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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

DISCUSSION OF PROGRESS, STATUS & PLANS

OF THE NUCLEAR SAFETY ANALYSIS CENTER

PUBLIC MEETING

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

Wednesday, June 12, 1980

The Commission met, pursuant to notice, at 10:10 a.m.

BEFORE:

JOHN F. AHEARNE, Chairman of the Commission

JOSEPH M. HENDRIE, Commissioner

PETER A. BRADFORD, Commissioner

RICHARD T. KENNEDY, Commissioner

VICTOR GILINSKY, Commissioner

STAFF PRESENT:

LEONARD BICKWIT, General Counsel

ALSO PRESENT:

F. LEWIS

B. LEE

DR. E. ZEBROSKI

R. BREEN

W. LAYMAN

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P R O C E E D I N G S

CHAIRMAN AHEARNE: One of the major items identified by a number of the review groups of the Three Mile Island accident was the necessity for changes to be made. Changes in the Nuclear Regulatory Commission, changes in the nuclear industry.

The industry responded quite rapidly after the accident, and formed two groups: The Institute of Nuclear Power Operations and the Nuclear Safety Analysis Center.

Earlier this spring, the Commission heard from INPO and they outlined what they were planning to do and how they were getting started. This morning, we have an opportunity to hear from the other organization, Nuclear Safety Analysis Center.

I know, speaking, I'm sure, for my colleagues and other members of the Commission staff, we are quite interested in hearing how NSAC is coming and what kind of program they have under way and under development.

Probably during the discussion period, we will get to some questions on how they and we can work together. With those opening comments, I would like to welcome the gentlemen here, and Floyd Lewis in particular. Floyd?

MR. LEWIS: Thank you, sir. We appreciate very much the opportunity to appear before the Commission this morning to provide information about our industry response, and particularly the Nuclear Safety Analysis Center.

My name is Floyd W. Lewis. I am chairman and president of Middle South Utilities, headquartered in New Orleans, Louisiana. I will give a brief overview.

In there interest of time, I will read it. In April 1979, just a few days after the Three Mile Island accident, the board of the Edicon Electric Institute formed a committee to coordinate the industry response to that accident. I was designated chairman of that group.

The other members from investor-owned companies who were asked to serve were John Selby of Consumers Power, Frank Barn, Portland General Electric, Bill Lee of Duke Power, Tom Ayers of Commonwealth Edison, and Lee Everett of Philadelphia Electric. Walley Benke of Commonwealth Edison has recently replaced Tom Ayers who retired from that company.

This committee invited representatives of the American Public Power Association and the National Rural Electric Cooperative Association to participate to make it a truly industry wide committee.

These two organizations are represented by Jack Feester, general manager of the Salt River project in Arizona, and then president of the American Public Power Association; and Frank Limda, representing the National Rural Electric Cooperative Association, and general manager of Dairyland Power, which is the only cooperative with an operating reactor.

The Nuclear Oversight Committee moved quickly to organize the industry to address the problems reflected at TMI. Their efforts results in three new independent organizations: the

Nuclear Safety Analysis Center for detailed safety assessment, the Nuclear Electric Insurance Limited, for financial protection due to extended plant outages from an accident, and the Institute of Nuclear Power Operations for improved operations and training.

The committee also served as the industry's liaison with the White House, the Congress, the U.S. Department of Energy, the Nuclear Regulatory Commission, and the President's Commission in the accident at Three Mile Island. In addition to other actions, this committee decided within days of the accident that the industry should do its own investigation of the accident. For this purpose, requested the Electric Power Research Institute in Palo Alto, California, to set up the Nuclear Safety Analysis Center, which we call NSAC.

EPRI is the electric utility industry's research and development management organization. By mid-April of 1979, NSAC had started work. The initial charge to NSAC was basically to first assist Metropolitan Edison and General Public Utilities during the recovery phase of the accident.

Second, using all available information, determine what happened in the accident, ascertain the causes of the accident, note improvements that could be made in nuclear safety criteria, guide generic improvement of safety in any of the types of power reactors in use in the United States, act as a clearing house for information in exchange among the utilities, and provide information on the effect of radiation, particularly low

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level radiation on human health.

Shortly after NSAC began its work, the electric utilities industry established the Institute of Nuclear Power Operations, as an independent non-profit organization that is dedicated to ensuring the high quality of operation in nuclear power plants.

Its purposes, in brief, are to establish industry-wide bench-marks for excellence in nuclear operations and to conduct independent evaluations to assist utilities in meeting the bench-marks.

I know you have already heard from industry representatives about INPO. INPO and NSAC have been organized to complement one another. INPO to emphasize the operations aspect and NSAC to emphasize engineering and their respective efforts on this initial charge and from subsequent developments.

There is evolving a broad objective and a continuing mission for NSAC which may be stated breifly to provide to the utility industry the best available technical information and analysis on generic issues relating to nuclear power plant safety.

The oversight committee believes that the functions poerformed by NSAC will be needed by our industry on a continuing basis. Each organizational entity at the Electrical Power Research Institute has an advisory committee of utiltiy management to supply the utility perspective and guidance to EPRI's

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R & D efforts.

Accordingly, the Research Advisory Committee of EPRI -- that is the top industry committee in that organization -- established the Research Advisory Committee, Nuclear Safety Analysis Sub-commitee. Mr. Byron Lee, Executive Vice President of Commonwealth Edison is the chairman of this committee. He also serves as the chairman of the Atomic Industrial Foreign Policy Committee, which was formerly known as the Committee on Follow-up to the Three Mile Island accident.

He will give you a brief description of the workings of the NSAC commitee and NSAC's interactions with various industry groups. Byron?

MR. LEE: Thank you, Floyd. As Floyd indicated, I am the chairman of the Utility Committee for oversight of NSAC. it is a position I assumed early this year when Lud Lischer, who was an engineering Vice President at Commonwealth Edison retired. He was the intial chairman from the instigation of NSAC, itself.

Our committee has eight members. All from industry, with representation of investor-owned and publicly-owned. I might just indicate who they are.

Besides myself, Vince Boyer from Philadelphia Electric, Saul Burstein from Wisconsin Electric, L. S. Cox from Potomac Electric, Warner Owen from Duke, and Fred Weinhold from Tennessee Valley Authority, and Floyd Koehler from EPRI, are members of our NSAC Sub-committee.

We meet as often and have met as often as needed, either in person or via conference calls. That has averaged about once every five weeks over the past year. I would characterize our function as a technical board of directors. In addition to this oversight, each utility has designated an NSAC coordinator for the regular day-to-day communications with NSAC and the people in Palo Alto.

NSAC also receives advice from an outside utility industry through a scientific advisory committee, which is much like the EPRI structure. This brings together expertise from other industries and from the educational field. Two of these people we know are well known. More of them, of course, are but well known to you: Professors Norman Rasmussen and Joseph Palladino.

As Floyd indicated, I also serve as the chairman of the AIF regulatory policy committee, formerly the policy committee for follow-up on Three Mile Island. We have tried to maintain a good interface between NSAC and the various AIF subcommittees, and the subcommittees in the owner's groups that have been formed since Three Mile Island, following the Three Mile Island issues in the Action Plan.

I hope you are aware of the strong interaction that has existed between AIF and NSAC and the NRC staff. As you probably know, the industry has indicated to you several times that we were concerned because of the early draft of the Action Plan

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had such a large number of items with varying levels of safety value and feasibility.

In many cases, were not clearly defined or prioritized.

COMMISSIONER GILINSKY: Would you like us to hold questions or you mind -- where do you draw the line between NSAC and INPO in terms of the subject matter that you deal with?

DR. ZEBROSKI: We will cover that in the presentation.

MR. LEE: In the presentation later on we will get into it, but basically, it is a split between operations and, I guess I would say, engineering, technical, design areas.

COMMISSIONER GILINSKY: You will cover it and discuss your interaction with INPO?

DR. ZEBROSKI: Yes.

COMMISSIONER GILINSKY: Okay.

MR. LEE: The simultaneous requirements of the many overlapping items certainly has represented an overload on both industry and the NRC manpower and our resources, and has seriously diluted them.

One of NSAC's major contributions that we believe has been made in the past year was the prioritization methodology which is applied in a joint AIF-NSAC workshop. The industry recommended safety evaluations, cost estimates, and corresponding priorities for the major items in one of the early drafts of the Action Plan.

This effort was documented and presented to the NRC staff in February. We believe that that has had a considerable value. We think the staff has risen to it. Additional specific projects will be covered by Dr. Ed Zebroski in a presentation, and two of the other key personnel brom NSAC.

I would like to conclude by saying that all of the industry people that I have talked to over the past year believe that NSAC has provided the industry with the technical strategic planning and support that is needed to maintain safe reactor operations.

Our RAC subcommiee has recommended that NSAC be continued in its present form. That is, as an arm of EPRI at least through 1981. We will be developing, very soon, some recommendations as to the proper form for NSAC to take in years beyond that.

Now, I would like to turn the program over to Dr. Zebroski. Ed?

DR. ZEBROSKI: Thank you, Byron. I don't know. Did we distribute the agenda, specifically?

CHAIRMAN AHEARNE: Yes.

DR. ZEBROSKI: I will cover, just briefly then, a little bit about our organization. Then we would like to spend a little time giving you some of the texture of the effort of work going on.

We will start out with the first chart, please?

(Slide.)

Our major areas now, as you know, are the initial charter analyzing the TMI accident, itself. That was essentially completed last November. Our first report, as you know, was out in July of 1979. We have recently reissued a more comprehensive and, we think now, reasonably definitive document, NSAC-80-1.

I believe, if it has not been distributed to you already, it is in the process being so. This has [illegible]chnical appendices and covers much of the same ground as the technical supplementary staff work of the Kemeny Commission and Rogovin Studies.

As you know, however, we have tried to avoid subjective material. We have stuck as rigidly as possible to the objective evidence, preferably on tape or on strip chart, and analyzed the phsyical phenomena as distinct from the psychological or political phenomena, which have had plenty of analysis elsewhere.

That work essentially behind us now, except for a small continuing effort in following the clean-up and, hopefully, recovery effort of Three Mile Island.

NSAC -- as you know, I believe there are seven committees functioning in planning the R & D associated with TMI clean-up. Our role in that is really very passive. We are mainly serving as the keepers of the data so that if there is something that happens there that could be useful to other utilities, it is recorded and made available in the form that can be used.

So, our major effort now which will be one of the following presentations, we call the significant event program. That is the objective of making the process of learning from experience truly cumulative.

As we all know, it has not been as cumulative as we would like, since about '74, as the number of plants increased rapidly. We think we have that back on track now. That will be one of the next presentations.

That, in turn, splits itself into two areas: Category one and two, there. The screening phase, where we sit through both LERs and operating experience reports to see if there is another Davis Besse among them; then the second phase which is to dig in some depth on the analysis and potential remedies for such issues.

Category three there, response to regulatory issues at the most elementary level, we have been called in as a technical support staff, as you know. AIF has seven technical committees which are charged with the nominal industry base on such issues.

A couple of these, the high energy line break and the fuel channel venting issues which were, shall we say, one week wonders. In both cases, we identified the generic elements of that.

Instead of 70 letters coming back, we can come up with a single generic response. This was done, and successful, in cope with 100,000 records from TMI. So, right off, we established the Zytron documentation system, which has a 2 million document capability. It gives you a short abstract of the document, and retrieve it on an interactive basis, key words, descriptors, or dates.

You punch those in and it flashes back the document. It is the like the dialogue RECON system that NASA and DOE use to search their documentation system.

That system is also accessible by telephone link by any utility. The NOTEPAD system we ill discuss in a little more depth. I think you know about that. We feel that is a bit of a breakthrough in communication, also in management. It is a problem that every large organization has. The right hand does not know what the left hand is doing, sometimes.

This avoids the buck slip problem We see that having a very constructive effect, already in many utilities. The use of that system has doubled every month since December when we set it up.

It is also now international. We will have the ability to tap in to utilities in Europe, in Taiwan, and in Japan and probably in South Korea. There are satellite links there, so it is an international network. We have expression of interest from eight foreign countries now to join in this network -- that is, utilities from eight foreign countries.

None of this is entirely satisfactory when you apply diffusing those issues from proceeding beyond the factual basis requried.

That pattern, I think partly at Dr. Denton's request, has been institutionalized. Each of the owners groups has something called a regulatory response group. NSAC gives staff support to some of these.

We also offer the services of our communications network to help with such activities in the future. The generic safety evaluations, that is the one part of why it is not in very good focus. I think that is characteristic of that area. Of course, there is a long list of items that need to be worked on.

I think we will just take a few of the pieces that had the lighest level of activity in that area, which is the degraded core and class 9, which we will discuss last.

Emergency decision process Bob Breen will discuss. Key safety parameters and safety goal formulations I know are of interest to the Commission. We will mention activities on these.

Another charter is to activate the clearing house for the industry. We have done that by tryong to make a national conscience for the utilities. Conscience requ[illegible]es a good memory, so we have set up two computer based, but very convenient systems.

One, a documentation system. First of all, we had to it under stress conditions. So, we are also doing some studies on how to get such systems to work well, even under emergency conditions.

We found that at Crystal River, phone lines saturate very quickly. So, many utilities, I think the Emergency Response Committee is studying use of extending the microwave relay links that utilities have for load dispatching, to take care of some of the special commication needs.

So we are not dependent upon the saturation of the commerical systems. There are some sophisticated systems under way, which we have more utopian studies on. As you know, there are load dispatch, load control, load dispatching systems. Some of these systems we think may have potential value for radiation monitoring, for emergency notification, and particularly for non-emergency notification.

These look like they can be dedicated systems of very high reliability. We will be pursuing those at a technical level and discussing them with the Emergency Response Committees both at NRC and in the industry.

Finally, the TMI follow-up, we are involved by request with the state of Pennsylvania to help a study which is already under way there with great foresight. It was started about a year before the accident at TMI. They asked us -- the funding was running out. They asked us to help provide interim funding because of a budget year problem. We have done that.

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Our only participation is that we sit on the review committee that hears a summary of the data periodically. We are trying to ensure that it has good statistical validity. With that, I would like to introduce Bob Breen -- Bill Layman next. He will talk about the significant events.

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CHAIRMAN AHEARNE: You were going to briefly describe your organization?

DR. ZEBROSKI: Excuse me. The next chart please. I think this is pretty much self-explanatory.

(Slide.)

We function as a division in EPRI administratively. That is, follow the contract rules that EPRI has set up. We have dispensation from some of the procedures which make R & D contracting sometimes a slow process.

We often run three to six months in negotiating an R & D contract. For our purposes, we are able to send someone a letter of intent the afternoon of the day we have a meeting with them and agree on scope.

So, we are able to move very rapidly. We have roughly 25 active contractors. Roughly 50 that we have worked with. For example, on the significant events program, there are ten active contractors who were able to work with them on that basis. So, we can pick particular people and say, "Hop to it." They respond pretty well.

The funding is -- I don't know what the 80 story is since it takes a time to spread over time, but in '79, we had 100 percent of the nuclear utilities, public and private, part of the funding supporting structure for NSAC.

I believe we will have -- we have only heard one that would have a rate problem. They indicate that whether they can make their 80 contribution.

MR. LEWIS: I might break in and say that the ad hoc committee, the investor-owned part of the industry set a goal of $12 million this year, $7 1/2 million would be our part of the NSAC budget.

We have commitments in hand now for about $8 million -- almost $9 million of that, and have an effort lined up now to follow-up on those we have not heard from.

The formula we used would produce about another $3 million from the companies that we have not yet gotten an answer from. I made a report on this to the EEI board in Chicago this week, and I had two people come to me -- three, really, right after the meeting to see which list they were or.

They did not know whether they had committeed or not, so we are fairly confident that we will come very close to the goal we have set out to do in 1980.

CHAIRMAN AHEARNE: I had a question that I am sure you asked before, but I would just like to have it answered again. What kind of a level of independence does NSAC have after they have done the review?

For example, you do a review of some accident situation. You identify in that review some problems, serious problems. What kind of independence do you have to: (A) Communicate those problems, and (B) to put those problems right?

DR. ZEBROSKI: We had a discussion with Dave Okrent's subcommittee. I gave an answer and Warren Owen gave an answer. The guidance we have is that when we find a concern, we communicate that immediately to the entire list of people that we think ought to be interested. We do that by NOTEPAD and with a follow-up letter to the NSAC coordinator.

If it is an item that is likely to require action, there is letters to the two vice presidents of generation and engineering. In the case of Crystal River, we had on NOTEPAD the same afternoon, a statement that we were undertaking a study that we saw three major areas of concern; several of which were sufficiently important that the utiltiy should start looking at it on their own.

For example, the first item was: Are you dead sure that you have got a satisfactory and comfortable shutdown procedure for loss of instrumentation situation. We understand quite a few utilities picked up on that and started studies immediately on that afterwards, recognizing they might not be completely safe on that.

The second part of the discussion that we had with ACRS was the question of making recommendations. We have been directed by one of Byron Lee's committees that when we do these studies, we produce recommendations. We communicate those, again, with the interested people by the same channels, the early alert phase on the follow-up phase.

Bill Layman will discuss that a little bit further. We basically -- Warren Owens answer is we are told not to pull any punches. We basically express what we feel to be the concerns. However, we avoid prescriptive solutions because there are so many different plant designs and so many different -- there are many ways to skin a cat.

So, we try to give functional recommendations, make sure your functions can accomplish this. There is the issue of the adequacy of the accomplishment, which is discussed separately. Basically, we are under no inhibitions and without being flippant about it. I think we are going to have to steer a course down the middle here between the perception that we are a creature of the utilities and some utilities perceptions that we are an additional regulatory apparatus riding on their back too hard.

I think if we get about equal screens on those two sides, we are on the right position.

COMMISSIONER GILINSKY: When you do a report such as the one you did at Crystal River, is that at the request of the utility, or do you have some arrangement that would automatically bring you into the act?

DR. ZEBROSKI: In that case, two things happen simul-

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taneously.

I talk with the executive vice president of the utility. I said, "We would like to send three people down."

It turned out eventually to be six, the same afternoon of the accident. Independently, Andy Heinz called up Bill Lee and said, "We think there ought to be a study of this thing."

So, we were fortunate that both are directed by the Byron Lee Committee, which is basically we go in on our own initiative -- that the utility was -- it was more comfortable if the utility is also inviting you and the staff feels that their company president is backing them.

I think we would have volunteered in any event.

COMMISSIONER GILINSKY: That report was made public. Is that a normal procedure, or was that simply because the utility decided to make it public?

DR. ZEBROSKI: That is my understanding. Our guidance from the committee is that our reports go to the utility basically for their information. They understand that under the Public Information Act, this eventually becomes public. They -- the advice was that it was preferable that the utility decide on --

COMMISSIONER GILINSKY: Why do you say it eventually becomes public?

DR. ZEBROSKI: Any such document in the utility's file is available to the resident inspector, for example.

So, the issue of our passing it on or not passing it on, in a sense, is moot.

However, the advantage of saying, "We can look at the recommendations and get our ducks in a row to respond to them before they become issues in the newspapers," is a privilege that most utilities would like to have.

My feeling is that in the future we will not so promptly pass on -- directly pass it to the NRC. We directly send it to Mr. Denton at the recommendation of Mr. Heinz. He felt that the independent -- just the issue you are raising -- the independence of our report would be less compromised if we transmitted it directly than if we pass it to Florida, then Florida passed it to NRC.

COMMISSIONER GILINSKY: Even if you simply send it to the utility without directly sending it to the government, would you send it to other utilities for similar problems, or potentially similar problems?

DR. ZEBROSKI: Yes.

COMMISSIONER GILINSKY: So, the Crystal River report would be sent to -- to all the member utilities?

DR. ZEBROSKI: In that case, it was. It was mailed to all member utilities.

COMMISSIONER GILINSKY: Would you do that routinely?

DR. ZEBROSKI: I believe so. There may be some issues which are clearly not generic to all plants, but are generic to a limited category. Even by a stretch of the imagination do not

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not apply to others.

If you had a steam generator problem, we would not push too hard on BWR utilities on that issue. In most cases, we would distribute them all.

MR. LEE: I think we would be following it basically, or the policy is the same as INPO. The report is for the use of the utility. The utility should be the one that decides how it will distribute it, as far as NRC and any other sources.

COMMISSIONER GILINSKY: Does that also apply to other utilities, other members of NSAC? When you say it is for the utility, I thought you were saying that that meant it did not go directly to the government.

Would it automatically go to other members?

MR. LEE: As Ed said, it would go to other members, too.

COMMISSIONER GILINSKY: The utility does not control that?

MR. LEE: No. That's right.

CHAIRMAN AHEARNE: You would not then have a situation where you would do a report for Utility X and Utility X would decide --

MR. LEE: Another utility could pass it on, even though the --

CHAIRMAN AHEARNE: The other utilities would automatically get it?

MR. LEE: Especially if they had something they were

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going to do in response. There are several ways that --

MR. LEWIS: The answer is, the subject of the investigation would not be in a position to spread its distribution to other utilities.

COMMISSIONER GILINSKY: My point is not about public distribution, but whether those who need to have this information will have it.

MR. LE : They will have it.

DR. ZEBROSKI: Bill Layman's presentation will cover this. art of this, the information goes on the NOTEPAD system as it is developed. So, it is a much more brisk communication than we are implying by this discussion.

COMMISSIONER GILINSKY: All right.

DR. ZEBROSKI: Maybe we should let Bill do his thing.

COMMISSIONER HENDRIE: Before we get on with that, Byron, how do you see the NSAC reports on incident standing, with regard to Part 21 regulations?

Part 21 applies to officers.

DR. ZEBROSKI: Of licensees.

COMMISSIONER HENDRIE: Licensee companies, but it also extends to officers of at least principal contractors, doesn't it?

DR. ZEBROSKI: We have legal counsel with respect to EPRI, that, as a research organization, we are not subject to Part 21. However, when we supply the information to the licensee,

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he is subject to Part 21 if there is something in what we provide him. He has to treat it accordingly.

MR. LEE: Every utility that received it would have to review it that way. As you might guess, you would get different decisions made by different people, as has happened in the past, whether it is reportable or not.

CHAIRMAN AHEARNE: Why don't you move on?

DR. ZEBROSKI: Bill? Bill Layman is our manager of engineering.

MR. LAYMAN: Could we have the next vu-graph?

(Slide.)

In carrying out our evaluation of TMI accident and its precursor at Davis-Besse, it became evident that the utility industry needed a system that would feed back the learning, the plant operating experience to designers, and to operating reactor organizations.

NSAC initiated a program. We were joined later by INPO in this effort. We now have a joint NSAC-INPO significant event program. We believe that the effectiveness of this program is going to be increased greatly by our use of computerized conferencing communication system that we have already mentioned, called NOTEPAD.

I will describe the NOTEPAD system, after I go through a short discussion of the basis of the significant event program, itself. The next vu-graph.

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(Slide.)

These two objectives, of course, are to help assure that the cumulative learning experience from operating reactor plants is effectively distributed. For utility operating experience review programs, some mandated by the Commission, our mission in this area is to supplement those; also to relieve some of the dog work burden on individual utilities by doing things once and distributing it to them for their review that each one of them would have had to have done separately, otherwise.

Then next vu-graph.

(Slide.)

Data input to our significant event program relies heavily on the licensee event reports. However, we also are getting information from outage reports, from NPRDS, and there are other utility contexts. There are non-reportable events that occur at the plants.

Some of the utilities have agreed to start sending us those so that we can do in-depth analysis in areas such as balance of plant, which are not -- have not previously any way been covered by the LERs.

CHAIRMAN AHEARNE: How successful are you in getting NPRDS data?

MR. LAYMAN: We are successful at getting it. Making use of it is something else again. It has been difficult for

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us to integrate that part into our program to date.

CHAIRMAN AHEARNE: You are getting it from all your utilities?

MR. LAYMAN: We have access directly from NPRDS, of course.

DR. ZEBROSKI: We get the tapes.

CHAIRMAN AHEARNE: You have that data, but you are not getting additional -- all the utilities are not giving it to us.

DR. ZEBROSKI: We have the same limitation of completeness that the system has, but it is reasonably complete now. I think 95 percent.

MR. LAYMEN: Can we have the next vu-graph?

(Slide.)

This shows the flow of information in our significant even program. A utility reports an event. If it is a significant event in the eyes of the utility, this comes to us directly on our NOTEPAD communications system. It comes to NSAC. We distribute to INPO on NOTEPAD and INPO reviews for the human factors procedures, training and operations. We review for things such as thermo-hydraulic, neutronics, instrumentation, and control, and systems.

Obviously, there is a overlap. You cannot separate out the operations from the systems. From that standpoint, we communicate daily with INPO; but when we have an instrumentation and control system, obviously the way the operator handles it

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makes it a joint effort so that immediately it becomes something that joins.

We put together a joint INPO-NSAC plan of attack on the item through this preliminary evaluation. We decide whether we need an in-depth field evaluation or not. If it something that can be cleared up with additional information on the telephone, either INPO or NSAC would call the utility.

If it takes an in-depth field evaluation, we put will put together a joint group to do the in-depth field evaluation, as we did at Crystal River. Then, there will be a final evaluation by INPO and NSAC.

Then, INPO will distribute the final report and recommendations and do the follow-up to see that actions are taken. We are involved in that aspect from the standpoint of analyzing the responses that have come back to see that they are technically adequate to cover the problem.

CHAIRMAN AHEARNE: On the right hand side, that is the joint INPO-NSAC effort. Is that independent of whether or not there is an overlap? For example, if it is something that focusses solely upon the control system non-operational, would it still be a joint effort with INPO doing the distribution of the final report?

MR. LAYMAN: INPO would, yes.

CHAIRMAN AHEARNE: So that, in essence, as you see it, or the working arrangement is that INPO always produces the final report?

MR. LAYMAN: Yes.

DR. ZEBROSKI: It it part of the evaluation process which they have to do to see the adequacy of utility operations. For that purpose, they are set up to have field teams visit plants roughly once a year.

So that function -- we are not staffed to do the field visits at that level, so it is agreed that that is an INPO function, to follow-up.

CHAIRMAN AHEARNE: Let's take the Crystal River, as an example. Is the document an NSAC-INPO document, INPO document, or NSAC document?

MR. LAYMAN: It is a joint document.

DR. ZEBROSKI: We have a staff member working with Florida Power on their 19 follow-on actions.

CHAIRMAN AHEARNE: Is that the final evaluation?

DR. ZEVROSKI: No. This is a recommendation.

CHAIRMAN AHEARNE: Well, that says INPO puts out the recommendation.

DR. ZEBROSKI: There will be a final evaluation. That is to come.

CHAIRMAN AHEARNE: Where is this on the outline you have up there?

DR. ZEBROSKI: There should have been a box. The preliminary evaluations are published either by INPO or NSAC.

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CHAIRMAN AHEARNE: That's what this would fit under?

DR. ZEBROSKI: Yes.

MR. LAYMAN: There is a circle that says that obliquely. INPO-NSAC preliminary evaluation.

CHAIRMAN AHEARNE: Okay.

MR. LAYMAN: It is a circle --

DR. ZEBROSKI: It is not a very final study.

CHAIRMAN AHEARNE: But any final recommendations are INPO recommendations. Is that correct?

DR. ZEBROSKI: Taking account of INPO, yes. Recommendations which require field evaluations, let's put it that way. There are some which are objective, some are procedural.

MR. LEE: By "field evaluation," evaluation has two real meanings here. One, you can use the term "evaluation" as kind of an inspection or an audit, if you want. That is the "field" aspect of it. INPO will be out in the field doing these avaluations, inspections, audits, and so on.

COMMISSIONER KENNEDY: Adequacy of response, you were talking about?

DR. ZEBROSKI: Yes.

MR. LAYMAN: We may have caused some confustion because the evaluation that we have on this vu-graph is the kind of thing that we did at Crystal River, where we had a joint INPO-NSAC task force go to the site. We spent a week at the site evaluating the information, interviewing the operators, and gathering the infor-

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mation. We then retired from the scene and went back to Palo Alto, where INPO and NSAC put together the final report -- not the final report.

e... t2

CHAIRMAN AHEARNE: The preliminary evaluation.

bgn t3

MR. ALYMAN: This stiuation seems to be working fairly well so far. It is a practical system, but it is only practical because of the NOTEPAD communications, in my opinion. We are in daily communications with INPO on the initial screening on the back-up information needed and on doing preliminary evaluations where that can be done without having a joint meeting or without doing further field work.

The next vu-graph, please.

(Slide.)

COMMISSIONER HENDRIE: I am curious. What do you think the capability of NOTEPAD is as an emergency communication link?

MR. LAYMAN: Could I defer that until the last vu-graph? We do have --

DR. ZEBROSKI: We're going to have to move along.

MR. LAYMAN: The next vu-graph shows different action analyses, or more in-depth analyses that need to be made. We have conducted fault tree analysis after an initial screening. We have done field investigations after the initial screening.

There is sometimes other work going on at the vendor shop, at the utilities, or at other data bases. These are part of our program. The next vu-graph please.

bfm30

(Slide.)

The next vu-graph shows what we really did at Crystal River within 20 hours of the time of the incident. We had a joint NSAC-INPO task force at Florida Power Corporation. After first offering the assistance, which they did not need from a plant standpoint, but which they did ask us for from an analysis of the incident standpoint -- after we had offered any kind of assistance that we could. We then got to work and started analyzing what had acually happened.

As I mentioned before, we stayed on site for seven days, reviewing data. They put at our disposal, a trailer right outside of their administration building, gave us telephone. They did typing for us. The reproduced things for us. Their cooperation is what really allowed us to put the thing together, and get our preliminary report in a 14 day period.

Since the preliminary report was issued, we have been conducting further transient analyses of the period of time when the instrumentation lost information. Also, we have had one engineer participating with Florida Power Corporation on follow-up of the assessment that they had been making of their own needs.

We had been in communication with Florida Power Corporation very closeley since the February incident. In my opinion, their evaluation is an extremely thorough one. I don't know whether they have been to you lately with descriptions of what

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they have done, but I think they have done a very competent technical job.

The next vu-graph please.

(Slide.)

As part of our routine screening, we have identified the four areas in which we classify them as significant areas, because of the frequency of occurrence that we saw in our screening of the '78 and '79 and early '80 LERs. Loss of power on instrument and control buses, overcooling transients, inadvertent opening and sticking of relief and safety valves, failures involving the emergency cooling system.

We have initiated an in-depth evaluation project on each of these four event types.

CHAIRMAN AHEARNE: Do you have a time schedule when you hope to end those, or get preliminary results?

MR. LAYMAN: At this point in time, we have not finished our assessment to the point where we would even judge that we have a time where we would get a final report out of it.

The next vu-graph please.

(Slide.)

An important component of our information network, and it has come up about a dozen times already this morning, is NOTEPAD, which is a computerized conferencing system linking NSAC-INPO and utilities. The computer is in Palo Alto. The user needs only a computer terminal. This can be a very simple one.

One that we have been promoting is about a 15 pound terminal that you can carry with you. I think about $1500 is kind of cost for this type of terminal we are talking about.

You can plug it into a telephone. We have had people --

COMMISSIONER HENDRIE: Like a typewriter system?

MR. LAYMAN: Yes, it is. We have had people couple up in the Harrisburg Airport, for instance, on a pay telephone and communicate with us in Palo Alto.

The acoustic coupler is what really allows us to use this kind of a system. It also has gotten us into some problems in areas such as Crystal River. We carried a terminal down there with us, but we had two problems. One was a broken wire in the terminal, so we had some equipment difficulties.

Then, when we got that fixed, we still had telephone company difficulties. I would characterize the telephone system down there as a Mom and Pop country telephone system.

We had to communicate with the Florida Power Corporation office in Tampa and have them go on NOTEPAD to carry out our NOTEPAD communications. We could not really do it from the site when we tried it.

Ed mentioned we are working on that now to get better communications systems.

COMMISSIONER HENDRIE: You ought to be able to get back from the sites which tend to be somewhat remote, for the most part, and back to main offices on dispatch -- pretty

bfm33

reliable dispatch links. At main offices, the telephone system ought to be good enough to go across country.

MR. LAYMAN: That is what we did, but we did not use NOTEPAD from the site to the home company. We think we need to get NOTEPAD to the site. We can do that. It is just that we failed in our first attempt.

The next vu-graph please.

(Slide.)

Some of the things that we put on NOTEPAD -- and this is nor in order of priority. It is historical order. We started out just trying to put the system together. We put upcoming meeting announcements and things like that.

Then we started summarizing the key points from previous meetings just to get the system working and people talking to each other. Then, we came on with the significant plant events.

Within a matter of hours of events like the Arkansas transient, they were on NOTEPAD and the rest of the utilities knew what had happened, knew the significance. It was a very successful communications exercise. NOTEPAD also has the capability for personal communications.

Somebody at a plant will come on the line and say, "I have a problem, my turbine blade, stage L-1. I found it cracked. Does anyone have the same thing?"

Withing an hour, he started getting answers back from various utilities who may have had similar circumstance, or had some advice for hi[illegible]

CHAIMRAN AH[illegible]RNE: Are you able to fit propietary information b[illegible] [illegible]en two users?

MR. LAYMAN: Yes. It is a secure system from that standpoint. I can take a terminal and hook in to Ed and call Ed; and notbody else can pick up that message.

The next vu-graph please.

(Slide.)

I have talked abou the pertinence already of the significant event reports and other things that we are putting on NOTEPAD. The information is timely. I think I mentioned, that within hours of an occurrence, we have had good accurate communications with the site. The information is broadly disseminated.

We have, right now, 39 utilities and three service companies that are very active in the system, about 200 different individuals. Because of the convenience of having a fairly low cost terminal capability, an average of about five individuals, four or five individuals, in each one of these separate utilities will have a terminal capability so they can communicate different areas within the company.

CHAIRMAN AHEARNE: None of the vendors are on it, then?

MR. LAYMAN: No. There is one vendor on a special project, y[illegible]s. He cannot get into the rest of the circuits. He

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is on that one limited project.

DR. ZEBROSKI: All the vendors are on the significant event screening.

MR. LAYMAN: That is another project. Again, the vendors have limited access to NOTEPAD. It is really on a need to know, or need to cooperate basis in a particular project. Ed has already mentioned the foreign utilities that have expressed and interest in coming into the system.

The information is retrievable, which is another extremely valuable aspect. Telephone communications so often get lost in the middle of one of these crisis type events. NOTEPAD does store this information. At the present time, it is not kicked out automatically. It has to be selectively pulled out of storage if somebody wants to pull it out.

We, as the manager of the system, are the only ones right now who have the capability of pulling it out, erasing it from the system, or putting it into a permanent file, such as our Zytron.

The security of the system is encrypted in storage, also. So, it makes it, in our opinion, an adequate storage for our type of proprietary thing. It undoubtedly would not pass any of the DOD requirements for encryption of security information.

You need a password to get on to the communications network. You need another password to get from the communica-

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tions network into the comupter. This gives each one of the individual users a secure way of getting his message on. Then he can address either the group, or he can select various members to do his communication with.

It is a personal password known only to the individual user. He can change it weekly, if he wants to. We are impressed with the way the system is working.

CHAIRMAN AHEARNE: I think your last slide, though, gets back to Commissioner Hendrie's point. Not this slide, the last one.

(Slide.)

You say it can do real time exchange of information during a crisis. Joe, that was your concern.

DR. ZEBROSKI: We are not promoting it as an emergency management system, a real time emergnecy management system.

Obviously, a modest development could give some of that characteristic, a modest development being -- getting priority lines locally. So, if the telephone switchboard saturates with 20 percent use, you get priority lines like the police and medical people have so that you have a secure way of always getting to a trunk, then the reliability problem that we saw at Crystal River would be largely obviated.

In the long term, meaning about a year or so, we see that we really should make more use of the microwave link that most utilities have, which would get you entirely out of -- then you could weather earthquakes, storms, whatever. You would not be subject to the vicissitudes of the commercial system.

COMMISSIONER HENDIRE: Can you get through to the vendors on NOTEPAD if you want to?

DR. ZEBROSKI: Yes, sir.

CHAIRMAN AHEARNE: All the vendors have terminals?

DR. ZEBROSKI: All the vendors are on the significant events portion only.

CHAIRMAN AHEARNE: If you had a crisis at a plant, it would seem obvious you would want to get to that vendor.

MR. LEE: They all set up their own emergency response centers themselves. They would have communications with the site also directly.

MR. LAYMAN: We have the capability in the system to set up a project immediately. For instance, at Crystal River, we set up the special project for Crystal River. We put whoever we want to on that project. That could be all of the vendors, all of the owners groups, or whoever.

I think that the bottom two bullets show some of the capabilities also, since it is a computer coferencing system. We have a demonstration project where we have put in the capability to calculate hydrogen bubble sizes. We just demonstrated this to ourselves.

Also, we can put in atmospheric dispersion calculations. These things can be preprogrammed and put into our NOTEPAD system. Then each utility would know what is on there and could call up these various programs and use them in case of emergency.

This is not a practical thing today, but we are developing and experimenting around with it, also the maintenance of lists, of equipment locations, personal contacts, and things like that for emergency response.

One of the problems you have in emergency preparedness planning is that lists get out of date and new lists come in and they do not get to the right people in organizations. They have an outdated list. We can make sure that the manager of the emergency preparedness system has control of an area in NOTEPAD and all that can be kept up to date.

The utility just has to push a button. It chunks out the information. So, it eliminates some of a problem.

DR. ZEBROSKI: Bob Breen is manager of our Safety Analysis Department. He will cover two more other topics.

MR. BREEN: We have already covered one of the areas here, where a great deal of our effort has gone, one of our larger technical programs. There are a number of smaller programs. I would like to just touch fairly briefly on a couple of those as an example of other areas.

One of these in an effort that we are undertaking here; recently in the area of probabilistic risk assessment. The first slide indicates what the main objectives are of this program.

(Slide.)

We are doing this in cooperation with Duke Power. It is going to be done on one of the Oconee plants of Duke. Our basic effort here is to develop what we consider a bench-mark or a model PRA study for the industry's purposes, to bring together at this stage of the game the methods that can be used, identify what kind of results you can expect, and deal directly with the significance of those results, try to make fairly clear to us and to the industry, itself, what kind of decisions or conclusions can be made based upon the PRA type of information.

This will also act as a tutorial, then, for the utilities, and a reference plan from which they can work towards doing other evaluations of their own.

A second objective of this method is to improve the industry capability and PRA methods. We are going to do that in two ways. One is through involving the utilities in doing the PRA study and the other is through identifying to the management of the utilities how this can be used as a managment tool in making decisions.

Then, the end product will be an evaluation of the public health risk of the plant we are studying. We are also going to emphasize more than has been done in the past, the plant damage risk. So, again, this will be directly involved for the utility and its consideration.

One of the end products of this work will be the event trees and fault trees that we will leave with the utility itself. They will use this as a working tool for accumulating operating experience. Their plan is to update the event trees and fault trees on a contunuous basis so they become a living representation of the utility's inderstanding of where they stand in terms of perception of risk for that plant.

The next vu-graph indicates some of the features of this implementation.

(Slide.)

NSAC is going to be managing the study. We will have three of our people assigned full time to that. We are hiring about five full time contractors to work with us. We are soliciting from the utility's efforts of about ten of their engineers so that we are talking about a staffing here of around fifteen to twenty people to do this study.

We expect it to run approximately one year. We are establishing an advisory review group to help us guide this -- help us evaluate as we go along down the pike how things are going.

At the present time in this month of June, we are developing a detailed work plan, right now. Plant data is being collected via Duke Power for this. We are developing training sessions. We are asking that the utilities furnish us people to work in this area that are not necessarily skilled in PRA methods, but that do know reactor plant systems very well.

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We will be affording them the training so that they can play a role with our contractors in this area. Th next vu-graph shows an outline of the various tasks that we see to be involved in this.

(Slide.)

Without marching through these in detail, the center line there, the focus of key systems, et cetera, develops a background for the internally generated events. On the bottom is the work that has to be done to identify those events that would be initiated externally: seismic, missiles, fire, flood, et cetera.

On the top line of work, it identifies the various tasks involved in the consequence analyses.

CHAIRMAN AHEARNE: I notice you end up having a risk reduction recommendation, which must have at least at some stage, the concept that there will be a threshold of acceptable/unacceptable.

How do you intend to establish that?

MR. BREEN: No, the concept there, I think, is to identify what the higher risk contributors are, and to look at it at least in terms of the cost benefit aspect that would be involved in making changes.

COMMISSIONER HENDRIE: Just in pushing those particular ones down.

CHAIRMAN AHEARNE: Independent of?

COMMISSIONER HENDRIE: Down in to the level of the bulk of the others, really.

CHAIRMAN AHEARNE: Not trying to establish anv absolute, but trying to --

DR. ZEBROSKI: I will discuss that later.

COMMISSIONER HENDRIE: That is another effort.

(Laughter.)

MR. BREEN: I would like to move now to the next vu-graph and introduce the second subject that we have spent a little time on. This is related to thinking in the emergency planning area.

Particular emphasis here has been in terms of the -- trying to use the decision analysis techniques that have been developed, and used in other fields to support the process of emergency planning, recognizing that a good decisionmaking process is a key part of any emergency planning activity.

We have identified -- have used a contractor, SRI International, in particular, who has some good background in decision analysis to apply decision analysis to this process.

The next vu-graph shows just kind of a sketchy outline of some of the factos involved.

(Slide.)

The decision analysis process combined the preferences that people have -- that is, what do I want to accomplish -- with the information available with the alternatives; and tried to identify these in a seni-quantitative basis. Anyway, to arrive at a logical decision process.

CHAIRMAN AHEARNE: Do you have people yourself who have worked in the field of decision analysis?

MR. BREEN: We do not have people on our own staff at this time that have direct background. Our contractor is located about five miles up the road. Consequently --

CHAIRMAN AHEARNE: Formerly with SRI?

DR. ZEBROSKI: It is SRI.

MR. BREEN: Ron Howard from Stanford is involved as a consultant to that group.

DR. ZEVROSKI: I think we have a dozen people on staff who had Ron Howard's course at a one year level. We have about a half a dozen people who are deep in the probabilistic assessment. So, in that sense, we have at least awareness of the tool on the staff.

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MR. BREEN: The next viewgraph, the second half of that, identifies some of the basic elements and some of the conclusions that have been arrived at in some of our earlier studies.

(Slide.)

Let me just identify them quickly and not dwell on them particularly.

One of the things that is apparent to us in just looking over the emergency planning considerations is that it is important, of course, and we do this as a matter of course, to include procedures and systems to cope with the most likely thesis, that our whole emergency procedure process is built around that.

But going on to the next step in the emergency planning area, we concluded it is important to distinguish between those cases for which we have standard procedures established and those cases for which we don't. And it is also very vital, we feel, that we try to make full use in the emergency planning process of the time and information that can be available. And we believe that the emergency planning -- that the decision analysis framework offers a framework in which to try to assure -- try to achieve a balance that we are looking for there.

(Slide.)

My next viewgraph I'm not going to go into. We don't have the time right now. It identifies kind of a black flow diagram of a way to look at the emergency planning process. I'm afraid it would take more time -- let me just leave that with you, if I may.

I will turn it back to Ed.

DR. ZEBROSKI: Thank you.

We still have three more topics I will try to get to in the time available. The next one is the safety panel or console and related activities. I think we have a chart on that.

(Slide.)

In NUREG-0578 I believe item 7.2 had the concept of a system safe vector, and that has persisted through the drafts of the action plan. I think we are in good agreement it is a wise idea. In fact, on two occasions where people have done either a consulting situation, this item comes up as one of the top three constructive actions that can be done to prevent future Crystal Rivers. The other two being the operator -- better operating training and procedures and analysis of probable events, and the other one is better emergency planning and decisionmaking.

So in a hardware sense, the safety panel comes up. This is the single most important thing to do. It is a response to the factors issue. It is a response to better emergency decision-making. It is a response to the various needs for offsite information and communication.

COMMISSIONER GILINSKY: How would this have prevented Crystal River?

DR. ZEBROSKI: Let me run through it.

At the most elementary level it gives one additional redundancy for loss of conventional instrumentation. It is not dependent on the process instrumentation, so it is independent power supply. It would have -- it is one condition of redundancy.

COMMISSIONER GILINSKY: They could have terminated safety injection earlier, is that what you are saying?

DR. ZEBROSKI: Quite possible.

COMMISSIONER GILINSKY: Is that your point?

DR. ZEBROSKI: Yes.

Okay. The human factors element of it, I think there is pretty good agreement that the human mind can grasp a small number of related parameters very quickly if they are organized properly. In the display that we -- the approach that we like, we have a limited number of areas. You can cut these in several different ways.

One vendor has all -- has a little card he hands out now where at least three safety areas are grouped into three groups; but basically you can have a small number of groups, each of which can be a panel, say like a CRT or a 2 by 2 foot section of the control panel, and on that group you display preferably as few as five but a maximum of about eight signals. And to make that a little picturesque, if you're worrying about whether an aircraft engine is in trouble, you want to know lube oil, you want a temperature fuel flow, and maybe vibration, and if you just see a few things like that, you know whether you're in trouble or not in trouble. And in many cases you know whether a protective action if you're low on lube oil, you know you'd better do something. If you're know you're low on fuel flow, you now you'd better do something. So a very simple display gives you a very good, solid picture.

One of the things that we are very impressed with is the extreme clarify of the Three Mile Island accident with a relatively small number of parameters. Hopefully we have that -- this chart which is in the NSAC 80-2 report, this very limited set of parameters. It is about 20 parameters. There are 30 signals. It is an absolutely comprehensive description of a lack of coolant and loss of heat sink accident.

The operator, had he had this on a CRT set of recorders in front of him with trend information, could not possibly have had any of the confusions he had; so it is -- it is --

CHAIRMAN AHEARNE: Had the operators had it, understood it, and had time to think about it.

DR. ZEBROSKI: No, no. I think the chances of misunderstanding it would have been very small.

COMMISSIONER HENDRIE: I agree. I agree.

DR. ZEBROSKI: Let me say why the deficiencies -- in the real situation this stuff in the gray area they did not have at all. Most of the others they only had point values, and most of the point values were scattered out over 125 feet of control panel, so no one brain could ever see them all together.

Knowing the training of those people, if any one of thos guys, any one of the four of them had had this display in front of them, there is zero chance that he would not have understood the situation. So the human perception problem was the disorganization of the information, its spread, and the lack of some key pieces --

COMMISSIONER GILINSKY: What are the gray readings?

DR. ZEBROSKI: Stuff not available.

COMMISSIONER GILINSKY: What is that?

DR. ZEBROSKI: Reactor coolant system outlet, temperature.

MR. LAYMAN: The gray areas were off the range of instrumentation. The information was later retrieved from the reactimeter and put on this chart.

DR. ZEBROSKI: So if you had the design -- if you had to design a safety panel overnight, you could do a lot worse than just to pull out stuff together.

So the human factors aspect would actually not organize the information this way. It would say reactivity information would be this block, heat sink information another block, radiation release information another block. There would be four or five CRT's.

This one tells you reactivity, no problem; heat sink, no problem; radiation leak if I have a leak somewhere. So immediately you focus on that thing. It has another interesting characteristic, that you can put wide-range alarms on it. So instead of seeing the normally dozen or two dozen alarms that operators often see on minor transient, you would have a system that would almost never alarm. It would alarm maybe once or twice in the whole plant's lifetime; but when that alarm came on, you would know that you drop everything else and correct that situation.

COMMISSIONER GILINSKY: Along that line, I went down to Crystal River. One of the things that impressed me, which does not seem to have appeared in any of the reports, was that they had over 1,000 alarms; and I found that a staggering number. What does that say about how we are doing things?

DR. ZEBROSKI: Let's take a simple case.

COMMISSIONER HENDRIE: It says we required -- either they added or we required practically everything in the world to be alarmed.

COMMISSIONER GILINSKY: Is that good or bad?

DR. ZEBROSKI: Many alarms are for our operations. If I want to get feedwater turned on, I need to know about 40 things and have about 40 indicators, many of which are alarmed. I need to know is there lube oil flowing to that pump, is there cooling water flowing to the pump, are the valves aligned, are the different tanks aligned, and then finally somewhere I gather is there flow going or not.

From a safety standpoint the only issue that is significant is is there flow or not, and all these other things which are required to control it are nothing in the safety sense. If I have flow, I don't care about all the other things. If I don't have flow, I'd better go fix it.

So you can compress the operating information to a very small piece when you talk about safety state, and that was the concept of the safety state vector.

COMMISSIONER GILINSKY: What produces this large number of alarm settings really? Is it an NRC requirement or just the way --

COMMISSIONER HENDRIE: Just equipment protection?

MR. LEE: There are a lot of things you want the operator to keep his eyes on and maintain within prescribed limits. Unfortunately, when you get into any kind of a transient, a lot of them get outside.

MR. LAYMAN: Some of those things should not be called alarms. They should be called annunciators of abnormal conditions.

DR. ZEBROSKI: There is no hierarchy of importance in the alarms.

COMMISSIONER GILINSKY: The system is useful as long as there is a small number of alarms. Then you can cope with that information. But there is nothing you can do with 1,400 alarms.

DR. ZEBROSKI: The next chart, please.

(Slide.)

I guess on the previous chart we are all aware that the safety panel has imminent relationships to data link, to emergency operations, to technical support center, and the Reg guide 1.97 and

1.47. This chart is a little bit philosophy here.

I would like to emphasize that there is good agreement now. There has been an industry committee established which brackets these different areas. These are the most important things we can do to help the operator during actual operations to get these things done.

I would like to express a concern about some problem areas, that there is concern in my mind at least that we will have delay in the implementation because of human factors; and human factors are both in the utilities and NRC.

There are very divergent views on what the objectives --

COMMISSIONER GILINSKY: Are you talking about requirements for what would go into one of these systems?

DR. ZEBROSKI: Yes. Divergent views on the objectives of each of these different functions and what is required to meet those objectives. And as a consequence, we have divergent designs from each of the vendors and individual utilities, and they are trying to interpret what they believe staff requirements to be.

Finally, there is even the question whether Reg guide 1.97 has its own momentum and right now seems to be driving the whole system. So I would like to call attention to the fact that in this area you have three objectives possibly.

One objective is what can I do to make the likelihood that the operator will respond optimally in a -- in an unusual transient; that is, a transient which is not routinely covered in normal procedures, like turbine trip or loss of tie line, etcetera. So that one objective is help the operator, and I think the industry group is unanimous in saying that that should be the first controlling objective in this area.

Another objective is to get as much data as possible on data links to help keep Commissioners, Congressmen and media informed. It is a noble objective but perhaps not the driving one.

COMMISSIONER GILINSKY: If you have any further thoughts on that, I would be interested in hearing them.

DR. ZEBROSKI: Another objective would be to get a large mass of information out quickly to enable post-accident analysis or archaeology to be performed.

CHAIRMAN AHEARNE: It is interesting you do not see in your hierarchy of objectives any transmission of data in order for emergency action to be taken.

DR. ZEBROSKI: I think the key to this question and Commissioner Gilinsky's question, I think the key safety parameters are very important to have available in an emergency decision process.

CHAIRMAN AHEARNE: I was not talking about the actual data. You listed three sets of objectives, and they did not have in them transmission of data in order for emergency action to be taken; and I was just curious.

COMMISSIONER HENDRIE: You are talking about a board in the control room, why you could either parallel those systems back some place --

CHAIRMAN AHEARNE: He was just identifying three sets of objectives.

COMMISSIONER HENDRIE: On the board in the control room, why would you include --

DR. ZEBROSKI: The offsite data can be useful for -- anywhere from media to emergency decisionmaking, okay?

CHAIRMAN AHEARNE: I recognize that. I am trying to obviously make the point that one of the fundamental reasons that certainly some of us are interested in getting offsite data is not just to keep people's curiosity satisfied, but it is really to be able to either recommend or have taken appropriate emergency action.

DR. ZEBROSKI: Yes. I think that Bob Breen did not emphasize that, but in the emergency decisionmaking process, having objective, real time information in front of all of the decision-makers, whether they be NRC people or the PEMA people, having that information in front of them simultaneously and with no hiatuses between them as we had at Three Mile Island where different people were seeing different data sets with different time characteristics, I think it is very important to the emergency decision process. So I agree with that. Perhaps I did not emphasize it.

But the offsite data links still have this thing: what is the data required to make good emergency decisions versus a much broader set of data which would enable you to do post-accident analysis.

CHAIRMAN AHEARNE: We have been struggling with that issue, as I am sure you know.

DR. ZEBROSKI: What we have underway now is what we think is the nearest you can get to an objective validation of this question of parameter sets. We have three contractors working which are testing the different proposed data sets against actual transients that have occurred or can be postulated. And then we will test these by actually simulating the panel on the simulator and testing it with real live operators to see if they respond properly.

COMMISSIONER GILINSKY: Is that a generally held view that this information ought to be available here and duplicated in Bethesda? Is that your personal view, I mean widely held in the industry?

DR. ZEBROSKI: I think the key safety parameters obviousl need to be in front of anybody who is involved in the emergency decision process, so I think where there is a difference, where the system got a bad name because it started out with 1,500 parameters, and people said my god, you cannot understand what you are seeing, much less make any intelligent decisions on it.

If you boil it down to something -- the present nuclear data set with 115 parameters is a reasonable one.

MR. LEE: I think there is no objection. I think there is concern that there will be so much data, and the more data you get -- and that was applied to us in the home office as well -- the more data we get, the more chances we are going to try and make a decision or second guess something that is going on in the field where they really have the best feel.

DR. ZEBROSKI: Let me interpolate one thing. When you recognize that a relatively simple set of parameters at not very high time frequency give you a very good picture of what is going on, we have considered this situation: what if we have another incident like Crystal River except it is not all over by the time we hear about it.

Basically we got on the phone after twenty minutes, and it was clear that the thing was quietly settling down. What would you like to have in a real emergency situation like that? And it turns out that something you could put on about one page of tele-copy is pretty close. You can run that through every five minutes or three minutes depending on the system, and that gives you a pretty good -- it is almost impossible to think of any situation where a potential emergency decision and feedback would involve a shorter time than that. In fact, our analyses on all these transients, as we mentioned at a previous meeting, tend to go after the issue that all the scenarios we have been able to play with, even that do nothing, that is, no automatic response, no constructive response, you are still in between tens and hundreds of hours before you are really threatening the public in any serious way. So the issue of having to make decisions on three-second data repeats seems to --

CHAIRMAN AHEARNE: You are saying 20 hours.

DR. ZEBROSKI: Yes.

CHAIRMAN AHEARNE: So, for example --

DR. ZEBROSKI: There is one exception, and I will talk about that exception. We think it is unreal, but it is worth studying. The exception is a steam explosion, and we are trying to do something about that one.

The utilities have put together a Key Safety Parameters Information Committee. Steve Howell and Warren Owen are co-chairmen. The NRC has put --

CHAIRMAN AHEARNE: I'm sorry. Your conclusion on tens of hours, does it have the assumption that in those tens of hours appropriate actions are going to be taken within the plant?

DR. ZEBROSKI: I am saying I do not like worst case scenario. If you take a worst case scenario where no one does any -- an incredible scenario --

CHAIRMAN AHEARNE: I'm not saying does nothing. I'm trying to assume people do things incorrectly.

DR. ZEBROSKI: We are trying to make a situation where an incorrect action for lack of education is corrected, and we are trying to make a situation where incorrect action for lack of information is --

CHAIRMAN AHEARNE: You are assuming that things are corrected.

DR. ZEBROSKI: Yes, sir. So the staff has put together a wor.ing group on this same issue, and hopefully we will be having from them what we urge as functional criteria -- what do you expect from the Emergency Response Center, what will the nuclear data link do for who, and we feel we have a pretty good handle on what it should do for the operator. So this is a case where the better is clearly the enemy of the good. People are inventing better and better systems and attempts to delay anything being done.

This system being put in will solve 99 percent of the human factors problem. It is better to get this system in quickest than to get a more elaborate system in over years. We eventually believe we should have a disturbance analysis system. There are a couple of groups at work on that. We have four years of projects in that area. Eventually we think you can have a computer-aided disturbance system, yet it is very premature now.

Let me go on to the next topic which is the safety goals.

The next chart, please.

(Slide.)

This is simply noting that the parameter validation process -- this is not in your handout. This says there is an objective parameter validation process. We have the three contract: working on that, one for BWR, one for PWR, and one for a simulator.

The next slide, please.

(Slide.)

Those are the three contractors.

(Slide.)

Going on to the safety goal, we have heard and read with interest the discussions of this group and in ACRS on safety goals. There are now, I believe, seven recently identified formualations of proposed safety goals. I think one of the aspects of a safety goal is it cannot be a zero risk goal. At least the philosophical part of the risk community are saying you can never -- if you drive one risk down to zero, you'd better look at what other risks you have increased.

And unfortunately, as we have heard with the Delaney Amendment, even if the regulator has it absolutely on stone tablets that lack of saccharin would lead to deaths from obesity, etcetera, and so he gets a public outcry on it; so I think this aspect of the legislation certainly has a deficiency.

And I think one of the pieces of legislation I have seen in draft -- I think it is very good. It corresponds with my prejudice, which is the use of relative risk assessment for regulatory purposes generally. It is not in the nuclear area because Congressman Ritter, I believe, is composing this --

COMMISSIONER HENDRIE: On a general basis.

DR. ZEBROSKI: On a general basis. And I think our inability as a society to face up to that is not just the $30 billion from the delays we talked about in the AIF-NSAC study on the action plan.

The fact as I see it now is this delay or non-commitment of nearly 100 gigawatts of plants which could have been built in the '80s which will not be built, we will either have a deficiency of substantial part of that energy, or we will have about a trillion dollars additional fuel bill for your children and grandchildren.

COMMISSIONER GILINSKY: What are you assuming there when you say plants that will not be built? How many plants?

DR. ZEBROSKI: About 100 gigawatts; that is, commissions at one time in the pipeline which are not now.

COMMISSIONER GILINSKY: And you attribute this to what?

DR. ZEBROSKI: I attribute this to the increased financial -- people call it regulatory uncertainty. Basically the unmanageability of risk in the financial managerial sense in committing a new plant to that, and that same risk is now coming at us --

CHAIRMAN AHEARNE: Is this a particular set of 100 then?

COMMISSIONER GILINSKY: This is a reduction, presuming the pipeline that was 250 is now about 100.

CHAIRMAN AHEARNE: Not assuming you would take it out of the pipeline. Assuming a drop in demand.

DR. ZEBROSKI: No.

MR. LEE: They may be dropped now instead of delayed.

DR. ZEBROSKI: I think the utility executives -- it is an acceptable answer to your PUC to say demand is not growing very fast, but if you are using 70 percent oil on the system which you may not have next year, is it in the public interest to drop that plant? I think various analyses have said that is the worst thing in a national policy sense you can do, but it is the prudent thing you can do financially.

COMMISSIONER GILINSKY: There are quite a few -- let's take this a little bit off the subject, but you do have it on your side -- there are a lot of plants in the pipeline that could, in effect, replace the oil that is being used now.

What I am saying --

CHAIRMAN AHEARNE: It is.

COMMISSIONER GILINSKY: A number of plants.

MR. LEE: East and west coast.

CHAIRMAN AHEARNE: Northeast.

COMMISSIONER HENDRIE: We are using about four quads of primary energy to make electricity from oil which damn well ought to be some place else -- coal, nuclear, hydro -- because we are bleeding out through to the Middle East to pay for that four quads. It is a whopping piece of energy.

COMMISSIONER GILINSKY: I think this whole subject has been exaggerated. If we are using residual oil, which there is an enormous glut right now, but there is a problem in cost. Obviously you are spending a lot of money on that oil, and it is an expensive way to generate --

MR. LEWIS: Not very secure.

DR. ZEBROSKI: I think if we could take a poll at this table of whether we are going to have five, ten, or twenty interruptions in continuity of oil supplies from overseas in the '80s, there certainly will be some.

COMMISSIONER GILINSKY: But let's take --

DR. ZEBROSKI: If you take the New York City blackout as costing $300 million for one day, each one of these will have a substantial socioeconomic impact.

COMMISSIONER GILINSKY: The amount of oil burned now is equivalent to 50 nuclear plants, and you are talking about 100. Where is the other 50?

MR. LEE: There is growth coming. It may not be as large as it was in the past, but everybody is still experiencing some growth at various degrees over the country; and there are some old plants that are going to have to be retired.

COMMISSIONER GILINSKY: Are you saying that -- I mean, after all people are not building a lot of coal plants either, as far as I can tell.

MR. LEE: The same reason. There are some delays. There are some financial constraints, and there are becoming -- there is a growing regulatory constraint also.

COMMISSIONER KENNEDY: The same people suggesting there ought not to be growth of nuclear plants are suggesting there ought to be growth of coal plants and for the same reason.

COMMISSIONER BRADFORD: One of those people is Dave Freeman, and the reason is he feels he can meet the same needs cheaply by financing other alternatives for his customers.

MR. LEWIS: There are a lot of people who disagree with Dave Freeman in the industry.

CHAIRMAN AHEARNE: Could I -- wait.

DR. ZEBROSKI: What he said was, discussing alternative energy R&D, he said as a guiding function that when you recognize that many of the large-scope technologies will take 10 to 15 years to bring to fruition because of the long time it takes to do things in this country, you must perforce consider alternatives, even at high costs which have shorter time scales because they are more manageable. He did not say you should drop large-scale energy production. He said you had better consider the shorter term things just because they become financially feasible.

It is financially unmanageable to take a coal plant for eight to ten years with possibilities of extensions and delays. It becomes very difficult to manage.

COMMISSIONER GILINSKY: Can I ask one question?

CHAIRMAN AHEARNE: People are going to start disappearing in a few minutes, and we still have to get to some other things.

COMMISSIONER GILINSKY: I just want to ask one question which is this: Are you saying that if there weren't regulatory constraints on either nuclear or coal plants -- let's forget about the difference between them -- you would be ordering more electric power plants?

MR. LEE: Yes. We would be planning. You know, we project our load growth out for 15 to 20 years. Even in our case where we have six large units under construction at the present time, by 19 -- and we have kept dropping our projections of load growth, and we don't plan to retire anything between now and about 1993 or '94 -- that we are still going to need additional capacity sometime in '88, or '89, or '90. If the growth drops a little more than we have projected, it could be '90. If it picks up a little more than we are now projecting, it could be '88.

CHAIRMAN AHEARNE: That is with or without greater growth?

MR. LEE: With greater growth. We are going to be forced into doing some of the things I think Ed was indicating Dave Freeman was saying. We may end up going to less desirable alternatives because it is the only thing that is practical.

MR. LEWIS: Puget Sound Power and Light told the stockholders that they were applying for exception to put in a lot more gas turbines in order to keep the lights on, because they have had to scrub their nuclear plants and fossil plants for a variety of reasons. That is moving in exactly the opposite direction the way we ought to be going.

CHAIRMAN AHEARNE: They had to scrub the fossil also?

MR. LEWIS: Yes.

DR. ZEBROSKI: I promised to avoid controversy.

(Laughter.)

(Slide.)

Attributes of the safety goal I think we can all agree on. We must give an objective basis for a regulatory utility analysis and agreement on what is safe enough, and we have all been agonizing on that. It must clearly be a non-zero risk goal. I think the business of the media saying you told us it would be perfectly safe -- I don't know who that was, but people keep saying that.

Clearly, non-zero must be honestly described, must be easily understandable and acceptable to the layman, and our recommendation that it use the best available data in the decision process.

One possible formulation of the safety goal which I have discussed several places is one of the seven that we are looking at. We combined the most frequent and the probabilistic aspect. The most frequent aspect is you specify that the systems have an expected -- that is, for the whole operating population that you don't expect to see a core damaging accident more often than 30 years. That is something you can define fairly objectively by ratioing experience you have now.

If we had the pre-TMI situation continuing with the expected growth of reactor population, the mean time to the next event would be 6 1/2 years. Even if it has zero public and environmental impact, it is clearly intolerable for society. So some number in the range of 30 years, which puts it out into the next century, is both financially, practical, and perhaps perfectly acceptable.

COMMISSIONER GILINSKY: In coming to that conclusion you are lumping together all our reactor years from the beginning of nuclear time.

DR. ZEBROSKI: Yes. Just commercial.

COMMISSIONER GILINSKY: I understand that. And do you see a difference the earlier plants and later plants in terms of --

DR. ZEBROSKI: Not all bad. There are differences, but earlier plants had some advantages --

COMMISSIONER GILINSKY: That's what I'm trying to get at. In some sense -- they did not satisfy the requirements we have laid on since, and presumably they are smaller and simpler. Would you lump these reactor years in together?

DR. ZEBROSKI: I am inclined to do so, because if you -- if you do this -- if you take these as philosophical things and you try to do them mathematically, you try to make a risk function with coefficients for each plant, if you will, or each class of plants, and you say I would like to have the total of that risk function -- the reasonable -- just as you have often discussed in this group. If you have an outlier, you do something about the outlier; but if you have more or less uniform contribution, I believe the older, smaller plants tend to be a proportionally smaller contribution.

So the idea -- if you take the philosophy that I take the risk of a small plant and assume I multiply it by 300 large plants, then I would come to a different conclusion than if I take the actual contribution of one small plant.

I don't know if I'm making that clear.

COMMISSIONER GILINSKY: I don't know if I'm following you, but the point I was trying to get at is our experience with 500 reactor years in total, if you look at the plants, 900 megawatt and above, it may be 50 years or 100 years. I think it is based on 100 years.

And do you see any distinction between those plants and the earlier plants that might affect these numbers?

DR. ZEBROSKI: I would have to answer that -- I cannot make a short answer to it because the thing you have to look at is what are the common elements of design, and if I say I take -- if I go at it in a WASH-1400 basis, I can say here are my leading contributors to a risk, and I say how many years of experience do I have on the common elements of design.

Now, of 70 plants, say a given 40 may contribute to the experience on one element of design, and a different group of 40 may contribute to the risk history on another element of design. It is the summation of these risks you are looking at, so it is a complicated answer. But the basic answer is yes, you count the old plants. They are contributing. They are experiencing. In fact, even the military plants should contribute some experience.

Okay. Now, the 30 year mean time I believe cannot be of itself acceptable unless you add to it the recognition that you can make containments extremely reliable. Our analysis on Three Mile suggests that even with no automatic action and long delayed operator action, the plant still has a 99.9 -- better than 99.9 percent chance of terminating the accident without damage to the public -- more damage to the public. Even if you let the core melt, you let the vessel melt, and you dump the core on the floor, even if you let it go far, you still have multiple means for termination which are highly reliable, and you can even improvise more.

CHAIRMAN AHEARNE: Is that independent of the type of containment?

DR. ZEBROSKI: It has some differences with containment designs, and these are being analyzed, as you know. Zion, Indian Point, Sequoyah and some others are doing such studies, but it certainly is -- I will stick to one that we have analyzed in depth which is, of course, Three Mile Island. We have NSAC-2 --

CHAIRMAN AHEARNE: You did not intend to have that statement apply to all containments?

DR. ZEBROSKI: I believe it can be made to.

COMMISSIONER BRADFORD: On the previous slide can you tell me what I am to make about the phrase "the need for an emotionally stable public?"

DR. ZEBROSKI: I think if you describe a non-zero risk -- there is certainly an element of the public which says everything should be zero risk, and that is clearly physically -- in any dimension that is an unattainable goal. The only zero risk is in the grave. I am not even sure there. So zero risk is a cruel deception to our naive, uneducated segment of our population. I would be glad to be quoted.

There is no such thing as zero risk, and yet, some folks try for it, and that is a deficiency of the regulatory process that I think the Ritter legislation is attempting to address. You have to say compared to what? Compared to walking across the street, or breathing, or getting out of bed in the morning.

COMMISSIONER BRADFORD: I can agree with most of what you just said, and I guess it is indisputable that one's goals have to be comprehensible to people who are emotionally unstable, and that if they are not comprehensible to lunatics, then that is not necessarily a fatal defect. But I wondered why you felt it necessary to say that?

MR. LAYMAN: Let these truths be self-evident.

DR. ZEBROSKI: I think at the very least I, as anyone else in this business knows -- recognizes that you must something which is publicly acceptable, including the segment of the population which is not educated in technical matters, which does not understand any technical language, and resents trying to be told anything in technical terms.

So even if you could prove zero risk to them, they would not buy it. Recognizing that that is a political reality, nevertheless, you have to start some place, and that is why I just said for simplicity, let's start in the place where you at least have an unbiased or are at least willing to be informed -- a segment to whom it would be acceptable. In addition, if you can make it acceptable to other people, that is wonderful.

The first step at least -- if it does not pass -- it will not pass the second one either.

If I may go on -- we are running out of time -- I would like to say a little bit about the degraded core, because it comes to the other question. You had a separate handout on that.

(Slide.)

We have done the degraded core studies in considerable depth for Three Mile Island with various hypothetical extensions of the accident, as I mentioned, including core melting, vessel melting, melting to the concrete, and threats to the integrity of the containment.

And the interesting thing here is that the conditions for the rate or progression of this accident are easily definable, and they are available for operator guidance and emergency decision-making.

Next slide, please.

(Slide.)

And we have done at least preliminary analysis of the reliability of the terminating links. Once the operator goes into the cognitive mode, what are the means available for him? In other words, he was trapped into what we call a skill mode. He was desperately trying to find a procedural rule to follow at Three Mile Island for several hours. Finally he said I'd better start thinking instead of following rules. Once he started thinking, there were many means available to terminate.

We are simply making the point that that same -- even if you postulate the switch to the cognitive mode was delayed by many hours, you still stop the accident, even if it has progressed to a much more severe situation.

We documented part of this for TMI. There are many different sequences one can define. We have another report coming out defining the different sequences, and we will then have a series of reports on the deterministic analysis of the main sequences.

Next slide.

(Slide.)

I think the bottom line in the third one here is all of the sequences we have looked at can be successfully terminated without loss of containment integrity using available water supplie or their backups, and available heat sinks or their backups. This is a very high probability.

The other point -- earlier Commissioner Ahearne asked this question -- even for the do nothing cases, the times involved are long, the heat capacity of the system takes a long time to soak up -- to either melt something or to make high pressure.

Now, given the favorable -- I should make one further point, that the near-disaster postulations which were rampant at the time of Three Mile and which have occurred occasionally sinc then have been somewhat laid to rest by the Kemeny and Rogovin Commissions. The staff studies do a nice job on some of these. Even there they have some sequences which lead to breach of containment. But each of those we looked at require assumptions of things that are unreal in order to get the result. In other words, if you define the problem backward -- tell me what had had to happen in order to reach containment -- you can answer that question. But if you say were those conditions active there, they were not, so we have no breach of containment available.

COMMISSIONER GILINSKY: Can you give me an example of that?

DR. ZEBROSKI: One of the Battelle studies, for example, done for the Kemeny Commission, which I'm not sure has been published yet -- in other words, they assumed that some of the water supplies which actually went into the reactor were not running; in other words, you kept the reactor dry and you did not have a pool of water in the bottom of the containment. And if you let that sequence run long enough, you get high pressure in the building. But it involves, I believe, two assumptions which are contrary.

The next slide on the degraded core studies is that. In agreement with the action plan, we believe that operator training for degraded core conditions is very important for a real increase in public safety. Because these events will probably never happen in the lifetime of most plants, therefore, the operator has a hard time being interested in it. Nevertheless, you must be trained for this infrequent contingency.

(Slide.)

Making these analyses and getting them into the training program is a real plus. Secondly, though, and this is more difficult, I think it should also enter the perception of the regulator. I say that in all humility. I think we do not now credit the very great capability of the system to cope with much more severe accidents than we put in the FSARs. There is a design capability far beyond what we credit for, and for some utilities, they go ahead and train and exploit these capabilities anyhow. Obviously, it is not required by regulation, why bother. I think they should be credited.

COMMISSIONER GILINSKY: What is required by regulation?

DR. ZEBROSKI: What is not credited in the licensing process is the capability of the containment to cope with much more severe accidents; in other words, a question of, you know, further mitigating methods. Should we one a second dome around the first dome?

COMMISSIONER GILINSKY: Are you on point 2?

DR. ZEBROSKI: Yes, sir.

COMMISSIONER GILINSKY: Okay. What about hydrogen burns? Is that something you looked into?

DR. ZEBROSKI: That is something -- that is a long topic in itself, but I believe that is something nicely managed with essentially existing containment design.

COMMISSIONER GILINSKY: Supplemented with techniques we are not now using?

DR. ZEBROSKI: The hydrogen pilot light options are certainly being looked at very hard, but more basically, if I say I want to get a factor of ten or more in a given risk reduction, I can present the initiation, I can get determination earlier in the event, or I can strengthen my catching it after it has happened.

I am simply saying we are not giving enough emphasis to th first two steps. We are still tending to focus on worst case, large event and then catching it after it happens, whereas we have a great deal of options in the middle ground to --

COMMISSIONER GILINSKY: You are talking about coping with accidents beyond a normal design basis. That assumes that there has been degradation in the core, right?

DR. ZEBROSKI: Yes.

COMMISSIONER GILINSKY: And you are talking about systems which can be added to existing systems.

DR. ZEBROSKI: Already there, if they are recognized.

COMMISSIONER GILINSKY: What?

DR. ZEBROSKI: I think we will never get through. Can I refer you to a couple of -- we have published a number of papers in this area.

COMMISSIONER GILINSKY: I would very much like to see them. This is a subject we are going to be discussing I think nex week.

DR. ZEBROSKI: I think there is a real increase in public -- let's give an example. Several plants, I think, Oconee and Zion, for example, have hookups so that if you use offsite power you can get a fire engine to still pump water in several places. That is a very real increase in your termination capability of unpleasant events.

It is not required in the license. It is not credited in the license.

COMMISSIONER GILINSKY: I guess what I'm alluding to is we have a whole class of plants which have rather lower design pressures than say TMI. I would be interested in anything you have done on this subject.

DR. ZEBROSKI: I would just make an observation that we very often have one plant get hit by an ambulance going to another plant's accident. We tend to translate an accident from one design to another design and say that it does not resist it as well.

I think you have to look at the specific accidents in areas to the specific plant designs.

COMMISSIONER GILINSKY: In any case, if you have reports on this I would certainly be interested in seeing them.

DR. ZEBROSKI: Okay. Finally, on step three, rational basis for emergency decision-making that Bob Breen described, if it is desired to avoid false alarms and consequences, psychological and possible physical damage from panic, we should use the best decision process available. I put the "if" there not with malice but with real concern. I do not see in the system now a clear motivation to avoid psychological stress and false alarms. We have now in the system many trigger events which have normally been non-consequential where there is a defined emergency procedure to cope with them which will have benign results; and yet, if we alarm the public, we alarm the sheriff, we will get the media going.

COMMISSIONER GILINSKY: In Crystal River the man called the state on a line that was not open to the sheriff or the local authorities. He did not carry out his responsibilities notifying the state, but yet there was kind of a tendency to avoid -- I don't know how to say this exactly, but creating too much uproar about what was going on at Crystal River

And I think it is an understandable reaction, but I think it's one one has to combat.

COMMISSIONER KENNEDY: It needs also to be said --

DR. ZEBROSKI: The motivation to utilize improper false alarms is not clearly built in the system now. I think we can agree on that. I think I agree with the implication of what you are saying. I think it must be absolutely transparent, the system must be transparent, that there can be no coverup. And making the safety panel the key safety parameters available --

COMMISSIONER GILINSKY: "Coverup" is much too strong a word here. Just a tendency not to be as forward and as quick as one might be otherwise.

CHAIRMAN AHEARNE: I would agree with Ed that I think the system we now -- we have swung the pendulum sufficiently far that there is no concentration at all on avoiding the false alarms, and as a result, I think we are in a situation where --

COMMISSIONER KENNEDY: There is danger of irresponsible notification of the public, and I mean irresponsible, because alarming them unduly or unreasonably is an irresponsible act.

DR. ZEBROSKI: I have two more charts and taking about five more minutes. Can I take that long?

CHAIRMAN AHEARNE: Yes.

DR. ZEBROSKI: Next slide, please.

(Slide.)

I think we all understand the relationship of the degraded core studies to other issues -- emergency response, the class IX rulemaking, and the siting criteria. And I regrettably must add now that it looks like it becomes an issue in many individual plant licensing actions. So our hope from an industry side is that the basis elements of these kinds of issues which are generic be handled at least on a group of plants basis, at least one class of designs -- high pressure containments, low pressure containments, so on -- rather than be argued amateurishly in different licensing actions, which seems to be a concern people have.

So we believe the work that is underway now to define these observable factors -- rates of progression, time available for judging the seriousness of the problem -- are the essential inputs that you should have before you make siting rulemakings, before you make emergency response rulemakings final in terms of things like reaction time and expected worst case.

I believe the expectations on worst case will be much more modest now if we do these analyses on a plant-by-plant basis -- category by category as they are coming along. Maybe the time has passed. Obviously people have to do something about emergency response very briskly, and provisionally that will tend to be not an entirely rational decision process. It will still have false alarms built in it. But there is a potential logical progression, and if we can get it, that would be very desirable. That is, to take a look again at the design capabilities, which are much greater than the FSAR calls for; take a look again at the rather long time involved in the damage scenarios when you do postulate them, and the many mitigation and termination actions you have already built into the systems, some of which are not explicit.

When you have all that under your belt, then I think both the emergency response plan and the siting criteria will proceed more rationally. Otherwise, those things will have to be assumed on a worst case basis prematurely, and that is very hard to back away from that worst case function.

The last slide is a little bit of interesting experimental work. One of the main uncertainties on the coremelt scenarios is the alleged steam explosion. We think that that has been very concisely contained now analytically, worked on large by Bob Henry from formerly Argonne, but we have an interesting option to confirm this with some large-scale experiments.

People have noted that the slag-type furnaces dump large amounts of molten slag which is not too far different in density from melted core material, and actually we are Tuesday of this week -- there was a first observation on this in getting ready to define the instrumentation required which will give us, I think, a breakthrough in modeling capability on the large-scale steam explosion kind of activities. That is a joint NSAC-Argonne-Commonwealth Edison project.

Thank you.

COMMISSIONER GILINSKY: Thank you.

CHAIRMAN AHEARNE: That is very good. It certainly sounds like you are moving out briskly on some very important areas

Let me get back to a question that I asked in the beginning. Obviously, there are some of the areas where it is probably not practical for us not to mutually overlap; for example the AIF policy committee. We will probably also be giving advice in a different format, but there are a number of things you are doing -- the analysis of events and so forth -- that obviously they are very similar to the work that, for instance, Karl Michaelson's group is doing.

Can you give me some sense of your thoughts of where you are on trying to get some working relations with them?

DR. ZEBROSKI: We have met with Karl and his staff, in fact, with the staff before Karl was appointed, and Karl and staff have been out to Palo Alto since them. We have exchanged our plans in some detail, our operating manual on the significant events program, and we have a drafted a memorandum of understanding on how we will work together, which due to lack of diligence on my part -- hopefully it would have been finalized by now, but I have been overseas a lot, so I just talked to Karl today, and around the week of June 25th we will have another session to try to zero in on that memorandum of understanding.

CHAIRMAN AHEARNE: At the moment then, at least as far as NSAC, you do not see any major problems arising in trying to get some working relationships established.

DR. ZEBROSKI: I think certainly on some basics. Right now we have three indexing efforts on LERs, for example -- one at Oak Ridge, one here in Washington, and then we do a certain amount in Palo Alto. Certainly at that basic -- the basic working tools of the business, we can share that. We can share the inputs. So I think we have to recognize that there is a somewhat adversary relationship in the analysis phase, so those will be conducted independently. But the givens of a situation, there is no reason why we should not agree on the givens going into an analysis, and we will probably share the arguments and the conclusions after they are in a publishable form. But during the process of analysis

CHAIRMAN AHEARNE: Developing the data, I would imagine that for a variety of reasons each of us will have access to some data the other will not, and if we can work out some cooperative arrangement so that we can get the best set of data that has the best data base to work from, then we are all better off.

DR. ZEBROSKI: I think in a way the inhibition may be stronger on the NRC side than our side, because if we -- certainly Karl cannot afford to be in any position where it appears that we are influencing his analysis.

CHAIRMAN AHEARNE: Of course.

DR. ZEBROSKI: So I think --

CHAIRMAN AHEARNE: Whereas we would not mind influencing yours.

DR. ZEBROSKI: I think, however, when you are coming to a conclusion on something and you know it is then going to go out for peer group review, both in and out of the NRC, if you have a -- my analysis comes out different from yours, I think at that point we are going to discuss it.

CHAIRMAN AHEARNE: Yes.

COMMISSIONER GILINSKY: From your travels abroad, is there anything that foreign utilities do that stands out as an improvement over what we do?

DR. ZEBROSKI: Many things, although many of them feel obligated to understand the American scene enough -- enough to want to be participants in INPO and NSAC. I think that they -- they have come to many of the realizations that we are getting through Rogovin and Kemeny, and a part to the action plan as the emphasis on the current operations as distinct from this predominant emphasis on worst case issues for licensing purposes, licensing versus operation.

I think some of them would tend to say it is a way of life. I cautioned them. I think that is a little bit of a copout, because I think the same was true in this country up to about '73 when we had two things happen. We had a monumental increase in the number of plants operating. We had a doubling time of two years for a while of the number of plants in operation, so there was a rapid increase on both management and technical support, and that is just starting to happen in Germany, and France and so on. So that is one factor.

The other factor which is it dilutes the people. The communication we are talking about, NOTEPAD, probably existed de facto up through '71, '72, '73. There were a small number of plants, a small number of people who largely had come out of the same background and communicated by telephone, by meetings and so on. Everybody knew everybody else. And I think it was a doubling from 20 to 40 megawatts where the -- made the transition from the Mom and Pop store to the supermarket, and you needed the computer at that point to help you out.

MR. LEE: Well-founded by a growth in regulatory requirement standards and what have you almost at the same time.

DR. ZEBROSKI: That was the other factor.

COMMISSIONER GILINSKY: Do you see them unburdened in this way?

DR. ZEBROSKI: They have taken -- I am just now putting together a paper -- I have been asked to put a paper together on overseas responses. I have a fragmentary picture of this now.

The French, for example, as you probably already know, are redefining operating procedures very carefully as a key issue. They basically have rewritten every procedure in their operating book as one of the main responses they saw as being necessary. The Germans have taken very seriously some elements of analysis that they get out of their probabilistic risk assessments, and it needs some not very major -- rather minor design changes, but which clip off some of the lead risk elements.

So I think they are -- if you state what you mean by "engineering judgment," very often it comes back to what people used to call a design tradeoff. You can do a design tradeoff with either economics as the tradeoff, or you can do it with reliability as the tradeoff. If you do it with reliability design tradeoff, you are doing exactly what we are advocating as a relative PRA. You take your base experience as your reference line, and then you say I would like to be -- I do not want a six-year mean time to another TMI. I would like to make it better. I can define that factor of five relatively with much greater precision and believability than I can design 10^{-6} in the Rasmussen sense.

So this relative thing which really goes back to engineering tradeoffs is basically what I see being exercised in most of the overseas utilities, both in operation and regulation. Some elements are showing in the action plant -- the tendency to give the IRAC kind of activity a great deal of importance. And I think on the utility side the tendency to use the probabilistic decision tools more in deciding -- say, every plant has a menu of 50 to 100 urgent things to be done at the next shutdown. Some of them will be ten times as reliable to safety as others. How do I pick the one ten times as valuable and not get diluted by the unimportant ones?

It is the same problem you had with th action plans, so I think the picking of the important ones, which is basically the engineering tradeoff -- I see that happening fairly commonly overseas, and hopefully we will be more aware of that.

COMMISSIONER KENNEDY: You said they were interested in NSAC and INPO. Is there some relationship being developed?

DR. ZEBROSKI: Yes. We have four now, from Britain, Sweden, Japan -- who is number four -- I have forgotten. And we have negotiations with eight countries now. They want to get in on NOTEPAD and all this.

COMMISSIONER HENDRIE: I think this has been a most interesting discussion, and on subjects which are obviously of crucial importance to us here. I thank you for it.

CHAIRMAN AHEARNE: At some other point perhaps we can back to the cause of delays and growth and things like that, but thank you very much, Floyd, Byron, and gentlemen. It was very interesting, very useful, and I hope we will be able to work --

MR. LEWIS: The Deputy Chairman of the United Kingdom Atomic Energy Agency showed a slide to the industry in Chicago this week in which he made the very graphic point that in their safety inspection operation, they do not have a single lawyer.

CHAIRMAN AHEARNE: Do you notice --

(Laughter.)

(Thereupon, at 12:24 p.m., the meeting was concluded.)

This is to certify that the attached proceedings before the

NUCLEAR REGULATORY COMMISSION

in the matter of: Discussion of Progress, Status & Plans of the Nuclear Safety Analysis Center Public Meeting

Date of Proceeding: June 12, 1980

Docket Number: ____________________

Place of Proceeding: Washignton, D. C.

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

David S. Parker

Official Reporter (Typed)

Official Reporter (Signature)

Foyer at end

SIGNIFICANT EVENT EVALUATION AND INFORMATION NETWORK

(SEE-IN)

NSAC/INPO PROGRAM

SEE-IN OBJECTIVES

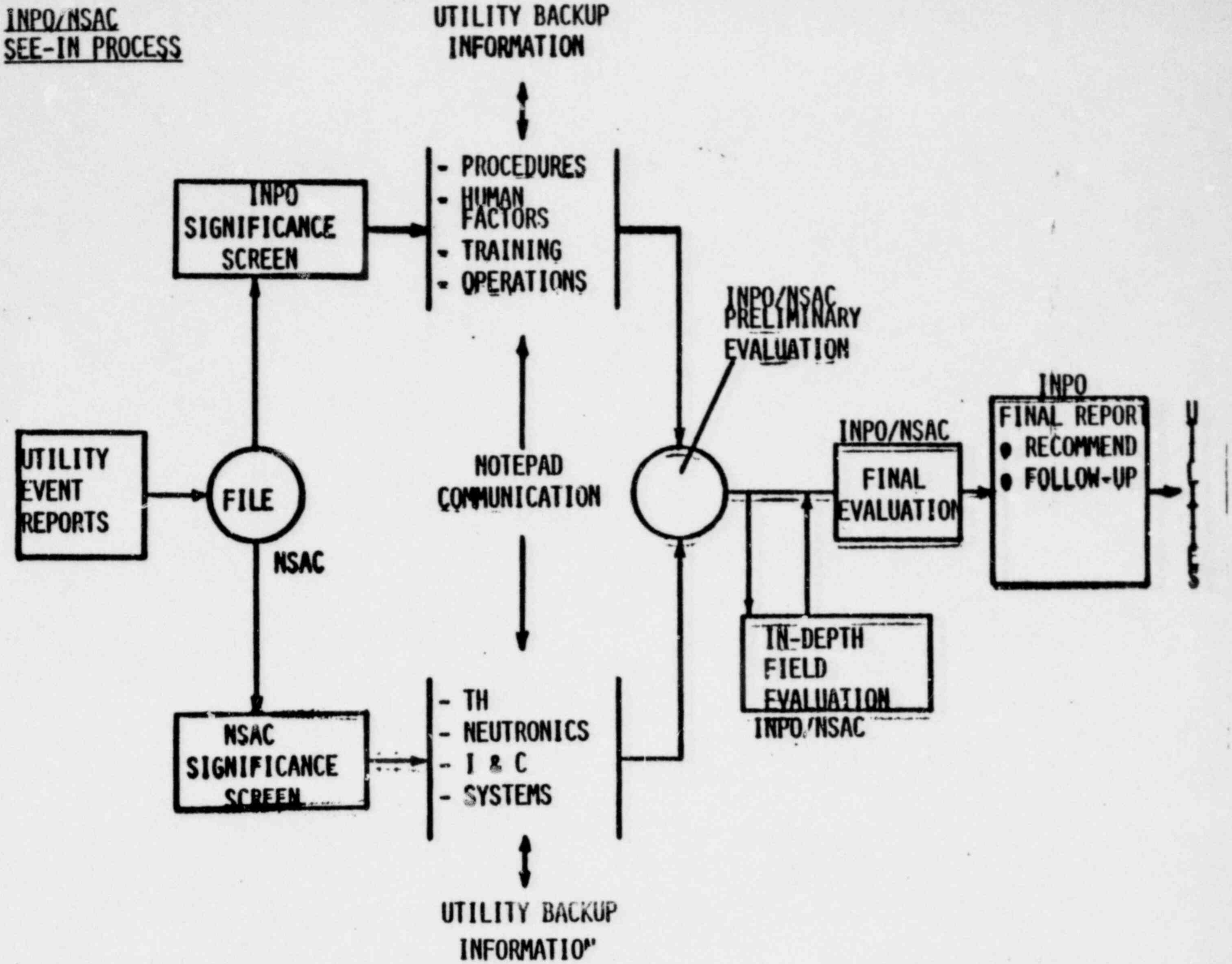
- HELP TO ASSURE THAT THE CUMULATIVE LEARNING FROM OPERATING EXPERIENCE IS EFFECTIVE

- SUPPLEMENT UTILITY OPERATING EXPERIENCE REVIEW PROGRAMS

DATA INPUT

- LICENSEE EVENT REPORTS
- OUTAGE REPORTS
- NPRDS
- UTILITY CONTACTS FOR BACKUP

INPO/NSAC SEE-IN PROCESS



ACTION ANALYSIS METHODS

- FAULT TREES AND EVENT TREES
- FIELD INVESTIGATIONS
- ASSESSING OTHER WORK IN PROCESS
- REVIEWING DATA BASES
- CONTACTING UTILITIES AND VENDORS

ANALYSIS AND EVALUATION OF CRYSTAL RIVER INCIDENT

- JOINT NSAC/INPO TASK FORCE AT FLORIDA POWER CORP IN 20 HRS
- FIRST PRIORITY WAS TO OFFER ASSISTANCE
- JOINT TASK FORCE REMAINED ON-SITE 7 DAYS REVIEWING DATA AND INTERVIEWING OPERATORS, TECHNICIANS, AND MANAGERS
- PUBLISHED REPORT 14 DAYS AFTER THE INCIDENT
- FOLLOWED UP BY FURTHER TRANSIENT ANALYSIS AND PARTICIPATION IN FLORIDA POWER CORPORATION IN-DEPTH EVALUATIONS

WHL/6-9-80

SIGNIFICANT EVENT TYPES
IDENTIFIED IN PILOT STUDY

- LOSS OF POWER ON INSTRUMENT AND CONTROL BUSES
- OVERCOOLING TRANSIENTS IN PWRS
- INADVERTENT OPENING OR STICKING OF RELIEF AND SAFETY VALVES
- FAILURES INVOLVING EMERGENCY COOLING SYSTEMS

NOTEPAD IS A COMPUTER CONFERENCING SYSTEM LINKING NSAC, INPO, UTILITIES

- COMPUTER IN PALO ALTO
- USERS CONNECT VIA A WORLD-WIDE COMMUNICATIONS NETWORK
- USER NEEDS ONLY A COMPUTER TERMINAL, ACOUSTIC COUPLER, TELEPHONE

6/9/80

NOTEPAD UTILITY PROJECTS

- * 1. UPCOMING MEETING ANNOUNCEMENTS
- 2. SUMMARY OF KEY POINTS FROM PREVIOUS MEETINGS
- 3. SIGNIFICANT PLANT EVENTS
- * 4. PERSONAL COMMUNICATIONS
- 5. SPOTLIGHT ON IMPORTANT DOCUMENTS
- 6. NSAC/INPO COORDINATION PROJECT

NOTEPAD IS A UNIQUE MEDIUM FOR THE EXCHANGE OF INFORMATION WHICH IS:

- PERTINENT
- TIMELY
- BROADLY DISSEMINATED
- RETRIEVABLE
- SECURE

6/9/80

POSSIBLE FUTURE APPLICATIONS OF NOTEPAD ARE:

- REAL-TIME EXCHANGE OF INFORMATION DURING A CRISIS

- SUPPORT OF COMPUTER CODES TO BE COMMONLY ACCESSED BY USERS DURING A CRISIS, E.G., HYDROGEN BUBBLE SIZE, ATMOSPHERIC DISPERSION CALCULATIONS

- MAINTENANCE OF LISTS OF EQUIPMENT LOCATIONS, PERSONAL CONTACTS, ETC., FOR EMERGENCY RESPONSE

6/9/80

DEGRADED CORE STUDIES

E. L. ZEBROSKI

FOR PRESENTATION TO NRC

JUNE 12, 1980

DEGRADED CORE STUDIES - I Topics Covered

1. Explicit analysis of the progression of physical processes in core-damaging accidents.

2. Mapping of alternate scenarios of various hypothetical extensions to severe core damage, core melting, vessel melting, concrete melting, and threats to integrity of containment from overpressure or melt-through.

3. Analysis of observable conditions and rate of progression for each accident scenario for operator guidance and emergency decision-making.

4. Analysis of effectiveness and reliability of available means for terminating each accident sequence at any stage in progression, to preserve integrity of containment.

5. Analysis of backup means and added reliability of termination of accident -- including improvisable means such as fire-engine water supply.

STATUS

- For TMI, Items 2 and 3 complete and documented (NSAC-2 March '80)
- Several main sequences analyzed, series of reports scheduled
- Analogous studies for other designs scheduled

DEGRADED CORE STUDIES - II Results to Date

- Hypothetical extensions of the TMI accident beyond core melting have been mapped and physical effects of main lines analyzed.

- All sequences provide definite patterns of a wide variety of observable factors, clearly indicating the progression of the accident.

- All sequences can be successfully terminated without loss of containment integrity using available water supplies (or backups), and available heat sinks (or backups).

- At least 99.9% probability of preserving the integrity of containment appears to have been available at TMI, even if complete core melting and vessel failure are postulated to occur before any remedial action (automatic or manual) occurs.

- For "do nothing" cases, sequences studied to date require long periods of time to produce significant threats to integrity of containment. Even these cases do not result in major releases of radiation such as postulated in WASH-740.

- Eventual threats to containment can be postulated for some sequences, but so far this occurs only if: (A) there is no manual or automatic response; or (B) additional low probability conditions are assumed, contrary to actual situation.

- Detailed physical analysis of further hypothetical sequences and system designs is proceeding. Experiments to reduce uncertainties in analyses are being pursued by NSAC, Argonne, Sandia, Karlsruhe Labs.

DEGRADED CORE STUDIES - III

RESULTS OF REALISTIC STUDIES OF DEGRADED CORE PROGRESSIONS ARE USEFUL OR ESSENTIAL FOR THE FOLLOWING:

1. REAL INCREASE IN PUBLIC SAFETY BY ADDED OPERATOR EDUCATION AND TRAINING TO COVER MEANS FOR RECOGNIZING AND TERMINATING SUCH EVENTS.

2. REAL INCREASES IN PUBLIC SAFETY IN RECOGNIZING AND MAINTAINING A HIGH DEGREE OF CAPABILITY OF CONTAINMENT SYSTEMS FOR COPING WITH ACCIDENTS BEYOND NOMINAL DESIGN BASIS (NOT NOW FULLY EXPLOITED OR CREDITED IN RISK ANALYSIS WHICH FOCUSES EXCLUSIVELY ON "DO-NOTHING" WORST CASES).

3. PROVIDING A RATIONAL BASIS FOR EMERGENCY DECISION-MAKING; IF IT IS DESIRED TO AVOID FALSE ALARMS AND CONSEQUENT PSYCHOLOGICAL AND POSSIBLY PHYSICAL DAMAGE RESULTING FROM PANIC. PRESENT POLICY AND RULES APPEAR TO GUARANTEE MANY FALSE ALARMS FROM EVENTS WHICH HAVE OCCURRED MANY TIMES WITH BENIGN RESULTS.

NSAC 6/12/80
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DEGRADED CORE STUDIES - IV RELATIONSHIP TO OTHER ISSUES:

DEGRADED CORE STUDIES

- ACCIDENT SCENARIOS FOR SPECIFIC DESIGN
- TERMINATION MEANS AVAILABLE
- PROBABILITIES OF TERMINATION WITHOUT THREAT TO CONTAINMENT
- POSSIBLE CONTAINMENT LEAKAGE MODES AND PROBABILITIES
- PROBABILITY, TYPE, AND RATES OF RELEASE TO ENVIRONMENT
- CONSEQUENCES TO ENVIRONMENT

DEFINE: OBSERVABLE FACTORS AT EACH STAGE;
RATES OF PROGRESSION;
OPTIONS FOR SAFE TERMINATION;
OBSERVATIONS TO CONFIRM SAFE TERMINATION, AND/OR
OBSERVATIONS TO CONFIRM IF EVACUATION MAY BE PRUDENT ON INDICATIONS THAT TERMINATION MEANS ARE INEFFECTIVE.
TIMES AVAILABLE EVEN IF TERMINATION MEANS ARE INEFFECTIVE (TO PREVENT PREMATURE ALARMS OR PANIC JUDGEMENTS)

ESSENTIAL FACTUAL INPUTS TO:

EMERGENCY RESPONSE PLANS

RATIONAL EMERGENCY DECISION PROCESS

CLASS 9 RULEMAKING

REALISTIC VERSUS EXTREME WORST-CASE ASSUMPTIONS

SITING CRITERIA

REALISTIC VERSUS EXTREME WORST-CASE ASSUMPTIONS

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6-80

DEGRADED CORE STUDIES - V. MELTED CORE TEST SIMULATION

- SOME UNCERTAINTIES REMAIN IN ANALYSIS OF SOME CORE-MELT SCENARIOS

- MELTING CORE FALLS INTO WATER-FILLED CAVITY
  - POSSIBLE STEAM EXPLOSION
  - FRAGMENTATION OF CORE DEBRIS
  - COOLABILITY OF FRAGMENTS

- ANALYTICAL BOUNDS ON EACH ITEM STRONGLY SUPPORT MODERATE EFFECTS, CONTAINMENT INTEGRITY INTACT

- CONFIRMATION OF KEY ELEMENTS OF ANALYSIS TO BE TRIED BY LARGE SCALE SIMULATION USING "SLAG-TAP" COAL FURNACE
  - OVER 50 KG/MINUTE FLOW OF MOLTEN SLAG SIMULATING "CORIUM"
  - HIGH SPEED MOVIES AND INSTRUMENTATION FOR INPUT TO ANALYSIS
  - JOINT PROJECT OF NSAC/ANL/COMMONWEALTH EDISON

- EXPECT MAJOR STEP IN CONFIDENCE OF REALISTIC MODELLING OF EXTREME-CASE EVENTS, AND ASSURANCE OF LONG TERM COOLABILITY

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6-80

PROBABILISTIC RISK ASSESSMENT

EMERGENCY PLANNING

R. J. BREEN
NUCLEAR SAFETY ANALYSIS CENTER

FOR PRESENTATION TO NRC
JUNE 12, 1980

OCONEE PROBABILISTIC RISK ASSESSMENT

MAIN OBJECTIVES

- BENCHMARK INDUSTRY PRA STUDY
  - METHODS
  - RESULTS
  - SIGNIFICANCE OF RESULTS

- IMPROVE UTILITY/INDUSTRY CAPABILITY IN PRA METHODS
  - HANDS-ON EXPERIENCE
  - MANAGEMENT TOOL

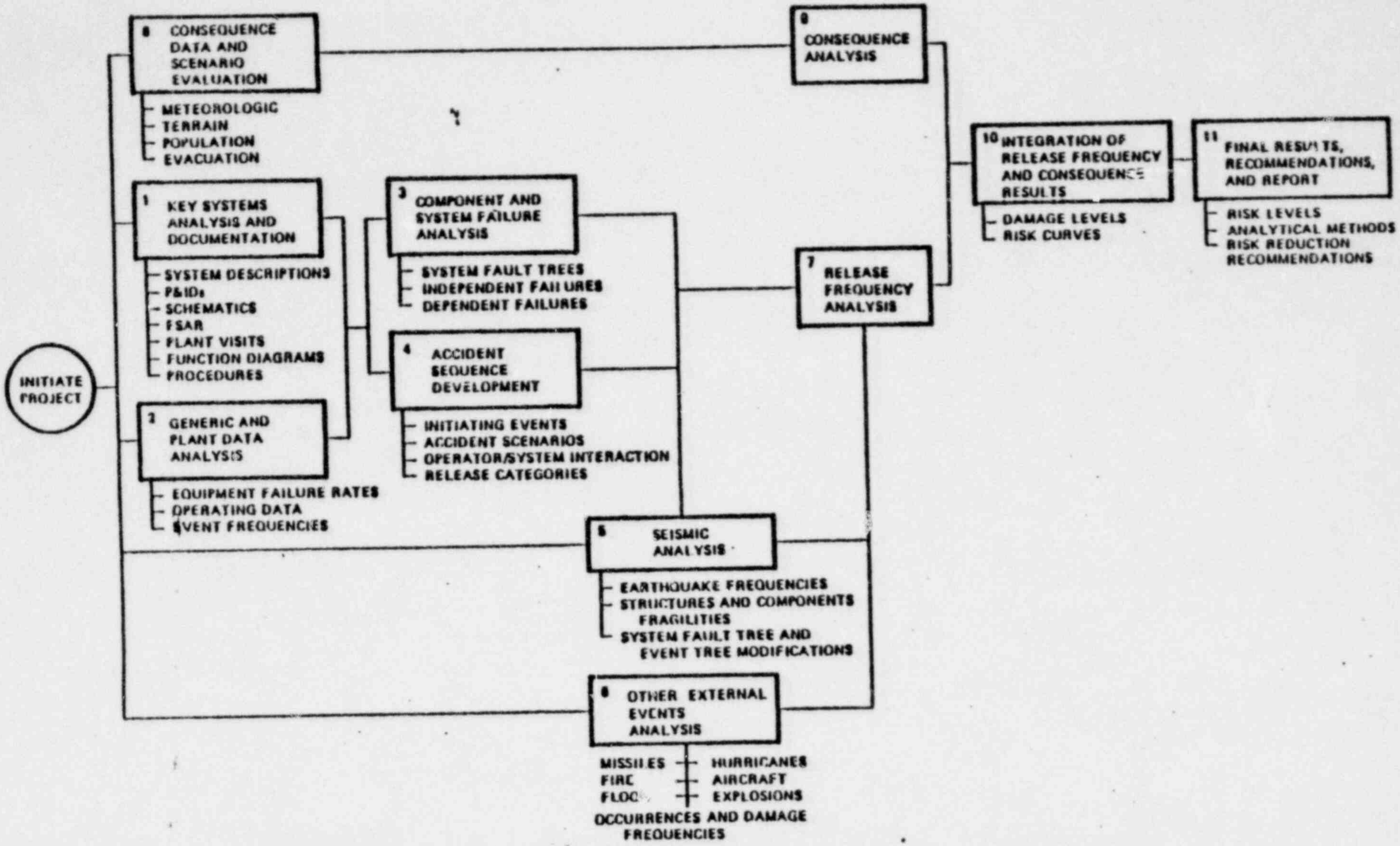
- EVALUATION OF PUBLIC HEALTH RISK AND PLANT DAMAGE RISK

- DEVELOP EVENT TREE/FAULT TREE MODEL FOR USE BY UTILITY -- WORKING TOOL FOR ACCUMULATING OPERATING EXPERIENCE.

OCONEE PROBABILISTIC RISK ASSESSMENT

IMPLEMENTATION

- STAFFING
  - NSAC
  - CONTRACTORS
  - UTILITIES
- ONE YEAR DURATION
- ADVISORY REVIEW GROUP
- DETAILED WORK PLAN BEING PREPARED
- PLANT DATA BEING COLLECTED
- TRAINING SESSIONS BEING DEVELOPED



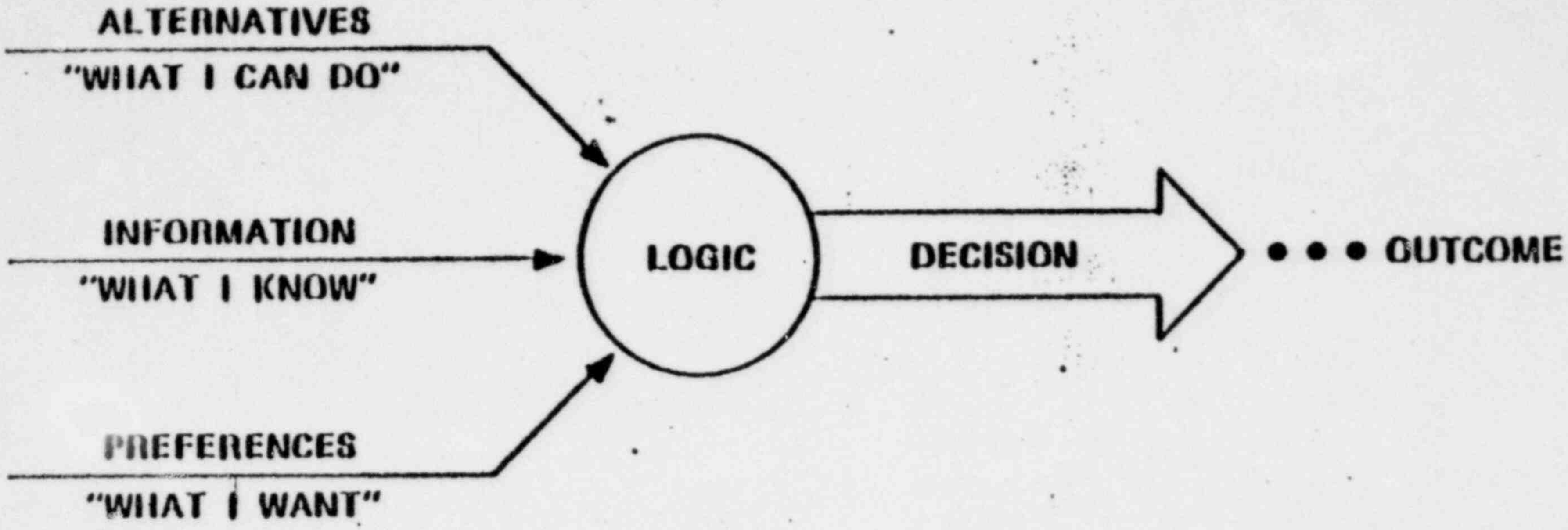
TASK NETWORK OCONEE PROBABILISTIC RISK ASSESSMENT

Emergency Planning

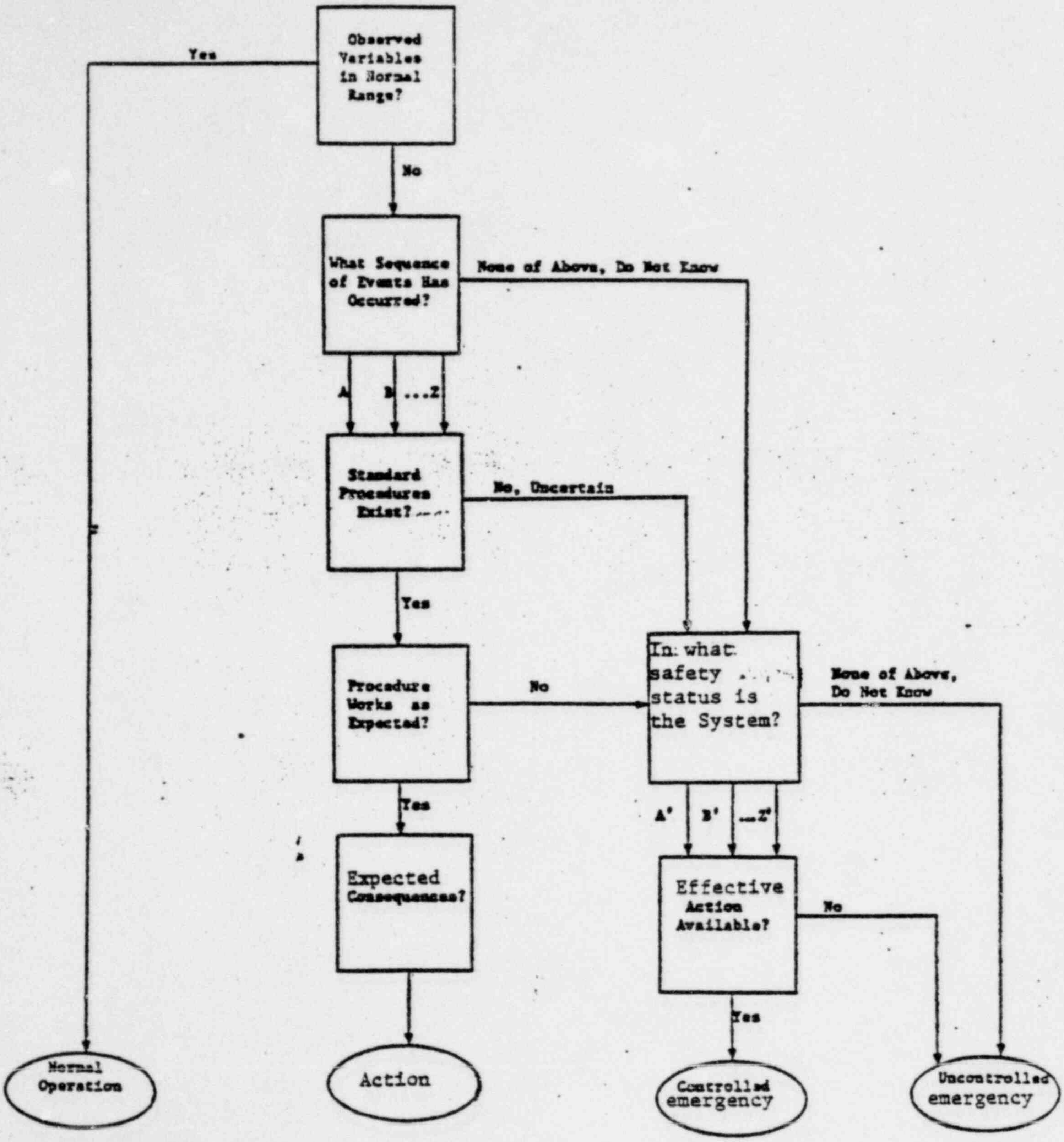
NSAC Studies

- Application of Decision Analysis
  - Systematic Approach to Decision Making
  - Basis for communication among diverse parties

- Basic Elements
  - Include procedures and systems to cope with most likely cases
  - Distinguish between cases with and without standard procedures
  - Make full use of time and information available



ELEMENTS OF GOOD DECISIONS



DECISION MAKING IN EMERGENCIES

NSAC PROGRAM OUTLINE

NSAC ORGANIZATION

SAFETY CONSOLE

SAFETY GOAL

E.L. Zebroski

For presentation to NRC
June 12, 1980

NSAC WORK PROGRAM OUTLINE
1980-1981

MAJOR PROJECT AREAS:

I. SIGNIFICANT EVENT SCREENING AND EVALUATION

II. NUCLEAR POWER PLANT OPERATING EXPERIENCE; CASE STUDIES OF POTENTIALLY SIGNIFICANT EVENTS

III. RESPONSE TO REGULATORY ISSUES;

- ACTION PLAN
- HIGH ENERGY LINE BREAKS
- TECHNICAL SUPPORT TO REGULATORY RESPONSE GROUPS

IV. GENERIC SAFETY EVALUATIONS

- PROBABILISTIC STUDIES
- DEGRADED CORE STUDIES AND CLASS 9
- EMERGENCY DECISION PROCESSES
- KEY SAFETY PARAMETERS DISPLAY
- SAFETY GOAL FORMULATIONS
- STRATEGIC PLANNING FOR GENERIC ISSUES

V. INFORMATION AND DATA NETWORK

- ZYTRON DOCUMENTATION SYSTEM
- NOTEPAD - COMPUTER CONFERENCING NETWORK & DATA SYSTEM WITH ALL NUCLEAR UTILITIES; WORLDWIDE CAPABILITY

} OPERATIONAL SINCE 1979

- ADVANCED COMMUNICATION SYSTEM STUDIES

VI. TMI FOLLOWUP; HEALTH STUDY, CLEANUP DATA

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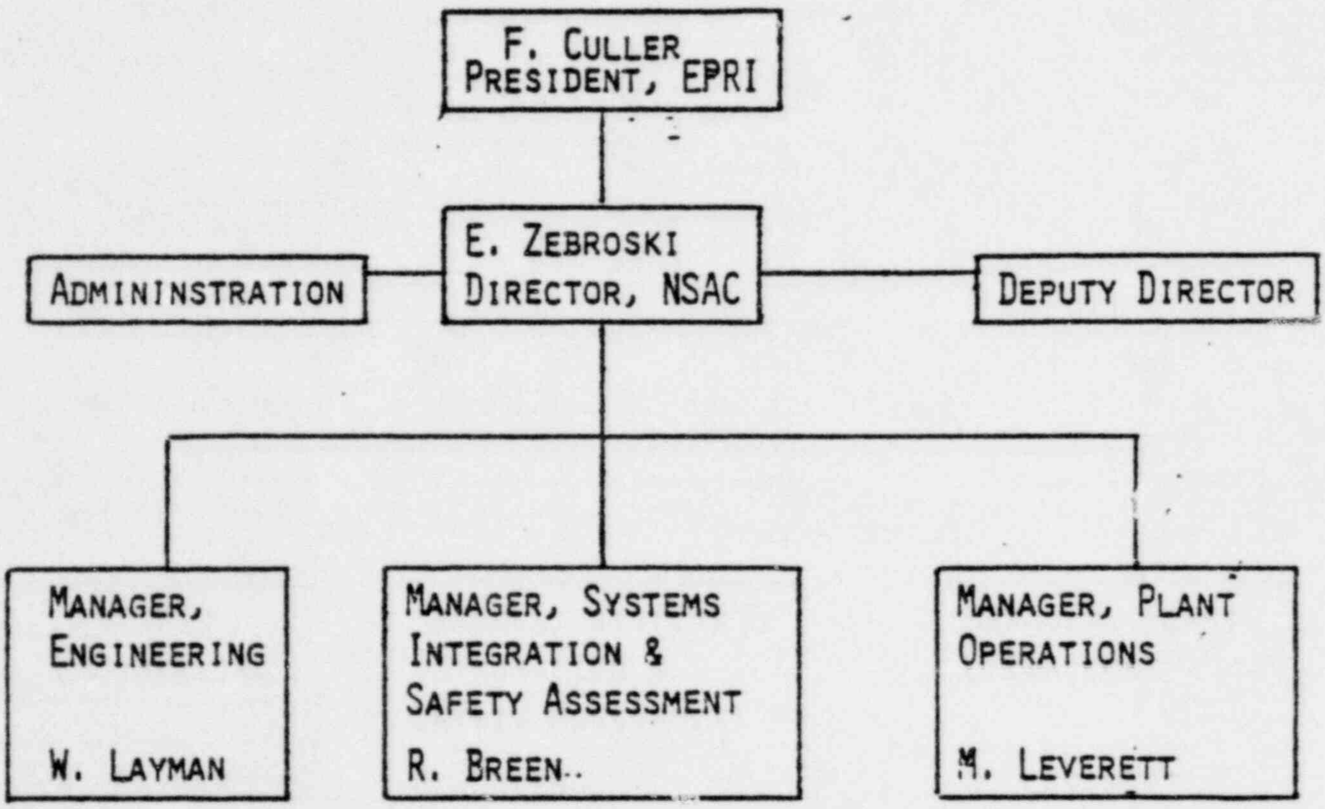
NSAC ORGANIZATION

- ADMINISTRATIVELY FUNCTIONS AS A DIVISION OF EPRI.
- FUNDED SEPARATELY BY CONTRIBUTION OF MOST NUCLEAR UTILITIES, PUBLIC AND PRIVATE.
- STAFF AND STRUCTURE: STAFF 51 INCLUDING LOAN EMPLOYEES FROM 4 NSSS SUPPLIERS; 6 US UTILITIES; 4 OVERSEAS UTILITIES.



CORE ANALYSIS
INSTRUMENTATION & CONTROLS
SIGNIFICANT EVENTS
SAFETY CONSOLE
STRUCTURAL ANALYSIS

PROBABILISTICS
EMERGENCY DECISION PROCESS
INFORMATION AND DATA SERVICES
SAFETY ANALYSIS

PLANNING
RADIATION & HEALTH
PLANT CHEMISTRY
INDUSTRY REPORT

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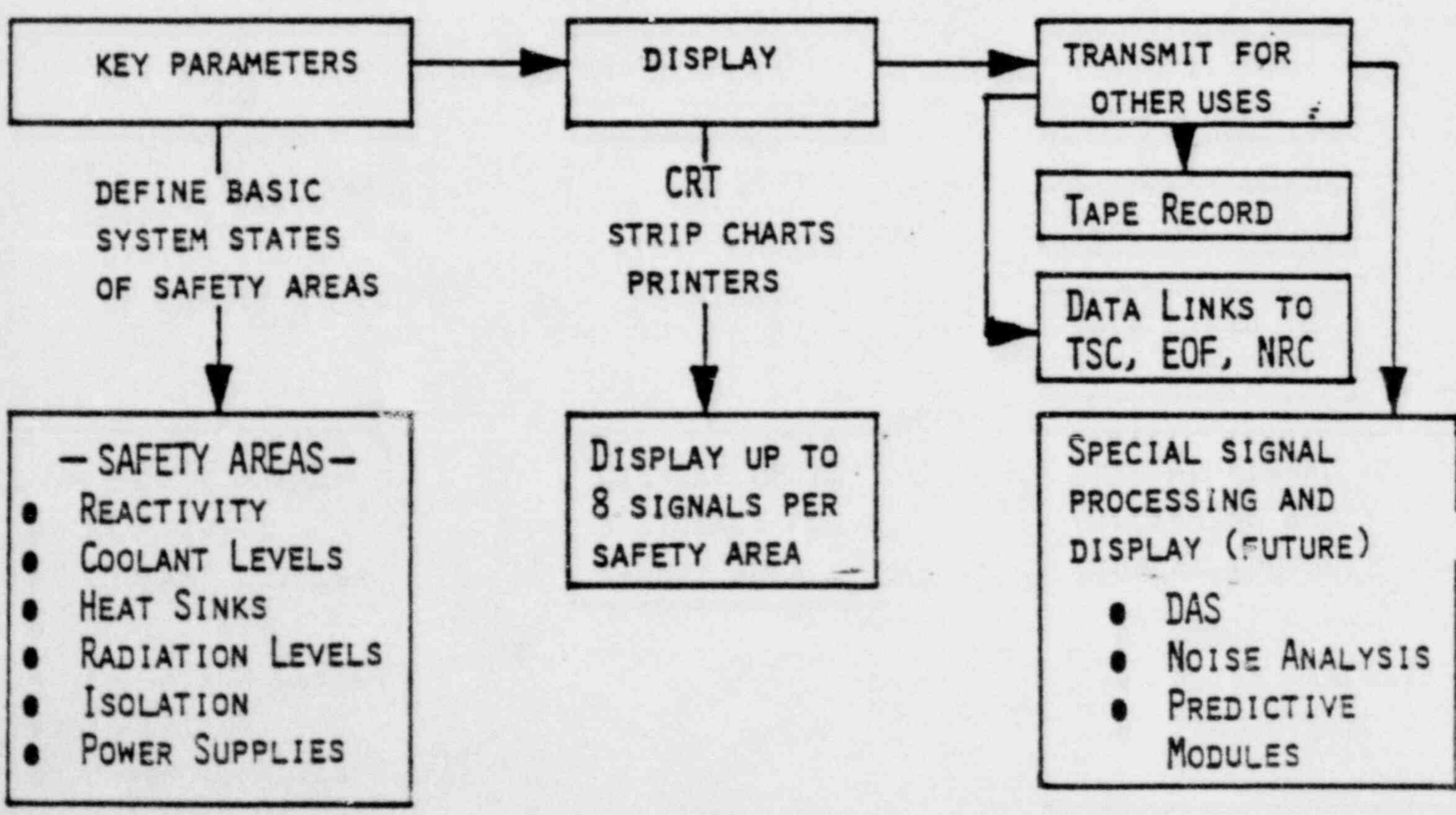
SAFETY PANEL OR CONSOLE

OBJECTIVES:

- Human Factors Design to Avoid Possible Confusion
- Clear Description of State of the System
- Unambiguous Verification of Problem/No-Problem Situation
- Primary Aim - Plant Safety
  - KEY SAFETY PARAMETERS ONLY
  - SIGNALS FROM EXISTING SENSORS
  - CONTINUOUS DISPLAY WITH TRENDS
  - MINIMUM COMPLEXITY IN DATA PROCESSING AND DATA LOGGING SYSTEM
  - DOESN'T REQUIRE ANOTHER LARGE COMPUTER
  - CONTROL AND ACTUATION INFORMATION OMITTED



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KEY SAFETY PARAMETERS DISPLAY

- PROBABLY THE MOST EFFECTIVE PLANT CHANGE AVAILABLE FOR IMPROVING PLANT AND PUBLIC SAFETY

- PROBABLY THE MOST PRACTICAL AND EFFECTIVE RESPONSE TO BASIC "HUMAN FACTORS" LIMITATIONS OF MOST CONTROL ROOM DESIGNS (FOR UNUSUAL PLANT UPSETS OR ACCIDENTS)

- PROBLEM AREAS:
  - DELAYS IN IMPLEMENTATION DUE TO HUMAN FACTORS OF NRC, UTILITY, AND VENDOR ORGANIZATIONS.
  - DIVERGENT NRC STAFF VIEWS ON OBJECTIVES OF SAEETY CONSOLE, DATA LINK, TECH. SUPPORT CENTER, EMERGENCY FACILITY, AND REG GUIDES 1.97 AND 1.47.
  - DIVERGENT VENDOR PRODUCT DESIGNS.
  - DIVERGENT UTILITY APPROACHES REFLECTING VARYING INTERPRETATIONS OF STAFF INTENT.

- POSSIBLE RESOLUTIONS:
  - KEY SAFETY PARAMETERS INTEGRATION COMMITTEE FORMED: UTILITIES, SUPPLIERS, AND NSAC.
  - NRC WORKING GROUP; MATTSON, HANAUER, GRIMES, BASSET, ET AL.
  - SERIES OF MEETINGS PLANNED TO DEFINE FUNCTIONAL CRITERIA AND DESIGN CRITERIA.

- POLICY OPTIONS
  - KEEP IT SIMPLE TO HELP THE OPERATORS AND PLANT SAFETY, OR -
  - GET AS MUCH DATA AS POSSIBLE FOR DATA LINKS] · POST-ACCIDENT ANALYSIS · OFF-SITE INFORMATION NEEDS

- UNDERWAY: PARAMETER SET VALIDATION STUDIES
  - 3 CONTRACTORS.
  - TEST AGAINST KNOWN & POSTULATED ACCIDENTS.
  - TEST OPERATOR PERCEPTIONS ON SIMULATORS.

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SAFETY GOAL - I

- "Risk Envelope" estimate by WASH-1400 useful technique but not of itself a workable tool for design, operation, & regulation.

- Absent a practical safety goal. There is tendency of all regulation to strive for near-zero risk from any defined hazard.

- Members of Bio-Ethics Community (DNA, saccharin, extreme life support measures, abortion criteria, etc.). Note that extreme reductions in a specified risk often increase other, less well-studied risks.

- Present legislation provides no guide for regulation to avoid excessive increased in alternate risks of human misery and death (e.g., deprivation, social chaos, inflation, possible contributing factor for wars) from dilatory exploitation of domestic energy capabilities.

- One measure of penalty to society; nearly one trillion dollars added fuel bill in this century due to delays, cancellations, or non-committments of nuclear units.

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SAFETY GOAL - II ATTRIBUTES REQUIRED

- REQUIRES DEFINITIONS OF PRACTICAL METHODS FOR DESIGN & OPERATING DECISIONS
- MUST PROVIDE AN OBJECTIVE BASIS FOR REGULATOR-UTILITY ANALYSIS AND AGREEMENT ON WHAT IS "SAFE ENOUGH"
- MUST BE CLEARLY A "NON-ZERO" RISK GOAL AND METHODOLOGY
- MUST BE DESCRIBABLE IN TERMS WHICH ARE UNDERSTANDABLE AND ACCEPTABLE BY REASONABLY INFORMED (AND EMOTIONALLY STABLE) LAYMEN
- MUST PROVIDE FOR FULL USE OF BEST-AVAILABLE DATA AND DECISION PROCESSES

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SAFETY GOAL - III One possible formulation of Safety Goal

1. Reactor design and operation to insure that expected time to core-damaging accidents is not less than 30 years.

2. Reactor and containment system design and operation to maintain assurance of not less than 99.9% probability of termination of the accident without radiation release leading to a total dose of 1 REM to any member of the public.

3. Use relative risk assessment methods (similar to conventional engineering trade-off studies) to establish need for, or adequacy of, design or operating improvements which establish that criteria (1) and (2) above are met, using existing operating experience as reference base.

4. Use statistically rigorous formulation with defined confidence levels and permissible error bounds, where needed, and include cummulative effects of actual total population of operating reactors.

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