T-1322

ORIGINAL

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS SUBCOMMITTEE

MEETING ON ADVANCED REACTORS

Location: Washington, D.C. Pages: 1 - 87

Date: Tuesday, June 12, 1984

T-104 Delete
0/1 B. White

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS SUBCOMMITTEE

MEETING ON ADVANCED REACTORS

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

Tuesday, June 12, 1984

The Subcommittee met, pursuant to notice, at 8:00 a.m.

SUBCOMMITTEE MEMBERS PRESENT:

MR. MAX CARBON
MR. JESSE EBERSOLE
MR. CARSON MARK

PRESENTERS:
MR. P. WOOD
MR. T. SPEIS
MR. C. ALLEN

DISCLAIMER

This is an unofficial transcript of a meeting of the United States Nuclear Regulatory Commission held on June 12, 1984 in the Commission office at 1717 H. Street, N.W., Washington, D.C. The meeting was open to public attendance and observation. This transcript has not been reviewed, corrected, or edited, and it may contain inaccuracies.

The transcript is intended solely for general informational purposes. As provided by 10 CFR 9.103, it is not part of the formal or informal record of decision of the matters discussed. Expressions of opinion in this transcript do not necessarily reflect the final determinations or beliefs. No pleading or other paper may be filed with the Commission in any proceeding as the result of or addressed to any statement or argument contained herein, except at the Commission may authorize.

PROCEEDINGS

MR. CARBON: The meeting will now come to order. This is a meeting of the Advisory Committee on Reactor Safeguards Subcommittee on Advanced Reactors.

I am Max Carbon, Subcommittee Chairman. The other ACRS Members in attendance are Jesse Ebersole and Carson Mark.

The purpose of this meeting is to review NRR/RES activities related to LMFBR and Advanced Reactor research. This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act and the Government in the Sunshine Act. Paul Boehnert is the Designated Federal Official for the meeting.

The rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in the Federal Register on May 22 and May 30, 1984.

A transcript of the meeting is being kept and will be made available as stated in the Federal Register Notice. It is requested that each speaker first identify himself or herself and speak with sufficient clarity and volume so that he or she can be readily heard.

We have received no written comments from

members of the public. We have received no requests for time to make oral statements from members of the public.

We will proceed with the meeting, and I call upon Mr. Phil Wood, NRC-RES.

MR. WOOD: As we all know, things are in a precarious state in the fast reactor business today and, so, I'll restate our objectives that we've probably discussed before, what it is we're trying to accomplish.

The first one is during this period of uncertainty when there is real no licensing action for a fast reactor, we're trying to maintain a group of people with the necessary skills to be able to, to provide expertise in answering fast reactor questions to the Commission and be in a position to take -- and help the licensing action if one should come up.

We've got a fair number of foreign agreements and commitments that give us access to foreign technology, trying to maintain those relationships. And I'll discuss those programs in a little more detail later.

We've made a fairly large investment in three large computer codes; the SS Cease Super Systems Code, the COMIX Three Dimensional Thermal Hydraulics

Code and SIMMER for CDA analysis. We've kept the contained code alive under the Live Water Reactor Program. We intend to keep it probably with Japanese support in a condition so that it can handle liquid metal systems.

The activities I anticipate for FY --

MR. CARBON: Hold, hold up, just a minute, the codes again? The SS Cease --

MR. WOOD: (INAUDIBLE) -- and contained --

MR. CARBON: And you say in conjunction with the Japanese?

MR. WOOD: The Japanese are offering us 80K to keep contain updated for our liquid metal systems. Remember, contain started out to be a liquid metal containment code, and when we ran out of money, we started using it as light water reactor code.

MR. CARBON: Okay.

MR. WOOD: The activities we anticipate for FY '85, we anticipate the DOE is going to come in with some advanced design concepts and ask NRR to help them evaluate whether they're really ultrasafe or not or how licensable they are. And we anticipate we'll be preparing a fair amount of support to NRR in that area. But that's kind of undefined right now because I don't think DOE has made any firm requests.

Carter is going to talk about that later.

MR. EBERSOLE: Pardon me. You're outside the scope of just LMFBRs now, aren't you?

MR. WOOD: I anticipate for my work it will be liquid metal systems. Whether they're breeders or not, I don't know. They wouldn't even necessarily have to be fast reactors.

The concepts we've seen to date are pretty much standard LMFBR concepts, however, the ones that have been in the, you know, the scandal sheets.

Okay. We intend to continue to participate in our foreign --

MR. CARBON: Excuse me, just a second. Jesse, he is talking in the context of the LMFBR.

MR. EBERSOLE: Will that be the entire conversation today?

MR. WOOD: No. On your part -- on my part it will be because I think --

MR. CARBON: But on NRR, might as well discuss gastoral (Phonetic) reactors.

MR. WOOD: Okay. We intend to continue our participation in foreign corporate programs. Probably the largest of those is the Cabre Program in France where we're using the SIMMER Code to cal -- pre-calculate their trest results and analyze those tests.

And that's a fairly large program. I think the Cabre Program all together is about $20 million.

MR. CARBON: In later parts here for next -- fiscal year '85, will you be indicating the budget for that?

MR. WOOD: Our budget or --

MR. CARBON: Yes.

MR. WOOD: Our participation in the Cabre Program is -- has no real dollar exchange involved. It has -- it's occupying the time of about 2-1/2 people. We have Alex Lumpton stationed over there that's actively working on the houdoscope work, and I'd say we're using an analyst and a half at Lassel (Phonetic) to look at the experimental data.

MR. CARBON: So, we're calculating and getting their data in return?

MR. WOOD: Yes.

MR. CARBON: Is that correct?

MR. WOOD: That's right. And providing a full time professional at the reactor.

We have agreements both with the -- I should say we almost have an agreement with the HDR Project. That's the High Density Steam Reactor which is being used with Live Water to study certain stratification problems and thermal down shock problems

and also some containment related work.

That agreement has been signed with the German Government. Let's see what's that -- BMFT, but the agreement with the KFK people has not been signed yet, but we have given them the COMIX Code and have it -- they have it operational.

Now, the primary work on that project is, from my standpoint, is the validation of COMIX ability to -- stratification.

MR. CARBON: What does this cost, do you know?

MR. WOODS: It's costing us the code plus some consulting work. And if we analyze the data ourselves, it will cost us the computer time to analyze it.

Both the HDR Project and the Interatom Projects are no money exchanged. The Interatom large lube just out of -- I think it's out of Cologne -- is a one meter diameter lube with sodim metal as the fluid. And it has the capability of injecting large quantities of sodium at something like 200 degrees centigrade temperature difference in the main lube and provides an excellent measure of the ability to handle stratification.

And we have the data from those experiments.

It's just a question of spending the computer money to analyze them.

We recently signed an agreement with CA of France to exchange the COMIX Code for operating an experimental data out of the Phoenix reactor, the Rhapsody Reactor and three other facilities, Super Cavan (Phonetic) and -- Facility, which our out of piled small -- not too useful experiments, but that, again, the only cost to us was to send a technician to France for two weeks to get the COMIX Code running for them.

MR. CARBON: And, and in this one, you're giving them the use of COMIX and what you're getting back is the information on how the code puts it out.

MR. WOOD: Well, we'll get two things. One, we'll get the results of their calculations on these experiments, and we may use some of the Rhapsody to aid ourselves to do calculations. That's a very small reactor, but that's a very interesting experiment.

MR. SPEIS: Is it being dismantled, the Rhapsody Reactor?

MR. WOOD: As far as I -- yes, it is.

UNIDENTIFIED SPEAKER: What did we get from Phoenix?

MR. WOOD: What they did with Rhapsody, it had been shut down. They put a lot of good instrumentation in it and they started it up and ran some experiments that you wouldn't normally run with the reactor. And I think it's now shut down.

The Phoenix Reactor was a disappointment. We have their operating data or can get it. It's very poorly instrumented. And they had planned in '85 to instrument it and do some good experiments, but their budget wouldn't let them do it.

MR. SPEIS: Are you talking about flow distribution, detailed flow --

MR. WOOD: Flow and temperature.

MR. SPEIS: Flow temperature model.

MR. WOOD: Yes. Unfortunately, the instrumentation is very poor.

MR. SPEIS: Just more design oriented more than safety, then?

MR. WOOD: I, I don't distinguish the two, myself.

MR. SPEIS: Well, --

MR. WOOD: I'm interested in strong thermal gradients and in components from a safety standpoint.

MR. EBERSOLE: This French work is using

the COMIX Code?

MR. WOOD: Yes. They're going to use COMIX to evaluate those experiments.

MR. ALLEN: And that's all we're getting is the -- is the COMIX Code plus --

MR. WOOD: The COMIX Code plus two weeks of Bob Smith's time.

The next item I have on my list is a moderate statement. We want to maintain and improve our safety evaluation codes. The -- I have contain down even though it is a light water code at this point. Have been offered 80K from the Japanese to, to bring it up to date for sodium, and I think we'll probably manage to have that supplemented by enough money to bring it to one man year from somewhere else.

Okay. In '85, we're going to try to complete the accident energetic experiments and the ACRR at San Dia. There still is a lot of foreign interest in those experiments, and I'm sure if we had the budget to do it, we could probably get additional foreign support, but at this point, I'm giving source term work priority over the ACRR work. And, so, we plan to finish it up in FY '85.

The last item I have on my list is to give

NR whatever support they need to develop regulatory positions for liquid metal reactors. They have the -- in that as far as I'm concerned.

Okay. In Fy '86, we intend to continue the FY '85 program pretty much as is. The exception that we're going to terminate the ACRR experiments at San Dia. And budget allowing, we intend to initiate a program to extend the source term research work to the liquid metal reactors, probably at San Dia with some help in chemistry and literature sources from RNL.

MR. ALLEN: Phil, before you go on.

MR. WOOD: Yes.

MR. ALLEN: Does -- when you terminate the ACRR work, does that mean that we kind of relinquish an option on the ACRR? Will that -- can you ever get that back if you want it?

MR. WOOD: The answer is I think we could get it back because we did, indeed, pay for half the fuel. I think that's a standing agreement that we could use it. Our finding increasingly that it's more and more difficult to get experiments into that reactor because of the increase interest in the weapons program right now.

I might as well discuss my thoughts on the source term work right now. There's two options we

have in doing what I call experimental work that's needed. This will depend to a large extent on what DOE does. Their plans in that area are still kind of nebulous as far as I can tell.

There's a lot of interest in the affect of cesium (Phonetic) as a volatile material at high temperatures and both its effects on the HCDA pin ruptch (Phonetic) problem and how it gets carried out of the fuel as a source term. In both KFK in Germany and San Dia propose that it would be interesting to do some experiments in the ACRR to better understand this -- the association of cesium compounds and to cesium gas.

Our position in the past has been that source term coming through the top of the reactor vessel from a CDA is probably not the most probable source. The CRBR licensing position was very strongly that that didn't happen.

From the standpoint of the outcome of the CRBR licensing discussions, a much more likely source of problems is core falling on the concrete and getting sodium concrete reactions. And last year we started a program but had to ter -- I guess it was this year -- to evaluate the sodium chemistry of fission products coming out of sodium pools as the

pool went from a reducing sodium atmosphere to an oxidizing concrete reaction product atmosphere. And I, myself, am inclined to think that's the more interesting problem but I'd say at this point it's still under discussion.

The ultimate goal would be to bring the LMFBR source term regulatory position up to what the light water position will be in a couple of years.

MR. CARBON: Do you have any idea of what it's going to cost and how long it's going to take to do that?

MR. WOOD: I think that once the light water reactor position is really firmly established and becomes part of the regulations or rules or what, whatever it becomes, it's my jud[illegible]'s going to take of the order of three ye[illegible]oughly $1 million to get the liquid metal [illegible]n at the same point.

MR. CARBON: [illegible]o cheaply --

MR. WOOD: Now, I -- that -- My, my getting the light water reactor stuff in a good legal position, I think is a big step.

MR. SPEIS: I doubt that --

MR. WOOD: Pardon?

MR. SPEIS: Well, you can't do that for $1 million.

MR. WOOD: I said $3 --

MR. SPEIS: Oh.

MR. WOOD: -- million dollars a year for three years. Having the light water position firmly established, I really think the liquid metal source term chemistry is in a lot better shape than most people realize.

MR. CARBON: Well, that would be tremendous. I would guess that's like --

MR. WOOD: That's optimistic.

MR. CARBON: Way, way, way far more, but I hope you're right.

MR. WOOD: Well, if we get to making a big task force out of it, like the light water reactors Duff has gotten into, I think your $10 million is a more appropriate number. But if it's handled as a, -- as a fairly low pressure scientific program, I think we'd be in pretty good shape in three years.

MR. EBERSOLE: I want you to clarify that for me. I guess I don't understand the physical constituents of what you're talking about, a source term in this case. You're talking about severe accident source term, aren't you?

MR. WOOD: Yes.

MR. EBERSOLE: So, what's the mechanics of the accident that lead you -- lead you to a fix on the source term? They seem to be so intermixed to me that you can't sort them.

MR. WOOD: Well, there's two ways you can get a bad source term, I guess. One is to have the head blow off and have plutonium and fission products come squirting out the top of the reactor. And in the CRBR licensing action, we pretty much rule that out as so improbable that you wouldn't worry about it.

MR. EBERSOLE: It went down?

MR. WOOD: Correct. The other way is to have the core fall on the floor in reacte with the concrete and produce all sorts of aerosols and the fission products get carried along with the aerosols.

MR. EBERSOLE: That's the one you're referring to?

MR. WOOD: That's the one I think is the most probable large source term. And the unanswered question there is the pool chemistry changes as you use up the sodium and are left with sodium oxides and sodium hydroxides. Not much iodine comes out of a sodium pool.

MR. SPEIS: I guess the only problem with

that I have, Phil, is that you really have in mind a specific design of source, and a source term is -- has to be looked in a broader context. You have to look at not only a variety of designs but, you know, the accidents, the -- can be associated with that design. Then, then you have to go beyond that. It's the -- the whole response of the -- of the primary system, the containment itself. And then you have to factor the unknown. So, the source term is -- it's more -- you know.

MR. WOOD: Well, no. How can you have a research program, a generic research program come to any conclusion or position when you're going to say you're going to have to do the whole thing over for a different design. That's a design problem. That comes up with, you know, every regulatory action.

MR. EBERSOLE: When you talk about source time, you're talking about the source that gets inside the containment.

MR. WOOD: Yes. Yes.

MR. EBERSOLE: Not the source that gets outside the containment. This always gets to be a funny thing.

MR. WOOD: Yeah.

MR. SPEIS: I'll let you focus some specific technical aspects, you know, just some chemistry or physical aspects of, of -- from a system that you have some ideas whats all about. Then you can do that. But -- well, I'm involved in the source term FFOR (Phon.) reactors, --

MR. WOOD: Yes.

MR. SPEIS: -- and it's a very complex undertaking. And we, we realize that the only thing that we can codify and maybe to put to bed would be some, some, some very narrow scientific aspects, you know, some chemistry aspects and some physical aspects.

MR. EBERSOLE: Can you bracket the problem? Can you say in the beginning there will be at least this much and in the end, they'll be no more than this, and we're going to be somewhere in between?

MR. WOOD: Unfortunately, people can already bracket it by seeing everything gets out, and that's the position people have taken today. -- with that position source terms haven't been all that bad. The CRBR one wasn't.

MR. EBERSOLE: Well, if they're not that bad.

MR. WOOD: I guess we're having a little bit of sematic problem in just how how far a generic

program can go in defining a source term.

MR. EBERSOLE: And what's it worth -- what's it worth when you're done in view of its -- and accuracy? If you knew already, what would you do with it?

MR. CARBON: Well, it surely will have to be tied fairly closely to designs that come out.

MR. WOOD: Yes.

MR. CARBON: I can see where if DOE changed the design from a CRBR type reactor to something else, might just totally change the, the source term research and the source term problem and so on, I think.

MR. SPEIS: Are you -- is research also doing a similar program on -- a source term?

MR. WILLIAMS: I, I can answer that for you.

MR. WOOD: Pete Williams can probably answer that.

MR. WILLIAMS: Yes.

MR. SPEIS: And maybe we'll talk about it later.

MR. WILLIAMS: For the -- all right. I'll plan to talk about that later.

MR. CARBON: Are you in touch with DOE

on what they're doing on source term work?

MR. WOOD: I was in touch with DOE on what they were doing on source term work up till about three months ago. And at this point, I'm a little confused about anything DOE is doing. They had set up a group, primarily the PNL people, to write a program plan for what they intended to do in the source term research work. They had a meeting at Argonne last December, and I sent Rick Randy from San Dia to, to the meeting to be involved with what they were doing because he was going to run our program at Dan Dia. And since then, I frankly don't know. And it's not fair to me that they know.

MR. CARBON: I can imagine maybe they don't know. It seems to me that it's very much worthwhile for NRC to be working as closely with DOE -- as reasonable, practical and possible -- can we do things -- can I do things that would, would make it easier for you to be able to stay in close touch with DOE?

MR. WOOD: I really don't think that's the problem. I've got very good personal relationships with the people at DOE on the working level. The problem is that, that DOE's whole program is completely out of focus today, I believe. And as soon as it gets back in focus, I intend to keep up with it.

We've got a year and a half to make up our mind what we want to do, really.

MR. SPEIS: One of the things I would like to talk -- you people invite DOE in the near future, you know, invite some high level people to maybe provide an overview where they're going so you can have that input as part of your auditing -- the Office of Resources --

MR. WOOD: I think as soon as we get this current and a letter to the Commissioners on --

MR. SPEIS: -- show an interest.

MR. WOOD: -- the budget, we'll move into the broader aspects.

MR. ALLEN: May I ask -- raise the question? Phil, is it appropriate to say something -- what you just talked about was two possible source terms, either --

MR. WOOD: Yes.

MR. ALLEN: -- through the head or through dropping down in the cavity, on the floor. There's another possibility, not a source term, but there's a possibility then vessel retention?

MR. WOOD: Right.

MR. ALLEN: Is it appropriate to say something about that? In particular, in view of some

of the newer concepts that are being talked about in the smaller reactors, there may be -- that may be a real option. I don't know, a real possibility that nothing gets out.

MR. WOOD: Yes, I think that is an option. The source terms I was talking about are those where things really go to pieces and a lot gets out. The two things that would help a lot would be in-vessel retention. The experimental work at San Dia looks good on that.

I think we can calculate what happens to, to -- beds and how coolable they are at this point. Our problem is we don't know where the debris would end up and more work needs to be done on that.

The others, I think great strides could be made in improving the kind of concrete that's under the reactor vessel. There's no real good reason for using calcite concrete. Effectively, it's -- people don't like core catchers for some philosophical reason, but I don't see anything wrong with them.

The next slide I have is of the foreign support we're anticipating in '85, which at this point is getting to be a fair chunk of our budget. The San Dia ACRR experiments, the largest source of money, is the Japanese and Germans both were

interested in those experiments. We had $1 million come up in '84, of which half of it is to be used in '85 from the Japanese. We're negotiating another 300K right now with the Japanese, I think -- our draft of the concrete -- of the contract has gone to them and we haven't heard back from them. That's the status of that.

The trans (Phonetic) experiments, we have 200K from West Germany already, and we're negotiating another 300K. Brookhaven work is primarily almost job shop work, using SSC on -- they've been giving us about 100K a year, and we have another 100K contract that's being written. That contract is not particularly well defined right now. It's -- we haven't really defined the technical scope on it. The '84 technical scope was to make improvements in SSC to handle very low flow conditions where you could go through flow reversals.

At San Dia, as I said before, PNC has offered 80K to -- our version up to date, not a major source of income or help from San Dia as they've got roughly six people working at San Dia on the ACR, two from France, two from Germany, one from Japan and one from Ispra (Phonetic), and that's worth about 130K or 140K per man year for that program.

And Lassel, we are negotiating with the Japanese to provide 190K to improve the nutronics in the SIMMER Code and one professional to work on it. I'll discuss the details of that later if you're -- if you're interested.

Okay. The next slide,I've just listed the five programs that we intend to support in 1985 if we get our $3-1/2 million budget. And if you read the newspapers, you know that our budget has been under very heavy attack from the, the House Committee. The -- I think it's the -- Committee, isn't it?

UNIDENTIFIED SPEAKER: Devil (Phonetic).

MR. WOOD: Devil, Devil Committee wants to cut $30 million out of the NRC budget and take it all out of research. The Senate Subcommittee said, well, we want to reduce the NRC budget by $10 million and not take it out of research. And, so, what the compromise will be, I don't know.

But the advanced reactor is, I think, very vulnerable right now, advanced reactor budget. Okay. That finishes the slides that I prepared. I've brought copies of the program assumptions that were sent out or are being sent out to the laboratory based on a $3-1/2 million budget. And I'll be happy to answer any questions anybody has on those items.

MR. BOEHNERT: How much are you budgeting for FY '86?

MR. WOOD: Before this problem with Congress, the agreement with Dirk's office was to keep the budget level at $3-1/2 million.

MR. BOEHNERT: But you don't know right now what's going to happen?

MR. WOOD: No.

MR. CARBON: Going back to these five items for Fiscal Year '85, the Argonne reactor safety model and assessment, is that the work by Harry Hummell?

MR. WOOD: Yes.

MR. CARBON: And what's he doing at the present time?

MR. WOOD: I have here the program plan for '85.

MR. CARBON: He sat in here?

MR. WOOD: Yes, the second one, I believe. His part in the CRBR licensing activity was to run all the accident initiation work, SAS 3D and SAS 4A and his program is at about at a man and a half level. We've dropped the work on the by-flow code that proved to be not very productive. Nobody seems to be able to do a very good job of boiling sodium and

--

MR. BOEHNERT: Of what?

MR. WOOD: Boiling sodium. And that computer code never was -- we never really could get it consistently stable. So, we gave up on it. Harry Hummel has continued to participate in the liaison with UK and the -- atom WAC groups. That's -- accident studies.

MR. ALLEN: We don't really even know what Argonne or what DOE's expectations are with respect to the SAS 4A program, do we? We don't know what they intend to do with that?

MR. WOOD: Not at this point.

MR. ALLEN: That's the only code that has the capability of detail looks at early phases of the -- of the accident, if we get into those kinds of accidents.

MR. CARBON: This 183K, is this essentially Harry and his support, computer time and --

MR. WOOD: It's Harry and about a half of another person plus computer support.

MR. EBERSOLE: And he's doing this, whatever you need doing with --

MR. WOOD: Yes. And keeping up to date with the foreign technology.

MR. CARBON: And the 3D time dependent code development and application?

MR. WOOD: Well, that's the COMIX Code. I've already discussed some of the foreign involvement in verifying that code. I anticipate if these new concepts have what are purported to be very sophisticated to K heat removal systems, that we'll spend a lot of our money analyzing the K heat removal systems with the COMIX. It's the only code I know of that's capable of handling the entire internals of a reactor vessel in three dimension.

MR. CARBON: This 612 K must be going for a lot of development, is it not?

MR. WOOD: I, at this point, don't know. It would depend on the workload from --

MR. CARBON: Well, the work that you talked about, the foreign work, didn't seem to amount to much of any money back here.

MR. BOEHNERT: (INAUDIBLE).

MR. CARBON: Pardon?

MR. BOEHNERT: -- (INAUDIBLE). (Several people talking on top of each other).

MR. WOOD: Well, the man power on the COMIX program is about four people plus maybe four -- maybe four and a half people. And the Court is a heavy

computer time user. And I consider that a -- kind of a minimum critical mass. And I, I think looking at these new designs is going to be very expensive in order to really do a detailed 3D treatment of the decayed -- systems.

Until we get a heavy workload in that area, I intend to continue doing verification calculations on the Interatom loop in Germany and we're, we're working on a new numerical technique in COMIX that's I think will be very profitable on vector machines.

The new concept is a complete matrix inversion solution at each time -- which, which should be very fast on a vector machine. So, we've got development work going there. We've got a small effort going on trying to get the two phase version to be stable and workable.

The present two phase version is -- I call it an equiliberium -- homogenius equiliberium with slip model, but it's not a true two phase flow, a two phase code.

MR. CARBON: The 4-1/2 people -- what's it cost per person, 100K or something?

MR. WOOD: With computer time, it's running --

MR. CARBON: Without computer time?

MR. WOOD: Well, the Argonne lab overhead is over a factor of two. So, it's a little more than 100K. If a professional makes between 40,000 and 50,000, it's going to cost you with computer time in the neighborhood of $120,000.

MR. CARBON: Well, still without computer time, it sounds like it's costing $110,000?

MR. WOOD: Yes, something like that.

MR. CARBON: So, $500,000 for people. Does $150,000 go for computers or something?

MR. WOOD: Probably close to that.

MR. CARBON: And these 4-1/2 people, what part of that is actually aimed at developing the code, improving the code, not the foreign or -- as I understood you back here on participation on the foreign cooperative programs, you basically given them the COMIX Code for their use, their calculations, and you're getting the results from it.

So, I ask, are, are these four people, primarily, working at Argonne to improve this code, to check to see how well it does, to do some work on the two phase version, to change this, change that and so on?

MR. WOOD: With no workload from NRR in

looking at DOE concepts, I would say that's a correct statement. I anticipate that in '85 that we will probably have to pull between two and three of those people off to work on application work.

MR. CARBON: Requests from NRR for calculations under designs.

MR. WOOD: Yes. If they get into, into a heavy workload of looking at DOE concepts, I anticipate I'll have to pull between two and three people off to work with them.

MR. CARBON: Can you anticipate anything like that?

MR. SPEIS: Well, not in the very immediate future. I guess we're talking about it -- how things look.

MR. CARBON: But in fiscal '85?

MR. SPEIS: I think the most probable thing in fiscal '85 that will happen will be -- related efforts. I don't think we see any --

MR. ALLEN: We seem to be lagging the ACGR efforts, activities.

MR. SPEIS: So, the, the greater effort seems to be focused on ACGR right now, anyhow, you know. Unless, Phil, you know anything different otherwise.

MR. WOOD: I don't really know. I try to plan my work so I can respond to a need if there's there. If not, continue to do development work, but if we don't keep an active group, we're going to lose our investment that we've made in these large codes.

MR. CARBON: What would happen if you simply sat the COMIX on the shelf or had some summary reports, status reports and satted on your shelf and left there?

MR. WOOD: I guess people would go get other jobs and do something else, and when we came back two or three years from now, we wouldn't have that capability anymore.

MR. CARBON: Would you have a better use for the money in the meantime? Are there other things that might very well have higher priority?

MR. WOOD: Well, that gets into its value judgment area. And it's my personal opinion that that's one of our more productive and useful groups.

MR. SPEIS: I guess your question is a little bit broader -- it's in the broader advanced reactor area, you know. Where is the country going? Where is the -- going? Where is Congress going, you know. If we get the, the notion that nothing will

happen the next ten years in the area of LMFBRs, you know. I mean Phil's -- will be different than if something will happen in the next two or three years; right, Phil?

MR. WOOD: No, if there's not going to be any work for ten years.

MR. SPEIS: Then I'm sure you don't want to be spending, you know, $1 million a year in --

MR. CARBON: No, my question really isn't that broad. At the moment, it's assuming that we will have something in the LMFBR area, and is simply saying could we put our money to better uses than, than these 4-1/2 people on COMIX? Could we start source term work sooner? And I expect their answer will be, they don't want to phase it in at this time. But all kinds of possibilities. Are there other LMFBR generic research things that might be more productive than this, is really what I'm asking.

MR. WOOD: Well, I don't know how to answer that. My own judgment is that to keep the thermal hydraulic capabilities and the system code capabilities and to be able to look at the consequences of how design changes would affect the serious accident or all important problems and they're the ones that I think will lose capability fastest if we

quit doing work in that area. And I could name another -- some other very important areas, but I think they're areas that we can pick up and do useful work on very quickly; things like high temperature material research. DOE should be doing that kind of work, not us. And I think that there will be good mechanical engineers in the world that we can hire to work for us to do that kind of thing in the future, a lot easier than we can to people that can operate very large complex safety codes.

MR. EBERSOLE: If we ever build another LMFBR, will it be a pipe or a pot? It seems that what Paul -- all the things you're talking about are so heavily dependent on a conceptual configuration that you're totally awash if you don't have a conceptual configuration to work on. And without it, I find a lot of trouble in --

MR. WOOD: I, I don't think that's the case.

MR. EBERSOLE: You think you can do that --

MR. WOOD: I think that all three of the codes I'm talking about are capable of having either kind.

MR. EBERSOLE: Either kind?

MR. WOOD: Yes.

MR. ALLEN: That was one of the questions we, we -- recommendations, suggestions we made at the mid year review, was to make sure and look at the capabilities of the codes, their applicability to the variety of concepts that are being discussed. There's quite a variety of concepts being -- about, G.E.'s little tiny one, Westinghouse's fairly large pot and others.

Now, I don't know if, if a large -- a smaller number of people dedicated to looking at the applicability of the code. For example, COMIX, at the decay heat removal natural circulation type thing which is probably going to be a very fundamental question in any of these concepts.

You know, if that could be a more economic or more efficient utilization or not, as a -- as a suggestion.

MR. CARBON: To, to --

MR. ALLEN: Well, I was thinking of maybe fewer people. I don't know if fewer people could look at the applicability of COMIX to addressing the natural -- decay heat removal questions of tne variety of concepts that are being discussed now. And that's going to be a very fundamental question, the decay heat

removal question because that may very well determine whether you get into a severe accident, what the likelihood of a severe accident is. It's a possible option. Well, that's the whole problem once you get rid of --

UNIDENTIFIED SPEAKER: Yes, right. Once you don't have to worry about that, it's just removing the heat.

MR. CARBON: Let's go on, then. The Los Alamos, the 940 on SIMMER.

MR. WOOD: That's about 6, 6-1/2 people. The Lassel people cost a lot of money. They were 140K people. The Lassel activity, as I said, I have something like 2-1/2 to 3 people out of that working on the Cabre work. The other three will be primarily doing code improvement work of which the nutronics is in conjunction with the Japanese. It's going to be the major effort in '85.

We anticipate that by cleaning up the way we handle the cross section generation in self-shielding, we can cut the running time of SIMMER by a quarter. And that, I think, is going to be a worthwhile investment.

MR. CARBON: Is SIMMER going to be as useful on some of the concepts being -- about at present as

they would be on a large 1300 megawatt CRBR 2?

MR. WOOD: I anticipate that by doing some detailed SIMMER calculations on some of these "very safe reactor concepts", we may find some surprises. And we may find that things we think are safe are not as safe as we thought they were. And that's why I think that SIMMER is going to be very useful in evaluating new concepts.

MR. CARBON: Do you have any support from -- other than from the Los Alamos people?

MR. WOOD: I think the San Dia people would support that position. My own experience tells me that two negative coefficients are not always good. I think back to the EBR-1.

MR. CARBON: I'm not -- I'm not sure I follow that --

MR. WOOD: Well, that's the one that melted down.

MR. CARBON: But your example, and I'm not sure --

MR. WOOD: Well, in small reactors, one can get into troubles other than having positive coefficients is all I'm saying.

MR. CARBON: Oh, sure. No question.

MR. WOOD: And this has to be looked at.

MR. CARBON: But I wonder if San Dia is -- I mean if SIMMER is going to be really the useful tool or -- its overkill or something like that, along those --

MR. WOOD: I guess the only way I can react to that is that if I didn't have SIMMER, I'd have to make conservative judgments on what I think the consequences of an accident are. And that would muddy the ability to make distinctions between which reactor concept is really safe and which one isn't.

MR. CARBON: But you're going to have to do that anyway?

MR. WOOD: Yes, but I think SIMMER is a useful tool in making a judgment.

MR. CARBON: It's a tool, but when it came to licensing a CRBR, at least the primary version that was presented to us in the licensing was that you were not really relying very heavily on SIMMER.

MR. ALLEN: Not on the -- just the actual numbers that came out of it, but as an intelectual aid as a tool to evaluate the likelihood of the events. It was useful but not as a -- not as just a calculation on the results.

MR. WOOD: That's right.

MR. EBERSOLE: Let me ask a question. In

the -- in the secret metal reactor field, is there a range of safety considerations within that field, considered in several designs, it might come o t which is a broad range --

MR. WOOD: I think there's a very broad range.

MR. EBERSOLE: Yes; I was about to say as broad as we have in the two LBAR systems we got, the PWR and the -- we're still, still spending about ten times as much research money on the PWRs, on thermal hydraulics as we are the old boilers.

On the other hand, we've got a lot of metal allergical problems on the boilders. And where these strike some sort of good position, I don't know, but is there that sort of a -- design possibilities in the -- field as we had in the -- waters?

MR. WOOD: I think there is that breath of range. I don't anticipate seeing it, though, because I -- all of the designs I've seen come out recently from the various potential vendors are not all that different.

MR. EBERSOLE: They tend to standardize? Would there be an effort to force standardization to some degree before we get in this mess we're in in the LWR field? You know, we're in a hell of a mess in

the LWRs because of the openess of concepts.

MR. CARBON: At this point, that's a philosophical question. I, personally, hope we don't standardize because at this point we don't have a viable design, anyway.

MR. EBERSOLE: Well, that was true 30 years ago in the flat waters.

MR. ALLEN: There's a pretty wide range, Phil. Westinghouse is -- at least the one -- the only source of information we have is what everybody else sees, energy daily. We don't have any inside information from DOE, but Westinghouse's was a big pot, a 1000 megawatt pot, a fairly large pot. G.E.'s is a very small 110 megawatt little tiny module. That's a wide range. And AI came in with a 330 megawatt intermediate, and I'm not sure if it's a pot or what it is, a modified pot. So, there's a wide range of concepts.

Hopefully, what we're -- well, what we're badly in need of is a decision or a selection. My understanding is they're in the midst of -- and one of the reasons we haven't seen a lot of detail is that DOE is in the midst of a competitive selection on those bids to award the concepts. So, they think it's not appropriate to come forward with any detail at

this point, and maybe later this year, they'll, they'll make some selection and we'll know better what we'll have to focus on in the near term, anyway.

MR. EBERSOLE: I -- mine impression has always been that NRC clearly just bombed out because it had too many variations to deal with. It came out of a deal. And it's in no way capable of keeping up with it.

MR. SPEIS: That's one of the biggest problems we're facing, you know.

MR. EBERSOLE: Yes. And here is a chance to avoid it.

MR. SPEIS: The examples that we're facing daily, would come up with a solution to an issue an it's only applicable to one or two plants.

MR. EBERSOLE: Right.

MR. SPEIS: And here you have 100 plants.

MR. EBERSOLE: Yes. The search for genera-cicity, I guess that's a good word is a futile search in the LWR field. And you may as well give it up. Everyone of them is unique.

MR. SPEIS: That's right.

MR. WOOD: I think, clearly, that if you open up the design concept, just liquid metal cooling is the only criteria, you've got a hughe range.

MR. EBERSOLE: You've got big problems, too, when you get something coming out of the woods.

MR. WOOD: I remember the Shunute (Phonetic) Reactor that was studied in 1956, had -- as a moderator and sodium as a coolant.

MR. EBERSOLE: There's a good example of how afield you can get.

MR. SPEIS: That's the days of the dreams, you know. Those dreams -- carry too far.

MR. CARBON: In the interest of time, we've just got to move ahead I guess, will you say something quickly about SSC and the ACRR experiment?

MR. WOOD: SSC is, as you know, our systems code that can handle the reactor transients all the way from the fuel rod clear out through the -- and condenser. It runs in better than real time, usually a factor of two better than real time. And I think it's going to be invaluable in evaluating new concepts from the standpoint of whether they really will perform the way they say they will.

And I anticipate that most of -- if we have the requirement from NRR that I could use everybody I've got on SSC doing applications work, if that work doesn't come to pass, then we will continue to make improvements and do validation work and that's

about all I can say.

We're coming from a, a budget level because we had another program called balance of plant that is going to be terminated in '85. So, we're reducing the budget of SSC by 50% -- by 30%, I guess, if you look at the present.

MR. EBERSOLE: Did you say that will take it all the way out to the condenser?

MR. WOOD: Yes.

MR. EBERSOLE: Let me try a shot in the dark. Would it take a secondary blow down with run on the main feedwater?

MR. WOOD: Well, what do you mean by secondary blow down?

MR. EBERSOLE: You depressurize secondary and then you continue to pump cold water into it. It's a -- transient, and it's possible.

MR. WOOD: It will handle it as long as your accident scenario doesn't assume pipes broken.

MR. EBERSOLE: Well, this is secondary pipes broken, high pressure pipes.

MR. WOOD: You mean the steam system type?

MR. EBERSOLE: Yes.

MR. WOOD: It will handle that.

MR. EBERSOLE: Including killing, killing --

MR. WOOD: Well, you'd have to put boundary conditions on what you expect the steam flow to do.

MR. EBERSOLE: I was maximizing a chilling effect in the secondary system.

MR. WOOD: It will handle the chilling part of it, but you'd have to put boundary conditions on -- blow down.

MR. EBERSOLE: Blow -- adversary.

MR. WOOD: You've going to have to put some model that tells how pressure --

MR. EBERSOLE: Yes, sure.

MR. WOOD: But, yes, it will handle that. Okay. The last one is the ACR work. I don't really think there's any flexibility in what we do with the ACR work right now because that's so heavily tied up with foreign agreements. And our present plans are just to finish the series of experiments that are defined and that will be that.

So, that, I guess, is all I have to say unless there's some questions.

MR. CARBON: Again, in the interest of time, just quick ones of my own and whatever Jesse would like.

In 19 -- or for fiscal year '86, you would -- (END OF TAPE).

The SSC work goes up and the simmer -- stays about the same I guess. The ACRR drops to zero and you replace that with source -

MR. WOOD: That is our present plan, yes.

MR. CARBON: So, everything is the same except dropping ACRR-

MR. WOOD: Yeah.

MR. CARBON: And the source -- will stay out.

MR. WOOD: Well, I think that that first -- maybe part Sandy and part Oakridge.

MR. CARBON: Okay. Do you have more questions?

MR. EBERSOLE: No, I don't.

MR. CARBON: Maybe then we better switch over to NRR.

(Speaker has very strong foreign accent and is difficult for reporter or transcriber to understand.)

MR. SPEIS: Well, I am happy to be back talking to you gentlemen again. The last time it happened it was in the late '70's.

MR. EBERSOLE: It is good to see you again.

MR. SPEIS: As you know, - since your project was canceled we had a -- program office and following the cancelation the program office was kind of phased out and in its place we have put together advanced reactors which covers all advanced reactors, whatever they are,

including far out LWR's, there is such a thing. This Advanced Reactors group has been pushed under the Division of Safety Technology and basically, about 4 people or so, so far, -- --Did I give the right names?

MR. CARBON: That's right. And also -- and also the -- three reactors.

MR. SPEIS: Tom King is the branch chief -- of a very small group for the time being and depending on what goes on in this area, can go up or down, but the objective is to have a -- three or four people and attempt to stay informed of what is going on -- -- more importantly the United States.

MR. CARBON: Who do you report to?

MR. SPEIS: -- I report to them.

MR. CARBON: Directly to Denton?

MR. SPEIS: Yes.

MR. CARBON: Very good.

MR. SPEIS: I am -- there so- I am in the Division of Safety Technology.

MR. CARBON: Very good. It is fully recognized-

MR. SPEIS: It is fully recognized.

MR. CARBON: In place.

MR. SPEIS: In fact, we -- February 27, 1984. I guess I can provide you the review --of our briefing at that time and we informed them of what we are planning

NRC 19
Tape 2
6-12-84
LAR 2

to do. Important activities that have been coordinated between the office of Quality Evaluation and -- -- put together a quality for advanced reactors. I don't know if you people have seen it yet.

UNIDENTIFIED: Yeah, that is the February 27.

MR. SPEIS: I think it is very important, in light of your letter which I read a while back, your February 15 letter. In fact, I read it at that time and I utilized some of the -- because you were providing this letter and providing feedback to the OPE on the -- of advanced reactors. -- --to look at it very carefully.

I think the latest -- of the two commissioners.

(Multiple conversations)

MR. CARBON: Excuse me. Who has approved it?

MR. SPEIS: I think Palidino and -- -- there is no problem. I understand that ----

MR. CARBON: Roberts is not --

MR. SPEIS: -- -- in light of the -- and things of that sort -- are really strongly in favor of it. So, once it gets the approval of the -- commissioners we will go out -- -- I guess I have an early draft with me. It provides the legislative backgroud -- --, previous experience. It talks about the current commission policy and then tries to -

NRC 19
6-12-84
Tape 2
LAR 3

MR. EBERSOLE: You are referring specifically to the March 30 version?

MR. SPEIS: I have some -- But the outline, the frame work --

(Multiple conversations)

MR. SPEIS: We have worked very hard -- --

MR. EBERSON: Jon, is it possible for you to address yourself to perspective time for paper, with a background of all these 30 odd years -- -- working with and set up some guidlines for potential standardization that might be employed by the industry?

There are two committee members. I am on the PWR -- --. -- like all reactors, there are only two. By the way, I think that will be reversed. I will get on the board, but I recently came back from the -- reactors and they are on the verge, apparently,- they are in financial trouble. My observation was -- interesting concept that produced high quality steam and is efficient but it is a technological monster. They can't keep water out of the gas. They have got the water above the seals and they seem to be down. Their availability is good.

MR. SPEIS: Those problems have been recurrent for the last seven or eight years.

MR. EBERSOLE; So, I look on it as a,- I first

admired the project and then I got back and I will just give you some, whatever it is worth, some thought I had later on.

I had earlier attended a meeting on one of the major problem they have got which is the -- 345 -- And I tend to break down our problems into regulatory problems, -- -- the local problem, large and small, then the residual which is about 80 percent was getting rid of -- --

And from that point, I got a look at the HGR and the TWR -- and tried to focus in on what would I do if I were emporer. And, I go down to real primative considerations. It seems like we always got to cut magnetic fields and wires and that takes a steam engine, so I got to make steam no matter what I do, and if I am going to make steam, -- just about the simplist way to do it, and if I could throw pellets into a pot and cap the pot and make steam that way, I would do that. And that is the nearest approach I can see to simplifying the whole process. Of course, that converges on the -- right away without all the secondard problems in trying -- 10 to 1 ratio of trying to understand difficulties on this thermalhydraulics.

So, I converge -- -- and then I begin to look at problems with the boiler and the boiler has got some

NRC 19
6-12-84
Tape 2
LAR 5

problems and most of it focused on the inability to take heat out of the bushing tubes. And so, you begin to think about that and you try to argue that, oh, I made lots more electric power and we found out last week that the rubber band, that third deisel they got is dependent on one of the other two, believe it or not, to provide its cooling water.

Talk about lousey design. So, you see, the institution they created believes in the single -- criteria. If you have two, you have got enough, don't bother with further diversity and liability. So, they ride the third diesel on one of their other two.

And I then come to this thing I've been long looking for which is appearing just on some of the water -- which is,- there is a way -- -- a simple way, and that is the process of opening the primary containment, Primary vessel, -- reliable not like the ones we got now, with a reliable valve,and reducing the containment pressure on the primary boiler and using such third capacity as we have, and the -- tool which is limited.

You could make more than that. And, at the end of that rope, if you forced -- which you might be by fire, earthquake, loss of AC fire or a host of other things, you are left then with something I think -- -- simplicity and safety --

NRC 19 24
6-12-84
Tape 2 25
LAR 6

If you are reduced to that level of facility, you are reduced to a point where all you need do on a -- like that is pump up fresh water into it and maintain the cover on the fuel. Let the steam go through the now boiling -- -- and emit it straight to atmosphere before core damage occurs.

I want to prosecute that right into the ground. I noticed that -- they are not going to build a second unit. So, they have got this enormous lake or -- next to one side. And, I said in my own mind, yeah, if you really want it to. If you want to exploit that, you could have secondary -- --.

And, in the end, this leads to my model which I am going to stick with. That all you need to cool a boiler is an old man and a shack out in the garden -- -- about 300 horse power and to hell with all the rest of the mechanics.

MR. SPEIS: I understand that.

MR. CARBON: And I think we should focus in on some kind of a national model. That is a simple way of cooling.

MR. SPEIS: -- --

MR. CARBON: See, we tried this in '68 on -- -- we got thrown out. It showed its head --. Now, this is pre-core damage.

MR. CARBON: Part of your charge from the commission will be strange LWR's as well.

MR. SPEIS: I will say a few more things about that. So, let me say one more word about the policy statement and the -- part which is the important part is the -- and what are the important issues that have to be addressed. So, we have put together a number of policy issue questions.

So, again, I urge you to look at it very carefully because I think your -- should be an important contribution to finalizing policy.-- -- I think we will keep in touch with you just in case there is something mismarked. -- -- keep in contact with you when it goes out and make sure you are aware of -

MR. CARBON: I understood from Paul that you likely will be coming to us for formal comment.

MR.SPEIS: Yes it will, yes.

MR. CARBON: I have the advantage that Jesse didn't have. I looked at it -- I would like to ask you some questions.

MR. SPEIS: -- I have a few other things to say, but -

MR. CARBON: Go ahead. I will wait. You go ahead.

MR. SPEIS: Well, I was going to summarize

NRC 19
6-12-84
Tape 2
LAR 8

what our plans are basically and maybe we can go to the next view graph. -- -- responsibilities and as I said we plan to interact with DOE,- I have some examples -- interactions that can take place early in the process particularly for designs -- and these people who will be involved with design -- -- before we suffer with the same mistakes.

Identify unique -- and characteristics of advanced reactor designs compared to current technology -- -- -- -- I think we feel very strongly. In fact, we have started the proc:ss based on our perception of what is going on out there ACGR -- -- As you know, they are looking at a number of ways -- including the modular concept.

The are talking about steel vessels, PCRV vessels and they are trying to decide at what point in the size perameter you leave the PCRV or you leave the steel vessel and you go to -- -- So, these are important questions -- -- technicals questions.

So, based on our perception -- trying to define what are the most important areas that -- can pursue to provide early knowledge and so our feedback can be mo.e meaningful and more technical. So, we are in the process of re-evaluating the ACR program which has now -- I am talking about resource art -- -- large ACTR and we

NRC 19
6-12-84
Tape 2
LAR 9

are working very closely with resorce to define what we think is needed and more important in terms of priorities. So, we are planning to formally transmit our evaluation of our needs to -- --

MR. EBERSOLE: You going to rid of the -- We are getting rid of a lot of problems -- Why weren't they helium cooled -- pump?

MR. WILLIAMS: Okay. Helium bearings have difficulty -

MR. EBERSOLE: Not bearings. I didn't say bearings but helium cooled -

MR. WILLIAMS: Motor driven pumps?

MR. EBERSOLE: -- --

MR. CARBON: Well, you could argue steam driven pumps which is what they are, provides apparent little more safety and also economy than some of the designs do have.

The new designs still have water bearings. There is a poor technical argument-

MR. EBERSOLE: You mean water buffered seals?

MR. CARBON: Yes. Because evidentally, water is something you can get out of ACTR and if you do use oil it is likely --

(Multiple conversation)

MR. SPEIS: Speaking of,-- you people and all of

NRC 19
6-12-84
Tape 2
IAR 10

us having been listening to a lot of things about inherent --. Everyone is throwing that -- around. Every time they talk about a cost that is different than -- they call it an inherent -- design. It is a word that isn't used.

Of course, we do encourage inherent safe design and all of us, I guess, have some notion of what inherent safe design is. -- -- supplemental systems, you start charging for work the moment something happens.

I am afraid that the way our discussions have been going with DOE, they are using words like that without -- -- They had done their homework to say, you know, we don't need containments, let's -- them any place. Let's move the containments, you know, things of that sort. As -- says, it is time we provided this -- --

But, we are interested in working with them and Providing -- -- and see if -- -- They would like to utilize the advance reactors to come forward with maybe some different approach -- -- which is great. But, one of the things they will have to do is do their homework and tell us how they will do things differently based on the designs that they are talking about, and not just come and say, I have a reactor which is inherently safe because of some superficial -- and then, I don't need containment, I don't need -- -- I don't need general

NRC 19
6-12-84
Tape 2
LAR 11

design criteria, I don't need -- -- People are talking about getting away from -- approach and come foward with performance criteria.

My answer to that is, fine, but tell me how different, how would you design a good shut down system using new performance criteria? How would you, how are you going to make sure that you are meeting your objectives? How would the inspectors use the performance criteria to make sure that you have a pump -- --.

So, we are pushing them to come up with a good example. Give us, in specific areas, you know, in areas we had problems the last 20 years. How your new framework will improve things? And that's

MR. WOOD: Generally, that performance criteria is just a big road you can sweep things under.

MR. SPEIS: That's right. I agree with you and that is why we are pushing them very hard to tell us precisely how would you carry them through all the way to the point where inspector can go there and make sure that things are done, have been accomplished, have been implemented the way you say it.

MR. WOOD: DDC19 verses appendix R.

MR. SPEIS: After all, all of us know that there were times in the early 70's that we weren't paying any attention to specifics and even though we do have

NRC 19
6-12-84
Tape 2
LAR 12

criteria for, let's take your favorite area of -- --, the criteria that exists right now, they are already -- -- and everybody is one way and they did whatever they wanted. You know, there is a plan out there, or maybe more than one, that has -- --

But experience knowledge is showing us that there are -- -- The -- configurations are all over the place. I have been very heavily involved in looking at the issue of A44 which is the -- outside power and the diversity of -- because of outside characteristics, because of -- configurations, because of -- reliability -- -- varies by a factor of a 100. I mean that is obserd.

Talking about relative basis, it is good information -- -- So, I am telling,- how are you going to take all this and use that information and build the framework using your performance type data. So, we are having these discussions. We are putting pressure on them to tell us, give us a good thing about this and maybe there is a better way of doing it.

So, these are the type of initial interactions we are having with -- -- As I say, they would like you to delay in time, you know, to think of some more rational approach to licensing and design.

MR. EBERSOLE: The STAP44 is a good example of the utility -- verses --

NRC 19
6-12-84
Tape 2
LAR 13

MR. SPEIS: That's right. As you know, our approach has been to utilize the criteria if they are applicable to new design, and use them. If some of them can be adopted in areas where unique differences exist. You know, formulate completely new criteria.

So, one of the things we would like to do is work on criteria because I think that is always a good beginning. You have to have good criteria. We don't have any logical idea -- -- if we have something good that we can build on it's fine.

MR. EBERSOLE: Tell me when you work out a good criteria and we are going to pay for it. You then go through the analysis of how many ways people interpret this and how many of them are good and maybe only one is good and the rest are no good, and so, therefore, I'll write that one which is --

MR. SPEIS: Some of the current activities that our friend here, Phil, said that as far as -- FBR's -- -- They don't know where they are going to go right now. -- -- They are having all kinds of symposiums, meetings, and they are inviting experts from the United States and the world and they come up with a program and then they take it up to the high -- -- back to the drawing board.

NRC 19
6-12-84
Tape 2
LAR 14

I don't think anything precise or nothing is emerging

yet -- -- as far as we know. As I said already, you know, there is much more activity and much more effort on ACTR's and I don't know how real it is -- --

-- -- in the next few months we have asked them to tell us, tell us formally, -- -- because if there is no real effort, you know, our activities, as I said earlier, will go up or down depending on what is going on with the problems in the other areas. But, you know -- --

MR. CARBON: To put this in context, I'm not sure I followed some of the things you said. DOE does have a budget of 250-300 million for -- -- next year -- and the budget for AGER's is 35 or 40 million or some such thing. So, the emphasis is really heavily on LMFBR's.

MR. SPEIS: Well, it is mostly base technology -- -- Talking about -- -- program in 15 or 20 years you will build something. That is what I am talking about.

MR. CARBON: In the -- area, has DOE gone out with requests for proposals to design new LMFBR's which might be modular or something?

MR. SPEIS: That is what they are trying to decide right now. What kind of things to persue.

MR. CARBON: So, they have not gone out with-

MR. SPEIS: They haven't gone out. Even though there have been some proposals from --

NRC 19
6-12-84
Tape 2
LAR 15

M R. WILLIAMS: -- one that I mentioned earlier, GE, that came in with that small concept. They are still discussing but they haven't selected a contractor.

(Multiple conversations)

MR. SPEIS: Well, there have been kind of preliminary proposals. You know, you assign GE to do a preliminary study just to get ideas, okay? All that is being done to form ideas to put a lot of things on the table and then make some decisions which directs us to persue.

MR. ALLEN: An additional context is I believe, that the funds associated with that activity is 15 million dollars if I read the -- correctly, for studies of these concepts.

MR. WOOD: What is the primary goal of modularity?

MR. SPEIS: I gues it is -- --

MR. CARBON: On the STPR modular the main goal is -- -- removed by radiation of the vessel itself -

(Multiple Conversations)

MR. -- : -- -- If you go larger you can't do that. You then exceed the fuel temperature.

MR. -- : So it takes a low pressure, low temperature water cooling --

MR. EBERSOLE: Well, they have alternatives.

NRC 19
6-12-34
Tape 2
LAR 16

They blow air -- They could have air come through the bottom and go out the top of the chimney but there are objections to that.

MR. WILLIAMS: But, it would be reparable which is --

MR. EBERSOLE: It would be really entirely different -- -- type of fuel.

MR. WILLIAMS: I would like to take the opportunity to say the fuel is really what people are trying to build a reactor around. The fuel performed well in -- it performed well in -- and yet we have yet to have a reactor that correctly -- the fuel.

MR. CARBON: Are they talking -- fuel or -

MR. WILLIAMS: Yes.

MR. SPEIS: Also the reason is the -- utility group, right?

MR. CARBON: The -- of Reactor Associates is a mixture of -- Philadelphia Electric, Public Service of Colorado who have both had experience with -- -- TVA, I think is a member of it. How do you get rid of the notion that if one reactor is unsafe, 10 reactors are 10 times as unsafe?

MR. SPEIS: Say it again.

MR. CARBON: It is like an airplane engine. The worst kind would be to have the one that had -- engines on

it, one of which would take it down. This here, because they are going to put them on the same site. May I answer that in terms of - General Electic is also involved in this effort and they do have some advanced control of this group in San Jose and facilities -- -- and they are planning to build a simulator for this modular type of reactor just to, I think, work on that problem.

Can one operator operate more than one reactor, or one controller operate more than one reactor. This is very key, I think, in the economics. -- -- that this module design is anywhere close to being economical. It may have good safety advantages. I happen to think it does. But, I think that the economics can be overwhelming.

MR. EBERSOLE: Well, I thought they planned to take as many as they can and a couple - - one receiver.

MR. WILLIAMS: Well, the base plan is really two coupled into one steam terminal.

MR. EBERSOLE: Oh, is it two to one?

MR. WILLIAMS: And there will be about 200 mega -- electrical --

MR. SPEIS: I think an important thing is included in Baltimore, as you know, and the president of the utilities -- -- working on evolutionary design -- -- and I think they are planning to -- --

MR. BOENNERT: I am really not sure. I think

NRC 19
6-12-84
Tape 2
LAR 18

there was something on --

MR. SPEIS: I also understand that some of the utilities are getting together to form a group to deal with -- reactors to make sure that they ---- in addition to the -- -- You people have heard of the -- Concept.

MR. EBERSOLE: I hoped you weren't going to mention that.

MR. SPEIS: Well, the Sweeds are pushing it very hard. They came in here with kind of a detailed -- last week. And you were there right?

MR. ALLEN: No, but we got a briefing. The Sweeds came into the ACR and -- --

MR. SPEIS: The same type of group?

MR. ALLEN: Yeah. No, it was like a few months ago.

MR. SPEIS: But now they are going to step farther and they are trying to decide how their concept meets the general design criteria. They are trying to develop criteria for that concept -- -- I don't,- the only interest,- I asked them, you know, who is interested in this concept -- -- Hugaria-

MR. EBERSOLE: You might ask them to qualify their -- interest -- and how sophisticated they are in their engineering. You can get people interested in --

NRC 19
6-12-84
Tape 2
LAR 19

of the world in almost anything.

MR. SPEIS: But when you look at the combination of the LWR, ACER -- --. In fact now they are going -- They are talking about a big vessel that they will put different units depending on the need. -- --

As I said, we would like to interact with people. There is an interest. Okay, there is a utility interest or DOE now has coherent plans that they want to get some place eventually. -- -- crazy ideas. And, again, it is a matter of resources -- --

I guess Harkness will say a few things more -- -- The other thing I wanted to talk about was,- I think I covered, in my rambling way, most of the things I wanted to cover. One thing, the people that you have in this group are -- -- that have been involved in advanced reactors -- --

So, again, we would like to keep a small cadre of people because I think, as I said earlier, it would be important to see if you can make contact with DOE and see what type of story they present to you.

MR. CARBON: And when you say this, are you thinking we ought to be asking them about--and --

MR. SPEIS: Whatever.

MR. CARBON: And white water and-

MR. SPEIS: Whatever they would like to pursue.

NCR 19
6-12-84
Tape 2
LAR 20

Again, our goals are no different than the ones you and Jesse described in the letter -- --address questions based on our 20 years of experience -- --.

MR. CARBON: Let me go on and ask a couple of general questions here. You had two particular ones, both philosophical or something. DOE seems to be encouraging innovative thinking -- -- (Inaudible) I am not that acquainted with what they are doing. I see no effort on the part of DOE to encourage any new thinking in the LWR area.

Almost for sure, in my humble view, we are going to start ordering LWR's again. The United States is,- it doesn't matter whether you agree with me or not, but I really think that the utilities are going to begin ordering LWR's again, and it looks to me like what they are going to order essentially is the same reactors that we have got on line at the present time.

They are going to be changed a little bit because GE has -- and its standard by now. And Westinghouse has a standard plan in cumbustion engineering. But, they are going to be generally very similar to the reactors that we currently have.

Now, maybe those are good enough. They are safe, I think, but we sure have to baby the hell out of them in everything. Should DOE be doing more to encourage

NRC 19
6-12-84
Tape 2
LAR 21

innovative thinking in the LWR area and should NRC or ACRS, or somebody, be doing more to encourage innovative work in LWR? I want to ask you that.

MR. SPEIS: Well, I think both the ACRS and the NRC should -- -- We should be encouraging designs that have -- -- So, you have margins so you don't have to run around like a chicken every time there is a small problem. But, that is not the way things are going. What is going on right now is you have the -- effort which is a kind of a slow evolutionary,- you know, 60 problems that have come up. You know, make sure that they have the right materials and boilers.

That effort, you know, is not looked,- you know, make sure that you have water there or 24 hours or 48 hours to make sure you have a passive way of cooling the system so you don't have to-

MR. CARBON: It is not looking at any of the kinds of things that Jesse is -

MR. SPEIS: That's right. The Japanese in cooperation with Westinghouse, as you know, have gone a step farther from the present generation.

MR. CARBON: The ATWR -

MR. SPEIS: Even though you design,- we have seen -- goal is not quite the same as the one that I saw a few weeks ago. You know, they are chipping away at

NRC 19
6-12-84
Tape 2
LAR 22

some of the things that -- -- a year ago.

MR. CARBON: Yeah, they are just chipping away and they really are not, basically, changing the LWR that they are going to come out with, at all.

UNIDENTIFIED SPEAKER: I am anxious to see if the reactors will become more tolerant.

MR. SPEIS: Mere tolerant. I think that is important because you know, you have -- -- You don't have to shut down everytime -- -- everytime a reactor sneezes they have to shut down because --

So, it is in their interest -- --

UNIDENTIFIED: -- -- if you lose the intake -- -- I think they should be tolerant enough to live through it within -- and they can be done that way. But you got to -- which are the real barriers of the problem.

MR. SPEIS: But, you know, there is a financial problem right now. I guess,- you know, the activities by Westinghouse and by GE are in association with the Japanese so the Japanese have a big input because they are putting so many dollars into it.

MR. CARBON: They certainly are. They are calling the shots.

MR. SPEIS: We think we are not going to go with -- or it is going to be a long time -- -- The number

that you mentioned earlier is 250 million dollars -- --

We are in a -- position because we have to review designs -- -- and you have more freedom and independence to throw -- --

MR. CARBON: You should not get into design.

MR. SPEIS: Even though Congress has given us the right, if you remember, to look into specific systems -- --

MR. EBERSOLE: But you can say, if I have a design with integral characteristics that you will have less trouble with it.

MR. SPEIS: That is the thing we are trying to work with in the field of advance reactors, but -- -- -- --

MR. CARBON: There are going to be LWR's, the early ones. I personally think LMFBR's is very important in the long run and I personally want to see it stay on. So I have no problem with -

(Multiple conversations)

MR. CARBON: But my question is, the thing I am trying to ask is, are we, DOE, NRC ACRS, somebody, doing enough to get better LWR's out?

MR. SPEIS: I guess maybe we are doing enough maybe -- because we are dealing with all all these problems as they come up and if one thinks about them,

you know, -- -- shut reactors down or just -

MR. CARBON: It is working on today's problems.

MR. SPEIS: On today's problems, but all these problems,- sit down and how they can overcome these and overcome by going to the -- --

MR. CARBON: But the vendors apparently have no understanding -- --

MR. EBERSOLE: You know, there is a -- at work which says, everytime I suggest doing something better, in a way, I personally condem what I have already built.

MR. SPEIS: Well, that is a problem too because, you know, the perception is that the machines are there and are not safe and most of think the machines there are basically safe. -- shut down or the capacity factor is way down compared to the capacity factor in Japan for example. -- -- or something like that. -- --

MR. EBERSOLE: Above average, what is it, .31 -- and about 6 to 1 for us?

MR. SPEIS: -- --

MR. EBERSOLE: They don't ever want to shut down when they are running.

MR. CARBON: Let me put my question differently. In the February 27, March 30 policy statements -- put together, says, Section 205 of the -- Reoganization Act,

NRC 19
6-12-84
Tape 2
LAR 25

charges NRC with development of "A long term plan for projects for the development of new and improved safety systems -- ". It seems to me that NRC doesn't do that. Are your words the same as mine? Would you interpret it that way? It is on page 3 of the second paragraph of the March 30.

MR. SPEIS: Section 205 of the energy,- it is long term plan for what? -- -- This is the system,- I guess this thing was passed when you people were pushing us to get better,-- -- or somethings like that.

I think the way we are interpreting -- separate systems but maybe we are not enforcing this. We are not enforcing,the daily problems are so overwhelming that we don't have time to go back and think about these things. But, you know, nobody is building -- any more.

MR. CARBON: They aren't but they surely will. And I guess the thing I am still trying to get at is should we be doing more right now along the lines of encouraging safer reactors even though currently they are safe because we are going to have, I think, lots more of them starting in 5 or 10 years?

MR. SPEIS: I think we are to some extent but maybe not as explicit as you and others would like it to be, and again, because of the protections,-- you know, of such explicit pronouncements would imply, you know, --

MR. EBERSOLE: Well, I see these big 4 billion projects that are standing now, rusting away and not -- -- that they are not tolerant of -- failures as they should be. To accept the kind -- --

MR. CARBON: Incidentally, I am not making any criticisms here, I am trying to ask a question that I really seriously have on my mind.

MR. EBERSOLE: Somebody is going to have to order the plan.

MR. CARBON: (Mumbling)

MR. SPEIS: As I say, the Westinghouse -- with Japan has -- -- large tests. -- --(mumbling)

MR. CARBON: Is it your impression that they are going far enough that if we suddenly started building several of these a year starting in 1990 that people could look back in 2015 and say, boy, we have got a whole bunch of good reactors?

MR. SPEIS: I am not so sure they will build that reactor. I think, my impression from what I see, more probably they will build,- it all depends. If they build in four or five years before they build the present ones, they won't even go to the Westinghouse -- -- With most of the problems we know today, fixed, but against the margins,- they are not going to be there you know. The margins as we understand them. I think it is pretty

NRC 19
6-12-84
Tape 2
LAR 27

hard to say when, you know -- --

MR. CARBON: Well, let me stop. I just wanted to get your view on that.

MR. SPEIS: -- -- we are coming to you people on Friday for the final full committee meeting and, you know, that's a vehicle that we can say, look at more there because there we are addressing both standard designs and what -- -- Roger will be coming to make his final presentation. You know Roger Marx? -- -- Friday is his last day. -- --

MR. BOENNERT: We don't have to vacate the premises at 10:00 but Jesse is going to have to leave because -

(Multiple Conversation)

MR. ALLEN: As you see on the next viewgraph, the advanced reactor group activity run -- liquid metal reactors. The topics on that page are ones we have already discussed pretty much. We are,- our current activity is, we are trying to develop a licensing framework for liquid metal reactors and we are basing it largely on the existing, drawing heavily on white water reactors. And the work that was done on the -- River.

We are looking at -

MR. SPEIS: Except the -- we have called them to come forward with the -

NRC 19
6-12-84
Tape 2
LAR 28

MR. ALLEN: Oh yes, we have. I was going to mention that. In addition to using this, we are encouraging them to come forward, the applicant, with their own suggested criteria and we will look at other sources and these will all be part of our review, our activity.

In redrafting, one of the first steps we have taken right now, in lieu of having anything in hand, we have taken a look at the existing PDC's for Clint River and we've redrafted them to state the purpose clearly to begin each criteria. That will help us try to focus on the function of that criteria.

But, other sources of recommendations are going to be very important for the development of this framework. We will look at the standard review plan and try to identify those applicable to the liquid metal reactors as will on the reg guides. We are giving some thought to trying to write a standard review plan for severe accidents. That is a pretty good size undertaking.

Other topics, going down the list, is maintain awareness of changes in the LWR licensing and as we just mentioned we are tracking the severe accident policy and the safety goal activity to try to assess the implications on the licensing framework for advanced reactors.

NRC 19
6-12-84
Tape 2
LAR 29

In addition we are trying to,- we are developing ways to maintain cognizance of foreign -- and licensing philosophy. Currently through internation programs and technical exchange agreements we have and the documents we get from them, partly through our research exchange agreements and our research colleagues , the foreign and domestic liquid metal reactor operating experience, AAOD has a program where they get event exchange, event information, and we are trying to develop a way to utilize that program.

The next two, the research mid-year review and the establishment of research, we talked about that earlier. We worked closely with research and the needs will evolve as we develop the criteria and the licensing structure or licensing approach we are going to use for LMR's, and, as we get more details on the new concepts, these needs will become more clear.

MR. SPEIS: I think -- whether something else could be done in lieu of -- If we find out that there is some real effort going on then we will take a look at that effort in DOE and what it is all about and then, in light of that, you know, -- -- What are our priorities? -- -- Right now we are doing this for ATTR because we think it is more accurate in this area. -- -- I am sure they will argue hard with us and we will argue

NRC 19
6-12-84
Tape 2
LAR 30

hard back, but, you know, that is the game anyhow. -- --

MR. ALLEN: Then, of course, we are trying to track the AC..S activities. -- letter that was referred to earlier, that you and Mr. Ebersole wrote, plus the licensing and safety philosophy work that I understand is still on going. We will take that into consideration.

And the last item is trying to establish the ground rules and the interaction structure with DOE. That's in progress. It is slow going. We think they will be coming forward with somethin in the near future but we are not sure how substantial it will be.

MR. SPEIS: I think, to have many interactions with you people, if DOE takes an int rest in what we have told them, if you come forward and tell us, how would you like the licensing to be done differently than before for advanced reactors, then we will have to discuss it with you. Get your people, your consultants, have a real working type interaction. -- -- Let's see if we can do something real.

So, I think we want to make sure that that happens. We consider that an important part of our interaction.

MR. CARBON: Fine. And I sure complement you or comend you for,- welcoming their ideas on how to develop the licensing framework. They may not come through with a damn thing but we hope they do.

NRC 19
6-12-84
LAR
Tape 2
31

MR. ALLEN: It is worth it even if they don't.

MR. SPEIS: Again, we are challenging because they are talking about -- we want to use performance criteria. Fine, tell us how you are going to use them, how you going to implement them, how are you going to apply them? Give us examples of specific systems, specific reactors. -- --

MR. ALLEN: The next, the second viewgraph-- reiterating comments we made on the interaction research programs. We participated in the mid-year review and we offer those suggestions which complete the foreign committments as Phil discussed earlier. Maintain cognizance of foreign designs which is always written into their program assumptions anyway I believe, and it is pursued.

-- -- in house capabilities to come -- -- And, as the concepts come forward, the LSPD and the other concepts, to help us evaluate those and provide support to us and we support the source term work initiation.

And the last one, I think, is probably in my opinion, one of the more important ones. That is to be sure that the tools we have available are going to be capable of addressing safety evaluations in the new concepts.

MR. WILLIAMS: Okay. I was wondering if Dr.

NRC 19
6-12-84
Tape 3
LAR 32

Carbon would prefer to just ask these questions or go-

MR. SPEIS: __ __

DR. CARBON: Go ahead.

MR. WILLIAMS: Our first activity here is the development of licensing guidelines and general design criteria. We have a goal of October first to come up with some very rough draft -- -- for the socalled inherent safety --

In Port -- we never did develop specific criteria for ATER's. We used the existing criteria and found that it was possible, at least at that time, for the applicant to take exceptions and then justify them to the different criteria. And this probably was a poor way to go because we have had difficult experience with Port St. -- and in retrospect I would advocate that we attempt, as best as we can, even though we don't have a hard design, to look at it, to try to develop general design criteria and the other tools of licensing.

So, that is high on our priority list and it is also high on DOE's priority list. They are planning to suggest criteria sometime this fall and perhaps this would be a good thing for the ACRS to help us with -- --

Items two and three do go together in a way. Unlike the -- our world, we do have an licensing operating reactors and we, from the advanced reactor group, have

NRC 19
6-12-84
Tape 3
LAR 33

consciously -- feel that there are many lessons to be learned in Port and Grain. And Port St -- is inaa position of having to walk this middle ground between a different kind of reactor yet having to conform with the general rules of licensing developed for light water reactors.

We are very fortunate in this position that we can keep closely abreast of the licensing trends and answer the specific characteristics of an operating -- --. So, most recently, we do have participating in the activities of Human Factors.

I said a moment ago that the fuel is par excellance, but there has been a problem with graphite block, the containment fuel, development of cracks. These, scfar, have been determined to have resulted from thermal stresses and are judged at this point inconsequential. But, there was an investigation into that.

In particular there is a recent ACR subcommittee meeting -- -- review this problem. Also, fire protection is being reviewed at Port St. --.

We have had a number of discussions with DOE and most recently we had a discussion with DOE contractors on ACERs and we have mentioned that -- reactor associates, this is essentially the lead contractor. -- --

NRC 19
6-12-84
Tape 3
LAR 34

It was funded partly by utilities, approximately a million

or two million dollars total funds. The balance of the funds have come from DOE.

The other principals in the DOE stable of contractors are General Atomic Technologies which is a new name for Gener.' -- -- It has a long corporate history of name changes.

At this briefing, I think some important dates evolved. On October 30 DOE has promised us a licensing plan and we have asked them to write us a letter telling us what kind of response they want from our review of the plan. First of all, confirming that this is a firm delivered product and we are interested in what they want to hear back from us. So, that is another item that developed from that meeting.

Other important dates on that schedule are also in the fall of this year. DOE will complete an evaluation of conceptual HTDR designs. There are some 8 to 10 modules of different concepts being investigated and there are, perhaps, a few concepts called in the integrated concepts which is a scale-down version of their reference concepts. And the reference concepts is a scaled up version of Port St. --.

The reference concept was basically Summit -- -- during the mid 70's. They recently renamed the 220 mega watt thermal -- plant. They integrated concepts

which we expect to hear about in the fall, will be a design of 11 -- or half of the concept, half the power of a reference concept and that would be about 400 megawatts electrical which the General Atomic -- has determined is what utilities would like to buy.

They did a survey of the industry and it was decided that the utilities no longer want the risk a multi-billion dollars on a larger plant, but if they could buy plants now they would like to buy -- in the 400 megawatt range.

Therefore, in October, or later, there will be a decision on which of the modular plants they will pursue, which of this integrated-

MR. SPEIS: -- --

MR. WILLIAMS: That's right. There is a horse race going on and in October there will be three entries in the horse race. One of the modular designs, the socalled integrated design which is based on the reference concept but I perceive will be,- will include natural convextion cooling, and then, the lead plan itself, the 220 thermal megawatt lead plan which is their long standing lead plan design.

So, there will then be three HTDR's in the -- horse race. This is expected to be concluded about a year from now. I think in September, excuse me. It will

be in September of '85. They will then narrow down the concepts to one reactor either the modular, the -- -- plants or the integrated plants.

A year from then, September '86, they plan to utilize the document called a Preliminary PSID, Preliminary Safety Information Document. This will be sort of a pre-application document. It will have some characteristics of a PSAR. Such a strategy was used many years ago for the-- -- concept -- --

It may have been used by other applicants but I am not aware of them. This document, I guess, they would expect eventually receive a fairly large licensing review and I believe eventually -- --

MR. SPEIS: Based on all the things you said, what is the nearest date where they might do something, build something or decide to build something?

MR. WILLIAMS: -- said,- talk about building something, what is -- and what has been written here and there, is a demonstration modular --. I think that they feel that anything that comes soon, it would be trying to prove the inherent safety principal of the modular plan and one of the gentlemen at this meeting said he felt it could be operational in 7 years from now.

MR. SPEIS: Is this something that -- expected to participate -- extensively --

NRC 19
6-1284
Tape 3
LAR 37

MR. WILLIAMS: Well, I think it is too early to talk of reality of such a plan. I bring it up, I think, almost as a hypothetical question. There is a lot of water to go under the dam, I think, before I think they are ready to go for the demonstration plan.

MR. CARBON: What in Richmond are they talking about, or does it vary and -

MR. WILLIAMS: They are now talking of long -- fuel. Originally, the HTER's -- fuel, I had thought was an economical advantage to the -- fuel and frankly asked that question. And they say, no, long -- fuel is fine by us and we are going to stick by it and there is only a minor economic penalty.

MR. CARBON: By load, do they mean 3 percent or 20 percent or -

MR. WILLIAMS: Less than 20 percent.

MR. CARBON: Two or three. My would it be very much different, it would probably be a lower difference- lower than the light wire reactor because it has got no -- in the modirator to speak of.

MR. WILLIAMS: Well, they use the term here -- -- less than 20 percent in other conversations I had with them. It could be --

MR. WOOD: The EGCR that was built in Milton Hill Lake in something like 1962 had 2.2 percent enriched

NRC 19
6-12-84
Tape 3
LAR 38

fuel.

DR. CARBON: It would seem, would it not, if it had truely 20 percent they would have so much U235 tied up that wouldn't they almost have to recycle fuel for it to be economical. Could you afford to -

MR. WILLIAMS: Well, we haven't talked fuel economics very much with them.

MR. SPEIS: Well, that should be a very important consideration.

MR. WOOD: There are a number of papers who will -- -- that deal with -- --

MR. CARBON: And you are confident -

MR. WOOD: My memory is extremely -- --

MR. SPEIS: -- -- they were looking at all kinds of variations and enrichment verses economics, verses reprocessing, verses -- --

MR. WILLIAMS: And I was surprised at the answer that -- fuel was economic --

MR. WOOD: The only reason you go up in enrichment above the 2 percent level is if you want to go to burn-out -- about 20 or 30 thousand,if you are shooting for very high burn-out they would have to put in the fuel to burn-out. With 100,000, with a low breathing rate, you are probably in the 5 percent range.

MR. WILLIAMS: Numbers 5 and 6 on the viewgraph

NRC 19
6-12-84
Tape 3
LAR 39

-- review and -- research needs, more or less went together. Following the mid-year review, during which discussion of the modular concept did come up, we have begun to redirect the research program towards the modular plan and toward the socalled integrated plan, toward the -- -- safety and away from the reference design.

And, I will go into the research program if we have time and I will point out where the directions are taking place. Again, item 7, is quite important and we do plan at least, for the research program, to initiate gathering of foreign experience and criteria.

I might mention that the Germans have had, go-critical, and expect to start up in 1985. their THTR reactor. It is a larger pebble bed reactor -- -- One was passed around at the DOE table and it was just about that size. A little less than -- --

DR. CARBON: And it has gone critical?

MR. WILLIAMS: It has gone critical and it has had licensing problems over the years and one of our immediate steps will be to try to find the German licensing criteria. We are very anxious to understand the basis for the licensing with the ACR. We will get that as soon as we can.

Alright, I will try to speed up here. The research program has sort of three parts. One is related to

Port St. -- needs. These are continuing activities as expressed from Region 4. Region 4 now has the technical responsibilities for Port St. --

It will be redirected to, as I said before, into a smaller modular design and in doing that we will cancel some of the existing programs. We will cancel a program at Brookhaven on oxydation and one at Los Alamos on concrete -- We feel these are programs that can just as well be undertaken by DOE and we are with very limited funds. I should point out that the entire RES program for AGER's for this year, next year and the previous year is 1.6 million dollars.

So, we are conscious of cost of feeding very small sub programs. We are also canceling the programs that are relating to this large plant, the former lead plant. This is a plant that its basic accident is an uncontroled core heat up accident. The newer designs would have different accidents, in fact, they are designed to eliminate the uncontroled core heat up accident, so, with that, we would undertake other work.

As I say, we are making maximum use -- -- We will initiate what we call an integrative analysis. And this is our major program that would be given in fiscal '85. We need to understand the safety design of the proposed advanced concepts. We really feel we

need to understand it before we can do much development along the line of severe accidents, find out our additional research needs. So, we expect to do something of our own accident delineation assessment of two designs which we will select from the small type chosen by DOE in the fall.

Along with this analysis we have small programs in code development in assessing what we have. There have been a lot of ACER codes made available and probably most of these, but not all -- --

We also would like to make use of some German work performed in -- analysis. Oakridge some access to that experiment code.

We don't plan to do any high temperature materials work ourselves. This, or course, is very important to the safety -- ACER, performance of metals -- graphite. We just can't afford to but we would take what -- -- N47 on high temperature metals and then there is -- Section 3, Division 2 on graphite structures and SME, Section 2 on -- inspection.

In service inspection is an area where we do want to spend a little bit of effort, mainly for two reasons. If accidents are to be prevented or be precluded by design, we want to know to what extent the design provisions require life time testing and -- inspection.

And the other is, the reactor should be designed realisticaly to prevent,- to provide for in-service inspection as it is needed. -- --

Reactor Vessel study, we need to know the differences between the PCRV and the steel prssure vessel. Steel pressure vessel would be unique for gas -- reactors and would ultimately be a problem -- --

I think that practically concludes my talk except to mention the HTGR handbook. We have a program where we assess worldwide data experience and those data board or a group of editors decide -- are useful would eventually find their way into a handbook type format.

This would also be useful for Port St.-- people -- --

DR. CARBON: What sort of money will be involved in this research program?

MR. WILLIAMS: 1.6 million dollars for fiscal '85 and '86.

DR. CARBON: Each?

MR. WILLIAMS: Yes.

MR. SPEIS: This includes the rearrangement, right?

MR. WILLIAMS: This includes the redirection.

MR. SPEIS: Terminating some and starting some others relevant to the concepts --

MR. WILLIAMS: We may eventually go back to our earlier -- program if they, in fact, choose -- -- we would then pick up some -- --

MR. SPEIS: So that concludes our presentation.

DR. CARBON: Well, perhaps in the interest of everyone's schedule, it is 10:00, maybe we better call it quits. I could keep asking questions for quite a while but I think I have gotten most of what I wanted.

MR. SPEIS: We have told you everything we know.

DR. CARBON: Thank you gentlemen. It was real interesting and real informative.

MR. SPEIS: Thank you and I guess we will be seeing you more often.

(Meeting adjourned at 10:00)

CERTIFICATE OF PROCEEDINGS

This is to certify that the attached proceedings before the NRC COMMISSION

In the matter of: ACRS Subcommittee Meeting on Advanced Reactors

Date of Proceeding: June 12, 1984

Place of Proceeding: Washington, D.C.

were held as herein appears, and that this is the original transcript for the file of the Commission.

Tom Berry
Official Reporter - Typed

Tom Berry 6/7/B
Official Reporter - Signature

[illegible] BY ACRS ADVANCED REACTORS SUBCOMMITTEE CHAIRMAN

JUNE 12, 1984

INCLUDE THIS AT THE BEGINING !

The meeting will now come to order. This is a meeting of the Advisory Committee on Reactor Safeguards Subcommittee on Advanced Reactors.

I am M. Carbon, Subcommittee Chairman.

The other ACRS Members in attendance are: J. Ebersole and C. Mark.

The purpose of this meeting is to review NRR/RES activities related to LMFBR and Advanced Reactor research.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act and the Government in the Sunshine Act.

Paul Boehnert is the Designated Federal Official for the meeting.

The rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in the Federal Register on May 22 and May 30, 1984.

A transcript of the meeting is being kept and will be made available as stated in the Federal Register Notice. It is requested that each speaker first identify himself or herself and speak with sufficient clarity and volume so that he or she can be readily heard.

We have received no written comments from members of the public.

We have received no requests for time to make oral statements from members of the public.

(CHARIMAN'S COMMENTS - IF ANY)

We will proceed with the meeting and I call upon Mr. Phil Wood, NRC-RES.

5/30/84

ACRS ADVANCED REACTORS SUBCOMMITTEE MEETING
JUNE 12, 1984
WASHINGTON, DC

- TENTATIVE SCHEDULE OF PRESENTATIONS -

	PRESENTATION TIME	ACTUAL TIME
I. Introduction M. Carbon - Chairman	5 min	8:00 am
II. RES FY 85-86 Advanced Reactors Research Program P. Wood - RES	30 min	8:10 am
III. NRR Advanced Reactors Group Activities T. Speis C. Allen	30 min	8:50 am
IV. Discussion and Adjourn*		10:00 am

*Please note the meeting must adjourn at 10:00am to allow use of the room for another Subcommittee meeting.