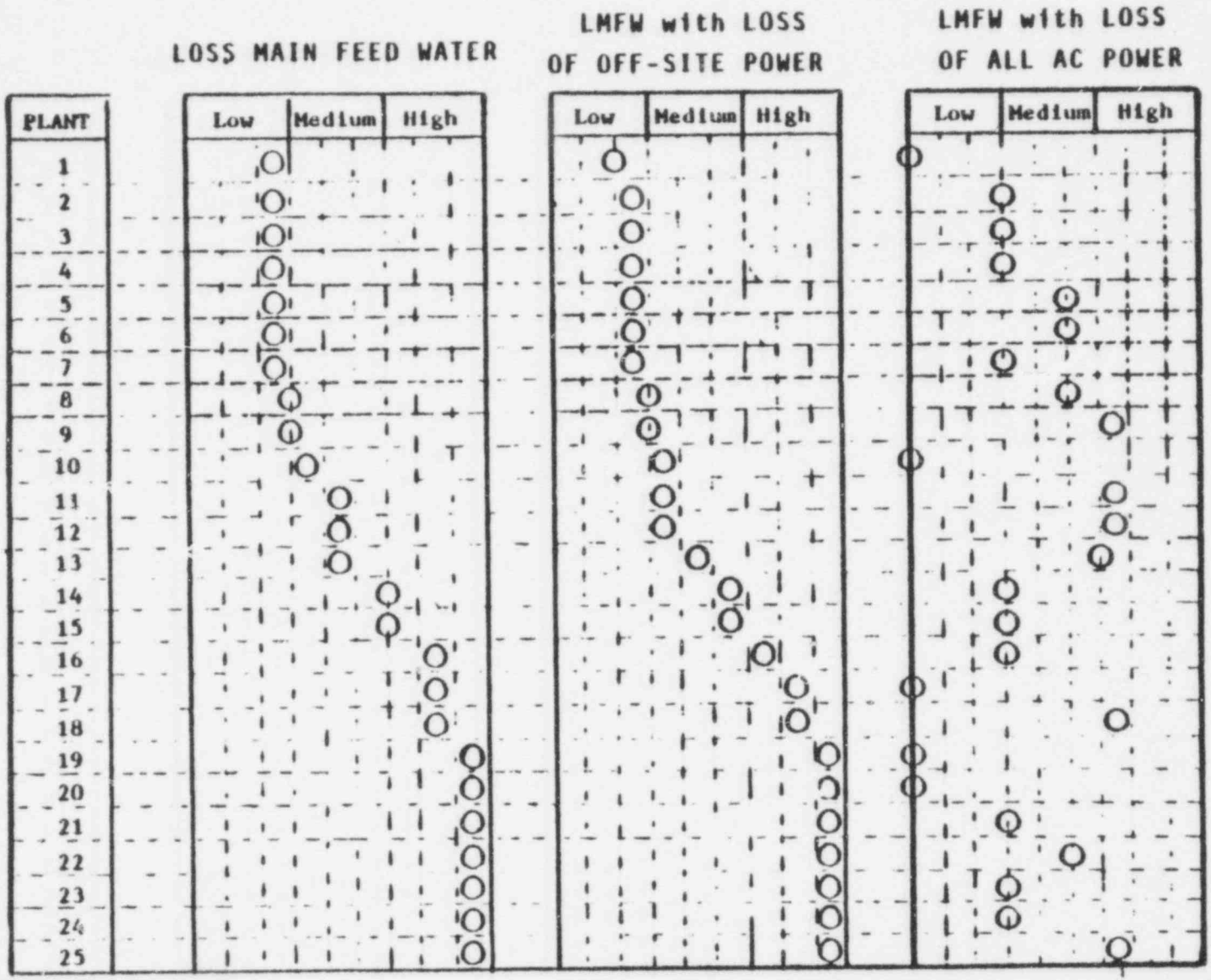
- USE RSS PROBABILISTIC METHODOLOGY MORE EFFECTIVELY TO GUIDE REACTOR SAFETY RESEARCH SO AS TO REDUCE UNCERTAINTIES IN ANALYSIS, AND TO GAIN GREATER UNDERSTANDING OF THOSE POINTS TO RISK UNCOVERED.

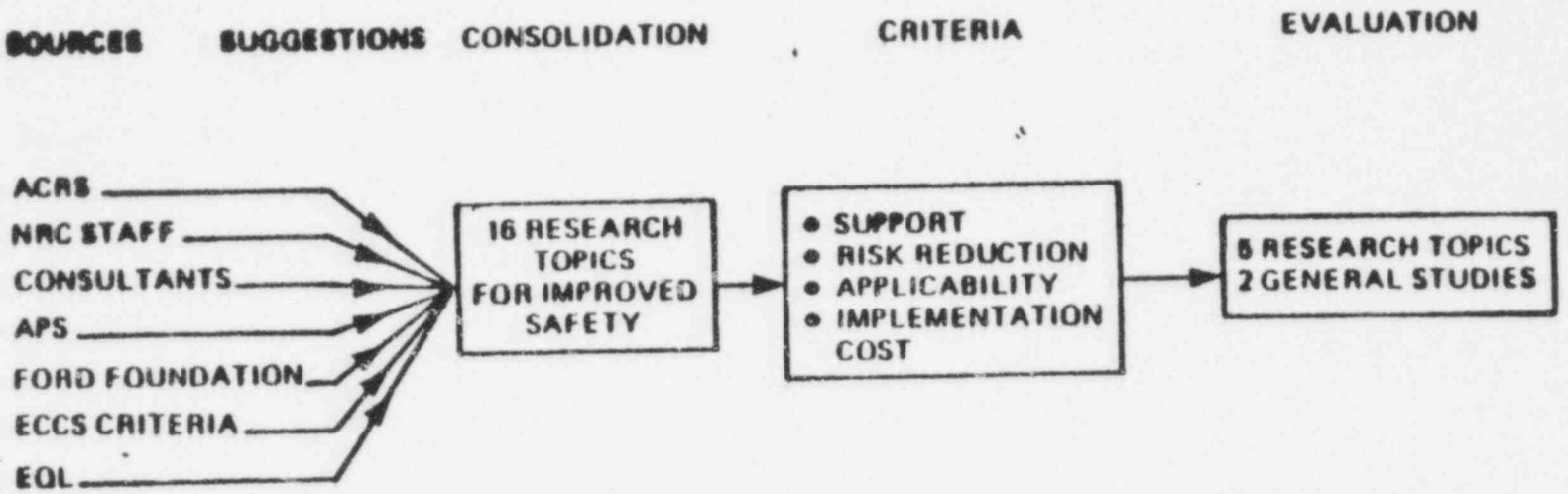
- WHERE DATA BASE IS INADEQUATE, METHODOLOGY OF WASH-1400 CAN STILL BE USED TO UNCOVER THE TOPOLOGY OF ACCIDENT SEQUENCES. LIMITS OF KNOWLEDGE SHOULD BE STATED, WITHOUT PRESSURE TO QUANTIFY (OTHER THAN BOUNDING) THAT WHICH IS UNQUANTIFIABLE.

- FAULT-TREE/EVENT-TREE ANALYSES SHOULD BE AMONG THE PRINCIPAL MEANS:
  - TO DEAL WITH GENERIC SAFETY ISSUES.
  - TO FORMULATE NEW REGULATORY REQUIREMENTS TO ASSESS AND REVALIDATE EXISTING REGULATORY REQUIREMENTS TO EVALUATE NEW DESIGNS.

- GENERIC SAFETY ISSUES RELATED TO NUCLEAR POWER PLANTS.
- THE STANDARD REVIEW PLAN USED IN THE SAFETY EVALUATION OF PLANTS.
- SOME OF THE DECISIONS REQUIRING SAFETY CHANGES IN PLANTS MADE BY OUR REGULATORY REQUIREMENTS REVIEW COMMITTEE.
- THE SYSTEMATIC EVALUATION PLAN BEING FOLLOWED TO REVIEW THE SAFETY EVALUATION OF THE 11 OLDEST OPERATING PLANTS.
- PROPOSED CHANGES TO AND OVERALL CONTENT OF TECHNICAL SPECIFICATIONS FOR NUCLEAR POWER PLANTS.

RELIABILITY OF PWR AUXILIARY FEEDWATER SYSTEMS





RESEARCH PROJECT	PROGRAM SUPPORT (SM)	DURATION (YEARS)
A. ALTERNATE CONTAINMENT CONCEPTS	1.1	1-2
B. ALTERNATE DECAY HEAT REMOVAL CONCEPTS	1.2	1-2
C. ALTERNATE ECC CONCEPTS	3.9	1-3
D. IMPROVED IN-PLANT ACCIDENT RESPONSE	1.6	1-2
E. ADVANCED SEISMIC DESIGNS	3.6	1-3
F. IMPROVED METHODOLOGY	0.5	1*
G. SCOPING STUDIES	1.5	1-2
SUBTOTAL	13.4	1-3
ADDITIONAL MANPOWER (8 STAFF)	1.5**	
TOTAL	14.9	

* WILL INVOLVE CONTINUING STUDIES FOR SEVERAL YEARS
** COVERS 3-YEAR PERIOD ($500K PER YEAR)

NUCLEAR REGULATORY RESEARCH
PERSONNEL

	FY 80				FY 81		
LWR SAFETY RESEARCH	CONG	EDO MARK	RES REQ	RES RECLAMA	EDO MARK	RES REQ	RES RECLAMA
SYSTEMS ENGINEERING	18	20	20		22	22	
LOFT	9	9	10	1	10	10	
CODE DEVELOPMENT	8	9	10	1	9	11	2
FUEL BEHAVIOR	8	9	10	1	9	10	1
PRIMARY SYS. INT.	8	8	8	-	9	10	1
TOTAL LWR	51	55	58	3	59	63	4
SEISMIC ENG. SAFETY	19	19	19		19	23	4
FAST BREEDER REACTORS	11	11	11		0/12	15	15
ADV. CONV. REACTORS	-0-	-0-	-0-	-	0/3	3	3
TOTAL RSR	81	85	88	3	78/15	104	26
REACTOR ENV.	6	6	6		7	10	3
FUEL CYCLE	6	6	6		7	7	
WASTE MANAGEMENT	10	12	12		15	18	3
SAFEGUARDS	8	8	8	-	8	8	—
TOTAL SAFER	30	32	32	-0-	37	43	6
RISK ASSESSMENT	23	26	30	4	26	33	7
IMPROV. REACTOR SAFETY	1	1/2	3	2	0/4	4	4
PROG. DIR & SUPPORT	24	24	24	-	24	28	4
TOTAL	159	168/2	177	9	165/19	212	47

NUCLEAR REGULATORY RESEARCH

EQUIPMENT

(IN MILLIONS)

	FY 80		FY 81		
LWR SAFETY RESEARCH	CONG	EDO MARK	EDO MARK	RES REQ	RES RECLAMA
SYSTEMS ENGINEERING	$1.7	$1.7	$2.0	$2.0	
LOFT	2.2	2.2	2.2	2.2	
CODE DEVELOPMENT	0.2	0.2	0.5	0.7	$0.2
FUEL BEHAVIOR	1.5	1.5	1.5	1.5	
PRIMARY SYS. INT.	1.1	1.1	1.6	1.6	—
TOTAL LWR	6.7	6.7	7.8	8.0	0.2
SEISMIC ENG. SAFETY	0.2	0.2	0.2	0.9	0.7
FAST BREEDER REACTORS	0.8	0.8	0/1.0	2.1	2.1
ADV. CONV. REACTORS	-0-	-0-	0/0.4	0.4	0.4
TOTAL RSR	7.7	7.7	8.0/1.4	11.4	3.4
REACTOR ENV.	0.4	0.4	0.3	0.5	0.2
FUEL CYCLE	0.2	0.2	0.2	0.2	
WASTE MANAGEMENT	0.9	0.9	1.0	1.0	
SAFEGUARDS	0.1	0.1	0.1	0.1	—
TOTAL	$9.3	$9.3	$9.6/1.4	$13.2	$3.6

NUCLEAR REGULATORY COMMISSION

FY 1981 BUDGET REQUEST

DIVISION OF REACTOR SAFETY RESEARCH

SEISMIC, ENGINEERING AND SITE SAFETY PROGRAM DESCRIPTION

($ In Millions)

	FY 1980 Incl. Suppl.	FY 1981 Res. Req.	Change	Comment
Personnel	19	23	4	
Structural Engineering	$ 3.0	$ 6.0	$ 3.0	Assess Safety Margins and Factors Contributing to Seismic Risk of Structures, Systems and Components
Mechanical Engineering	3.9	7.4	3.5	Benchmark of Seismic Computer Programs
Site Safety	5.1	6.5	1.4	Increased Need in Soil Foundation Properties, Earthquake Response Study, Source Modeling Studies and Field Dispersion Programs
Total Prog. Spt.	$12.0	$19.9	$ 7.9	
Equipment	$ 0.2	$ 0.9	$ 0.7	Instrument and Recording Equipment for Seismic Experimental Programs

ACRS COMMENTS

SEISMIC, ENGINEERING AND SITE SAFETY

ACRS: IN GENERAL, ACRS SUPPORTS THE PROGRAMS WITHIN THIS DECISION UNIT AND RECOMMENDS A FUNDING LEVEL OF $17 MILLION FOR FY 1981.

RES: ACRS GUIDELINES, SUCH AS LIMITING EXPERIMENTS AND INTERDISCIPLINARY INVOLVEMENT IN CERTAIN PROGRAMS, WILL BE FOLLOWED.

ACRS: FURTHER ATTENTION BE GIVEN TO THE RELIABILITY OF ELECTRICAL SYSTEMS AND COMPONENTS UNDER EARTHQUAKE CONDITIONS.

RES: AGREE. THIS WORK IS ALREADY PLANNED FOR FY-80.

ACRS: NOT PREPARED TO ENDORSE THE LARGE PROPOSED GROWTH IN ATMOSPHERIC TRANSPORT AND DIFFUSION.

RES: THIS PROGRAM IS ENDORSED BY NRR AND SD AT THE REQUESTED LEVEL AND IS NEEDED FOR CURRENT LICENSING DECISIONS. GROWTH IN PROGRAM IS NEEDED FOR TESTS TO PROVIDE GUIDANCE ON PLACEMENT OF RADIATION MONITORS AROUND NUCLEAR PLANTS.

PROGRAM BREAKDOWN

SEISMIC, ENGINEERING, & SITE SAFETY

CONTINUATION OF ENDORSED PROGRAM	$16.5M
TMI-RELATED	2.0
NEW STARTS	1.4
SEISMOLOGY & METEOROLOGY REQUEST IN HAND	$0.4
EVALUATION OF ASME & OTHER INDUSTRIAL CODES & STANDARDS - USER REQUEST IN PROCESS	0.4
EVALUATION OF NEW CONCEPTS IN PIPING RESTRAINTS AND PLANT COMPONENTS DURING EARTHQUAKES - USER REQUEST IN PROCESS	0.5
	$19.9M

SEISMIC, ENGINEERING AND SITE SAFETY RECLAMA

FY 1981

	RES Req.	EDO	RES Reclama
Program Support	$19.9M	$13.9M	$ 6.0M
Equipment	0.9	0.2	0.7
Personnel	23	19	4

Impact of EDO Mark

Programs Delayed

- SSMRP, Atmospheric Dispersion, Benchmark of Computer Codes, Pump and Valve Qualification Requirements

Programs Deleted (Existing)

- Snubber Qualification Requirements, Missile Impact on Structures, Dynamic Testing of Structures, Nonlinear System Modeling of Reactor Components

Programs Deleted (New)

- ASME Code Evaluation (Stress Corrosion Cracking), Seismic Stability of Waste Disposal Sites, Assessment of Minimum Meteorological Monitoring

RES Reclama

- This Decision Unit is Funded $0.6M below the Minimum Level Considering the Work Needed to Continue the FY 1980 Supplement.
- ACRS Recommends Funding at a Level Closer to the Requested Level.
- Important Programs, Endorsed by NRR, IE, and SD, will be Delayed or Deleted Affecting NRC's Ability to Assess Licensing Problems.
- Additional Staff Needed to Manage Growing Programs

IMPACT OF ACRS FUNDING LEVEL RECOMMENDATIONS
SEISMIC, ENGINEERING AND SITE SAFETY
FY 1981

	RES Req.	ACRS	RES Reclama
Program Support	$19.9M	$17.0M	$ 2.9M

Impact of ACRS Mark

The Following Programs will be Delayed or Deleted

- HDR Analysis and Test Evaluation
- Snubber Qualification Requirements
- Impactive Loads and Dynamic Testing of Structures
- ASME Code Evaluation (Stress Corrosion Cracking)
- Safety Margins for Structures Other Than Containment (Auxiliary Bldgs., Etc.)
- Assessment of Minimum Meteorological Monitoring

RES Reclama

- Important Programs, Endorsed by NRR, IE and SD, will be Delayed or Deleted Affecting NRC's Ability to Assess Licensing Problems

SYSTEMS ENGINEERING RESEARCH DESCRIPTION

($ In Millions)

	FY 1980 Incl. Suppl.	FY 1981 Res. Req.	Change	Comments
Personnel	20	22	2	
Semiscale	$ 10.2	$ 8.1	-$ 2.1	Simulate Effects of PWR Small LOCAs and Anomalous Transients
Blowdown/Reflood Heat Transfer	9.2	8.4	- 0.8	BWR Transients and PWR Bundle Boiloff Expts.
3D Flow Distribution	15.8	10.0	- 5.8	Reduced Delivery of Instruments to Germany and Japan
ECC Bypass	0.9	0	- 0.9	Current Small Scale Tests Complete. Full Scale Bypass Data from 3D.
Model Development	1.9	3.5	1.6	Investigate & Model Steam/Water Interaction Phenomena
				Containment Intercompartment Flow Tests
Operational Safety	2.6	6.1	3.5	Evaluate Fire Protection and Qualification Test Methods, Noise Analysis, Safety & Relief Valves, and TMI Class IE Safety Eqpt.
Tech. Support	1.7	1.9	0.2	Maintain Code Center, Nuclear Safety Information Ctr. and Instrument Calibration
Total Prog. Spt.	$ 42.3	$38.0	-$ 4.3	
Equipment	$ 1.7	$ 2.0	0.3	

ACRS COMMENTS
SYSTEMS ENGINEERING

SEMISCALE

ACRS: DOES NOT ENDORSE SEMISCALE USE FOR INTEGRAL SYSTEM TEST: SOME REDUCTION COULD BE MADE.

RES: DISAGREE. IN ORDER TO STUDY MANY ANOMALOUS TRANSIENTS AS RECOMMENDED IN 5/16/79 ACRS LETTER, WE NEED SEMISCALE FOR SEPARATE EFFECT TESTS OF SMALL-LOCA AND PLANT-TRANSIENTS AND FOR LOFT SCOPING TESTS. SEMISCALE PROVIDES A CONVENIENT RESEARCH TEST FACILITY WITH QUICK TURNAROUND CAPABILITY. NRR SUPPORTS THE NEED FOR SEMISCALE TESTS.

BLOWDOWN/REFLOOD HEAT TRANSFER, 3D FLOW DISTRIBUTION, & MODEL DEVELOPMENT

ACRS: AGREE WITH PROPOSED PROGRAM AND BUDGET

ECC BYPASS

ACRS: REALLOCATE FUNDS FOR SMALL SCALE TESTS TO HIGHER PRIORITY RESEARCH

RES: AGREE

ACRS COMMENTS
SYSTEMS ENGINEERING (Contd)

OPERATIONAL SAFETY

ACRS: PROGRAM RESPONSIVE TO LAST YEAR'S ACRS RECOMMENDATION TO INCREASE BUDGET. THIS YEAR, ACRS AGREES WITH HUMAN FACTORS, COMPUTER CONTROLS, AND OPERATIONAL SAFETY STUDIES. ACRS SUPPORTS NRC PARTICIPATION IN TMI POSTMORTEM OF SAFETY-RELATED EQUIPMENT AND QUESTIONS OF REQUALIFICATION. NRC SHOULD COMPLETE FIRE, QUAL. TEST., AND NOISE ANALYSIS PROGRAMS. (MAY ATTENUATE FOR HIGHER PRIORITIES.)

RES: AFTER ACRS AND BRG REVIEW, RES REDUCED REQUEST FROM $9.3M TO $6.1M. HOWEVER, EDO MARK-IS $3.7M. RECLAMA. NRR WANTS FULL-SCALE FIRE TESTS. QUAL. TEST PROGRAM IS KEY TO POSTMORTEM AND REQUAL. STUDIES. NOISE ANALYSIS IS NEEDED TO ASSESS PLANT CONDITIONS. ACRS SUPPORTS HUMAN FACTORS.

PROGRAM BREAKDOWN

SYSTEMS ENGINEERING

CONTINUATION OF ENDORSED PROGRAM	$22.9M
TMI-RELATED	14.1
NEW STARTS	1.0
CONTAINMENT INTERCOMPARTMENT FLOW TESTS	
	$38.0M

SYSTEMS ENGINEERING
FY 1981 TMI-RELATED RESEARCH

PWR TRANSIENTS (SEMISCALE)	$6.5M
BWR TRANSIENTS & PWR BUNDLE BOILOFF (BLOWDOWN/REFLOOD HEAT TRANSFER)	3.0
3-D FLOW DISTRIBUTION	1.5
MODEL DEVELOPMENT EXPTS.	1.0
VALVE TESTING	2.1
IE-REQUESTED STUDY OF RESPONSE CENTER	0.3
TECHNICAL SUPPORT	0.2
	$14.6M

SYSTEMS ENGINEERING RECLAMA

FY 1980

	RES Req.	EDO	RES Reclama
Program Support	$42.3M	$41.3M	$ 1.0M
Equipment	1.7	0.5	--
Personnel	20	20	--

Impact of EDO Mark

Operational Safety

- Defer Preparation for Post Mortem of TMI Class IE Safety Equipment.
- Defer NRC Participation in Program to Test Safety and Relief Valves.
- Defer Study of Accident Instrumentation Technology.

RES Reclama

$ 0.5 - Valve Testing - Lessons Learned Task Force Wants NRC to Participate in Industry Program

$ 0.3 - Evaluate and Plan TMI Post Mortem

$ 0.2 - Begin Accident Instrumentation Study

SYSTEMS ENGINEERING RECLAMA

FY 1981

	RES Req.	EDO	RES Reclama
Program Support	$ 38.0M	$ 35.6M	$ 2.4M
Equipment	2.0	2.0	--
Personnel	22	22	--

Impact of EDO Mark

Operational Safety

- Defer NRC Participation in Industry Program for Safety/Relief Valve Testing
- Defer IE Support on Communications Center and Inspection Instrumentation

RES Reclama

$ 2.1M - Valve Testing - Lessons Learned Task Force Wants NRC to Participate in Industry Program

$ 0.3M - IE Wants RES Survey of Plants to Determine Response Center Requirements.

LOSS OF FLUID TEST (LOFT) PROGRAM DESCRIPTION

($ In Millions)

	FY 1980 Incl. Suppl.	FY 1981 Res. Req.	Change	Comment
Personnel	10	10	--	
Planning & Analysis	$ 3.8M	$ 5.4	$ 1.6	Increased Analysis Costs for More Tests
Fuel	7.5	7.7	0.2	
Operations	9.0	10.6	1.6	Operating Costs of Hot Shop and Hot Cells
Instrumentation	7.9	7.4	- 0.5	
Facility Support	9.9	10.2	0.3	Control Room Diagnostic Eqpt. Plant Mods for Added Tests
Engineering and Physics	6.5	6.7	0.2	
Adv. Fuel Instr.	0.3	0.3	--	
Total Prog. Spt.	$44.9	$48.0	$ 3.1	
Equipment	$ 2.2	$ 2.2	--	

ACRS COMMENTS

LOSS OF FLUID TEST (LOFT)

ACRS: SUPPORT $49.3M RES REQUEST.
RESTORING $1.3M WOULD ACCELERATE TEST PROGRAM.

RES: RES ACCEPTS BRG/EDO MARK OF $48.0M.

RES AGREES THAT $1.3M REDUCTION PROBABLY WILL REDUCE NUMBER OF TESTS IN FY 1981. BUT BECAUSE TEST REORIENTATION IS IN PROGRESS, SPECIFIC CASE FOR ADDED $1.3M CANNOT BE MADE YET.

PROGRAM BREAKDOWN

LOSS OF FLOW TEST (LOFT)

CONTINUATION OF ENDORSED PROGRAM	$19.2M
TMI-RELATED	28.8
NEW STARTS	0
	$48.0M

LOSS OF FLUID TEST (LOFT)

FY 1981 TMI-RELATED RESEARCH

3 OPERATIONAL TRANSIENTS

2 INTERMEDIATE LOCAS — 60% TMI-RELATED

1 LARGE LOCA — $28.8M

DIAGNOSTIC INSTRUMENTATION

LOFT RECLAMA

FY 1980

	RES Req.	EDO	RES Reclama
Personnel	10	9	1

Impact of EDO Mark

Analysis of Significantly Increased Number of Tests Due to TMI Will Lag and Slow NRR Related Activities

RES Reclama

Additional Test Analyst Needed to Analyze Larger Number of Tests.

LOFT TEST PLAN

JULY 1979

FY 1979	
L2-2	Large LOCA (8 Kw/ft.)
L2-3	Large LOCA (12 Kw/ft.)
L3-0	Zero Power Small LOCA
FY 1980	
4	Small LOCA
2	Operational Transient
1	Large LOCA
FY 1981	
3	Operational Transient
2	Intermediate LOCA
1	Large LOCA

SAFETY CONTRIBUTIONS OF LOFT

- Demonstration of ECCS Performance During a Large LOCA.
- Demonstration of ECCS Performance and Other PWR System Behavior During a Small LOCA
- Improved Understanding of PWR Behavior During Anomalous Transients
- Study Effects of Operator Intervention and Recovery Procedures During Small LOCA and Anomalous Transients.
- Study Effectiveness of Alternate ECC Systems During LOCAs.
- Testing of Mechanical Design and Piping Design Codes by Comparison with Actual Behavior During LOCAs and Anomalous Transients.
- Demonstration of Improved Control Room Display and Diagnostic Methods
- Demonstration of Improved Instrumentation for Measuring the Behavior of the Reactor and the Status of Core Cooling During LOCAs and Anomalous Transients.
- Demonstration of Improved In-Service Inspection Techniques for Mechanical Components and Systems.
- Provide Generic Data on Suppression Tank Response During LOCAs.

CODE DEVELOPMENT PROGRAM DESCRIPTION

($ In Millions)

	FY 1980 Incl. Suppl.	FY 1981 Res. Req.	Change	Comment
Personnel	10	11	1	
Systems Codes	$ 6.2	$ 6.3	$ 0.1	Expedite TRAC-BWR
				Accelerate Transient Codes (IRT & ROMONA)
				Develop Fast Running Codes for Small LOCAs and Transients
Component Codes	1.4	1.6	0.2	Expedite Detailed Code (COBRA) and tie to TRAC
TRAC Assessment	4.8	7.3	2.5	Continue TRAC Assessment
				Develop Data Bank on Power Plants
				Apply TRAC to Operating Reactors
Total Prog. Spt.	$12.4	$15.2	$ 2.8	
Equipment	$ 0.2	$ 0.5	$ 0.3	

ACRS COMMENTS

CODE DEVELOPMENT

ACRS: EMPHASIZE USE OF AVAILABLE CODES TO STUDY SMALL LOCAS AND ANOMALOUS TRANSIENTS.

RES: AGREES - PROGRAM BEING REORIENTED THIS WAY.

ACRS: DATA BANK ON OPERATING REACTORS COULD BE DEFERRED FOR HIGHER PRIORITY MATTERS.

RES: DISAGREE - DATA BANK IS TO COLLECT PLANT PARAMETERS FOR INPUT TO SAFETY ANALYSIS CODES. IMPORTANT CAPABILITY FOR NRC RESPONSE IN EVENT OF CRISIS. TAKES 3 TO 6 MONTHS TO GENERATE INPUT DECK. ALSO NEEDED FOR COMPREHENSIVE STUDY OF TRANSIENT BEHAVIOR OF DIFFERENT REACTOR TYPES.

PROGRAM BREAKDOWN

CODE DEVELOPMENT

CONTINUATION OF ENDORSED PROGRAM	$11.2
TMI-RELATED	4.0
NEW STARTS*	0
	$15.2

*TRAC applications to operating reactor problems included in TMI-related research. (Results from request of NRC TMI Special Investigation group.)

CODE DEVELOPMENT

FY 1981 TMI-RELATED RESEARCH

HYBRID CODE DEVELOPMENT	$1.0M
FAST-RUNNING CODE DEVELOPMENT	1.0
DATA BANK	1.0
TRAC APPLICATIONS	1.0
	$4.0M

CODE DEVELOPMENT RECLAMA

	FY 1981		RES
	RES Req.	EDO	Reclama
Program Support	$15.2M	$13.2M	$ 2.0M
Equipment	0.5	0.5	-
Personnel	10	9	1

Impact of EDO Mark

TRAC Assessment and Applications

- Defer Development of Reactor Data Bank to Provide Fast Access to Plant Hardware Data and Other Information Needed for Safety Analyses.
- Defer Use of Fast Running TRAC for Resolving Current Licensing Issues and Exploring Consequences at New Accident Scenarios. Involving Multiple Failures and Operator Actions.

RES Reclama

Data Bank	$ 1.0	- Collect Plant Parameters for Input to Safety Analysis Codes
Code Applications	$ 1.0	- Needed to respond to NRR requests.

Additional Code Analyst Needed for Increased TRAC Code Assessment Effort (If Not Granted in FY 1980)

FUEL BEHAVIOR RESEARCH PROGRAM DESCRIPTION

($ In Millions)

	FY 1980 Incl. Suppl.	FY 1981 Res. Req.	Change	Comment
Personnel	10	10	--	
Clad & Fuel	$ 3.1	$ 2.6	-$ 0.5	Prepare to Examine TMI Fuel Samples
Fuel Codes	1.4	1.5	0.1	Extend Fuel Code Development to Include Degraded Cooling & Higher Temperature Conditions
In-Pile Testing (PBF)	16.3	15.5	- 0.8	Experiments on Fuel Rod Boiling Conditions; Operational Transients; and Reactivity Insertion Accidents
In-Pile Testing (Other)	3.9	4.2	0.3	Full Length Fuel Tests in NRU Plan Essor Tests
Fuel Melt	4.0	4.1	0.1	Fuel Melt, Steam Explosions, Hydrogen Program, Fission Product Release & Transport
Total Prog. Spt.	$28.7	$27.9	-$ 0.8	
Equipment	$ 1.5	$ 1.5		

ACRS COMMENTS

FUEL BEHAVIOR RESEARCH

CLAD AND FUEL, FUEL CODES

ACRS: WORK OF SUBSTANTIAL AID IN REACHING REGULATORY DECISION. IT SHOULD CONTINUE AT CURRENT LEVELS. NRC SHOULD WORK ON MODELLING OF SEVERE OVERHEATING.

RES: AGREE.

IN-PILE TESTING (POWER BURST FACILITY)

ACRS: SUPPORTS AUGMENTATION OF PBF PROGRAM IN FY-80 IN CONTEXT OF NEED FOR PBF TO EMPHASIZE EXPERIMENTS RELATED TO CORE DAMAGE AND TO SMALL AND LARGE SCALE FUEL MELTING.

RES: AGREE.

ACRS: NRR SHOULD RE-EVALUATE REGULATORY REQUIREMENTS FOR RIA.

RES: WILL REVIEW RIA PRIORITY WITH NRR.

ACRS: IF RIA IS UNNECESSARY, PHASE OUT PBF PROGRAM UNLESS IT CAN AID IN STUDY OF FLOW STARVATION AND FUEL MELT ACCIDENTS.

RES: WILL PLAN TESTS REQUESTED BY ACRS IN FY-80, AND WILL RUN THE TESTS IN FY 81-83. IF RIA TESTS ARE NEEDED THEY WILL BE RUN IN FY 80-82.

ACRS COMMENTS

FUEL BEHAVIOR RESEARCH (CONTINUED)

IN-PILE TESTING (OTHER)

ACRS: TERMINATE NRU IN FY 83 AS PLANNED.

RES: AGREE.

ACRS: ESSOR PROGRAM HAS ATTRACTIVE ASPECTS, BUT REVIEW CAREFULLY BEFORE COMMITMENTS.

RES: AGREE.

FUEL MELT

ACRS: AUGMENT RESEARCH ON STEAM EXPLOSION AND CORE RETENTION.

RES: AGREE.

PROGRAM BREAKDOWN

FUEL BEHAVIOR

CONTINUATION OF ENDORSED PROGRAM	$19.9M
TMI-RELATED	8.0
NEW STARTS*	0
	$27.9M

*ESSOR experiments on small break and core boildown included in TMI-related research.

FUEL BEHAVIOR RECLAMA

FY 1980

	RES Req.	EDO	RES Reclama
Personnel	10	9	1

Impact of EDO Mark

New Programs in Coolant Chemistry Will Have Less Than Desirable Direction and RES Will Lack Expertise in Water Chemistry.

RES Reclama

Coolant Chemist Needed to Direct RSR Research on Accident and Safety Related Aspects of Normal Water Chemistry.

FY 1981

	RES Req.	EDO	RES Reclama
Personnel	10	9	1

Coolant Chemist (If Not Granted in FY 80)

FUEL BEHAVIOR
FY 1981 TMI-RELEATED RESEARCH

TMI FUEL EXAMINATION	$0.6M
PBF EXPTS. ON CORE BOILDOWN & COOLABILITY OF DAMAGED CORE	1.6
ESSOR EXPTS. ON SMALL BREAK & CORE BOILDOWN	1.7
FUEL MELT	4.1
	$ 8.0M

PRIMARY SYSTEM INTEGRITY PROGRAM DESCRIPTION

($ In Millions)

	FY 1980 Incl. Suppl.	FY 1981 Res. Req.	Change	Comment
Personnel	8	10	2	
Fracture Mechanics	$ 4.3	$ 5.9	$ 1.6	Improve Piping Integrity Analyses.
				Toughness of Irradiated Weld Metal.
				Pressurized Thermal Shock
				Hydrogen Embrittlement of Steel
Operating Effects	3.3	6.3	3.0	Stress Corrosion Cracking in Piping.
				Degradation of Steam Generators.
				Annealing and Surveillance Dosimetry
				Toughness Loss in Cast Stainless Steel.
Nondestructive Examination	2.0	2.9	0.9	Real-Time, Improved Flaw Detection
				Crack Monitoring in Hydrotest.
Total Prog. Spt.	$ 9.6	$15.1	$ 5.5	
Equipment	$ 1.1	$ 1.6	$ 0.5	Equipment for Pressurized Thermal Shock Tests

ACRS COMMENTS

PRIMARY SYSTEM INTEGRITY

FRACTURE MECHANICS

ACRS: AGREE WITH RES PROGRAM.

OPERATING EFFECTS

ACRS: LIMIT STEAM GENERATOR EXAMINATION TO CORRELATION BETWEEN NDE INDICATIONS AND TUBE INTEGRITY UNTIL CAREFUL STUDY HAS INDICATED THE POSITIVE CONTRIBUTION TO BE MADE BY ADDITIONAL WORK.

RES: NO IMPACT ON FY 1981 BUDGET; RES WILL DISCUSS WITH ACRS AGAIN NEXT YEAR IN CONJUNCTION WITH FY 1982 REVIEW.

ACRS: BROADEN BWR PIPE-CRACKING RESEARCH TO INCLUDE PWR's AND WATER CHEMISTRY LIMITS.

RES: AGREE.

NON-DESTRUCTIVE EXAMINATION

ACRS: IMPORTANT TOPIC. AGREE WITH BUDGET, BUT RES/NRR COORDINATION SHOULD IMPROVE.

RES: AGREE.

PROGRAM BREAKDOWN

PRIMARY SYSTEMS INTEGRITY

CONTINUATION OF ENDORSED PROGRAM	$9.4M
TMI-RELATED	1.6
NEW STARTS	4.1
STRESS CORROSION CRACKING & BWR PIPING REQUESTED BY ACRS	$2.4
INTERACTIVE PIPING CODE - RESULTING FROM PIPEWHIP USER ENDORSEMENT	1.5
TOUGHNESS IN CAST STAINLESS STEEL - RESEARCH NEEDED TO EXPLORE IN-SERVICE DEGRADATION OF EXISTING VALVE CASTINGS	0.2
	$15.1

PRIMARY SYSTEM INTEGRITY

FY 1981 TMI-RELATED RESEARCH

PRESSURIZED THERMAL SHOCK	$1.0M
HYDROGEN EMBRITTLEMENT	0.4
REQUALIFICATION AFTER ACCIDENTS	0.2
	$1.6M

PRIMARY SYSTEM INTEGRITY RECLAMA

FY 1981

	RES Req.	EDO	RES Reclama
Personnel	10	9	1

Impact of EDO Mark

Nondestructive Examination Programs will Have Undesirably Low Level of Direction

RES Reclama

Metallurgical Engineer to Direct Expanding Number and complexity of nondestructive Examination Research Programs

FAST BREEDER REACTORS PROGRAM DESCRIPTION

($ In Millions)

	FY 1980 Incl. Suppl.	FY 1981 Res. Req.	Change	Comment
Personnel	11	15	4	
Analysis	$ 5.4	$ 7.8	$ 2.4	Delineate Accident Sequences per ACRS Request
Safety Test Facility Studies	0	0.7	0.7	Define Requirements for New Facilities to Test Natural Circulation
Materials Interaction	2.8	4.6	1.8	Test Failed Fuel Behavior Models Needed for Licensing Evaluation.
Aerosol Release and Transport	2.2	3.0	0.8	Complete Tests of Source from CDA; Initiate Non-CDA Source Tests
System Integrity	3.3	6.0	2.7	Qualify CONTAIN code.
				Perform Larger Scale Fuel Melt Tests
Total Prog. Spt.	$13.7	$22.1	$ 8.4	
Equipment	$ 0.8	$ 2.1	$ 1.3	

ACRS COMMENTS

ADVANCED REACTORS SAFETY RESEARCH

ACRS: "THE ACRS REITERATES ITS CONVICTION THAT AN ADVANCED REACTOR RESEARCH PROGRAM SHOULD BE CARRIED ON."

"THE COMMITTEE ENDORSES THE LEVEL OF $22.1 MILLION FOR FAST REACTORS, AND $3.9 MILLION FOR ADVANCED CONVERTERS FOR FY 1981..."

ADDITIONAL EMPHASIS SHOULD BE GIVEN TO INVESTIGATION OF A BROAD SPECTRUM OF ACCIDENTS.

RES: AGREES.

FAST BREEDER REACTORS RECLAMA

FY 1981

	RES Req.	EDO (Set Aside)	RES Reclama
Program Support	$22.1M	$15.0M	$7.1M
Equipment	2.1	1.0M	1.1
Personnel	15	12	3

Impact of EDO Mark

- Built-in Growth In Current Programs Cannot be met at $15M Level
- Will Have to Shut Down Aerosol Test Facilities at ORNL.
- Will Have to Shut Down Th-H Facility at BNL
- Suspend High Temperature Material Tests at Sandia
- Cannot Meet ACRS Recommendation to Broaden Program.

RES Reclama

DOE Plans $500M Yearly FBR Program
Three ACRS Recommendations Give Rise to Need for Extensive New Work:

- Analyze Accidents Over a Broad Spectrum Events, Do Not Focus on CDA.
- Determine the Need for a New Facility to Test Capability For Natural Circulation
- Review Fuel Testing Capabilities to Define Additional Testing Needs.

ADVANCED CONVERTER REACTORS PROGRAM DESCRIPTION

($ In Millions)

	FY 1980 Incl. Suppl.	FY 1981 Res. Req.	Change	Comment
Personnel	0*	3	3	
Program Support	$ 0*	$ 3.9	$ 3.9	Graphite Core Support Block Surveillance Tests and Convective Plume Heat Transfer Tests in Support of Ft. St. Vrain .
Equipment	0	0.4	0.4	

*Current Congressional Action Identifies $3.7M to "Accelerate" GCR Effort in FY 80. This Program Requires Maintaining Three Staff Positions from FY 1979.

ADVANCED CONVERTER REACTORS RECLAMA

FY 1981

	RES Req.	EDO	RES Reclama
Program Support	$ 3.9M	$ 3.9M	$ 0.0
Equipment	0.4	0.4	0.0
Personnel	3	3	0

Impact of EDO Mark

Should the Program be Funded?

- Strong Support for Gas-Cooled Reactors in Congress
- User-Need Drafted to Support Near Term Ft. St. Vrain Program
- ACRS Recommends Continuing Current Program Plus Initiation of Scoping Studies on GCR Safety for Direct Cycle and Breeder.
- If No Funding Identified, and Congress Continues GCR Program into FY 1981, Other NRC Programs Suffer

FY 80 SUPPLEMENT REQUEST
BUDGET SUMMARY

	($ Million)
Better Understanding of Transient and Small LOCA Accidents	$ 13.4
Enhanced Operator Capability	3.6
Plant Response Under Accident Conditions	5.1
Post Mortem Examination and Plant Recovery	2.1
Improved Risk Assessment	3.1
Improved Reactor Safety	1.7
	$ 29.0
Waste Management	3.0
	$ 32.0

BETTER UNDERSTANDING OF TRANSIENT AND SMALL LOCA ACCIDENTS

	($Million)
Modifications and Checking of Existing Codes to Improve Their Capability to Handle Anomalous Transient, Natural Circulation and Small LOCA Accidents in PWRs and BWRs; Application of These Codes to Better Define and Understand Behavior of Reactors Under These Conditions	$ 3.1
Upgrade Semiscale to Study PWR Transients	3.0
Upgrade TLTA to Study BWR Transients and Small LOCA	2.2
Modify LOFT to accelerate Small LOCA Tests	1.0
Separate Effects and Thermal-Hydraulic Tests	1.3
Coolability of Severely Damaged Cores; Release and Transport of Fission Products	2.4
Establish Data Bank for Each Operating Reactor for NRC Calculations	0.4
	$ 13.4

ENHANCED OPERATOR CAPABILITY

	($ Million)
Develop Improved Control Room Display and Diagnostic Systems and Improved Requirements for Operator Training Simulators	$ 1.8
Develop Instrumentation Needs and Improved Status Monitoring of ESFs.	1.0
Define Data Transmission Requirements and Review Accident Response Procedures	0.8
	$ 3.6

PLANT RESPONSE UNDER ACCIDENT CONDITIONS

	($ Million)
Improved Understanding of Coolant Chemistry after Fuel Failure; Better Sampling Methods	$ 0.5
Hydrogen Behavior in Coolant and Containment; Effect of Hydrogen Explosions	1.2
Response of Plant Equipment and Structures to Accident Conditions	2.1
Potential Design Improvements for Maintaining Containment Integrity Under Fuel Melt Conditions	0.5
Benchmark Testing of Structural and Piping System Analysis Codes	0.8
	$ 5.1

POST MORTEM EXAMINATION AND PLANT RECOVERY

	($ Million)
Examine Samples of TMI Damaged Fuel	$ 1.0
Measure Fission Product Chemistry and Plateout Data	0.6
Post Mortem of TMI Safety Related Equipment and Establish Requalification Criteria	0.5
	$ 2.1

IMPROVED RISK ASSESSMENT

	($ Million)
Develop Event Trees of Accidents Leading to Severe Core Damage and Assess Site Specific Accident Consequences	$ 1.4
Analysis of Human Error Rates and Impacts of Human Errors on Risk	1.2
Operational Failure Data Analysis	$ 0.5
	$ 3.1

IMPROVED REACTOR SAFETY

	($ Million)
Improved Containment Concept	$ 0.5
Improved Safety Systems for Coping with Accidents Involving Severely Damaged Fuel	1.0
Improved Value/Impact Methodology	0.2
	$ 1.7

NUCLEAR REGULATORY COMMISSION

FY 1981 BUDGET REQUEST

PROBABILISTIC ANALYSIS STAFF

RISK ASSESSMENT

	FY 1980 INCL. SUPPL.	FY 1981 RES REQ	Δ	COMMENT
PERSONNEL	30	33	3	
METHODOLOGY DEVELOPMENT	1.7	2.5	0.8	IMPROVE TOOLS FOR RELIABILITY AND RISK PREDICTION
REACTOR SYSTEMS AND LICENSING SUPPORT	2.7	3.6	0.9	DEVELOP RISK-BASED INSIGHTS FOR LICENSING
NUCLEAR FUEL CYCLE RISK	1.1	2.0	0.9	SUPPORT DEVELOPMENT OF LICENSING CRITERIA FOR WASTE DISPOSAL
TRAINING	0.1	0.1	-0-	IMPROVED COURSE FOR LINE OFFICE PERSONNEL
RELIABILITY DATA ANALYSIS	2.6	2.6	-0-	DETERMINE LIKELIHOOD OF HUMAN ERRORS AND EQUIPMENT FAILURES
ACCEPTABLE RISK CRITERIA	0.2	0.3	0.1	RESEARCH BASES FOR CRITERIA

8230090

RISK ASSESSMENT (CONT.)

	FY 1980 INCL. SUPPL.	FY 1981 RES REQ	Δ	COMMENT
IMPROVE WASH-1400	0.1	0.3	0.2	IMPACT OF IMPROVED METHODS AND DATA
SUBTOTAL: RES	8.5	11.4	2.9	
OPERATIONAL SAFETY DATA ANALYSIS	0.5	1.2	0.7	KICK OFF NEW OPERATIONS EVALUATION GROUP, NOT FOR RES
GRAND TOTAL	9.0	12.6	3.6	

RISK ASSESSMENT

REACTOR SYSTEMS AND LICENSING SUPPORT

	FY 80	FY 81	FY 82	FY 83
PROGRAM SUPPORT (MILLIONS)	2.7	3.6	3.5	2.4

OBJECTIVE: APPLY TECHNIQUES OF ACCIDENT SEQUENCE ANALYSIS, SYSTEM RELIABILITY ANALYSIS, AND RISK ASSESSMENT AS NEEDED.

CONTENT:

1. DEVELOP ACCIDENT SEQUENCES AND RELIABILITY MODELS FOR OPERATING REACTOR PLANTS IN SUPPORT OF TASKS 3-5 BELOW.
2. IDENTIFY ACCIDENT SEQUENCES LEADING TO SEVERE CORE DAMAGE.
3. RESOLVE SELECTED GENERIC ISSUES
   - STATION BLACKOUT TAP-A-44
   - DC POWER A-30
4. DEVELOP IMPROVEMENTS TO SINGLE FAILURE CRITERION.
5. COMPLETE EXTENSION OF WASH-1400 TO 4 OTHER PLANTS.

REACTOR SYSTEMS AND LICENSING SUPPORT (CONT'D)

6. RISK ASSESSMENT FOR TRANSPORT ACCIDENTS NEAR PLANTS.

7. REVIEW FROM A QUANTITATIVE RISK ASSESSMENT VIEWPOINT.
   - R^3C CATEGORY II ITEMS
   - SEP PLAN
   - CONTENT OF TECHNICAL SPECIFICATIONS.

RISK ASSESSMENT
METHODOLOGY AND SOFTWARE DEVELOPMENT

	FY '80	FY '81	FY '82	FY '83
REQ PROGRAM SUPPORT (MILLIONS)	1.7	2.5	2.6	1.8

OBJECTIVE: DEVELOP IMPROVED TOOLS FOR RELIABILITY DATA ANALYSIS, SYSTEM RELIABILITY PREDICTION, HUMAN RELIABILITY PREDICTION, AND RISK ASSESSMENT.

CONTENT:

1. IMPROVE CONSEQUENCE MODEL
   - LIQUID PATHWAYS RESEARCH
   - SITE-SPECIFIC CAPABILITY
   - SENSITIVITY ANALYSIS
   - GUIDANCE FOR EMERGENCY PLANNING
2. FIRE RISK MODEL
3. IMPROVED CORE MELT MODELING
4. FLOOD MODELS
   - RIVER SITES
   - IN-PLANT SYSTEMS ANALYSIS
5. METHODS TO SELECT LIMITING CONDITIONS OF OPERATION

RISK ASSESSMENT

RELIABILITY AND HUMAN ERROR DATA ANALYSIS

	FY '80	FY '81	FY '82	FY '83
PROGRAM SUPPORT (MILLIONS)	2.6	2.6	2.4	1.9

OBJECTIVE: IMPROVE THE DATA BASE FOR RELIABILITY ANALYSIS AND RISK ASSESSMENT.

CONTENT:

1. HUMAN ERROR RATE RESEARCH
   - DATA COLLECTION: LER'S, PLANT LOGS AND INTERVIEWS, SIMULATOR EXPERIENCE
   - ANALYSIS - CODES AND DATA BANK
   - MODEL DEVELOPMENT - PREDICTION HANDBOOK

2. EQUIPMENT FAILURE DATA
   - ACTIVE COMPONENT DATA COLLECTION: LER'S AND PLANT LOGS
   - ANALYSIS: DATA BANK, TREND ANALYSIS, SPOT BAD ACTORS
   - PIPING AND PASSIVE FAILURE ANALYSIS

3. MEMBERSHIP IN UKAEA SYSTEMS RELIABILITY SERVICE

RISK ASSESSMENT

NUCLEAR FUEL CYCLE RISK

	FY '80	FY '81	FY '82	FY '83
REQ PROGRAM SUPPORT (MILLIONS)	1.1	2.0	1.8	1.3

OBJECTIVE: IDENTIFY THE KEY DETERMINANTS OF WASTE DISPOSAL RISKS, DEVELOP METHODOLOGY TO EVALUATE WASTE REPOSITORY SAFETY, AND ASSIST IN THE FORMULATION OF REGULATORY REQUIREMENTS.

CONTENT:

- DEVELOP METHODOLOGY FOR WASTE ISOLATION RISK ASSESSMENT
- EVALUATE SPENT FUEL ISOLATION ALTERNATIVES
- SCENARIO DEVELOPMENT FOR WASTE REPOSITORIES
- DYNAMIC SIMULATION OF WASTE/ROCK PROCESSES
- WASTE MANAGEMENT OF RADIOACTIVE GASES
- EVALUATE DECONTAMINATION ALTERNATIVES

ACRS COMMENTS

RISK ASSESSMENT

BUDGET

"THE ACRS STRONGLY SUPPORTS THE REQUESTED FUNDING LEVEL OF $12.6 MILLION" - NUREG-0603

COMMENTS

- ACRS URGES HIGH PRIORITY FOR:
  - ACCEPTABLE RISK CRITERION
  - FLOOD RISK ANALYSIS
  - HUMAN ERROR STUDIES
  - TRAINING LINE-OFFICE PERSONNEL
  - DATA COLLECTION ON TIME-DEPENDENT FAILURES
  - REALISTIC ACCIDENT RELEASE PREDICTIONS FOR EMERGENCY PLANNING
- RES: AGREES
- ACRS SUGGESTS LOWER PRIORITY FOR:
  - CLASS 3-8 ACCIDENT RISK ASSESSMENT
  - FUEL CYCLE RISK
- RES:
  - AGREES ON CLASS 3-8
  - SLIPPED SCHEDULE ON WASTE DISPOSAL RESEARCH COULD LEAVE NRC UNPREPARED TO LICENSE REPOSITORY

RISK ASSESSMENT

FY '80 (IN MILLIONS)

	RES REQ	EDO	RES RECLAMA
PROGRAM SUPPORT	9.0	9.0	-0-
PERSONNEL	70	26	4
EQUIPMENT	-0-	-0-	---

IMPACT OF EDO MARK:

THE EDO INCREASE OF 3 IS EARMARKED FOR RES SATELLITE OPERATIONS EVALUATION GROUP. PAS THUS GETS NO INCREASE ABOVE FY 80 FOR RISK ASSESSMENT STAFF.

REASON FOR RECLAMA:

- ACRS URGES MORE RESEARCH AND LICENSING APPLICATIONS
- REQUESTED PERSONNEL LEVEL IS NEEDED BECAUSE PROGRAM SUPPORT IS DOUBLED
- RISK ASSESSMENT APPLICATIONS ARE CONSTRAINED BY NUMBER OF TRAINED PRACTITIONERS

RISK ASSESSMENT

FY '81 (IN MILLIONS)

	RES REQ.	EDO	RES RECLAMA
PROGRAM SUPPORT	12.6*	9.0	3.6*
PERSONNEL	33	26	7
EQUIPMENT	-0-	-0-	-0-

* INCLUDES 1.2 M FOR CENTRAL OPERATIONS EVALUATION GROUP

IMPACT OF EDO MARK

- UNDERSTAFFING PROBLEMS (SEE FY '80)
- PROBLEMS DELAYED
  - ACCIDENT SEQUENCES AND RELIABILITY MODELS FOR OPERATING PLANTS
  - EQUIPMENT FAILURE DATA ANALYSIS
  - WASTE ISOLATION STUDIES
  - RESEARCH ON ACCEPTABLE RISK CRITERION
  - IMPROVEMENTS TO WASH-1400
- PROGRAMS DELETED
  - FUNDS INTENDED FOR CENTRAL OPERATIONS EVALUATION GROUP
  - RISK ASSESSMENT FOR TRANSPORTATION ACCIDENTS NEAR REACTOR PLANTS

RISK ASSESSMENT

FY '81 (IN MILLIONS)

RES RECLAMA

- THE VITALLY NEEDED PROGRAMS TO EVALUATE ACCIDENT SEQUENCES AND RELIABILITY MODELS FOR OPERATING PLANTS MUST BE ACTIVELY PURSUED TO IMPROVE NRC'S LICENSING PROCESS AS URGED BY ACRS AND LEWIS GROUP.

- NEED TO CONTINUE PROGRAM SUPPORT FOR NRC OPERATIONS EVALUATION FUNCTION WHICH WILL BE INITIATED IN FY 1980, INCLUDING ANALYSIS OF EQUIPMENT FAILURE DATA.

- WASTE ISOLATION STUDIES SHOULD KEEP PACE WITH NMSS NEEDS.

- RESEARCH TO DEFINE ACCEPTABLE RISK CRITERIA IS BEING STRONGLY SUPPORTED BY ACRS, EPA AND OTHERS.

- THE NRC IS COMMITTED TO MAKE TIMELY IMPROVEMENTS IN WASH-1400

IMPROVED REACTOR SAFETY

	FY 1980 INCL. SUPPL.	FY 1981 RES REQ	Δ	COMMENT
PERSONNEL	3	4	1	
IN PLANT ACCIDENT RESPONSE	2.1	2.7	0.6	REDUCE HUMAN CONTRIBUTION TO RISK
ALTERNATE CONTAINMENT+	0.6	0.8	0.2	VENTED AND OTHER CONCEPTS
ALTERNATE DECAY HEAT REMOVAL	0.4	0.4	-0-	INCREASE RELIABILITY
ALTERNATE ECCS	0.3	1.0	0.7	IMPROVE CORE-COOLING CAPABILITY
ADVANCED SEISMIC DESIGN	0.3	1.0	0.7	ABSORB ENERGY OR ISOLATE
SCOPING STUDIES	0.4	0.4	-0-	INVESTIGATE OTHER IRS CONCEPTS
VALUE/IMPACT METHODOLOGY	0.3	0.3	-0-	DEVELOP IMPROVED METHODOLOGY
TOTAL ($M)	4.4	6.6	2.2	

IMPROVED REACTOR SAFETY

HUMAN INTERACTION

	FY 1980	FY 1981	COMMENT
HUMAN ERROR SENSITIVITY STUDY	0.2	0.0	IDENTIFY MOST SIGNIFICANT CONTRIBUTORS
ACCIDENT INFORMATION DISPLAY & DIAGNOSTICS	0.8	1.0	COMPUTER-AIDED DISTURBANCE ANALYSIS
IMPROVED ACCIDENT INSTRUMENTATION	0.4	0.4	STUDY INSTRUMENTS NEEDED TO FOLLOW REACTOR ACCIDENTS
IMPROVED SIMULATOR CAPABILITY	0.3	0.6	DEVELOP REQUIREMENTS TO SIMULATE ACCIDENTS BEYOND DBA
IMPROVED ENGINEERED SAFETY FEATURES (ESF) RELIABILITY	0.2	0.5	DEVELOP REQUIREMENTS FOR AUTOMATED STATUS OF ESF OPER-OPERABILITY
ACCIDENT DATA INFORMATION	0.2	0.2	DEVELOP REQUIREMENTS FOR DATA TO MEET EXTERNAL NEEDS
TOTAL	2.1	2.7	

ACRS STRONGLY SUPPORTS RESEARCH
ON IMPROVED REACTOR SAFETY

NUREG-0496 (DECEMBER 1978)

"HIGH PRIORITY"

"DELAY IN INITIATING AND IMPLEMENTING IS UNFORTUNATE"

MAY 16, 1979 LETTERS TO NRC

EXPLICIT RECOMMENDATIONS FOR INDIVIDUAL PROJECTS AND TIMING

"GREATER SENSE OF URGENCY"

MORE "EXPLORATORY RESEARCH"

NUREG-0603 (JULY 1979)

RESTORATION OF FY 1980 SUPPLEMENT IS "ESSENTIAL"

"URGES STRONGLY" FULL REQUEST FOR FY 1981

IMPROVED REACTOR SAFETY

SET-ASIDE ISSUE

	FY 1980 (INCL. SUPPL.)		
	RES REQ	EDO	Δ
PERSONNEL	3	1(3)	2
PROGRAM SUPPORT	4.4	1.0(4.4)	3.4

	FY 1981		
	RES REQ	EDO	–
PERSONNEL	4	0(4)	4
PROGRAM SUPPORT	6.6	0.0(6.6)	6.6

SET-ASIDE ISSUE

OMB QUESTIONS NRC INVOLVEMENT IN "RESEARCH AND DEVELOPMENT"

RES RECLAMA

- NOT DEVELOPMENTAL ENGINEERING
- ESSENTIAL TO FORMULATION OF NEW SAFETY REQUIREMENTS
  - LONG TERM LESSONS LEARNED
- ACRS SUPPORT
- COORDINATION WITH DOE, INDUSTRY R&D

NUCLEAR REGULATORY COMMISSION

FY 1981 BUDGET REQUEST

DIVISION OF SAFEGUARDS, FUEL CYCLE

AND ENVIRONMENTAL RESEARCH

WASTE MANAGEMENT PROGRAM DESCRIPTION

(IN MILLIONS)

	FY80	FY81	CHANGE	COMMENT
PERSONNEL	12	18	6	
HIGH LEVEL	$ 5.0	$ 7.3	$+2.3	INCREASED EFFORTS ON WASTE FORM BEHAVIOR, AND SITE PROPERTIES
LOW LEVEL	3.2	5.4	+2.2	ADDRESSES IMPROVEMENTS IN MONITORING TECHNIQUES AND SITING EVALUATION
MILL TAILINGS	1.5	2.1	+0.6	ASSESSMENT OF IMPROVED STABILIZATION METHODS
TOTAL PROG. SPT.	$ 9.7	$14.8	$ 5.1	
EQUIPMENT	0.9	1.0	1.0	

WASTE MANAGEMENT

ACRS COMMENTS

GENERAL COMMENTS	RESPONSE
NEED TO DEFINE GOALS. . . ESTABLISH PRIORITIES. . . IMPROVE COMMUNICATIONS. . . INCREASE PERSONNEL ASSIGNED. . . DEVELOP CRITERIA. . .	AGREE - WMRG IS NOW FUNCTIONAL - NMSS CRITERIA EMERGING TO FORM BASIS FOR PRIORITIES FY80 SUPPLEMENT AND '81 REQ WILL PROVIDE INCREASED EMPHASIS NEEDED
NEED RESEARCH ON GROUND WATER HYDROLOGY (CORE MELT ACCIDENT) . . . ON GASEOUS WASTES . . .	AGREE - HYDROLOGY PROGRAM IN PAS WILL BE BETTER COORDINATED WITH PRESENT HYDROLOGY EFFORTS. DOE HAS MAJOR ($7M) IMMOBILIZATION PROGRAM FOR GASEOUS WASTES TO COMPLETE 1984. SAFER WILL FOLLOW WORK CLOSELY.
HIGH LEVEL WASTES	
NEED INCREASED ATTENTION TO GEOLOGY. . . GEOCHEMISTRY . . . AND GEOTECHNICAL ENGINEERING	AGREE - NEED WILL BE MET BY ADDITION OF STAFF TECHNICAL SPECIALISTS AND ADDITIONAL CONTRACT RESEARCH IN FY80 AND '81.
LOW LEVEL WASTES	
INCREASED RESEARCH ON VOLUME REDUCTION METHODS . . . FUNDING INADEQUATE. . .	NRC, EPA, NIH EXCHANGE INFORMATION AND GIVE ADVICE TO DOE. RES PROJECT PLANNED IN 1980 SUPPLEMENT TO REDUCE DISPOSAL VOLUMES FROM TLD.

LOW LEVEL WASTES	RESPONSE
STUDY OF ALTERNATIVES TO SHALLOW LAND BURIAL HAS NOT BEEN FUNDED	1980 SUPPLEMENT HAS $400K TO START THIS WORK.
DECOMMISSIONING AND LONG TERM CARE	THIS IS CURRENTLY BEING INITIATED UNDER SITE SUITABILITY STUDIES INCLUDING WEST VALLEY AND MAXEY FLATS FIELD WORK - WESTERN SITE STUDIES PLANNED.
METHODS. . . INCINERATION AND ACID DIGESTION. . . REDUCE VOLUMES OF WASTES	WITH NIH WILL SPONSOR PROGRAM ON INCINERATION IN '79 PLANNING JOINT DATA BASE, FIELD WORK, MODELING EFFORT REVIEW WITH EPA, USGS, NIH AND DOE
NEED DEVELOPMENT OF EQUIPMENT FOR ASSAY OF WASTE PACKAGES. . .	AGREE - DEFINITION OF PROGRAM SUBJECT TO FUNDING PRIORITIES.

WASTE MANAGEMENT RECLAMA

FY31
(IN MILLIONS)

	FY80	FY81 EDO	FY31	CHANGE
PERSONNEL	12	15	18	3
PROGRAM SUPPORT				
HIGH LEVEL	$5.0	$6.6	$7.3	$+ 0.7
LOW LEVEL	3.2	4.6	5.4	+ 0.8
TAILINGS	1.5	1.7	2.1	+ 0.4
TOTAL PROG. SPT.	$9.7	$12.9	$14.8	$+ 1.9
EQUIPMENT	0.9	1.0	1.0	0

$3.0 FY80 SUPPLEMENT PERMITS ACCELERATION OF ASSESSMENT METHODS FOR WASTE FORM STABILITY, BORE HOLE SEALING, LOW LEVEL SITE ASSESSMENT AND MILL TAILINGS STABILIZATION.

$1.9 RECLAMA IN FY81 WILL MAINTAIN PACE OF THESE, AND PERMIT TIMELY RESPONSE TO IRG AND DOE DISPOSAL INITIATIVES.

REACTOR ENVIRONMENTAL EFFECTS PROGRAM DESCRIPTION

(IN MILLIONS)

	FY80	FY31	CHANGE	COMMENT
PERSONNEL	6	10	4	
PHYSICAL TRANSPORT	$1.7	$ 2.1	$ 0.4	MECHANISMS OF PHYSICAL TRANSPORT OF EFFLUENTS
ECOLOGICAL PROCESSES	0.1	0.6	0.5	BIOENVIRONMENTAL PATHWAYS AND ACCUMULATIONS
RAD DOSIMETRY AND EFFECTS	0.4	1.2	0.8	EFFECTS OF ACCIDENT RELATED ACUTE RADIATION EXPOSURE
ECOLOGICAL IMPACTS	0.5	1.7	1.2	NPP IMPACT ON FISHERIES AND AQUATIC SYSTEMS
SOCIOECONOMICS AND REGIONAL	0.8	1.2	0.4	LAND VALUE AND USE, SITE SELECTION AND PREPAREDNESS PLANNING - FEDERAL AND STATE LEVEL
OCCUPATIONAL RAD. EXPOSURE	0.3	1.1	0.3	NPP OCCUPATIONAL RAD EXPOSURE
EFFLUENT CONTROL	0.5	1.0	0.5	SYSTEMS CLEAN UP TO REDUCE SOURCE TERMS GASEOUS, LIQUID AND SOLID.
DECOMMISSIONING	0.2	0.9	0.7	REACTOR DECOMMISSION METHODS ASSESSMENT
TOTAL PROG. SPT.	$4.5	$ 9.8	$ 5.3	
EQUIPMENT	0.4	0.5	0.1	

REACTOR ENVIRONMENTAL EFFECTS

ACRS COMMENTS

ACRS	RESPONSE
o IDENTIFY AND CONTROL SOURCES OF RADIATION IN NPP'S AND TO NOTE EFFECTS OF,E.G., LOAD FOLLOWING ON RAM BUILDUP o DEVELOP IMPROVED CONTROL SYSTEMS FOR RAM REMOVAL FROM PRIMARY COOLANT o CONFIRM IMPROVED DECONTAMINATION PROCEDURES FOR FAILED EQUIPMENT TO REDUCE OCCUPATIONAL EXPOSURES	SOME PROJECTS UNDERWAY TO DEFINE RAM DISTRIBUTION IN NPP - MAJOR RESPONSIBILITY IS INDUSTRY'S IF GIVEN OCCUPATIONAL ALARA GUIDANCE. MAJOR DOE PROGRAMS UNDERWAY TO REPORT IN 1981. SAFER WILL CONTINUE CLOSE CONTACT WITH THESE PROGRAMS
DEVELOP IMPROVED INSTRUMENTATION TO MEASURE RELEASES UNDER ACCIDENT CONDITIONS	PROJECT IS INCLUDED IN FY80 SUPPLEMENT
EVALUATE DESIGNS TO FACILITATE DECONTAMINATION, METHODS FOR RECOVERY OF LAND, DOSE LIMITS FOR RE-ENTRY INTO EVACUATED AREAS	AGREE - WILL DEVELOP PROGRAM IN FY80 AS LOGICAL FOLLOW ON TO ECOLOGICAL PROCESSES RESULTS.

REACTOR ENVIRONMENTAL EFFECTS

ACRS COMMENTS

ACRS	RESPONSE
CONSIDER REDUCING SUPPORT FOR APPENDIX I VALIDATION, ECOLOGICAL SOCIOECONOMIC AND REGIONAL IMPACTS APPLY GREATER EFFORT TO ESTABLISHING PRIORITIES FOR RESEARCH IN THESE AREAS DEVELOP BETTER PROCEDURES FOR IDENTIFYING AND SELECTION OF PROJECTS TO BE FUNDED	ACRS SUPPORT OF BRG MARK OF 6.2M$ WOULD ALLOW ACCOMPLISHMENT OF REACTOR SAFETY ITEMS THEY RECOMMEND. HOWEVER, APPENDIX I, ECOLOGICAL AND SOCIOECONOMIC PROJECTS ARE IN DIRECT RESPONSE TO USER NEEDS FOR NEPA COMPLIANCE WHICH RES CONSIDERS VALID. BRG MARK WILL NOT ALLOW ACCOMPLISHMENT OF REQUIRED 1981 PROGRAM.

REACTOR ENVIRONMENTAL RECLAMA

FY81

(IN MILLIONS)

	EDO	COMM REQ	CHANGE EDO	COMMENT
PERSONNEL	7	10	3	
PHYSICAL TRANSPORT	$1.7	$ 2.1	$0.4	STUDY DATA LINK FOR MONITORING ACCIDENT RELEASES TO ENVIRONS
ECOLOGICAL PROCESS	0.4	0.6	0.2	FATE OF RADIONUCLIDES IN ACCIDENT RELEASES IN RIVERS
RAD DOSIMETRY & HEALTH	0.9	1.2	0.3	ACCIDENT EFFECTS OF AEROSOL INHALATION
ECOLOGICAL IMPACTS	0.9	1.7	0.8	INCREASD EMPHASIS ON IMPACT OF EFFLUENTS ON WATER AND FISHERIES
SOCIOECONOMICS & REGIONAL	0.6	1.2	0.6	EMERGENCY PREPAREDNESS AND REGIONAL SITING IN NEW ENGLAND
OCCUPATIONAL EXPOSURES	0.4	1.1	0.7	FULLER INVESTIGATION OF EXPOSURE OF NPP WORKERS
EFFLUENT CONTROL	0.8	1.0	0.2	PERFORMANCE OF NPP CLEANUP SYSTEMS
DECOMMISSIONING	0.5	0.9	0.4	BROADER STUDY AND TEST OF DECOMMISSIONING METHODS
TOTAL PROG. SPT.	$6.2	$9.8	$3.6	
EQUIPMENT	0.3	0.5	0.2	

FUEL CYCLE AND ENVIRONMENTAL PROGRAM DESCRIPTION

($ IN MILLIONS)

	FY80	FY81	CHANGE	COMMENT
PERSONNEL	6	7	1	
EFFLUENT CONTROL	$0.3	$0.3	$0	- GASEOUS, LIQUID EFFLUENT CONTROL SYSTEM PERFORMANCE
SAFETY SYSTEMS	1.0	1.3	0.3	- ACCIDENT AEROSOLS, CRITICALITY
OCCUPATIONAL/HEALTH	1.1	1.2	0.1	- RESPIRATORY PROTECTION, DOSIMETRY
ENVIRONMENTAL IMPACTS	0.1	0.1	0	- PATHWAYS TO MAN
TRANSPORTATION	1.2	1.5	0.3	- MODAL STUDY OF RAM TRANSPORTATION
DECOMMISSIONING	0.1	0.6	0.5	- RESIDUAL CONTAMINATION - LEVELS AND CHARACTERISTICS
TOTAL PROG. SPT.	$3.8	$5.0	$1.2	
EQUIPMENT	0.2	0.2	0	

FUEL CYCLE

ACRS COMMENTS

ACRS	RESPONSE
RESEARCH ON REMOVAL, CONFINEMENT AND LONG TERM STORAGE OF GASEOUS WASTES SHOULD BE BETTER ADDRESSED	AGREE - WILL INITIATE PROJECT ON COLLECTION INTERIM STORAGE AND TRANSPORT OF Kr-85, I-129, C-14 AND H-3 IN FY80
RESEARCH SHOULD BE CARRIED OUT ON DECORPORATION OF INTERNALLY DEPOSITED RADIONUCLIDES	AGREE - WILL SEEK EARLIER USER ENDORSEMENT OF PROJECT ORIGINALLY SCHEDULED FOR FY82
RESEARCH ON SPENT FUEL HANDLING, STORAGE AND RETRIEVAL SEEMS INADEQUATE	DISAGREE - GEIS AND HISTORY INDICATES LOW RISK OPERATION. CRITICALITY WORK ON DENSIFIED STORAGE COMPLETE

SAFEGUARDS PROGRAM DESCRIPTION

(IN MILLIONS)

	FY80	FY81	CHANGE	COMMENT
PERSONNEL	8	8	0	
EFFECTIVENESS EVALUATION	$3.2	$2.4	$-0.8	MODIFY AND TEST MODELS TO UPGRADE RULES
INSPECTION METHODS	0.8	0.5	-0.3	DEVELOP METHODS, PROCEDURES FOR FIELD EVALUATION AND INSPECTION OF PHYSICAL PROTECTION SAFEGUARDS
ALTERNATIVE STRATEGIES	1.0	2.8	+1.8	o INTEGRATED RULE DEVELOPMENT o FUEL FACILITY DESIGN CRITERIA o ADVERSARY AND THREAT ANALYSIS
TOTAL PROG. SPT.	$5.0	$5.7	$ 0.7	
EQUIPMENT	0.1	0.1	0	

SAFEGUARDS
ACRS COMMENTS

ACRS	RESPONSE
STUDY OF SAFEGUARDS PERFORMANCE AT TMI, NOT OF HIGHEST PRIORITY	A LIMITED PART OF THIS RESEARCH WILL BE INCORPORATED INTO ANOTHER PROJECT (CONTINGENCY PLAN EVALUATION).
SAFEGUARDS EVALUATION OF LASER ISOTOPE SEPARATION PROCESS LOWER PRIORITY COMPARED TO CENTRIFUGE PROCESS	CONCUR, WILL EXAMINE ONLY CENTRIFUGE PROCESS AT THIS TIME

SAFEGUARDS RECLAMA

FY81

(IN MILLIONS)

	FY80	FY81 EDO	FY81 REQ
PERSONNEL	8	8	8
PROGRAM SUPPORT			
EFFECTIVENESS EVALUATION	$ 3.2	$ 2.4	$ 2.4
INSPECTION METHODS	0.8	0.5	0.5
ALTERNATIVE STRATEGIES	1.0	2.4/.4*	2.8
TOTAL PROG. SPT.	$ 5.0	$ 5.3	$ 5.7
EQUIPMENT	0.1	0.1	0.1

- REQUEST $0.4 SET ASIDE UNDER PROGRAM ELEMENT ALTERNATIVE STRATEGIES BE RESTORED TO PERMIT INITIATION OF ANALYSIS OF FBR SAFEGUARDS ISSUES. THIS RESEARCH WILL PROVIDE BETTER NRC PERSPECTIVE ON NASAP/INFCE RECOMMENDATIONS, AND TIMELY INPUT TO DOE AND NRC FBR RESEARCH PROGRAMS AND RELATED SYSTEM DESIGNS.