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AND ACTION PLAN

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PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Tuesday, August 30, 1994

The Commission met in open session, pursuant to notice, at 2:30 p.m., Ivan Selin, Chairman, presiding.

COMMISSIONERS PRESENT:

IVAN SELIN, Chairman of the Commission
KENNETH C. ROGERS, Commissioner
E. GAIL de PLANQUE, Commissioner

STAFF SEATED AT THE COMMISSION TABLE:

KAREN CYR, General Counsel

ANDREW BATES, Office of the Secretary

JAMES TAYLOR, Executive Director for Operations

WILLIAM RUSSELL, Director, NRR

ROBERT BERNERO, Director, NMSS

EDWARD JORDAN, Director, AEOD

ASHOK THADANI, Associate Director of Inspection and Technology Assessment, NRR

GARY HOLAHAN, Director, Division of Systems Safety and Analysis, NRR

JOSEPH MURPHY, Deputy Director, Division of Safety Issue Resolution, RES

P-R-O-C-E-E-D-I-N-G-S

2:30 p.m.

CHAIRMAN SELIN: Good afternoon, ladies and gentlemen.

The Commission over the years has been pushing to use risk-based analysis more broadly and more systematically in all of our work and there have been a number of interchanges between the Commission and staff. This is not an easy thing to do because you don't set up a department of risk-based analysis. It's a function that's supposed to suffuse everything we do rather than something that is centralized in the line organization where a line supervisor just has the job of making it work or not making it work.

As you well know, no one person is responsible. When everybody is responsible, nobody is responsible. So, it's hard to set up an organization to do this. So, not being able to use simple organizational tools, we've had to win the hearts and minds of the staff since we can't just tell them what to do and have them do it on this function. We're about to find out today how effective this soft approach is and has been.

Commissioner Rogers?

COMMISSIONER ROGERS: Nothing right now.

CHAIRMAN SELIN: Mr. Taylor, the floor is yours.

MR. TAYLOR: Good afternoon. With me at the table are representatives from the program offices.

I will start by noting that we have given the Commission two papers. One, the proposed policy statement, would be broadly applicable to NRC programs with most of the implementation activities in the reactor area. We also gave the Commission a paper on an overall agency implementation plan. The development of that involved all the program offices in the regions and it was undertaken following a meeting last November and a recommendation for such a plan by the major program office directors.

I would note at the beginning that with regard to PRA, we support it as a very valuable tool for assessing safety and it will complement our deterministic work. However, we still must look at the qualities of design, construction and operation as important areas of emphasis for the NRC and the industry and we certainly would not look at PRA as justifying poor performance or non-compliance with requirements. We look at it as the PRA techniques are most valuable when they serve to strengthen our defense in depth philosophy.

With those notes, I'll ask Ashok Thadani to continue.

DOCTOR THADANI: Good afternoon.

(Slide) May I have viewgraph number 1, please?

I will briefly cover the background that led to the proposal to develop a policy statement and an implementation plan for increased use of PRA in our regulatory activities and then Gary will go through the specific details of what's in the policy statement as well as the implementation plan and the schedule for moving forward.

(Slide) May I have viewgraph number 2, please?

We briefed the Commission in January regarding the recommendations of the PRA working group and our plans to develop a policy statement and an implementation plan for increased use of PRA in our regulatory activities. The purpose of this policy statement was to make clear the Commission's views on the value of PRA techniques and to make it clear to the staff, the licensees as well as the public its thinking in this important area.

The staff also proposed that the PRA

implementation plan would, as a minimum, include recommendations of the PRA working group, the regulatory review group and the regulatory analysis group.

The objective was to ensure that the increased use of PRA, both methods and technology in our activities would be implemented in a consistent manner and that, if you recall, was an important finding of the PRA working group.

Therefore, the plan addresses activities such as decision criteria, methods, data and the required documentation for specific applications. These are important elements to make sure there is, in fact, consistent use of these techniques.

In the development of this plan, we have recognized considerable progress has been made in applying this technology in several regulatory applications. Some of the recent applications of using PRA to separate the more important from the less important issues has been the implementation of the maintenance rule activities we have undertaken, as well as what we're doing in the area of graded QA.

The key point here is that this plan is very broad. It reflects agency thinking. It's not just one office, it's all offices with a lot of input from the regions as well. Therefore, it takes time and, as the Chairman noted, there are a number of issues that need to be addressed, but we're not letting the development of this plan, what we have in there, keep us from doing what needs to be done. So, we're moving forward in a number of areas.

We also think this plan needs to be a living document. We expect it to change as we go through and do a bunch of activities, the pilot studies that we're doing now, insights we might gain from our reviews of IPEs and IPEEEs. We expect those would impact the plan and the plan would, in fact, undergo changes. Thus, it has to be a document that can be adapted to the new information.

The Commission also asked that there needs to be a way to measure our success. What we propose to do is to come back and brief the Commission at some intervals but as a minimum provide you with progress reports semiannually for you to see where we are at that time.

With that I'll turn it over to Gary Holahan.

MR. HOLAHAN: Thank you.

I'll discuss both the proposed policy statement and the PRA implementation plan.

(Slide) Can I have slide number 3?

The objective of the overall policy statement would be to establish improved regulatory decision making. So, improved safety is really the first goal of the use of PRA.

Secondly, we're obviously living in an environment where there will be fewer staff resources and we want to use those resources as efficiently as possible and PRA is a valuable tool for focusing limited staff and limited industry resources on those things that are really important.

Thirdly, where it's possible, we would like to use PRA as a technique for improving the regulations in a way that can reduce unnecessary burdens on licensees. I might also mention that it seems appropriate to have a policy statement at this time since the Commission hasn't formally spoken to the role of PRA in a long time, not since 1979 when there was a first policy statement. Now, the Commission has taken the position on individual issues such as the safety goal, but there's really no sort of overall Commission statement of will in terms of the uses of PRA. I think this would play an important role in having the Commission's position clearly understood by both the staff and the industry.

In addition, it's clear that because there are many activities involved, and when we get to the implementation plan you'll see that there are over 100 individual line items, that the Commission's policy statement serves, among other things, as a guiding principle so that those other areas can be done in a coherent and consistent manner.

(Slide) Can I have the fourth slide?

The proposed policy statement itself would have four major elements, the first being the increased use of PRA in regulatory matters limited basically by the state-of-the-art and the availability of data. What we know is that PRA methodology has been under development for about 20 years. In fact, at this stage that's really the easier part of the problem. Data to make reasonable and consistent PRA analysis is an important element and you'll see that that's addressed in the plan.

In addition to that, the policy statement addresses removing unnecessary conservatisms in the regulations. It also addresses the fact that PRA analysis in order to be most useful and to focus on the most important safety issues really needs to be a realistic analysis. Conservatism and margins can be built in, but they ought to be done after the PRA analysis is done so that they're done in the most meaningful way possible. The policy statement also speaks to how uncertainties ought to be used in applying the Commission safety goal.

(Slide) Can I have the next slide?

There are a number of additional considerations associated with the policy statement. One is a statement of the relationship between the use of PRA and the NRC's traditional defense in depth policy. The policy statement would make it clear that these are meant to be supportive concepts, that the PRA use would augment the Commission's defense in depth philosophy.

I think one example that comes to my mind is if we think about one of the major improvements in containment performance over the last several years, what comes to my mind is the hardened vents on the BWR Mark I designs. That's an area in which PRA techniques, PRA analysis was used not in a way inconsistent with defense in depth, but actually to look at containment as a valuable safety barrier and to provide an insight as to how to make that barrier work better. That's one of the ways that we see PRA as supportive of defense in depth. It can actually give insights into the strengths and weaknesses of each barrier and it can provide insights as to how to balance safety among the various layers of defense in depth.

I think it's important that, and it is mentioned in the policy statement, that the PRA insights can be used to strength regulatory requirements in addition to the idea that you can reduce requirements where they may be overly conservative because, in fact -- I mean the Commission did put conservatism into its original rules. We may, in fact, be able to use PRA and safety insights to find additional areas where additional safety requirements might be appropriate. So, there is a balance addressed in the policy statement.

CHAIRMAN SELIN: I'd like to let you finish that policy statement part, but I have some comments before we get to the implementation plan.

MR. HOLAHAN: Okay. Fine.

CHAIRMAN SELIN: If you'll signal to me when you're there.

MR. HOLAHAN: (Slide) Can I have the sixth slide? This is the last one on the policy statement itself, which is the schedule.

The proposed policy statement would be available for publication on the Commission's approval. We've already been to the ACRS and discussed it. The comment period would be a normal 60 day comment period which would take us out to November. We would expect, after we've addressed public comments, to go back to brief the ACRS again and to have a final version of the policy statement available to the Commission in March. At that time, it's really up to the Commission as to when they would choose to act on it.

CHAIRMAN SELIN: I have a few comments to make. I think it's a very good statement. My comments really have more to do with what are we trying to do in the statement than how we've done it.

There are two different topics to be covered in a PRA statement. One is if you're going to do a PRA, how do you do it. The second is once you've done one or when you decide whether to do it, to what uses do you put the PRA? Most of the policy statement is, and I think appropriately, on the second point and that's where my comments are going to go. I believe that we need some more background for the background of the statement. I hope you will bear with me. As a practical matter, you have very little choice but to bear with me.

MR. HOLAHAN: Yes, sir.

CHAIRMAN SELIN: What we're trying to do, I believe, is the following. We've come to the conclusion that over the years a lot of stuff has crept into the regulations which not only may not contribute to safety but in some cases gets in the way of safety. What we're trying to do is to have an Ockham's razor kind of philosophy, get out of the rules that we don't need and enforce the devil out of what's left. So, you never end up saying, "Well, they didn't carry out the rules, but it was irrelevant to safety, so we won't follow." Not only is it a waste of resources, but that undermines the confidence and the status of the rules. Ideally you'd have a really lean set. Everybody would agree everything in that is essential and any violation would be capital punishment.

Obviously you can't get to that part, but that's an overall objective of what we're trying to do in the agency beyond the PRA. We're trying to do this with things like tech spec changes where we're trying to have generic improvements. We're trying to do this with the cost beneficial licensing activities which are to make the license amendments. We're trying to do this with how we allocate our resources with the SALP scores, et cetera. We're trying to do with this enforcement discretion which, if carried out correctly, says that there always are some gray areas and in some specific cases mechanically carrying out the rule is actually harmful for health and safety and we're trying to do this. As we get into our enforcement policy, we're trying to do it for PRA. So, that's the first sort of general consideration, the most general level.

The second is that if we've done our job correctly, and I think we have to state this, our policy is to err on the side of conservatism, not to err on the side of cutting corners. So, we would expect as the analysis gets better there would be a one way direction. I don't want to call it a bias because I don't mean that in the sense of a prejudice, but it would be a bias in the sense that the changes would tend to reduce not increase regulation as we get more precise and say what is the risk. So, it's not surprising that in many cases the PRA will let us be more realistic than we have in the past. And that's all fine.

And the third thing is that what we're after is reducing risk. I mean that's what health and safety is about. It's not -- I mean that's what we're really oriented to. So, a program that deals directly with risk instead of with surrogates should be more accurate and more precise and more helpful.

The fourth point is that you never get to an optimum position. You're always trying to go from where you are to something that's better. If you have to say does the agency do too much risk-based analysis or too little today, the answer is we do too little.

On the other hand, we're a lot closer to where we ought to be than we were a few years ago and we have to worry about overshooting and we have to worry about intellectual arrogance. I'd like to see this fifth point not just as an added consideration, but as central to the point. Nobody should ever be all that confident in an analysis. We should never say it can never happen that two safety systems fail at the same time because one is a 10^{-4} probability because somebody might leave them turned off or some fool might do maintenance.

So, this idea of not abandoning deterministic analysis or not abandoning defense in depth, which in many ways is the direct opposite of the PRA, you know, PRA says you do a calculation from one end to the other. If the overall risk is quite low you feel comfortable. Defense in depth says you don't rely too much on any one of these sequential factors in the PRA. Each one has got to be pretty good because you might just be wrong. If 95 percent of your risk avoidance is to avoid the challenge, not to react robustly, you can't be sure that the challenge won't arise.

So, I'd like to see a little more explicit discussion of the fact that PRA approach, a defense in depth approach, and a deterministic approach, these are three different approaches. Not 180 degrees out of phase with each other. You know, you can't have three things each 180 degrees out of phase with the other two things in two dimensional space, but they do come at things from a somewhat different angle and I'd like to see some of that. Particularly I would like see an admonition against hubris, against the fact that you can do a calculation to 10^{-7}. You should never believe that the answer is really 10^{-7}.

Then we need some statement about not only these approaches but the role of severe accident analysis that says that we have one way of analyzing systems, design basis, but we're not so sure that that's right. So, we want the systems to degrade gracefully as you get off. I want it to be a PRA statement. I don't want it to be a statement of Commission philosophy. At least if not in the statement, in the letter that goes out to cover the statement. I'd like you at least to think about these points. Whether we decide that it's too complicate, it's the wrong statement, we need it someplace else, I'm open, myself and my colleagues I'm sure, to some discussion.

But if we're going to talk about the role of PRA and how we do analysis, we have to talk a little bit more about how we do analysis. If I wanted to summarize this entire statement in one line, it's really avoid arrogance. Do not ever act as if we have all the answers, we can do the calculation and out it comes. That's why we do these things in so many different ways.

Having said all that, I think the statement is very, very good. But a little bit more of the context, I think, is important. It's a policy statement. We're not putting out the algorithms at this point and I think the policy has got to be embedded a little more into our regulatory philosophy.

Commissioner Rogers?

COMMISSIONER ROGERS: While we're on the policy statement, maybe it would be a good time to make some comments on it.

First, I'd just like to say I'm delighted with the whole approach that we're taking and in such a comprehensive way. However, and I agree with essentially everything that Jim had said, although I have a little different angle on some of these things that I'll mention at any rate because it's something I've referred to in the past anyhow.

But I do have a problem with the policy statement in that if I look at it, three out of the four points explicitly talk about nuclear power reactors. That's not the policy. The policy is to use PRA throughout the organization wherever it's appropriate. If I read the first one, the very first one, increased use of PRA in reactor regulatory matters will be implemented. We don't need the word "reactor" in there, do we? I thought this was a policy statement.

MR. HOLAHAN: I think Mr. Bernero -- I would love to have Mr. Bernero answer.

COMMISSIONER ROGERS: Unless we could say "won't be used in reactors."

MR. HOLAHAN: We have discussed this issue. So, Bob will take it.

MR. BERNERO: Yes. The basic thing, the state-of-the-art and the subject to be analyzed is so much more heavily developed and refined in reactors that each element of the policy statement does apply across the agency. It applies in the material safety programs, in waste management, but in a very different way. We had a lot of wrestling about when it was appropriate to say this is true for reactors, evidently true for reactors, and in some analogous way true for other things. But editorially you can get yourself into a muddying of the policy water by staying in the totally general and making it fit for all cases.

The idea of using it in regulatory matters to the extent supported by the state-of-the-art no doubt it applies. In fact, it's going to the one -- considering the uncertainties in the applications we have. It's a very, very important thing, especially the performance assessment on high-level waste. It's replete with the issue of how to deal with the uncertainties fairly. All of these elements of policy do apply across the board. But if you state them sharply, as the policy statement is attempting to do, it is often necessary to be more precise and state them specifically for reactors.

We were trying to strike a balance in the policy statement to have it be a general policy statement but not have it reactor from the top down or totally general from the top down because then it wouldn't be anywhere near as clear. So, it is a difficult balance to draw.

COMMISSIONER ROGERS: You haven't convinced me of anything. I'm sorry. I think that either it seems to me you have to make it very clear that it will be used everywhere else and that there will be special considerations applicable to other areas that are different from the use of reactors and spin it out that way. But as I've said, three out of the four major bullets here is just say reactor. It doesn't say, "and where applicable elsewhere," it just says, "in reactor regulatory," and I don't see any need for that.

This is a policy statement. This isn't an implementation statement, this is a policy statement. Are we or aren't we going to use PRA in places other than reactors? Yes, they'll be used as appropriate and the technology and techniques may be somewhat different in how they are. But this policy statement, if I read this thing, this is a reactor policy statement. It's not an across the board policy statement.

So, that troubles me because I think that -- I don't have any fault with these individual statements, but as an over arching policy statement it really says we're going to pay attention to reactors, period. It really doesn't say anything else about the rest of the agency.

So, I have a problem with it from that point of view. I think that it could be -- I don't see that you will lose anything by taking out the word "reactor" there. This is policy. This isn't implementation. If your implementation plan says we're going to be very careful where we use this and reactors are the best place to begin because we know the most about using it and the techniques are more fully developed there, that seems to me quite correct. But as a statement of policy, I think it's much too limiting.

So, comment.

MR. HOLAHAN: If I might say, there was a considerable discussion on that point and I think we'll go back and discuss it further with NMSS.

COMMISSIONER ROGERS: Now, when we come down to the fourth bullet, the Commission safety goals for a nuclear power plant, those are the only places we have safety goals, right?

DOCTOR THADANI: Yes.

COMMISSIONER ROGERS: We've talked about

a companion set of safety goals for non-power reactor uses. Commissioner Remick, I think, had suggested that we have a set of safety goals that are applicable to materials licensees, but we haven't really done very much with that. So, the only place we actually have safety goal statements are written for nuclear power plants. Maybe they can be extended a little bit to fuel cycle facilities or something like that, but I think the basic thrust of them is a power plant.

So, I don't really have a problem with it in there, the word "nuclear power plants" linked to safety goals, because that's really how they're written. But the very first bullet I do have a problem with and the second one as well. Same way. Same argument.

So, those are suggestions that I would make that we consider whether we really need to say "reactor" there. If you feel you do, then I think you have to say something about the rest of the activities of the agency as well. But I don't think you have to do it that way. I think just taking the reactor out will do it.

The other point that I wanted to say something on at some point, and the Chairman raised some issues that relate to it, namely analyses, deterministic analyses, defense in depth and PRA, and that they're all a little bit different. I just harken back to the response of the ACRS on the use of probabilistic assessment methods in regulatory activities, which follow very much along the lines of my own thinking because I had said something about this I think a year ago almost, that a proper PRA really is not that different from deterministic analyses in the sense that deterministic analyses look like they are without probabilities and yet there's an implicit probabilistic judgment made in setting up the scenarios in the first place.

So, I think that that was stated very, very well in the ACRS letter and, quite frankly, I'd like to see some of that reflected in our statement here. Not in the policy statement necessarily, but in the accompanying material because I think it's a very important point, that somehow or other we have the idea that a deterministic calculation has less uncertainty to it than a probabilistic calculation does. I don't believe that for a minute. You use exactly the same scientific and engineering knowledge. It's just that you're approaching the problem from a total systems point of view rather than a specific scenario point of view.

I think that point was made by the ACRS very well in their letter and I would suggest that that somehow be included here in our justification for the use of PRAs because I think there is a misconception that deterministic calculations are somehow or other sounder than PRA calculations and I don't believe it for one minute.

DOCTOR THADANI: If I may just comment on that.

We agree with the comment made by the advisory committee. As a matter of fact, the language in the plan was revised as a result of some of the comments that the ACRS made.

COMMISSIONER ROGERS: I didn't see that exact point in them though. Maybe I missed it.

DOCTOR THADANI: Perhaps we missed it. We tried to capture that point. I do agree that, in fact, these techniques help you bring uncertainties to the forefront so you can address them.

COMMISSIONER ROGERS: Absolutely.

DOCTOR THADANI: There is a bit of caution we should recognize. These studies are very expensive. In order to really do them well, you need an awful lot of information. You need to have thermal hydraulic analysis codes that you must run. You need to have a fair amount of data because the kinds of failure rates that are assigned to components are fairly low. And there's often a generic data are applied in these analyses and one has to be careful. Because of cost considerations people use shortcuts. They get answers. They're reflected in numerical values and sometimes people take -- perhaps they shouldn't be. They get over confident. I would say this is the intellectual arrogance comment that the Chairman made and I worry about that also, that sometimes people get carried away with 10^{-7} estimates. If you really dig down, if you go to the basis for those estimates, sometimes what you find is a lot of assumptions on the part of people without real substantial analysis or information.

But that's not to take away from the logic of what you say. What I'm worried about is -- I'm not convinced that people always utilized the level of resources that would be needed to do those analyses to be able to use them to that extent.

COMMISSIONER ROGERS: Oh, I quite agree.

DOCTOR THADANI: So, the application must dry. You have to be cautious.

COMMISSIONER ROGERS: I think what it is really is it's an extremely powerful tool but it's sort of like a high performance sports car. If it isn't all tuned up properly, it doesn't run very well. When everything is functioning properly, the performance is terrific. But you have to be very careful about it in that sense, that plugging in on substantiated data will give you exactly what it should produce, a poor result.

So, I think it's very proper to exercise that kind of cautionary oversight in the use of PRA and to make it clear. But to me, when you start to consider the use of PRA, it reveals your state of unknowledge. It reveals the lack of data that you would really like to have to be able to do a sound PRA analysis. When you don't do it, you're not looking in that room with all those difficult situations in it, you've just closed it off and you've picked a set of scenarios or whatever and done deterministic calculations very well and then added, as we normally do, an engineering conservative factor in some way to the result. But all those uncertainties are still there. The lack of knowledge is still there.

So, that's really what I wanted to say when we're talking about the comparative use of deterministic and probabilistic. Yes, it's quite proper to be quite concerned about getting numbers, probabilistic numbers that are really kind of absurd coming out because you really don't have the basis for doing that. That relates very much, implicit in the Chairman's remarks where he said, "Somebody might do something foolish." Well, we haven't adequately incorporated human factors into PRA analysis and maybe we'll never be able to. I don't know. But I would say that's another point I'd like to turn to someplace in the discussion because I don't see enough of a reference to the human factors elements in a PRA because either one has to say they're not there and therefore there is a great uncertainty introduced just by their absence, or we are trying to include them in some way and we're working very hard at trying to get better data to do that. It's a tough problem. Not easy.

But that's another area that I feel a bit uncomfortable with in the entire plan. Not the policy statement because I don't think you have to say that in the policy statement, but in the entire plan I'm a bit uncomfortable about a lack of adequate concern with either the absence of human factors in the analyses or an effort to get better human factors data to at least improve the analysis. Even with that, they still will be very imperfect but they still can be better.

MR. HOLAHAN: I'll discuss that to some extent when we discuss the data needs later on.

COMMISSIONER ROGERS: Yes. Okay.

It might be -- maybe this is a good point to turn to it. On the safety goals, I did have a problem with a reference to using PRA in connection with safety goal analyses. I don't know whether we want to talk about that now or not, but I have a bit of discomfort that what you may be proposing to do here is inconsistent with the staff direction given by the Commission back in 1990, the implementation of the safety goals where there was very clear direction given by the Commission. I'm not saying we shouldn't review that, but I'm just saying I'm a bit troubled that we may be inconsistent with that.

One of the points that was made is safety goals are to be used in a more generic sense and not to make specific licensing decisions. Now, some of the language in these reports tend to suggest that we might be using PRA in connection with safety goals to make licensing specific licensing rather than generic. I would hope you'd say something to that because I don't like the idea that perhaps we're just forgetting about that admonition. Maybe we want to revise it.

Maybe it's no longer, in fact, the position that the Commission should be taking. But I think then we ought to do that consciously rather than unconsciously.

MR. HOLAHAN: I think it will be covered under the subject of decision criteria. We recognize that if we come to a decision criteria which is in conflict with the safety goal, we would bring the issue back to the Commission.

COMMISSIONER ROGERS: Well, it's a question of specific licensing decisions.

There was another point. The Commission agrees that it must not depart from or be seen as obscuring the arguments made in court defending the backfit rule. I know that was a very interesting discussion that we had at the time on that particular matter because I know I had some arguments as to how you might be able to make a self-consistent approach here that wrapped everything together, but it turned out that it violated some of our arguments that we'd made in court in support of the backfit rule. So, I think that's another issue that needs to be looked at rather carefully here from a policy point of view.

Well, that's all for the moment on the policy statement.

COMMISSIONER de PLANQUE: Well, just from a general point of view, I have a lot of sympathy for what both of my colleagues said in general. I too noticed the emphasis on reactors which I think we have to be extremely careful about if we're trying to encourage a philosophy that's going to apply across the board. I'm not sure exactly the best way to fix that and I can see in some cases where clearly the reactor application is the best one to give as an example. But I do think we have to be careful of over emphasizing that and then it be viewed as to not apply in other areas.

This is a difficult subject and we're putting out a policy for public comment. It seems to me that we want comment from more than just those in the PRA community. For that reason, I think I'd expand even a little more on what was said earlier. I think it needs a little more user friendly explanation up front. This is a new road and I think people who need to understand what we're about in the regulatory sense need a little more of a tutorial up front as to what this really means and what it implies.

So, I guess I would like to see a little more educational material up front so that it is understandable to those from whom we would like to have comments on the approach.

That's all I have in general on the policy.

CHAIRMAN SELIN: You know, this question of reactors versus everything, it is a complicated question because on the medical side we're more driven by risk analysis than we are on the reactor side, whereas in some of the other materials areas we have some surrogates for the risk and we just carry it out.

So, I'd be very careful if we generalize on reactors unless we know we're generalizing. I'd almost feel more comfortable with a statement which says, "Here's our policy about PRA and reactor analysis and we would like to extend that to materials wherever it's appropriate.

I'd like to come back and stress we're talking about life and death here. We're not talking about an academic exercise. So, the policy statement, the whole thing really has to be in, as Commissioner de Planque said, user friendly terms about regulation because we are talking about -- the bottom line is not just justifying the same regulations, but changing our regulations based on these analyses. That's why I like her phrase about user friendly and I like the idea of taking a good look and say do we -- when we make a policy statement, what are the implications that we're looking for? We know what they are in the area of reactors. We may, if we think about it, know what they are in, say, medical regulations, but I'm not sure we know what they are across the board on the materials side. I need to think about that.

You probably should call this, to rephrase the old proverb, the only thing that's above 10^5 is death and taxes. We need to -- and someplace in this there needs to be a statement like, "Beware of very small numbers." For instance, the human factors -- if you're talking about 10^{-3}, 10^{-4}, I feel comfortable saying those are achievable because we know that human beings can operate with one error in 10,000 or a couple errors in 100,000. You see that on the medical side. Once you start getting to small numbers, you have to feel that your analysis is just very vulnerable to things that are very hard to picture.

So, where does that leave you? The answer is I'm not quite sure. I think it's really a very good job. We like what you've done. We don't agree on whether you did from the right outline or not, but that's a fair amount that has to be thought out.

The one thing I think we'll all agree is if it were for reactor applications, you've got a very good document that could be polished at the end and then what we have to think about is do we have something much more general than that that ought to be billed that way or should we start with a more modest bowl and then try and generalize from that as we look at the pieces? I'm not sure how I come down on that. Until Commissioner Rogers brought it up, I hadn't really thought about things that way. So, I personally as one Commissioner have to think about that point.

Shall we go on with the --

MR. TAYLOR: Yes.

CHAIRMAN SELIN: Fine.

MR. HOLAHAN: I might say thank you for the comments on the policy statement. I think they all will be very useful to the staff.

(Slide) Can I have slide number 7?

I'll discuss the PRA implementation plan and a number of specific items.

The plan itself has basically been under development since last November and it is an agency-wide plan and has had, I might say, an extraordinary level of coordination among the program offices. There have been -- I'm sure I've lost count a long time ago as to how many meetings among the working levels and the management in the offices. I think it was more than just each office providing its own piece to the plan. I think there was quite a lot of discussion and cooperation among the offices taking an interest in all of the pieces, both in the policy statement and in the plan. I thought it was a very cooperative effort.

The plan addresses both ongoing activities in the sense that it's meant to be a place to collect PRA activities such as the I^PE program that have been going on for several years, as well as a mechanism for stimulating new initiatives in the PRA area and to put both of those categories together in such a way as to make a single and unified activity.

It was also a very useful mechanism for assuring that the various pieces of the plan fit together well. An obvious example is research activities related to methods development are needed to be supportive of NRR, NMSS and AEOD activities. So, writing them down in place and having discussions was very helpful to assuring that those pieces fit together well. Also, as Mr. Thadani mentioned earlier, the plan presents a mechanism for management involvement and for monitoring progress on the use of

PRA.

(Slide) Can I have the next slide?

I'll just spend a few minutes on the structure and the scope of the implementation plan itself. There are five major categories, reactor regulation, which are predominantly the items of NRR activities, Research activities. AEOD has activities in two areas, reliability and risk analysis and also the training program. There are two areas in NMSS scope that is the medical industrial uses of byproduct materials and the high-level waste program, which has a PRA connection by the nature of the way the law is written.

(Slide) Can I have the next slide?

I'm not going to go through each of the next few slides in detail. What they do is present the major categories that the plan is written around. In each major topic area there are about half a dozen items and then there are specific activities numbering a little over 100 which are really the implementation methods to go into those areas.

In terms of reactor regulation, let me just point out a few things. That is we are doing some very fundamental thinking in this PRA implementation plan. PRA has been used before, but it never had a structured and formal decision criteria associated with it. PRA activities in the past have played a supportive role, but there were always some other regulatory requirement that made the staff feel reasonably comfortable about decisions that were being made. So, fundamental decision criteria would be developed as part of this plan.

In addition, there are a number of pilot activities. Some of them I'll discuss in more detail later. In fact, what we really think is that the decision criteria will not be developed in a purely abstract way. But we have specific examples, graded QA and the maintenance rule, things like that, where the staff is thinking about what does it mean to have an implementation technique, what are the decision criteria, how were we making these decisions. Those individual pilot type activities will be factored into an overall decision criteria.

CHAIRMAN SELIN: I'd like to stop you. That's very good. I'd like to add two pieces to that. One is if you get an answer that's very different from where you've been before, you obviously are going to deal with it very differently from just another one that says you can be a little tighter. In other words, you have to apply some kind of rule or reason to results and if they're quite different qualitatively.

The second is, and this is particularly appropriate where human factors are concerned or where it's hard to get factors, sometimes you want to calculate back. If you know most but not all of the items in a chain, you say what would the other item have to be for me to feel comfortable. In other words, you divide out instead of multiplying and say, what would the human factor error rate have to be for this chain to be uncomfortable to me? And it's a much easier question to say, do you think this is going to happen with a probability of less than 10^{-2}, rather than say what is the probability so we can calculate it out? You get a much better feeling for the sensitivities. Obviously, if you're missing five numbers in a chain, you can't do that. But if you have one unknown that's dominating that --

DOCTOR THADANI: In fact, Mr. Chairman, that is an important element, what we would call important measures.

CHAIRMAN SELIN: Okay.

DOCTOR THADANI: That's, in fact, what we would consider.

COMMISSIONER ROGERS: It might even have

more implications in doing it that way in that it gives you -- if you really feel confident of all the hardware issues, and in some cases you may, the data may be very good in some cases, then if you follow the path that the Chairman has suggested, what would you feel comfortable with at the end result and what do the human factors requirements have to be to give that, then you might even really start to look at some steps that try to give you some confidence that you can, in fact, make that goal? So, it could be a very powerful way of exercising a new kind of regulatory initiative on the human performance aspects of a system.

MR. HOLAHAN: In many areas, what we find is that the most valuable part of the PRA technique is not the bottom line number, but it's the insight as to what's important and what's not. The safety ranking of systems, other measures besides the bottom line number are often more useful in the regulatory arena than just trying to use the bottom line number. Those are very relevant comments.

(Slide) Can I go on to the next slide?

In the research area there are a number of activities, including methods development and some basic support for the development of decision making criteria.

Two other items I would point out. The IPE and IPEE programs are also captured in this plan and those are very important elements of the staff's and the industry's PRA activities. I think we're beginning to see a rather strong interest on the part of the industry. Now that they've invested in the IPE program and they have something of a PRA tool, there's an eagerness to find the mechanism to make good use of that activity. So there are a number of discussions with NEI and --

CHAIRMAN SELIN: Well, actually that really reinforces the point that I just made. There was an excellent article in the McGraw-Hill publications about the IPEEEs. The whole issue, I mean they took ten pages to say one line, but the whole issue was were we going to use these calculations to have plants reconstructed or were we going to bound the issue and say, "You have the plan. We have found it safe." We're not asking that, but are there vulnerabilities that could be fairly easily found within a limited set of plans. In other words, if we start with the answers, then we're going back to see do we have big vulnerabilities within those answers that can be obtained.

Why is that in the research program? Is that just because bureaucratically that's the way we do them?

MR. RUSSELL: Always leveraging their resources.

MR. HOLAHAN: Well, I think it has a lot to do with the expertise available at the time. At the time that those reviews needed to be started, the research organization --

CHAIRMAN SELIN: These are reactor regulatory reviews, whoever does those things.

MR. TAYLOR: Right.

DOCTOR THADANI: Yes. Yes.

CHAIRMAN SELIN: It's not a research program.

MR. HOLAHAN: No.

DOCTOR THADANI: And these are integrated. Both NRR and Research staff are participating in these reviews.

CHAIRMAN SELIN: Okay.

DOCTOR THADANI: It's just the lead is what --

CHAIRMAN SELIN: I mean I don't care who does the work as long as it's part of an integrated plan and towards a shaped result.

MR. RUSSELL: You mentioned the IPEEE reviews. I'd like to suggest that that be a topic that we come back to the Commission on. We are relooking at the approach that we're taking to that. We've had discussions back and forth with Research, within the staff, and we're going to be proposing an alternative approach to conducting the IPEEE as it relates to the seismic hazard for the various sites.

MR. HOLAHAN: (Slide) Could I have the next slide?

There are two major areas that AEOD has undertaken in the PRA area. One is reliability and risk assessment, basically looking at operating experience and individual events from a PRA perspective and also --

CHAIRMAN SELIN: Do you mean from a PRA or do you mean from a probabilistic? I mean it's not just risk assessment. These are the real experience that we have. Are we trying to look at the data and go back and see if they validate our models or if the data themselves tell us about weaknesses?

MR. HOLAHAN: Well, I would say some of each. For example, the accident sequence precursor program takes actual events and then looks at using the PRA type techniques, how much margin was there really to, what was probability of the event having gone to core damage, for example?

CHAIRMAN SELIN: And therefore what? I mean I guess the --

MR. HOLAHAN: And therefore it's a technique for identifying which events are more important than others. It also identifies which systems are more important than others. So, for example, my recollection is accident sequence precursor program over the last few years has been dominated by station blackout concerns. Not that there have been station blackout events, but there have been precursor events, loss of offsite power or diesel generator problems. By looking at actual events in a probabilistic arena, it helps to identify not only which events are more important than others, but also which human performance activities, which system, which programs are more important than others.

So, it's a way, again, of focusing on safety significance of operating experience. It's a valuable tool.

DOCTOR THADANI: I think the key is it doesn't -- most of the time you're not really doing consequence analyses to see actual risk to individuals. What you're looking at is contribution to core damage which is sort of an indicator of what the risk might be. The more likely precursor event that leads to core damage --

CHAIRMAN SELIN: This is a very good example because the way we use these -- as Mr. Jordan knows, I think there's a lot of gold in there that hasn't been mined. But the way we use them is really to say where should the staff put its incremental resources? We're not going back and saying, "Gee, these numbers are very different from the ones that we predicted and when you run in Monte Carlo, when you run real world, you get real outcomes. If they're not a large sample, they're not necessarily in the same portion. But if we get answers that are different from what had been predicted, we've got to go back and reexamine our models.

MR. HOLAHAN: Yes.

CHAIRMAN SELIN: We haven't used them to change regulations. We haven't really used them much to do our models. We've used them primarily to say where should the staff be working and what are the problems and where should we be tightening our regulatory -- and that's fine, but there's more to be done there if we put more of an effort into that. That also goes against your opening -- PRAs may lead to liberalizing regulations. Accident precursors lead to tightening regulations. We don't go back and say we never had an event that involved a triple LOCA, we can drop those. We always go back and say, here's something we didn't cover. Let's add it to what we're looking at.

MR. HOLAHAN: I might also mention that in the long-term, AEOD program would involve relooking at the performance indicator program to see if we could develop a more risk-based set of performance indicators. Then I will discuss later the reliability data needs as the specific example of what's in the program.

MR. RUSSELL: We'd like to comment on one application that we are looking at. The accident sequence precursor program has generally been looking at licensee event reports and events as a source of information. We're looking at conditions that may be discovered or inspection findings through inspection activity to attempt to put those into a similar context to judge what is the margin that may have existed given that this condition was physically found to exist. That's come about as a result of events that were reported where conditions existed for a long period of time that indicated that the systems were not capable of performing.

The one that was probably a watershed event was Sheron Harris where we found that there was a potential common cause failure that would have prevented high pressure injection from working. Well, if you consider that high pressure injection wouldn't work and you look at that in the context of risk, you find that that's fairly significant. So, that caused us to rego back and look. We're not trying to see if we can apply this to inspection findings or other things, other conditions. So, we're trying to expand the ASP techniques.

MR. HOLAHAN: (Slide) Could I have the next slide, please?

In the materials program, I think NMSS is beginning to develop PRA tools to look both at industrial and medical applications, also looking at low-level waste activities. In the high-level area, I think the concept of a probabilistic performance goal is built basically into the law itself. I will discuss medical applications a little further on also.

(Slide) Can I have the next slide?

Among the items in the plan, I've selected six as examples to give a little more insight as to how PRA analysis, PRA techniques are actually being used to address practical issues. The first one is graded QA. It's clear that the intent of this program is to focus NRC and licensee resources on the more significant safety systems and components. Using PRA insights is a valuable way of doing that. The current quality assurance requirements for reactors basically say we have a high level of requirements for what are called safety-related systems and components and we really have a set of undefined requirements for anything that doesn't fit exactly in that category. But what we know from PRA analysis is some safety systems are much more important than others and there are some systems which are not formally identified as safety systems in the sense that they're intended to mitigate accidents, but they might be important also and that the PRA analysis can show a more graded approach than just to say some things are important and some things are not.

There are a series of ongoing meetings with industry. The industry is working on the guidance document as to how to use PRA insights to have a more graded and more safety-oriented QA program. The staff and the industry are working towards an agreement on an assessment methodology, how do you make decisions about what's important enough to get the highest quality assurance requirements. And later this year, in the fall, there will be some pilot projects in which the staff will evaluate some licensee pilot projects. So, I think this is an area where the staff and the industry can very directly address those objectives that the policy statement and the PRA plan are built on, improving safety focus, making the best use of resources and tailoring the requirements to be most appropriate. If there are areas where all of the QA requirements are not important, then those can be reduced. If there are other items that are not captured as well as they should, those can be increased.

The second item is implementation of the maintenance rule. The maintenance rule itself calls for monitoring the performance of equipment against some goals. Those really are safety goals. Not safety goals in the sense of the Commission's safety goals, but they are goals at the equipment or safety level. Those goals were intended to be established based on PRA insights. Licensees are using their IPE results. The NRC has endorsed industry guidelines on how to identify risk significant equipment and I think this is an important area where not only PRA as a general concept but the IPEs as plant-specific analyses, play a very important role. In fact, it would be difficult to imagine how to implement the maintenance rule without having the level of PRA insights that are coming from the IPE program.

CHAIRMAN SELIN: Don't stop there. The license extension rule depends completely on the maintenance rule, which in turn depends --

MR. HOLAHAN: Yes.

CHAIRMAN SELIN: I mean here we don't even have a policy statement of PRA, but we passed one of the most significant rules we've passed which is based on an implicit policy statement. You know, I've been thinking a little bit about the policy statement. My view is we desperately need a policy statement now and therefore I think what we ought to consider doing is seeing how broad a policy statement we can turn out today.

Commissioner Rogers is right. He's definitely right. There's a certain amount of confusion as to whether this is a reactor policy statement or an agency policy statement. But rather than spend six months or a year coming up with a cleaner statement, I really think the issue is not should we have a reactor statement, but what are we ready to do today? If we're ready to do an agency-wide statement, then that's what we ought to go with. If we feel that we can be quite concrete on the reactor side, but we haven't really figured out how we can generalize it, then my view is that's what we ought to go with today and work towards that.

The reason is the one you put up there. We have the maintenance rule, we have the license extension. These are critical life and death issues, literally as well as figuratively. We don't have a policy statement behind them and that's a very uncomfortable position to be in any longer than we have to be.

DOCTOR THADANI: Gary, let me make a point on this. I think it's important.

The approach on both the maintenance rule and the credit QA is basically similar in terms of trying to find out what component systems and structures are more important and what might be less important. Gary touched on the point under graded QA that if you have some so-called non-safety related systems or components, traditionally we have not paid much attention to them, traditionally. Not only PRAs, but operating experience has shown us very clearly the importance of so-called non-safety related component systems and structures. The value of this approach is it doesn't limit itself to safety-related components or systems. It says, let's take most of the plant, so to speak, and then let's divide it up in two parts, what is more important and what is less important. The focus ought to be, greater focus ought to be on the more important systems, structures and components. That might include some so-called non-safety related. In fact, I'm convinced it will.

COMMISSIONER ROGERS: Sure.

DOCTOR THADANI: And so what it does, I think it probably enhances safety and yet provides flexibility and reducing attention to areas where perhaps it is appropriate to reduce attention. So, I think the way we're proceeding this approach, I think it's workable and it ought to lead to improved safety, I think.

MR. RUSSELL: Let me identify a practical issue. It relates to the timing of implementation of the maintenance rule and the graded QA pilot program activities. The Commission put quite a bit of emphasis on completing guidance for implementation of the maintenance rule three years in advance of the effective date of the rule such that there would be an opportunity to have experience using that guidance prior to the effective date of the rule. Industry broadly committed to attempt to have at least one full cycle of operation of each facility following the guidance as it was endorsed such that upon the effective date of the rule people would be in compliance with that rule.

As Ashok has said, the approach of determining what's significant on a relative basis when we're talking about design issues, and that's what we're talking about with maintaining hardware systems and components and generally the approach of quality as it relates to hardware. Set aside the quality requirements as they may apply to procedure or oversight issues. It's basically the same issues. Those activities are relatively well developed in PRA space. They're well understood in level one PRAs. You can do the sensitivity studies, identify what is important and what is not as important. We think the timing is right now during this development period when the industry is, in fact, starting with their implementation of the maintenance rule to marry these two together. We're proposing and trying to get to the point where we can conduct some pilots in parallel this fall with the pilot inspections that are going to be done under the maintenance rule which would be done prior to our workshops and actually promulgating the formal inspection guidance and which we've said we would do approximately one year prior to the effective date of the new rule.

So, we've been working to try and develop a consistent approach for both as it relates to quality of structures, systems and components. We are identifying non-safety systems that are important. Service air, control air systems turn out to be quite important because they are control functions, transient initiators, et cetera. Those have classically been non-safety systems. They are going to get increased quality attention, increased maintenance attention under the maintenance rule and a graded approach to quality.

There may be other areas that are less important where a less rigorous approach is appropriate. That's what we want to test and get some practical experience with this fall. I think that lends some emphasis to getting on with the policy statement given that we're developing this now and we're trying to move in this direction as it relates to the reactor program.

COMMISSIONER ROGERS: Absolutely.

MR. HOLAHAN: Let me just touch quickly on a couple of other items. In-service inspection and in-service testing program would also use PRA insights. It's pretty obvious that if you begin to think in terms of PRA techniques, if maintenance can be approached this way, if QA can be approached this way, why not the testing requirements, why not inspection requirements.

I think I promised to talk about data, so I think let me spend a minute on that subject.

Reliability data in terms of equipment reliability has been under discussions with INPO for some period of time. The data would be supportive of PRAs in general and would be useful to the implementation of maintenance rule. The approach that's being discussed with INPO is really an expansion of a safety system indicator that they had been working on and it looks like that may very well be an acceptable approach to getting hardware reliability data from plants. That would be a very important addition to information that the staff has had available for PRAs.

CHAIRMAN SELIN: This is no surprise to Mr. Jordan, but I don't think we've gone about this the right way. We have not set up in our rules a requirement that we get the reliability data. Therefore, you're putting INPO in the position of offering something to us that's not required by the rules. They can't speak for the industry. It's the wrong thing to do. We need a rule that says the implementation of the maintenance rule requires that these data be available to us and the responsibility is the utility's. Then, if a mechanism can be developed using INPO as an efficient channel, fine. But the backup is not that we get nothing, but that we get it directly from the utilities.

The reason I bring this up is not for a specific issue, it's the more general point that as we go to PRAs we have requirements for data. We need a policy statement, we need to look in the rules where we're going to -- in our regulations where we are going to require the data and then we can work out efficient mechanisms within these. There's just too much volunteerism. It's the training manuals all over again. We needed those training manuals, we had a right to them, and when we stopped asking for them and said, "If we don't get them this way, we'll get them that way," then we got the training manuals. That was the right thing to do.

What I'm saying is this whole discussion has had a little bit too much of an academic cast. These are critical issues. We're doing a lot on them and we need the policy statement and we need to see in the rules where we -- and the regulations where we will set the requirements for doing business the way we're planning on doing it.

I could see rather widescale releases from requirements on safety systems and we find that a lot of components that we've required the safety system degree of testing for we really don't need. But we have to have the solid basis for that, not an informal review.

MR. HOLAHAN: The staff recognizes the importance of getting the data and I think the need for rulemaking, I guess you could say, is under serious discussion within the staff at this time.

CHAIRMAN SELIN: Why am I not reassured by that?

MR. JORDAN: Could we say that it's imminent?

MR. RUSSELL: That's better, Ed.

MR. JORDAN: Your support for such a rule is welcomed.

CHAIRMAN SELIN: Well documented.

MR. RUSSELL: On a plant-specific basis as it relates to the data necessary for implementation of the maintenance rule, there has been agreement reached. That agreement is documented in the NUMARC Guidelines 93-01 which were endorsed by a regulatory guide that we went through the process on. That was debated back and forth. The issue is not one of plant-specific data being available at the plants, but rather reporting that data and making it publicly available and that has been the --

CHAIRMAN SELIN: And being able to generalize over it to say, "We've assumed diesel reliability is only going to be 99 percent." That's the whole inspection. If they're getting down to 92 or 93 percent, we've got review our approaches rather than the diesel at this particular plant is okay or not okay.

MR. HOLAHAN: And lastly the staff is preparing a plan and recognizes the importance of human performance data in the PRAs. It's really -- I think it's fair to say that the methodology is well developed, that we are optimistic about the availability of hardware data being improved in the future and the real weak link in PRAs in the future is human reliability.

I think as a related item, I think it's not captured as a line item in the plan, but there's a separate staff activity where the branches within

AEOD, NRR and Research who are dealing in the human factors and human performance area have been meeting and putting together an overall agency human performance plan, data needs and related research included. So, we're hopeful that some strides will be made in the human performance area as well. But we're also -- realistically we recognize this will probably always be the weak link in the analysis in the future. It's the most difficult piece to come to grips with.

COMMISSIONER ROGERS: I did touch on it earlier, but I don't think that that is coming through enough in the document.

MR. HOLAHAN: Okay.

COMMISSIONER ROGERS: I kept looking for human performance and I'd see it a little bit but it's always kind of tucked away someplace. It is so important in any bottom line PRA that I think we have to say something about it.

MR. HOLAHAN: Okay. I can see how it's not fully reflected because there are other sort of related programs going on that probably should be pulled in here as well. That's a good comment.

MR. MURPHY: Gary, if I can make the point. In the section on research, in Section 2.2, we do have -- in the tables we have mentioned two major initiatives we have. One is to work on the human errors of commission and the other is to try to incorporate the effect of safety culture. Both are major programs. Both have a long way to go yet.

COMMISSIONER ROGERS: Yes.

CHAIRMAN SELIN: I agree with that, but I want to make sure you don't miss the principal point. The inability to model human performance is a limitation on what you can do with PRAs. So, we're not just talking about how do you get better numbers, we're talking about setting some guidelines so that we don't just assume a number to fill out a formula, but realize there are limitations. These are intrinsic limitations. They're not because nuclear is behind say aviation as far as modeling.

I complete agree with Commissioner Rogers. The policy statement has to be very clear about what you can't do and don't be tempted to put in numbers, but to say there are just certain things in the chain we can't calculate with much confidence and we can't put too much reliance on PRAs in those cases except to see if we're in the right ballpark or not.

COMMISSIONER de PLANQUE: But I think it's also important to remember that we don't have that information now with the techniques we already use.

MR. HOLAHAN: That's right.

COMMISSIONER de PLANQUE: So, the glasses can be half full or half empty. I don't think we should emphasize that as a major deterrent to going ahead, just put it in perspective.

MR. HOLAHAN: In many ways, the PRA techniques are most valuable in those areas where the uncertainties are large because at least it forces you to focus on what you know and what you don't know and do some assessment as opposed to ignore the difficult issue.

DOCTOR THADANI: And, Commissioner Rogers, as Mr. Murphy said, there are activities underway to do better, be able to model human performance better in the organizational factors activities. Perhaps they need to get more limelight than this. They are in the tables, but not perhaps discussed as well.

MR. RUSSELL: But I think the Chairman's admonition is correct and it's similar to what we did in the advanced reactor design reviews when we did the PRAs. We did sensitivity studies to evaluate what the implications were of the human events activities that were modeled, whether it be a recovery action or it was associated with executing an emergency procedure. From that we've found certain human actions when you did task analysis you found that needed indications and controls and other information for. So, we used it in a relative sense, not an absolute sense, to get to a bottom line number and we looked at what the implication was if the activity was conducted correctly or if it was conducted incorrectly. So, we did extremes of analysis.

In that context, I think it's a very useful tool. I would be very hesitant to rely upon a bottom line number that incorporates a human error probability to say that that is necessarily sufficient. So, it's more how you use it to explore it. I think we can capture that in the policy statement to indicate that this is a limitation based upon the current state of the knowledge and that you should consider that limitation in how you proceed.

COMMISSIONER ROGERS: Yes.

COMMISSIONER de PLANQUE: It's an example of how you use it to complement something like defense in depth because if you find that this is a major flaw, the human reliability in a certain area, it may suggest you need more defense in depth in that particular sequence.

MR. HOLAHAN: In the interest of time, let me just cover one additional of the examples here and that is PRA training. That plays a really important role in the staff's ability to implement this activity.

Through the technical training center, AEOD has put together a program to improve PRA training and has a number of elements to it and there's an ongoing job task analysis to define those elements of the PRA analysis that various staff members need to be able to do in order to do their job in reviewing PRAs or in using the PRA insights. There are a number of new courses being developed for the technical training center, one of the interesting ones that relates to the training on Appendix C, which is a part of the PRA working group report that I think is a very valuable contribution that they made. So, there are a number of training activities which are intended to improve the expertise of those experts we already have.

But probably more importantly is to bring an understanding of PRA techniques and their insights to a broad collection of the staff. I think most of NRR and those regional inspectors need additional PRA training beyond the first level courses that they often get.

In addition to those two, the experts and a little bit more for everybody, it's important that some extra PRA training be made available to maybe not those experts in the PRA branches, but in every technical area and in every inspection area there needs to be a heightened understanding of PRA and its uses. This is part of the initiative to have senior reactor analysts in the regions and at headquarters and it's important that we have a mechanism for getting the expertise of a few people out so that it can be made use of by a much larger collection of staff.

COMMISSIONER ROGERS: Before you leave that, I think that's a very important activity, but a very difficult one. You know, the analogy that comes to mind in the early days of computers, when we were trying to teach people how to use computers, the first thing you did was teach them how to program. Who programs today? Very few people program today and yet everybody is using computers. Yet without some recognition of the limitations of the system that come about from programming errors, programming assumptions and so on and so forth, one is faced with the possibility of results that may be invalid.

So, it seems to me that a great deal of care has to be taken in thinking about how to convey what is really important about PRA say to inspectors. The last thing I want to see is inspectors sitting down and trying to stumble through a PRA analysis. Gosh, I mean, that would be a total waste of time. And yet, without some appreciation of how these things are done and how they might be used, and I don't know exactly how to do that myself, frankly, but I think it's very important that a great deal of thought be given to that by people who are experts in trying to convey the essence of a technology to someone who needs a working knowledge in some way of it but isn't actually going to carry out those analyses.

And that's not going to come from the PRA experts themselves. They're like the computer programmers who want to teach you how to program and you don't need to know how to program, but you need to know how to avoid the problems that might come from the use of a computer.

I think there is an analogy here and I think that it would be worth really going after that very early on in laying out our training programs at the training center and so on and so forth, because it seems to me we could very easily go down that same route that universities went and still do to some extent in trying to make computer scientists out of people who really need to use computers for engineering analyses, for example, and I think that it's worth now giving considerable thought to getting some unusual expertise to bear on this that I doubt very much if we have. I doubt it, because it's such a new kind of thing.

But as we try to take this tool over into the use by essentially non-practitioners as a guide, I think that kind of -- the questions that are involved in doing that sensibly and efficiently are very important and I would urge you to somehow take that as a special topic of study to do, because I think that you want to do it early on. You don't want to go down some path and then decide that what we did here really didn't work. We were teaching everybody about cut sets and that isn't what they needed to know at all. They needed to know something else, and so I think that's worth --

MR. RUSSELL: We agree. It's in two phases. I think the phase you're talking about relates to how the analysis is performed. We're finding that there are very key assumptions that go into the analysis along the lines of modeling assumptions, system availabilities, et cetera. We've been finding in some cases they've been changes in the way they're operating the plants that no longer match what the assumptions were that went into the PRA in the first instance, particularly as they are shifting to doing more on-line maintenance. We're finding that the unavailability is increasing for the systems, which is not consistent with what they had assumed in the IPEs that they have submitted to us.

COMMISSIONER ROGERS: Yes.

MR. RUSSELL: So that doesn't take a PRA analyst to find out that the assumptions they used in the documents submitted to us are different from the way they're operating their plants today, but that's an important insight that you can get out of it if you know where to look.

COMMISSIONER ROGERS: Right.

MR. RUSSELL: And so, you may start with an important system, look at what its unavailability was assumed to be, what it actually is, and see how that's being managed in the plant.

Ed is also looking at it from the standpoint of revising the training program.

MR. JORDAN: We are well along the way towards, I believe, responding to your comment. We anticipate various levels of users in the offices requiring different levels of expertise with quite different courses, and so both providing additional material for experts and for providing, for instance for inspectors, the right level of training so that they're able to use the tool, the insights from the tool, and not indeed be practitioners or gurus as I would call them. So --

COMMISSIONER ROGERS: I guess my worry is where do you get the right people to be instructors in those courses? That's the --

MR. JORDAN: We have a contractor that has been providing the training and we're using experts from outside NRC as well to help us in constructing these training courses as well as the experts within the various program offices for their particular activity. So for inspectors, NRR is providing a series of what do inspectors need and the regions are providing a series. So we have two advisory groups, a training advisory group and the training advisory council, at different levels that are helping us in us in developing that.

COMMISSIONER ROGERS: Well, that sounds very good. It's just that I'd emphasize here that, as you pointed out very early on in this document, this is a living system.

MR. JORDAN: It has to evolve.

COMMISSIONER ROGERS: That's got to be one that has a living quality to it that is constantly developing.

MR. RUSSELL: In fact, we're probably looking at 18 months or more before we get the first group of reactor analysts through training and out into the field to start working.

MR. TAYLOR: Gary?

MR. HOLAHAN: We're a little late here, but I don't think we could leave without talking about the resource implications.

(Slide) Could I have the next slide, please?

Resource implications are being addressed in two phases: short-term, which are basically the resources needed to get started on those on-going activities and to get the staff more involved in the PRA activities, and there have been a number of steps taken already, some additional positions in NRR, some to be filled very shortly and others perhaps a little later, and there have been some reorganizing activities both in AEOD and RES, Research, to consolidate activities to get the most out of staff that is available.

And it does appear that there are

reasonably strong contracting resources available. There has been a lot of PRA work done over the last half dozen years and there is a fair amount of expertise out at the National Labs and at contractors that the staff is using and I think will use more of in the future.

(Slide) Can I have the next slide?

In the longer term, really, the current staff resources, and that's in terms of both the experts and probably even more so this sort of intermediate level of experts, just doesn't exist to implement the full plan. And so the plan itself, both for the training activities and through the early readjustment and refocusing of resources, really needs to create its own resources. And in fact, the plan won't be successful really if it isn't creating resources as it goes in the sense that we will be identifying those areas where the staff has been spending resources in a less efficient way than possible and we'll need to move those resources to other areas. That's the only way that we're really going to succeed in the long-run in implementing a plan of the magnitude we have here.

Now, unfortunately, at this stage we can't tell you what we're not going to do, because it really is an evolving process. That is to say, some of our short-term activities should be helpful in seeing where to focus and then we're going to have to make some hard decisions to say we've identified areas where the staff has traditionally spent resources. It doesn't look like that's as important as a number of other things, and I think there will be some other considerations about regulatory requirements and credibility of the process, but there needs to be basic decisions made about shifting resources away from some traditional activities and we'll just, as the living document, we'll have to face those as we move forward. And, as they say, that's the best I can do with that one.

I think we've already discussed training a fair amount, so the last thing I would mention is the schedule, which is that we are going to have continuing interaction with the ACRS. I believe the next meeting is next month, September 27th, and we are committed to have some public work shops and we've had discussions with the regional offices and we're lined up to have discussions on the policy statement and the plan with two of the regions and we're going to line up the other two shortly.

And so there will be a fair amount of

activity in the near-term and what we see as the next formal step for the plan would be a report back to the Commission in March on progress, but that's not an end point in itself. That's sort of an arbitrarily chosen point to show progress. There will be continuing activities for the foreseeable future.

I guess that's all I have for prepared remarks.

MR. TAYLOR: That concludes our presentation.

CHAIRMAN SELIN: I'd like to make three comments, in addition to the fact this is an illuminating and really very positive piece.

One is, it's obvious from these discussions we've been doing PRA related things, like Voltaire's character who's been speaking prose all his life and didn't realize it, so we don't need a policy statement to get some of those work done. We need it to handle a number of specific issues.

My own advice would be to shoot for an interim policy statement -- don't try to get something that's going to sit forever as our policy -- and to have it focused, at least in the reactor area, on places where there are real issues. Don't spend a lot of time on how do we say the things that everybody is doing right already, but, you know, start with the issues. What are the half dozen serious concerns about training, about use of human factors, about whatever it is, and try to focus and then see if you can generalize beyond that.

But I would personally, and the Commission may not feel this way, but I'd personally like you to focus on getting an interim statement out that concentrates on giving guidance to people where they need guidance and may not be the best overall review of where we stand on these points, that concentrates on the problems, not the easy things.

The second is, rather than improve it for reactors, I would like you to, once you've done that, just take a look and see how much of that can be generalized beyond the reactor area. We need plenty of guidance on the material side.

The third is that it was my doing that really emphasized the need to have some kind of evaluation scheme, because, obviously, if we're going to put all this effort, we're going to have stuff to show for it. So we need to say in advance, if you come in with six issues in March, do we feel good or bad, I think we should put that off. I mean, you have only so many resources and the ACRS has legitimately said, you know, we're doing a lot of things but they're not satisfied and we haven't really set out in advance the ITAAC, if you will, for this program. What will it take to satisfy the Commission and the ACRS? But maybe it's too early for that. Maybe we ought to really concentrate on getting a program going and a little bit later figure out how you will judge yourselves and how we will judge you as to whether this rather major investment of resources is done. Obviously we're going to have something to show for it, so you need a "is it enough," rather than is it in the right direction.

I found a lot of great value in this presentation and now we need to be a little more action oriented. It's not criticism, it's just we're ready for the next step.

Commissioner Rogers?

COMMISSIONER ROGERS: Yes. I see this as a major redirection of NRC resources by the time it becomes fully blown and I do think that we're going to have to be very careful in setting priorities. I quite agree with the Chairman's comments there that we can't do everything at once.

My remarks with respect to the policy statement were from the standpoint of a basic structure of what a policy statement ought to be, not what the implementation program ought to be, and I think that the implementation program has to be one which starts out with what we feel are really the most important areas for us to tackle.

All of this is good. All of it is very good, but I think we could choke on it very easily if we tried to swallow it too fast, so I just think that it's going to be very important to prioritize these activities and analyze what the trade-offs are as we go along very carefully. Because, however enthusiastic we may be, and I'm very enthusiastic about this approach, I think we have to be very careful that we're not making unacceptable long-term trade-offs to move more rapidly on this. That could be, and I think that we don't want to find ourselves having made an important resource reallocation and then find out that that was really a big mistake, we have to go back and reprogram those resources from where we took them, and that would be unfortunate. And so, I think a great deal of care in that regard is called for.

I take it that you've shifted your work shop schedule a bit. The SECY said the fall. The implementation plan says December. Is that still the fall or is --

MR. HOLAHAN: Perhaps it will be early December.

COMMISSIONER ROGERS: Could be winter, you know.

MR. TAYLOR: Late fall.

COMMISSIONER ROGERS: So it's not too far off from what you were thinking of.

ACRS recommended that the implementation plan be put out for public comment along with the policy statement. I see that you've chosen not to do that. You may be right, but I do think we want to get public comment on the implementation plan as soon as we can. I wouldn't force you to lock step those two if you feel it's not advisable, but I do think that we want to get public comment on the implementation plan very early.

I had a question about a matter that was touched on in the Federal Register notice, and it gave me pause. I wondered what you really had in mind. This was on page 4 of, I guess, the proposed Federal Register notice which is in SECY-218, I guess, that is in the section labeled "purpose and scope." I don't know if you're with me or not, but the issue is the use of PRA, various ways you can use it. Some of these issues such as using PRA to assess the severity level of an enforcement action are being addressed in the staff's PRA implementation plan. That one raises some very big questions in my mind.

How do you use a PRA to assess what kind of a severity level of enforcement you're going to apply? It's an interesting concept, but one that strikes me as very difficult to get a hold of, and I wonder what you had in mind there.

MR. RUSSELL: It's similar to what I mentioned earlier. That is, you can use ASP techniques to look at conditions as discovered and if you found, for example, that the high pressure safety injection system was essentially inoperable from the time the design modification went in, then you can assess what is the implication of that to risk as it relates to the potential mitigation of small break LOCAs.

COMMISSIONER ROGERS: How does that relate to severity level of enforcement?

MR. RUSSELL: That gives you a measure of the safety significance and we already include --

COMMISSIONER ROGERS: I see.

MR. RUSSELL: -- within the enforcement policy a graded approach, so this is a vehicle to give us some measure as to the safety significance which we'd be then able to use within the existing policy which does consider significance already in determining what is the appropriate action to take.

DOCTOR THADANI: And, in fact, it has been used in some cases in the past.

COMMISSIONER ROGERS: Well, it was a new concept for me, but I do think that one has to be very careful how you do use it. I was thinking in terms of the level of -- you know, how big is the fine, and that's not what you're talking about here.

DOCTOR THADANI: It could impact that, but the idea here is how important was it.

COMMISSIONER ROGERS: Okay. That's helpful. I see what you're thinking about there.

The Chairman has had to leave, so he's asked me to just close up the meeting.

COMMISSIONER de PLANQUE: Commissioner Rogers --

COMMISSIONER ROGERS: I'm not closing it yet, but I don't have a lot of other things, except that I do feel that we do have to deal with the human factors element more explicitly.

I personally would like to complement the staff on the terrific job that has been done. My comments are not criticisms of your work, but this is a new area. This is important for us, coming to grips with it in a more systematic way, and so I think we'll all have a little bit different idea of what's important and how to go about it.

But the resource question does strike me as a very, very tough one, and one in which a lot of early-on thinking has to be made because I doubt if we can take on everything that makes very good sense to approach under this program, you know, first crack out of the box.

Yes, Commissioner de Planque?

COMMISSIONER de PLANQUE: First, I have a question on the implementation plan in the tables, on page 11 of the tables. Just out of curiosity, August '94 was given as the date for holding a work shop with respect to looking at this for the gamma knife. Did that take place already?

MR. HOLAHAN: Yes, I believe. Yes. It was two weeks ago.

COMMISSIONER de PLANQUE: Okay. All right.

Well, it leads me to the point that I think very often we've used this kind of technique in the materials area. We just haven't called it that.

And it may in many instances be a lot easier to apply it in the materials area and I get that sense sometimes when we probe deeply into a reactor area and "oh, this is very complicated because you've got to get all the thermal hydraulic codes correct," and et cetera, et cetera, which brings me to the point that I want to think a little more in light of the discussion we've had today about the thrust of the policy statement and whether it should be made entirely general or how we should strike the balance between the materials part and the reactor part and also what should be in the policy statement as opposed to the implementation plan. That may be a better place to make the division. I'm not sure yet, but I certainly will give it more thought and come back to you with my comments on it.

But I do think, no matter what, that we need to have a stronger tutorial component to this, because I think we have to be prepared to have all our constituents understand where we're headed with this and not just those who have expertise in this area. If we are going to use it more heavily, we have to bring everyone along with us so that there's a full understanding of where we're going and that there's not a fear of moving in this direction if indeed we go further down this path.

But, the briefing has been extremely useful and I thank you.

COMMISSIONER ROGERS: Just let me ask you one more thing, and that is, you know, in the United States we seem to talk about PRAs and the rest of the world is starting to talk about PSAs. They're doing exactly the same thing, but somehow or other it sounds a little bit better. I wonder if it might not be a good time to think about whether the name that we apply to this is in fact the one that in fact conveys the sense of it. It's a technique. It's an analytical technique. And where we're trying to strive for safety and when we call it a PRA we're emphasizing risk rather than safety, and I wonder if we might not think a little bit about whether it's not time to think about perhaps joining the rest of the world in naming this activity in a way that's a little bit more positive rather than a negative one.

With that, I'd just say thank you very much. I think it's been a great presentation.

(Whereupon, at 4:21 p.m., the above-entitled matter was adjourned.)

CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting of the United States Nuclear Regulatory Commission entitled:

TITLE OF MEETING: BRIEFING ON PRA POLICY STATEMENT AND ACTION PLAN

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: AUGUST 30, 1994

were transcribed by me. I further certify that said transcription is accurate and complete, to the best of my ability, and that the transcript is a true and accurate record of the foregoing events.

Carol Lynch

Reporter's name: Peter Lynch

United States
Nuclear Regulatory Commission

Commission Briefing

Proposed Probabilistic Risk Assessment (PRA) Policy Statement and Implementation Plan

August 30, 1994

Overview

- Background
- Proposed PRA Policy Statement
- Schedule for Publishing Final PRA Policy Statement
- PRA Implementation Plan
- Scope of the PRA Implementation Plan
- Ongoing PRA Implementation Plan Activities
- Resource Implications
- PRA Implementation Plan Schedule

Background

- Previously briefed the Commission on January 31, 1994

- Proposed PRA Policy Statement
  - Agency-wide policy statement
  - Broadest application to power reactors

- PRA Implementation Plan
  - Provides the necessary interoffice management framework
  - Implementation ongoing -- Plan is a "Living" document

Proposed PRA Policy Statement

- Overall Objectives of the Policy Statement:

  - Improve regulatory decision-making
  - More efficiently use staff resources
  - Reduce industry burden

Proposed PRA Policy Statement (cont'd)

Policy Statement

- Increased use of PRA in reactor regulatory matters will be implemented to the extent supported by state-of-the-art in PRA methods and data.
- PRA should be used to reduce unnecessary conservatism associated with current reactor regulatory requirements
- PRA evaluations should be as realistic as possible and supporting data should be publicly available
- Uncertainties in PRA evaluations need to be considered in applying the Commission's Safety goals for nuclear power plants

Proposed PRA Policy Statement (cont'd)

Additional Considerations

- PRA will be used to augment the NRC's traditional defense-in-depth philosophy.

- PRA insights may also be used to strengthen regulatory requirements where weaknesses are identified.

Schedule for Publishing Final PRA Policy Statement

◆ Publish Proposed PRA Policy Statement	September 1994
◆ 60-day Public Comment Period Ends	November 1994
◆ Resolve Public Comments/Brief ACRS	Jan/Feb 1995
◆ Final PRA Policy Statement to Commission	March 1995
◆ Publish Final PRA Policy Statement	April 1995

PRA Implementation Plan

- Agency-wide plan to implement the PRA Policy Statement

- Includes ongoing and new PRA-related activities

- Plan provides mechanisms for monitoring programs and management oversight

Scope of the PRA Implementation Plan

1.0 Reactor Regulation

2.0 Reactor Safety Research

3.0 Analysis and Evaluation of Operating Experience, and Training

4.0 Nuclear Materials and Low-Level Waste Safety
and Safeguards Regulation

5.0 High-Level Nuclear Waste Regulation

Scope of the PRA Implementation Plan (cont'd)

1.0 Reactor Regulation

1.1 Develop decision criteria for regulatory applications of PRA
1.2 Pilot application of risk-based concepts to specific regulatory initiatives
1.3 Inspections
1.4 Operator licensing
1.5 Event assessment
1.6 Evaluate use of PRA in resolution of generic issues
1.7 Regulatory effectiveness evaluation
1.8 Advanced reactor reviews
1.9 Accident management

Scope of the PRA Implementation Plan (cont'd)

2.0 Reactor Safety Research

2.1 Passive systems reliability assessment

2.2 Methods development and demonstration

2.3 Technical support and guidance development

2.4 IPE and IPEEE reviews

2.5 Generic issues program

Scope of the PRA Implementation Plan (cont'd)

3.0 Analysis and Evaluation of Operating Experience, and Training

3.1 Risk-based trends and patterns analysis

3.2 Accident sequence precursor (ASP) program

3.3 Industry risk trends

3.4 Risk-based performance indicators

3.5 Compile operating experience data

3.6 Staff training

Scope of the PRA Implementation Plan (cont'd)

4.0 Nuclear Materials and Low-Level Waste Safety & Safeguards Regulation

4.1 Validate industrial and medical device risk analysis methodology

4.2 Use risk assessment for low-level radioactive waste and residual activity

4.3 Develop guidance for review of risk associated with waste repositories.

4.4 Revise SRP

5.0 High-Level Nuclear Waste Regulation

5.1 Regulation of high-level nuclear waste

Ongoing PRA Implementation Plan Activities

- Examples of ongoing activities:
  - Graded Quality Assurance
  - Implementation of the Maintenance Rule
  - In-service Inspection/Testing
  - Reliability Data and PRA Training
  - IPE Insights Program
  - Medical Risk Analysis Project

Resource Implications

- Short-term resource implications
  - Five positions re-programmed to NRR PRA activities
  - AEOD reorganization
    - Established Reliability and Risk Assessment Branch
    - Re-programmed 2 FTE from reactor technology training to PRA training program development
  - RES reorganization
    - Consolidates all PRA-related research and IPE reviews from 3 branches to 1 branch
  - Ongoing contractor support

Resource Implications (cont'd)

- Long-term resource implications
  - Current allocation of resources is not sufficient to fully implement the plan
    - Continue re-directing existing resource allocations from lower priority (less safety significant) reviews and inspections
    - Continue training and recruiting initiatives

Resource Implications (cont'd)

- Training and Development of Staff

  - Develop in-house PRA expertise

  - Develop working-level knowledge (e.g., inspectors, reviewers)

  - Develop agency-wide appreciation for uses and limitations of PRA

PRA Implementation Plan Schedule

◆ Continued interoffice coordination	Ongoing
◆ Continued interaction with the ACRS	Ongoing
◆ Public workshop on PRA Implementation Plan	December 1994
◆ First Semi-Annual Progress Report to the Commission	March 1995

Corrected to notation vote - 8/31/94

UNITED STATES NUCLEAR REGULATORY COMMISSION

POLICY ISSUE

August 18, 1994

(NEGATIVE CONSENT)

SECY-94-218

FOR: The Commissioners

FROM: James M. Taylor
Executive Director for Operations

SUBJECT: PROPOSED POLICY STATEMENT ON THE USE OF PROBABILISTIC RISK ASSESSMENT METHODS IN NUCLEAR REGULATORY ACTIVITIES

PURPOSE:

To propose a policy statement concerning the use of probabilistic risk assessment (PRA) methods in nuclear regulatory activities.

To inform the Commission that the staff intends to publish the proposed policy statement in the Federal Register for public comment.

DISCUSSION:

PRA techniques are valuable in the analysis of design, operation, and maintenance aspects that affect nuclear safety. PRA techniques are useful for separating out the important safety aspects from the unimportant; for determining priorities and resource allocations; and for estimating the sources and magnitude of risk, particularly relative risk.

NRC requirements associated with the defense-in-depth philosophy and with the deterministic evaluation of design basis accidents have been effective in ensuring public health and safety. PRA has been used to complement these traditional, nonprobabilistic methods of analyzing nuclear plant safety and to facilitate the assessment of a broad range of beyond design-basis conditions involving multiple component failures or complex system interactions and interdependencies.

PRA methods have been applied successfully in numerous regulatory activities, proving to be a valuable complement to deterministic engineering approaches. Several recent Commission policies or regulations have been based, in part, on a recognition of the value of PRA methods and insights. Some of these policies and regulations include the Backfit Rule (§50.109, "Backfitting"), the Policy Statement on "Safety Goals for the Operation of Nuclear Power Plants" (51 FR 30038), the Commission's "Policy Statement on Severe Reactor

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NOTE: TO BE MADE PUBLICLY AVAILABLE AT AUGUST 30 COMMISSION MEETING

Accidents Regarding Future Designs and Existing Plants," (50 FR 32138), and the Commission's "Final Policy Statement on Technical Specifications Improvement for Nuclear Power Reactors" (58 FR 39132). The NRC has also used risk-based methods to refine the regulatory program for facilities and operations other than reactors. For example, the EPA proposed regulatory standard for high level waste is probabilistic in nature and requires a risk-based analysis, referred to as a performance assessment.

The NRC has completed several important studies that focus on PRA applications. Recently, the NRC's PRA Working Group, established by the Executive Director for Operations (EDO), assessed the status and initiated development of guidance for consistent and appropriate uses of PRA. The NRC Regulatory Review Group, also established by the EDO, reviewed Office of Nuclear Reactor Regulation programs and practices with an emphasis focusing on replacing prescriptive requirements and guidance with requirements based on performance and risk insights. The NRC Regulatory Analysis Steering Group has been overseeing the development of guidance for supporting and justifying proposed regulatory actions. Significant recommendations and guidance on the use of PRA methods have resulted from these studies.

Implementation of a policy statement regarding the use of PRA methods in nuclear regulatory activities would improve the regulatory process in three areas: through improved risk-effective safety decision-making; through more efficient use of staff resources; and through a reduction of unnecessary burdens on licensees. To realize these improvements, the staff proposes to increase the use of PRA in reactor regulatory matters to the extent supported by the state-of-the-art in PRA methods and data and in a manner supportive of the NRC's traditional defense-in-depth philosophy. However, expanded use of PRA in regulation may raise additional technical, policy, and legal issues that must be addressed to accomplish this goal. The staff has identified several technical issues associated with uncertainties in calculated probabilities, limitations in data and modeling, difficulties in addressing design or construction errors, and limitations in modeling human performance, especially errors of commission and organizational or safety culture issues. These technical issues are being addressed in the staff's PRA Implementation Plan.

There are several important regulatory or resource implications that follow from the goal of increased use of PRA techniques in reactor regulatory activities. First, the staff, licensees, and Commission must be prepared to consider changes to regulations, to guidance documents, to the licensing process, and to the inspection program. Second, the staff and Commission must be committed to a shift in the application of resources over a period of time based on risk findings. Third, the staff must undertake a training and development program, which may include recruiting personnel with PRA experience, to provide the PRA expertise necessary to implement these goals. Additionally, the staff must continue to develop PRA methods and regulatory decision-making tools and must significantly enhance the collection of equipment and human reliability data for all of the agency's risk assessment applications, including those associated with the use, transportation, and storage of nuclear materials.

CONCLUSIONS:

Based on the discussions above, the staff concludes that an overall policy on the use of PRA in nuclear regulatory activities should be established so that the many potential applications of PRA can be implemented in a consistent and predictable manner that promotes regulatory stability and efficiency. This policy statement would be valuable in articulating the Commission's current position on the role of PRA in various regulatory programs and in communicating that position to the staff, the public, licensees and applicants for licenses. In addition, the staff concludes that lessons-learned from operating experience and utilizing PRA methods should be more aggressively applied to achieve greater coherence in our overall regulatory program. Therefore, the staff proposes a policy statement (Enclosure 1) containing the following elements regarding the expanded NRC use of PRA:

(1) The use of PRA technology should be increased in all reactor regulatory matters to the extent supported by the state-of-the-art in PRA methods and data and in a manner consistent with, and complementary to, the NRC's traditional defense-in-depth philosophy (which is based, in part, on qualitative risk considerations).

(2) PRA and associated analyses (e.g., sensitivity studies, uncertainty analyses, and importance measures) should be used in reactor regulatory matters, where practical within the bounds of the state-of-the-art, to reduce unnecessary conservatism associated with current regulatory requirements, regulatory guides, license commitments, and staff practices. Appropriate procedures for implementing changes to regulatory requirements should be developed and followed. The intent of this policy is that existing rules and regulations shall be complied with unless revisions to these rules and regulations are made on the basis of the PRA insights.

(3) PRA evaluations in support of regulatory decisions should be as realistic as possible and all necessary supporting data should be publicly available for review.

(4) The Commission's safety goals for nuclear power plants and subsidiary numerical objectives are to be used with appropriate consideration of uncertainties in making regulatory judgments both in the context of backfitting new requirements on facility licensees and in granting relief from unnecessary regulatory requirements.

COORDINATION:

The Office of the General Counsel has reviewed the proposed policy statement and has no legal objection to it. The Advisory Committee on Reactor Safeguards (ACRS) reviewed the proposed policy statement and discussed the policy statement with the staff at its May meeting. The ACRS letter discussing the Proposed PRA Policy Statement is enclosed.

RECOMMENDATION:

The staff recommends that the Commission:

NOTE that unless directed otherwise, the staff will publish the proposed PRA policy statement (Enclosure 1) in the Federal Register for a 60-day comment period. The staff will publish the proposed PRA policy statement no earlier than 10 working days from the date of this Commission paper.

NOTE that the staff will continue to develop and implement a detailed interoffice plan for the expanded use of PRA in regulatory activities and that this plan will be provided to the Commission in August 1994. The Staff Requirements Memorandum dated May 18, 1994, requesting additional information regarding resources necessary to implement this proposed policy will also be addressed in the PRA Implementation Plan.

James M. Taylor
Executive Director
for Operations

Enclosures:
(1) Federal Register Notice Regarding the Proposed PRA Policy Statement
(2) ACRS Letter dated May 11, 1994

SECY NOTE: In the absence of instructions to the contrary, SECY will notify the staff on Thursday, September 1, 1994, that the Commission, by negative consent, assents to the action proposed in this paper.

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ENCLOSURE 1

[7590-01]

NUCLEAR REGULATORY COMMISSION

Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities; Proposed Policy Statement

AGENCY: Nuclear Regulatory Commission.

ACTION: Proposed policy statement.

SUMMARY: The Nuclear Regulatory Commission (NRC) is proposing a policy statement regarding the use of probabilistic risk assessment (PRA) in nuclear regulatory matters. The Commission believes that an overall policy on the use of PRA in nuclear regulatory activities should be established so that the many potential applications of PRA methodology can be implemented in a consistent and predictable manner that promotes regulatory stability and efficiency and enhances safety. The proposed policy statement would improve the regulatory process through improved risk-effective safety decision-making, through more efficient use of agency resources, and through a reduction in unnecessary burdens on licensees. The NRC will modify existing regulations and/or develop new ones as a result of new information from accident behavior studies and risk data when a sound scientific basis is found to exist.

DATES: Submit comments by (60 days after publication in the Federal Register). Comments received after this date will be considered if it is practical to do so, but the Commission is able only to ensure consideration for comments received on or before this date.

ADDRESSES: Send comments to: Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555, Attention: Docketing and Service Branch.

Deliver comments to: One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, between 7:45 am and 4:15 pm Federal workdays.

Copies of comments received may be examined at: NRC Public Document Room, 2120 L Street NW. (Lower Level), Washington, DC.

FOR FURTHER INFORMATION CONTACT: Thomas G. Hiltz, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Telephone (301) 504-1105.

SUPPLEMENTARY INFORMATION:

I. Background

This policy statement sets forth the Commission's intention to encourage the use of PRA and to expand the scope of PRA applications in reactor regulatory matters to the extent supported by the state-of-the-art in terms of methods and data. The NRC is also using risk-based methods to refine the regulatory program for facilities and operations other than power reactors.

Since the early 1970s, the NRC has expended significant resources in the development and application of PRA technology. This included the ground-breaking work of the Reactor Safety Study (documented in WASH-1400) in 1975. On January 18, 1979, the NRC issued a policy statement, entitled "NRC Statement of Risk Assessment and the Reactor Safety Study Report (WASH-1400) in Light of the Risk Assessment Review Group Report" [Risk Assessment Review Group Report, NUREG/CR-0400]. In addition to addressing specific criticisms of WASH-1400, the 1979 policy statement articulated limitations in the use of PRA in the regulatory arena. Many of these limitations have been addressed, however, some still remain pertinent today. Primary among these limitations is the characterization of uncertainties associated with calculated probabilities of reactor accidents. PRA methodologies have, however, provided a better means for identifying and narrowing the range of uncertainty.

Until the accident at Three Mile Island (TMI) in 1979, the Atomic Energy Commission (now the NRC), used probabilistic criteria in certain specialized areas of licensing reviews. For example, site hazards, both man-made (e.g., nearby hazardous materials and aircraft) and natural (e.g., tornadoes, floods, and earthquakes), typically involved the use of probabilistic arguments and initiating frequencies to assess risks. The Standard Review Plan for licensing reactors (NUREG-0800) and some of the Regulatory Guides supporting NUREG-0800, provided review and evaluation guidance with respect to probabilistic considerations.

The TMI accident substantially changed the character of the analysis of severe accidents worldwide. It led to a substantial research program on severe accident phenomenology. Both major investigations of the accident (the Kemeny and Rogovin studies) recommended that PRA techniques be used more widely to augment the traditional nonprobabilistic methods of analyzing nuclear plant safety. In 1984, the NRC completed a study (NUREG-1050) that addressed the state-of-the-art in risk analysis techniques.

PRA methods have been applied successfully in numerous regulatory activities and have proved to be a valuable complement to deterministic engineering approaches. This application of PRA represents an extension and enhancement of traditional regulation rather than a separate and different technology. Several recent Commission policies or regulations have been based, in part, on a recognition of the value of PRA methods and insights. Some of these policies and regulations include the Backfit Rule (§50.109, "Backfitting"), the Policy Statement on "Safety Goals for the Operation of Nuclear Power Plants" (51 FR 30038), the Commission's "Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants" (50 FR 32138), and the Commission's "Final Policy Statement on Technical Specifications Improvement for Nuclear Power Reactors" (58 FR 39132). An example of a major past PRA application is the Systematic Evaluation Program (SEP), in which risk importance was used to assess the significance of deviations from current licensing criteria for some of the oldest operating reactors. PRA methods also were used effectively during the anticipated transient without scram (ATWS) (§50.62) and station blackout (§50.63) rulemakings, and supported the generic issue prioritization and resolution process. Additional benefits have been found in the use of risk-based inspection guides to focus NRC inspector efforts and make more efficient use of NRC inspection resources.

In NUREG-1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants," the NRC used technological developments of the 1980s to assess the risk associated with five nuclear plants. This study was a significant turning point in the use of risk-based concepts in the regulatory process and enabled the Commission to greatly improve its methods for assessing containment performance after core damage and accident progression. The methods developed for and results from these studies provided a valuable foundation in quantitative risk techniques.

Currently, the NRC is relying extensively on PRA techniques to assess the safety importance of operating reactor events and is using these techniques as an integral part of the design certification review process for advanced reactor designs. In addition, the Individual Plant Examination (IPE) program and the Individual Plant Examination - External Events (IPEEE) program (an effort resulting from the implementation of the Commission's "Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants") have resulted in commercial reactor licensees using risk-assessment methods to identify any vulnerabilities needing attention.

II. Purpose and Scope

The NRC established its regulatory requirements to ensure that a licensed facility is designed, constructed, and operated without undue risk to the health and safety of the public. These requirements are largely based on deterministic engineering criteria, involving the use of multiple barriers and application of a defense-in-depth philosophy. Beyond its deterministic criteria, the NRC has additionally formulated guidance, as in the safety goal policy statement, that utilizes quantitative, probabilistic risk measures. The safety goal policy statement establishes top-level objectives to help assure safe operation of nuclear power plants. For the purpose of implementation of the safety goals, subsidiary numerical objectives on core damage frequency and containment performance have been established. The safety goals provide guidance on where plant risk is sufficiently low such that further regulatory action is not necessary. Also, as noted above, the Commission has been using PRA in performing regulatory analysis for backfit of cost-beneficial safety improvements at operating reactors (as required by 10 CFR 50.109) for a number of years.

The application of PRA to nuclear regulatory activities has evolved with improvements in PRA techniques and data bases. PRA techniques can be used to derive valuable insights, perspectives, and general conclusions as a result of the integrated and comprehensive examination of the plant design and a structured examination of plant and operator response to events. For a nuclear power plant, a plant-specific PRA can be used to derive plant-specific insights and conclusions where appropriate plant-specific modeling and data are available and used appropriately. PRA sensitivity studies are particularly useful in focusing designers, operators, and regulators on important aspects of design, operation, and maintenance.

The Commission has considered recent improvements in nuclear technology and accumulated experience with risk assessment methods, and concludes that increased use of these techniques as an integral part of the regulatory decision-making process is now justified. Consequently, the Commission has adopted the policy that the use of PRA should be encouraged and the scope of PRA applications in nuclear regulatory matters should be expanded to the extent supported by the state-of-the-art methods and data.

An important aspect of the expanded use of PRA technology would be a strengthening of NRC's defense-in-depth philosophy by allowing quantification of the levels of protection and by helping to identify and address weaknesses or overly conservative regulatory requirements in the physical and functional barriers.

However, the application of traditional risk methodology used in assessing risk for power reactors is limited for those applications where failures are primarily the result of human action, especially errors of commission and organizational or safety culture issues. In addition to limitations in modeling human performance, the Commission may need to address several other technical issues. These issues are related to the uncertainties in calculated probabilities, limitations in data and modeling, and difficulties in addressing design or construction errors. These issues have been recognized and are being addressed in the staff's PRA Implementation Plan.

In addition, the Commission expects policy and legal issues to emerge as increased reliance is placed on probabilistic- and performance-based approaches to support regulatory requirements and licensing decisions. Some of these issues, such as using PRA to assess the severity level of an enforcement action, are being addressed in the staff's PRA Implementation Plan. Those emerging issues not addressed in the plan will be addressed as needed.

III. The Commission Policy

Although PRA methods and information have thus far been used successfully in nuclear regulatory activities, there are concerns that PRA methods are not consistently applied throughout the agency, that sufficient agency PRA/statistics expertise is not available, and that the Commission is not deriving full benefit from the large agency and industry investment in the developed risk assessment methods. Therefore, the Commission believes that an overall policy on the use of PRA in nuclear regulatory activities should be established so that the many potential applications of PRA can be implemented in a consistent and predictable manner that promotes regulatory stability and efficiency. Implementation of the policy statement would improve the regulatory process in three areas: through improved risk-effective safety decision-making; through more efficient use of agency resources; and through a reduction in unnecessary burdens on licensees.

Therefore, the Commission proposes the following policy statement regarding the expanded NRC use of PRA:

(1) The use of PRA technology should be increased in all reactor regulatory matters to the extent supported by the state-of-the-art in PRA methods and data and in a manner consistent with, and complementary to, the NRC's traditional defense-in-depth philosophy (which is based, in part, on qualitative risk considerations).

(2) PRA and associated analyses (e.g., sensitivity studies, uncertainty analyses, and importance measures) should be used in reactor regulatory matters, where practical within the bounds of the state-of-the-art, to reduce unnecessary conservatism associated with current regulatory requirements, regulatory guides, license commitments, and staff practices. Appropriate procedures for implementing changes to regulatory requirements should be developed and followed. The intent of this policy is that existing rules and regulations shall be complied with unless revisions to these rules and regulations are made on the basis of the PRA insights.

(3) PRA evaluations in support of regulatory decisions should be as realistic as possible and all necessary supporting data should be publicly available for review.

(4) The Commission's safety goals for nuclear power plants and subsidiary numerical objectives are to be used with appropriate consideration of uncertainties in making regulatory judgments both in the context of backfitting new requirements on facility licensees and in granting relief from unnecessary regulatory requirements.

There are several important regulatory or resource implications that follow from the goal of increased use of PRA techniques in reactor regulatory activities. First, the NRC staff, licensees, and Commission must be prepared to consider changes to regulations, to guidance documents, to the licensing process, and to the inspection program. Second, the NRC staff and Commission must be committed to a shift in the application of resources over a period of time based on risk findings. Third, the NRC staff must undertake a training and development program, which may include recruiting personnel with PRA experience, to provide the PRA expertise necessary to implement these goals. Additionally, the NRC staff must continue to develop PRA methods and regulatory decision-making tools and must significantly enhance the collection of equipment and human reliability data for all of the agency's risk assessment applications, including those associated with the use, transportation, and storage of nuclear materials.

This policy statement affirms the Commission's belief that PRA methods can be used to derive valuable insights, perspective and general conclusions as a result of the integrated and comprehensive examination of the design of the nuclear facilities, its response to initiating events, the expected interaction between its elements and between the facility and operating staff, and the structured examination of its operating characteristics.

Dated at Rockville, Maryland, this ________ day of _____________, 1994.

For the Nuclear Regulatory Commission

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Samuel J. Chilk,
Secretary of the Commission

ENCLOSURE 2

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

May 11, 1994

Mr. James M. Taylor
Executive Director for Operations
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Taylor:

SUBJECT: DRAFT POLICY STATEMENT ON THE USE OF PROBABILISTIC RISK ASSESSMENT METHODS IN REACTOR REGULATORY ACTIVITIES

During the 409th meeting of the Advisory Committee on Reactor Safeguards, May 5-7, 1994, we reviewed the current draft Policy Statement on agency usage of probabilistic risk assessment (PRA). We had the benefit of discussions with representatives of the NRC staff. We also had the benefit of the documents referenced.

We are in general agreement with the Policy Statement. It appears to present an appropriate position on the use of PRA in the regulatory process. We are, however, concerned with some aspects of the Policy.

Some provisions of the Policy Statement are crafted in rather weak language. For example, we believe that in Item (2) of Section II, Policy Statement, the word "may" ought to be replaced by "should" to make a commitment to increase the use of PRA to help eliminate unnecessary conservatism associated with current regulatory requirements.

The Policy is very general and does not provide any specific guidance or plan for the expanded use of PRA in regulatory activities. This has apparently been relegated to an "implementation plan" which is referred to in the Policy Statement. We hope that this plan will provide some specific and definitive elements to guide the use of PRA in the regulatory process. We recommend that the implementation plan be submitted for public comment along with the Policy Statement.

The draft Policy Statement seems to draw a distinction between the traditional regulatory process (commonly known as "deterministic") and the PRA approach. This common perception causes some in the regulatory arera to be skeptical of and reluctant to embrace the PRA approach. However, we believe that treating the PRA approach as a distinct and unique method compared to the traditional approach is inappropriate and misleading. We believe that the PRA approach should be considered as an extension and enhancement of traditional regulation rather than a separate and different technology. Certainly, the deterministic approach is replete with implied elements of probability, from the selection of accidents to

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be analyzed (e.g., reactor vessel rupture is too improbable to be considered) to the requirements for emergency core cooling (e.g., safety train redundancy and protection against single failure). The PRA approach enhances traditional approaches by considering risk in a coherent and complete manner, thereby providing a method to quantify the overall level of safety.

We agree that there are uncertainties, limitations, and omissions with the PRA approach. However, we think it is important to understand that these uncertainties are derived from knowledge limitations. These knowledge limitations were not created by PRA, but rather were exposed by it. These limitations existed during the traditional regulatory approach, some were unknown, others only vaguely understood. Attempts were made to accommodate these limitations by imposing prescriptive and what was hoped to be conservative regulatory requirements. The PRA approach has exposed these limitations and has provided a framework to assess their significance and assist in developing a strategy to accommodate them in the regulatory process. We are pleased that these issues are identified in the Policy Statement and that they are being addressed in the implementation plan.

One of the more important shortcomings of PRA use was not identified in the Policy Statement. This is the misuse and misapplication of PRA results stemming from an incomplete and/or flawed analysis. While those in the nuclear regulatory arena have done an excellent job in many instances in applying and using PRA, there have been examples where this has not been the case. Among the more important of these are some of the cost/benefit analyses for backfits. We recognize that these analyses are difficult. We urge the staff to assign high priority in the implementation plan to improving and adding consistency to cost/benefit analyses.

We further believe that the implementation plan needs to address the need for PRA research to help assure that the PRA state-of-the-art is at a level consistent with the intended PRA usage in the agency. We intend to further consider the area of PRA research needs in the near future.

In conclusion, we reiterate our support for the overall thrust of the PRA Policy Statement and the allocation of resources to implement it. We would like to be kept informed of the progress in developing the implementation plan.

Sincerely,

T. S. Kress

T. S. Kress
Chairman

<u>References</u>:

1. Memorandum (Undated) from James M. Taylor, Executive Director for Operations, for The Commissioners, Subject: Draft Policy Statement on the Use of Probabilistic Risk Assessment Methods in Reactor Regulatory Activities, received May 5, 1994 (Predecisional)
2. Memorandum dated April 14, 1994, from Martin J. Virgilio, Office of Nuclear Reactor Regulation, to John T. Larkins, Executive Director, ACRS, Subject: PRA Draft Policy Statement, with Predecisional Enclosure
3. U.S. Nuclear Regulatory Commission, Policy Statement dated January 18, 1979, Subject: NRC Statement on Risk Assessment and The Reactor Safety Study Report (WASH-1400) In Light of the Risk Assessment Review Group Report

POLICY ISSUE
(Information)

August 19, 1994 SECY-94-219

FOR: The Commissioners

FROM: James M. Taylor
Executive Director for Operations

SUBJECT: PROPOSED AGENCY-WIDE IMPLEMENTATION PLAN FOR PROBABILISTIC RISK ASSESSMENT (PRA)

PURPOSE:

To inform the Commission of the proposed agency-wide PRA Implementation Plan that provides the necessary interoffice framework for strengthening and increasing the use of PRA technology in agency regulatory activities.

DISCUSSION:

In a November 2, 1993, memorandum to the Executive Director for Operations, the directors from the Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Material Safety and Safeguards (NMSS), the Office for Analysis and Evaluation of Operational Data (AEOD), and the Office of Nuclear Regulatory Research (RES) collectively focused on the findings of and recommendations made by the PRA Working Group, the Regulatory Review Group, and the Regulatory Analysis Steering Group regarding the status of PRA use and its role in the regulatory process. In the memorandum, the Office Directors concurred in the need to systematically expand the use of PRA within the agency. In order to ensure that the many potential applications of PRA can be implemented in a consistent and predictable manner that promotes regulatory stability and efficiency, the staff commenced work on an interoffice PRA Implementation Plan.

In order to establish top-level guidance on the use of PRA in nuclear regulatory activities and aid in development of a detailed PRA Implementation Plan, the staff proposed a policy statement regarding the use of PRA in regulatory activities. On August 18, 1994, the staff forwarded SECY-94-218, "Proposed Policy Statement on the Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities," to the Commission. In that Commission paper, the staff stated that an overall policy on the use of PRA in nuclear regulatory activities should be established so that the many potential applications of PRA can be implemented in a consistent and predictable manner that promotes regulatory stability and efficiency. In addition, the staff stated that the use of PRA technology in NRC regulatory activities should be increased. The increased use of PRA methods and technology is not intended to supplant the defense-in-depth based regulations, but to complement those

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(301) 504-1105

NOTE: TO BE MADE PUBLICLY AVAILABLE AT AUGUST 30 COMMISSION MEETING deterministic methods by using PRA technology in activities where methods and data are well understood. Even where data may be sparse, the technology may also represent a valuable supplement to the deterministic methods. The staff believed the increased use of PRA technology would lead to improved risk-effective safety decisions, more focused and efficient utilization of NRC staff resources, and reduced industry burdens.

The Office of Nuclear Reactor Regulation (NRR) coordinated the efforts of the Office of Nuclear Regulatory Research (RES), the Office of Nuclear Materials Safety and Safeguards (NMSS), and the Office for Analysis and Evaluation of Operational Data (AEOD) in the joint development of the draft PRA Implementation Plan. The PRA Implementation Plan was developed to ensure that the increased use of PRA methods and technology in nuclear regulatory activities would be implemented in a consistent and predictable manner that promotes regulatory stability and efficiency. This PRA Implementation Plan provides the framework for management oversight of the increased and appropriate use of PRA methods and technology in regulatory activities.

The proposed PRA implementation plan (enclosed) is considered a "living" document and is provided for the Commission's information. The staff considers the PRA Implementation Plan to be a management tool that will help ensure the timely and integrated agency-wide use of PRA methods and technology. PRA methods have been applied successfully in numerous nuclear regulatory activities and have proven to be a valuable complement to deterministic engineering approaches. However, the increased use of PRA in nuclear regulatory activities has broad implications and could result in changes in many areas associated with our current regulatory framework. These areas, considered by the staff in developing the draft PRA Implementation Plan, may include: changes to regulations and guidance documents and inspection programs; a substantial shift in staff resources including recruiting and training programs to provide the necessary PRA expertise, an increased emphasis on continued development of PRA methods and decision-making tools, and enhanced reliability data collection. As discussed in SECY-94-218, expanded use of PRA in nuclear regulatory activities may raise additional policy, technical, and legal issues that will be considered in subsequent modifications to the PRA Implementation Plan.

The Advisory Committee on Reactor Safeguards (ACRS) discussed the draft PRA Implementation Plan during its May 5-7, 1994, meeting. The ACRS recommended that the PRA Implementation Plan 1) emphasize improving and adding consistency to cost/benefit analyses, 2) address the need for continuing PRA research, and 3) be made available for public comment. Although not part of the PRA Implementation Plan, the staff is addressing improving and adding consistency to cost/benefit analysis. The staff's Regulatory Analysis Guidelines (NUREG/BR-0058, Rev. 1) are being revised. Further, a draft Regulatory Analysis Technical Evaluation Handbook (NUREG/BR-0184) has been prepared. The need to conduct PRA research has been incorporated into the proposed PRA Implementation Plan. The staff plans to solicit public comment on the PRA Implementation Plan through a public workshop to be held this fall.

In its Staff Requirements Memorandum of May 18, 1994, the Commission requested additional information regarding resources necessary to implement the proposed PRA Policy Statement and the PRA Implementation Plan. In Section V.A of the enclosed PRA Implementation Plan, the staff discusses its strategy for ensuring that adequate resources are made available to fully implement the plan.

The staff plans to provide the Commission with semi-annual updates on the status of actions discussed in the PRA Implementation Plan.

James M. Taylor
Executive Director
for Operations

Enclosure:
PRA Implementation Plan

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PRA IMPLEMENTATION PLAN

August 12, 1994

prepared by

Office of Nuclear Reactor Regulation
Office of Nuclear Regulatory Research
Office of Nuclear Materials Safety and Safeguards
Office for the Analysis and Evaluation of Operational Data

I. BACKGROUND

I.A Introduction

The 1979 nuclear accident at the Three Mile Island (TMI) nuclear power plant substantially changed the character of the analysis of severe accidents worldwide. Both major investigations of this accident (the Kemeny and Rogovin studies) recommended that the staff increase its use of probabilistic risk assessments (PRAs) to augment its traditional, nonprobabilistic methods of analyzing nuclear plant safety. It also led to a substantial research program on severe accident phenomenology.

The issuance of NUREG-1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants," for which the Nuclear Regulatory Commission (NRC) staff took advantage of the technological developments of the 1980s to assess the risk, including containment performance and consequence analyses, associated with five selected plants, represented a significant turning point in the use of risk-based concepts in the regulatory process. Similarly, since the mid-1970s the NRC has conducted a number of studies on risk associated with the fuel cycle including, for example, transportation and high- and low-level waste management.

PRA methods have been applied successfully in numerous regulatory activities, proving to be a valuable adjunct to deterministic engineering approaches. Several recent Commission policies or regulations have been based, in part, on a recognition of the value of PRA methods and insights. Among these policies and regulations include the Backfit Rule (§50.109, "Backfitting"), the Policy Statement on "Safety Goals for the Operation of Nuclear Power Plants," (51 FR 30038), the Commission's "Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants," (50 FR 32138), and the Commission's "Final Policy Statement on Technical Specifications Improvement for Nuclear Power Reactors," (58 FR 39132). In addition to the past application of risk assessment techniques in the Systematic Evaluation Program and rulemaking on anticipated transients without scram, PRA methods were utilized effectively during the station blackout rulemaking and in support of the generic issue prioritization and resolution process. Currently, PRA techniques are being used to assess the safety importance of operating reactor events and as an integral part of the design certification review process for advanced reactor designs. The NRC has also used risk-based methods to refine the regulatory program for facilities and operations other than reactors. For example, the Environmental Protection Agency (EPA) proposed regulatory standard for high level waste is probabilistic in nature and is referred to as a "performance assessment."

I.B Review Groups

There have been some recent criticisms of the staff's use of PRA. Primarily, these criticisms are that PRA methods are not applied consistently throughout the agency, that sufficient staff PRA and statistical expertise is not available, and that the staff is not deriving full benefit from the large agency and nuclear reactor industry investment in developing and applying risk assessment methods. To address these concerns, the agency established three high-level review groups. Specifically, (1) the PRA Working Group has assessed the status of and initiated development of guidance for consistent and appropriate current uses of PRA; (2) the Regulatory Review Group has reviewed NRC processes, programs, and practices with a focus on seeking replacement of prescriptive requirements and guidance with requirements based on performance and the use of risk insights; and (3) the Regulatory Analysis Steering Group has updated guidance for conducting regulatory analyses, including use of risk insights, for proposed regulatory actions. During this same period, the nuclear power industry established the Nuclear Energy Institute (NEI), formerly the Nuclear Management and Resources Council (NUMARC), Regulatory Threshold Working Group to promote the use of probabilistic safety assessment technology and other new approaches to regulation as an aid to focus industry and regulatory attention and resources more effectively on safety concerns. The staff has prepared a proposed Commission policy statement to declare the agency's commitment to increase the use of PRA methods and insights in its regulatory activities. This policy statement would articulate the Commission's position on the role of PRA in various regulatory programs and communicates that position to the staff, the public, licensees, and applicants for licenses.

II. PRA IMPLEMENTATION PLAN GOAL

In a November 2, 1993, memorandum to the Executive Director for Operations, the NRC Office of Nuclear Reactor Regulation (NRR), Office of Nuclear Material Safety and Safeguards (NMSS), Office for Analysis and Evaluation of Operational Data (AEOD), and Office of Nuclear Regulatory Research (RES) collectively focused on the findings of, and recommendations made by, the above three NRC study groups regarding the status of PRA use and its role in the regulatory process. In the memorandum, the offices concurred in the need to systematize and expand the use of PRA within the agency. A proposal was made to formulate a comprehensive plan for the application of PRA technology and insights throughout the agency. It is expected that this plan will provide the framework for continued and future applications of PRA at the NRC.

Development of a plan of this type is especially timely in recognition of Presidential Executive Order 12866. Among other guidance, this order calls for regulatory agencies to consider the degree and nature of risks posed in setting their regulatory priorities, as well as costs and benefits of intended regulation. NRC's large investment and substantial experience in the development of PRA methodology and in selected applications puts it in a strong position to implement the executive order.

This integrated PRA plan will provide substantial benefits, including

- improved regulatory decision-making,
- more efficient use of agency resources in focusing efforts on the most safety-significant issues, and
- reduced industry burden in responding to less safety-significant issues.

Therefore, the goal of the PRA Implementation Plan is to achieve these benefits by increasing the use of PRA in regulatory matters to the extent practical given the state-of-the-art in PRA methods and data available. This goal implies risk-based regulation in its broadest sense and raises technical, policy, and legal issues that must be addressed. An important aspect of the expanded use of PRA technology in reactor regulation will be a strengthening of NRC's defense-in-depth philosophy by allowing quantification of the levels of protection and by helping to identify and address weaknesses in the physical and functional barriers, should they exist.[1]

The staff recognizes that there are limitations in the current applications of PRA technology. However, these limitations are not necessarily unique to the PRA technology and can also apply to deterministic methods. In general these involve practical limitations in methods, models, and data used in PRA's which can introduce substantial uncertainty, both quantified and unquantified. This is especially true in the analysis of certain human performance issues, common cause failure analysis, and evaluation of seismic hazards. Human performance issues associated with errors of commission and organizational and management issues are examples of areas where current PRA's are limited. While these limitations may affect the precision in estimated risks, the PRA frame work offers a powerful tool for logically and systematically evaluating the sensitivity and importance to risk of these issues and their associated uncertainties. Reliance on PRA technology in decision-making continues to increase.

It is important to note that not all of the agency's risk management activities lend themselves to a risk analysis approach that utilizes a probabilistic, fault tree methodology. As mentioned earlier, current PRAs are of limited usefulness for modeling certain human performance considerations, especially errors of commission and organizational or management issues. In the areas of industrial and medical uses of nuclear materials, for instance, the primary contributor to overexposures is human error. Also of note is the difference in the availability of failure data for nuclear reactor and industrial or medical events. Materials events are generally frequent enough to allow statistical study, whereas reactor events are infrequent and require the use of probabilistic techniques.

Given the dissimilarities in the nature and consequences of the use of nuclear materials in reactors, industrial situations, and medical applications, the PRA Implementation Plan recognizes that a single approach to risk management is not appropriate. The staff will, however, share methods and insights to ensure that the best use is made of available techniques to foster consistency in NRC decision-making. The updated NRC guidelines for conducting Regulatory Analysis are expected to be an important step forward fostering this agency-wide consistency.

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[1]Note: The defense-in-depth philosophy for reactors is essentially equivalent to the multi-barrier concept used for a geologic repository for disposal of high-level waste.

There are several important implications that follow from the goal of increased use of PRA techniques in reactor regulatory activities. First, the staff, licensees, and Commission must be prepared to embrace changes to regulations, to guidance documents, to the licensing process, and to the inspection program. Second, the staff and Commission must be committed to a shift in resources based on risk findings. Third, the staff must undertake a recruiting and training program to provide the necessary PRA expertise. Additionally, the staff must continue to develop PRA methods and regulatory decision-making tools and must significantly enhance the collection of equipment and human reliability data for all of the agency's risk assessment applications, including those associated with the use, transportation, and storage of nuclear materials.

III. DISCUSSION OF ISSUES RELATED TO RISK ASSESSMENTS OF REACTORS

III.A Decision Criteria

NRC's regulatory requirements were developed to ensure that a licensed facility "can be operated without undue risk to the health and safety of the public" (Appendix A, 10 CFR Part 50). They are largely based on deterministic engineering criteria involving the use of multiple barriers and defense-in-depth. Implementation of this plan will increase the systematic use of risk assessment techniques. To ensure consistent and appropriate decision-making that incorporates PRA methods and results, it is crucial that coherent and clear criteria are applied. As part of this plan, such decision criteria will be established (incorporating safety goals and backfit rule considerations) that address the interdependence of probabilistic risk and deterministic engineering principles. The process of developing these criteria will involve communications among the NRC, the nuclear industry, and the public to ensure an understanding by all parties of the role of PRA methods and results in NRC's risk management efforts.

III.B Data

The NRC staff uses equipment performance data in the conduct of PRAs, reliability analyses, component failure studies, and plant aging studies; identification and resolution of generic issues; preparation for inspections; and reviews of technical specifications change requests. For these purposes, the staff uses generic data supplemented with a limited amount of plant-specific data. The use of the generic data is problematic because the data have not been verified or updated and do not differentiate between plant-to-plant variations in performance or changes in performance as reactor plants age. The ad hoc collection of plant-specific data is costly and inefficient.

The availability of human performance data is even more problematic. One reason is the lack of established and accepted human performance analysis methods and models upon which to base the collection of human performance data. This is particularly important in the analysis of operator performance in response to events during which both acts of omission and commission may occur. Human reliability methods and data are currently the focus of research and limited evaluations of human performance issues raised by analysis of operating reactor events.

As the NRC and the nuclear reactor industry move toward greater use of PRA, the need for better data on human performance, plant-specific safety system availability data (at the train level), and equipment reliability data will increase with the increased role of PRA in the regulatory decision-making process. Increased availability of data on equipment and human performance is very important to implementing many risk-based regulation initiatives. For example, this information is essential for implementing the maintenance rule and in supporting the development of risk-based technical specifications.

This plan recognizes the need to collect equipment and human performance data and includes an approach for collecting this data, derived from operating experience, to continue to provide a source of credible performance data for NRC use in the regulatory process.

III.C Consistent Methods

The PRA Working Group identified the need for the development and use of consistent PRA models and methods. Some steps toward this goal have already been taken, such as the use of RES-developed codes by agency staff. Other tasks that are now being undertaken include the development of more user-friendly computer interfaces; the development of low-power and shutdown models, external events models, and Level 2/3 PRA models compatible with the needs of events assessment staff; and the development of methods for consistently identifying the appropriate detailed PRA model for use in the analysis of individual events or issues.

It is important to note that not all of the agency's risk management activities lend themselves to a risk analysis approach that utilizes a probabilistic, fault tree methodology. This plan recognizes that a single approach to risk management is not appropriate. RES has the lead responsibility for developing and validating risk assessment models and methods.

III.D Training

Implementation of the plan will require users and developers of the new methods to have significant experience in PRA methods and statistics. It will take time for these staff members to gain the necessary experience. Some of the knowledge and skills needed to do this work can be obtained though traditional training. However, on-the-job training, classroom instruction, and industrial experience will be needed in order to acquire some of the required knowledge and experience. Recruiting of outside experts and intensified development of current staff members will likely be necessary to gain this staff experience. This process will take several years to accomplish and will be a major factor in the success of the PRA plan and in establishing the pace of its implementation.

Another issue is the training of the staff who will not be directly working with PRA methods. As the agency shifts to greater use of, and reliance on, PRA methods and risk-based regulation, all technical staff members, including inspectors, will need to develop an understanding of the strengths and weaknesses of PRA methods and their use. Training of such staff will be a critical part of the change in the regulatory culture of the agency. This training will require a large resource commitment over the next several years, since the number of staff members who will need the training is large.

To support the goal of improved regulatory activities through increased use of PRA technology, this plan includes an extensive training program. This training program is based on the systems approach to training, which includes completing job task analyses, developing learning objectives, developing and delivering courses, soliciting student and management feedback, and modifying the PRA training program as necessary.

IV. RISK-BASED CONSIDERATIONS IN OTHER THAN REACTOR PROGRAMS

IV.A Decision Criteria

There will be significant benefit from the cross-fertilization of the experiences gained from risk assessments as applied to NMSS facilities and operations with the experiences from PRA for power reactors. However, traditional methods used to assess risk in power reactors are not always appropriate for those NMSS applications where failures are primarily the result of human action and are only secondarily due to equipment-modes of failure. For NMSS-associated applications, risk-based methodologies will be used to the extent that the complexity of the system and the risks posed by the system require a particular complexity of analysis, and to the extent it can be supported by the state-of-the-art in terms of methods and data.

The NRC staff has used these criteria to assess the appropriate applications of probabilistic safety assessment techniques (which include PRA and other systematic safety assessment methods) to low-level and high-level radioactive waste disposal in the form of performance assessments. Furthermore, the 1985 version of 40 CFR Part 191 (EPA's high-level waste standard) prescribed the use of probabilistic safety assessment techniques (i.e., performance assessments) to assess the safety of the disposal of high-level nuclear waste. To provide additional assurance that the EPA regulations are satisfied, the Commission has formulated additional regulatory requirements in 10 CFR Part 60 (including deterministic requirements for some subsystems of the repository). Future techniques to be used for the assessment of risk for a high-level waste facility will depend on the requirements and standards that are expected to be developed by the EPA in 1995 as required by the Energy Policy Act of 1992. The Energy Policy Act of 1992 also requires that within 1 year the NRC is to modify its technical requirements in 10 CFR Part 60 to be consistent with the requirements to be developed by the EPA.

IV.B. Consistent Methods

The NRC has been developing performance assessment methods for low-level and high-level waste since the mid-1970s and intensified using performance assessments techniques in the late 1980s and early 1990s. This has involved the development of conceptual models and computer codes to model the disposal of waste. Because waste-disposal systems are passive, the fault-and-event-tree methods used for active systems in PRA studies for power reactors had to be adapted to provide scenario analysis for the performance assessment of the geologic repository at Yucca Mountain, Nevada. In regard to high-level waste, the NRC staff participates in a variety of international activities (e.g., the Performance Assessment Advisory Group of the Organization for Economic Cooperation and Development, Nuclear Energy Agency) to ensure that consistent performance assessment methods are used to the degree appropriate. In regard to nuclear medicine applications, NRC contractors have recently completed the preliminary development of a relative risk-ranking approach for analyzing nuclear medical devices.

V. AGENCY RESOURCE IMPLICATIONS

V.A Reactor Applications

Each Office associated with this PRA Implementation Plan has considered the resources required to implement this plan and has made or is making organizational changes or commitments supporting the enhanced use of PRA in reactor regulatory activities. NRR, for example, has initiated plans to add five senior positions to its Probabilistic Safety Assessment Branch and one Senior Level Service (SLS) position. The recent AEOD reorganization highlights the important role of PRA with the renaming of the Trends and Patterns Analysis Branch to Reliability and Risk Assessment Branch. AEOD's Technical Training Division has initially re-programmed approximately 2 full time positions, from the Reactor Technology Training Program, to work on the identification of PRA training needs and the subsequent curriculum development. The recently-proposed RES reorganization consolidates its PRA staff and methods development, staff support, and IPE/IPEEE review functions from three branches into one branch, improving the efficiency of the use of these staff resources.

The staff has started implementing portions of the PRA Implementation Plan. Initially this plan requires significant resources because of the developmental nature of the activities (e.g., development of decision criteria, guidance documents, training curricula, etc.). Current staffing level and level of expertise in the PRA area is not sufficient to fully implement this plan. Therefore, the staff plans to 1) augment its current staffing in the PRA area with personnel who have expertise in PRA methods and techniques and 2) develop additional in-house PRA expertise.

The resources needed to implement the PRA Implementation Plan will result from strategic hiring, re-direction of existing staff technical resources, including both technical reviewers and inspectors (from reduction in lower priority reviews and inspections), and conversion of management positions as part of the agency's streamlining initiative. The staff plans to add personnel in the PRA area to 1) analyze and apply PRA techniques to safety decision-making, 2) continue agency training in PRA methods and applications, and 3) develop guidance and implement risk-based (risk-focused) inspections and reviews. As staffing levels allow, priority consideration will be given to filling future vacancies with PRA skilled recruits. In the long term, existing staff resources will be re-directed to support the enhanced usage of PRA methods as outlined in this plan. This shift in resources will take place over several years after 1) considering the progress of our recruiting and training programs and 2) identifying less risk-significant areas where fewer staff resources are needed.

PRA expertise will be developed through modifications to the current PRA curriculum and additional curriculum development. Training will be used to increase the PRA skills of the current staff over the next several years. Where staffing and expertise levels are not keeping pace with emergent requirements associated with enhanced use of risk-based methodologies, the staff will procure technical assistance/contractor support. Contractor support will be used to supplement the staff's knowledge level as the staff continues to develop its own in-house expertise.

V. B. Non-Reactor Applications

An agency goal is to develop staff capability to review and provide timely feedback on major performance assessments and to make adequate independent licensing decisions. Training needs to meet this goal are currently being evaluated, and it is anticipated that training will be developed to address these needs.

The NRC anticipates that the staffing for activities associated with performance assessment is at the appropriate level through fiscal year 1997. Additional staff to address the anticipated level of complexity of the Department of Energy's performance assessment are provided for in outyear budgets. Risk assessment capability (including specific training) to deal with emerging issues in using risk analysis to analyze the use of nuclear medical devices will be augmented as required by the demands of the developing methodology.

VI. PRA IMPLEMENTATION PLAN DEVELOPMENT

VI.A Process

As a result of significant contributions to this plan by the Regions and headquarters program offices, regulatory activities for which PRA and other risk-based methodologies can have a role were identified. As part of the development of this plan, each office established an approach for accomplishing the goals and objectives for PRA use in its regulatory activities. The issues considered include objectives, methods, guidance development, training, regulatory changes, PRA methods and data, and resource implications.

The appendix contains tables detailing the results of this planning effort to date. Specifically, these tables give an overview of the objectives and methods associated with increasing the use of PRA technology in specific areas of reactor regulation and identify additional non-reactor programs areas where risk-based methodologies are being considered. More detailed internal planning documents are being developed by each program office to specify responsibilities, approaches, interface requirements, and interim milestones.

VI.B Policy Statement

As discussed earlier, the staff has prepared a proposed policy statement to declare the agency's commitment to increased use of PRA methods and insights in its reactor regulatory activities. This proposed policy statement would articulate the Commission's current position on the role of PRA in various regulatory programs and it would communicate that position to the staff, the public, licensees, and applicants for licenses. This is particularly important because significant improvements have been made in PRA methods, the NRC staff and industry have acquired additional experience in applying PRA, and because substantial operating experience has been accumulated since the Commission last published a policy statement on the use of PRA in 1979.

The staff plans to issue the proposed policy statement for public comment in September 1994. The staff plans to continue discussions with the Advisory Committee on Reactor Safeguards (ACRS) on the proposed PRA policy statement in January 1995 and present the final PRA policy statement to the Commission in March 1995. The staff anticipates publishing the final policy statement by April 1995 and intends to periodically brief the ACRS on the status and progress of the PRA Implementation Plan.

VI.C Ongoing Activities

During finalization of the PRA policy statement, the NRC will continue its current activities as outlined in the PRA Implementation Plan including the development of consistent PRA models and methods and will expand the data base on human performance reliability, plant-specific safety system availability, and equipment reliability. The NRC staff has been using PRA in design certification reviews, operating event assessments, licensing action reviews, and performance assessments of low-level and high-level radioactive waste disposal. In addition, the NRC will continue its current activities associated with industry initiatives, including the following

- Appendix B, Quality Assurance - Initiate pilot graded quality assurance program in September 1994.

- Appendix J, Containment Leakage - Publish proposed rule in late fall of 1994.

- Generic Letter 89-10, Motor Operated Valves - Follow up on industry implementation of the NUMARC and owners' group guidance concerning operability of motor-operated valves.

- Development of a means to establish an equipment reliability and availability database to support the maintenance rule and performance-based regulation.

The staff will continue to work with NEI to identify areas of mutual interest for the use of PRA methods and insights and plans to continue its interactions with the Institute of Nuclear Power Operations (INPO) concerning strengthening availability of plant-specific failure data.

1.0 REACTOR REGULATION

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
1.1 DEVELOP DECISION CRITERIA FOR REGULATORY APPLICATIONS OF PRA	* Develop decision criteria for determining when it is practical to enhance the regulatory decision-making process through the use of PRA; thereby, achieving the benefits of improved regulatory decision-making, as well as, more efficient use of agency and industry resources.	* Determine methods for dealing with uncertainties. * Evaluate available industry guidance. * Develop a draft position document that defines proposed decision criteria. * Incorporate experience from initial pilot applications, such as those under Item 1.2 below. * Solicit public comment on proposed decision criteria.	09/95	NRR & RES
	* Develop risk-based criteria for plant-specific and generic regulatory decisions in those areas determined practical using the criteria developed above.	* Identify PRA data and information needed to support staff evaluation of generic and/or plant-specific PRA results within the context of various regulatory activities. * Consider extension of safety goal concepts to specific applications. * Evaluate available industry guidance. * Develop draft guidance and decision criteria for the use of PRA results in regulatory activities. * Solicit public comment on proposed guidance and decision criteria. * Finalize guidance document.	03/96	NRR & RES
	* Revise decision criteria based on 1 to 2 years experience, reassess the appropriateness of the decision criteria and staff use of risk-based methods and insights.	* Compare decision criteria to staff positions associated with selected "PRA application" areas. * Provide recommendations to ensure consistency in staff positions across "PRA application" areas, as needed.	12/97	NRR

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
1.2 PILOT APPLICATION OF RISK-BASED CONCEPTS TO SPECIFIC REGULATORY INITIATIVES	* Develop staff positions on emerging, risk-based initiatives, including those associated with: 1. Motor operated valves. 2. Regulatory credit for on-line systems to monitor risk (e.g., as related to compliance with the maintenance rule, system configuration control and on-line maintenance). 3. ISI/IST requirements. 4. Graded quality assurance. 5. Containment leakage requirements. 6. Fire protection. 7. Maintenance Rule. 8. Risk-based alternatives to current system of deterministic technical specifications.	* Interface with industry groups. * Evaluation of appropriate documentation (e.g., 10CFR, SRP, Reg Guides, inspection procedures, and industry codes) to identify elements critical to achieving the intent of existing requirements. * Evaluation of industry proposals. * Evaluation of industry pilot program implementation. * As appropriate, identify proposed regulatory document revisions and develop associated regulatory analysis to support recommended revisions.	1. 12/94 2. 10/95 3. 12/96 4. 7/95 5. 9/95 6. 11/96 7. 7/95 8. 9/96	NRR
1.3 INSPECTIONS	* Include a pilot application of the use of risk-based results and insights in a trial assessment as part of the Customized Inspection Planning Process (CIPP).	* Develop risk-based input and guidance to the pilot inspection effort. * Assist in the evaluation of findings & development of recommendations for upcoming inspection activities to evaluate the effectiveness of licensees in identifying and resolving potential safety issues prior to them revealing themselves as plant problems.	6/94 Complete Ongoing	NRR
	* Continue to provide headquarters expertise in risk assessment to support regional inspection activities.	* Encourage interactions between regional and headquarters personnel in the assessment of the risk associated with plant configurations and events. * Provide opportunities for rotational assignments for regional personnel to headquarters for OTJ training on the use of PRA.	Ongoing	NRR

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
	* Provide guidance on the use of plant-specific and generic information from IPEs and other plant-specific PRAs.	* Develop guidance for the planning and conduct of inspection activities including those associated with implementation of the maintenance rule and evaluation of reliability assurance programs, 10CFR21 activities, emergency operating procedures, SAMGs and 10CFR50.59 evaluations. * Develop guidance on the disposition of inspection findings; i.e., when findings should be simply discussed with licensee management, or included in inspection reports (and in what manner), or recommended for enforcement action, enforcement discretion, or for determination of the appropriate severity level. (This activity will require interface between NRR, OGC and OE.) * Monitor IPE and IPEEE results and insights to identify needed revisions or additions to inspection guidance.	6/96 2/97	NRR NRR
1.4 OPERATOR LICENSING	* Revise knowledge and ability (K&A) catalogs (NUREGs 1122 and 1123) to incorporate operating experience and risk insights.	* Monitor contract in place with SEA through NRR/HOLB. * Coordinate with NEI. * Monitor insights from HRAs and PRAs (including IPEs and IPEEEs) and operating experience to identify additional revisions required to initial, requalification and examination inspection guidance for operator licensing activities. Monitoring activities will include cognizance of guidance developed under Item 1.1 above.	11/94 12/96	NRR NRR & Regions
	* Revise the Examiner's Handbook to reflect revised K&A's.	* Assess changes to K&A catalogs and their impact on guidance provided in the Examiner's Handbook. * Modify Examiner's Handbook as needed.	9/95	NRR
1.5 EVENT ASSESSMENT	* Continue to conduct quantitative event assessments of reactor events while at-power and during low power and shutdown conditions.	* Continue to improve models.	Ongoing	NRR
	* Develop guidance for improving risk assessments of reactor events while at power.	* Use the information gathered during a job task analysis (being conducted through AEOD TTC).	10/95	NRR

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
	* Develop guidance and models for conducting risk assessments of reactor events during low power and shutdown conditions.	* Develop model options * Develop prototype model * Test model * Refine model for staff use * Develop guidance and procedures	9/96	NRR & RES
	* Develop guidance and models for conducting risk assessments of reactor events initiated by external events.	* Develop model options * Develop prototype model * Test model * Refine model for staff use * Develop guidance and procedures	9/96	NRR & RES
	* Assess the desirability and feasibility of conducting quantitative risk assessments on non-power reactor events.	* Define the current use of risk analysis methods and insights in current event assessments. * Assess the feasibility of developing appropriate risk assessment models. * Develop recommendations on the feasibility and desirability of conducting quantitative risk assessments.	6/95	NRR
1.6 EVALUATE USE OF PRA IN RESOLUTION OF GENERIC ISSUES	* Audit the adequacy of licensee analyses in IPEs and IPEEEs to identify plant-specific applicability of generic issues closed out based on IPE and IPEEE programs.	* Identify generic safety issues to be audited. * Develop audit plan; i.e., what constitutes an adequate licensee analyses. * Select plants to be audited for each issue. * Evaluate results to determine regulatory response; i.e., no action, additional audits, or regulatory action.	1/96	NRR
1.7 REGULATORY EFFECTIVENESS EVALUATION	* Develop guidance for evaluating changes in risk as a result of cumulative changes to plant design, Tech Specs and features of the licensing bases, and other changes to plant operation and operating experience.	* Develop model options. * Develop prototype model. * Test model. * Refine model for staff use. * Develop guidance and procedures.	9/96	NRR & RES

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
	* Apply the developed guidance to assess the effectiveness of major safety issue resolution efforts (e.g., SBO and ATWS rules) for reducing risk to public health and safety.	* Select issue(s) for assessment. * Apply model to assess reduction in risk. * Evaluate results. * Propose modifications to resolution approaches, as needed.	9/97	NRR
1.8 ADVANCED REACTOR REVIEWS	* Continue staff reviews of PRAs for design certification applications.	* Continue to apply current staff review process.	Ongoing	NRR
	* Develop SRP to support review of PRAs for design certification reviews of advanced reactors.	* Develop draft SRP. * Solicit peer and industry review. * Finalize SRP.	9/95	NRR
	* Develop staff guidance for use of risk analysis methods and insights as part of the construction and startup test inspection program.	* Develop draft guidance. * Solicit peer and industry review. * Finalize staff guidance.	9/96	NRR
	* Develop guidance on the use of updated PRAs beyond design certification (as described in SECY 93-087).	* Develop draft guidance. * Solicit peer and industry review. * Finalize staff guidance.	9/97	NRR
	* Develop staff guidance on the use of risk assessment methods and insights to evaluate proposals for simplification of emergency planning requirements for plants with greater safety margin.	* Develop draft guidance. * Solicit peer and industry review. * Finalize staff guidance.	12/95	NRR
1.9 ACCIDENT MANAGEMENT	* Develop risk insights to support staff review and inspection of industry accident management programs (e.g., SAMG and containment performance improvement).	* Periodically search the IPE and IPEEE data bases (BNL/RES) to develop risk insights germane to accident management strategies.	9/97	NRR & RES

2.0 REACTOR SAFETY RESEARCH

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
2.1 PASSIVE SYSTEMS RELIABILITY ASSESSMENT	* Develop information needed to permit an assessment of the reliability of components in passive safety systems proposed for use in advanced reactor designs.	* Participate in NRR/RES workshop on licensing needs, identifying short and long term needs for AP600 and SBWR. * Initiate project to respond to NRR short term needs. * Initiate projects'to respond to NRR long term needs. * Provide support to NRR RAI and SER development. * Provide support for NRR RAI and SER development for CANDU. * Continue confirmatory research on AP600 and SBWR.	9/94 9/94 9/94 Continuing Continuing Continuing	RES RES RES RES RES RES
2.2 METHODS DEVELOPMENT AND DEMONSTRATION	* Develop, demonstrate, maintain, and ensure the quality of methods for performing, reviewing, and using PRAs and related techniques for existing reactor designs.	* Develop and demonstrate methods for including human errors of commission in PRAs. * Develop and demonstrate methods for better using operational events data in PRAs. * Develop and demonstrate methods for including aging effects in PRAs. * Develop and demonstrate methods for including design and construction errors in PRAs. * Develop and demonstrate methods for performing simplified PRA Level 2/3 analyses. * Develop and demonstrate methods to incorporate organizational performance into PRAs. * Develop improved methods for performing sensitivity and uncertainty analyses. * Develop and demonstrate risk assessment methods appropriate for application to medical and industrial licensee activities. * Perform a limited reevaluation of one or two of the NUREG-1150 plant risk assessments, integrating the effects of the methods improvements noted above.	6/96 3/97 6/96 6/96 3/96 9/97 12/94 TBD Start - 2/97	RES RES RES RES RES RES RES RES RES

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
2.3 TECHNICAL SUPPORT AND GUIDANCE DEVELOPMENT	* Provide technical support to agency users of risk assessment in the form of support for risk-based regulation activities, technical reviews, issue risk assessments, statistical analyses and such, and develop guidance for agency uses of risk assessment.	* Support refinement of existing guidance for using PRA for particular staff functions and develop new guidance as requested. * Continue to provide *ad hoc* technical support to agency PRA users. * Expand the database of PRA models available for staff use, expand the scope of available models to include external event and low power and shutdown accidents, and refine the tools needed to use these models. * Continue maintenance and user support for SAPHIRE and MACCS computer codes. * Support development of risk-based regulatory improvements. * Support agency efforts in reactor safety improvements in former Soviet Union countries.	Continuing Continuing Continuing Continuing Continuing Continuing	RES RES RES RES RES RES
2.4 IPE AND IPEEE REVIEWS	* Provide technical support to agency users of risk assessment in the form of support for risk-based regulation activities, technical reviews, issue risk assessments, statistical analyses and such, and develop guidance for agency uses of risk assessment.	* Interim IPE insight report (60 plants). * Conduct reviews of IPE and IPEEE submittals and develop insights.	12/94 12/96 (IPE) 12/98 (IPEEE)	RES RES
2.5 GENERIC ISSUES PROGRAM	* Provide technical support to agency users of risk assessment in the form of support for risk-based regulation activities, technical reviews, issue risk assessments, statistical analyses and such, and develop guidance for agency uses of risk assessment.	* Continue to prioritize and resolve generic issues.	Continuing	RES

3.0 ANALYSIS AND EVALUATION OF OPERATING EXPERIENCE, AND TRAINING

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office
3.1 RISK-BASED TRENDS AND PATTERNS ANALYSIS	* Use reactor operating experience data to assess the trends and patterns in equipment, systems, initiating events, human performance, and important accident sequence.	* Trend performance of risk-important components. * Trend performance of risk-important systems. * Trend frequency of risk-important initiating events. * Trend human performance for reliability characteristics.	Annual rpt Annual rpt Periodic Draft 1/95	AEOD
	* Evaluate the effectiveness of licensee actions taken to resolve risk significant safety issues.	* Trend reactor operating experience associated with specific safety issues and assess risk implications as a measure of safety performance.	TBD	
	* Develop trending methods and special databases for use in AEOD trending activities and for PRA applications in other NRC offices.	* Develop standard trending and statistical analysis procedures for identified areas for reliability and statistics applications. * Develop special software and databases (e.g. common cause failure) for use in trending analyses and PRA studies.	LOSP-8/95 CCF-12/94 Periodic updates, others as appropriate	AEOD
3.2 ACCIDENT SEQUENCE PRECURSOR (ASP) PROGRAM	* Identify and rank risk significance of operational events.	* Screen and analyze LERs, AITs, IITs, and events identified from other sources to obtain ASP events. * Perform independent review of each ASP analyses. Licensees and NRC staff peer review of each analysis. * Convert ASP analyses to IRRAS. * Improve recovery and uncertainty methods for use with IRRAS.	Plan-10/94 Annual rpt Peer review implemented for 1993 events analysis Complete 4/95	AEOD
	* Determine generic implications of ASP events and characterize risk insights.	* Develop engineering and risk insights from ASP events.	Initial rpt 6/95, then annually	AEOD

	* Provide supplemental information on plant specific performance.	* Share ASP analyses and insights with other NRC offices and Regions.	Annual rpt	AEOD
	* Provide a check with PRAs.	* Compare ASP quantitative and qualitative insights with PRAs and IPEs.	6/95	AEOD
	* Provide an empirical indication of industry risk and associated trends.	* Rebaseline selected ASP events. * Develop relationship between ASP CCDPs and core damage frequency.	11/95 Annual rpt	AEOD
3.3 INDUSTRY RISK TRENDS	* Provide a measure of industry risk that is as complete as possible to determine whether risk is increasing, decreasing, or remaining constant over time.	* Develop program plan which integrates NRR, RES, and AEOD activities which use design and operating experience to assess the implied level of risk and how it is changing. * Implement program plan elements which will include plant-specific models and insights from IPEs, component and system reliability data, and other risk-important design and operational data in an integrated frame work to periodically evaluate industry trends.	Plan-11/94 11/95, then annually	AEOD
3.4 RISK-BASED PERFORMANCE INDICATORS	* Establish a comprehensive set of performance indicators and supplementary performance measures which are more closely related to risk and provide both early indication and confirmation of plant performance problems.	* Identify and evaluate new or improved risk-based PIs which use component and system reliability models & human and organizational performance evaluation methods. * Develop and test candidate PIs/performance measures. * Implement risk-based PIs with Commission approval.	Plan-12/94 6/97 12/97	AEOD
3.5 COMPILE OPERATING EXPERIENCE DATA	* Compile operating experience information in database systems suitable for quantitative reliability and risk analysis applications. Information should be scrutable to the source at the event level to the extent practical and be sufficient for estimating reliability and availability parameters for NRC applications.	* Manage and maintain SCSS and the PI data base, provide oversight and access to NPRDS, obtain INPO's SSPI, compile IPE failure data, collect plant-specific reliability and availability data. * Revise LER rule to eliminate unnecessary and less safety-significant reporting and to better capture ASP, CCF, and human performance events. * Develop, manage, and maintain agency databases for reliability/availability data (equipment performance, initiating events, CCF and human performance data).	Ongoing Draft 9/95 Final 8/96 ASP,CCF,& HP database-12/95	AEOD

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
3.6 STAFF TRAINING	* Present PRA curriculum as presently scheduled for FY 1994.	* Continue current contracts to present courses as scheduled. * Maintain current reactor technology courses that include PRA insights and applications. * Improve courses via feedback. * Review current PRA course material to ensure consistency with Appendix C.	Ongoing	AEOD
	* Develop and present Appendix C training courses.	* Prepare course material based on Appendix C. * Present courses on Appendix C.	12/94	RES and PRA Working Group
	* Determine staff requirements for training, including analysis of knowledge and skills, needed by the NRC staff.	* Review JTAs performed to date. * Perform representative JTAs for staff positions (JTA Pilot Program). * Evaluate staff training requirements as identified in the PRA Implementation Plan and the Technical Training Needs Survey (Phase 2) and incorporate them into the training requirements analysis. * Analyze the results of the JTA Pilot Program and determine requirements for additional JTAs. * Complete JTAs for other staff positions as needed. * Solicit a review of the proposed training requirements. * Finalize the requirements.	12/96	AEOD
	* Revise current PRA curriculum and develop new training program to fulfill identified staff needs.	* Prepare new courses to meet identified needs. * Revise current PRA courses to meet identified needs. * Revise current reactor technology courses as necessary to include additional PRA insights and applications.	12/97	AEOD
	* Present revised PRA training curriculum.	* Establish contracts for presentation of new PRA curriculum. * Present revised reactor technology courses. * Improve courses based on feedback.	12/97	AEOD

4.0 NUCLEAR MATERIALS AND LOW-LEVEL WASTE SAFETY AND SAFEGUARDS REGULATION

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
4.1 Validate risk analysis methodology developed to asses most likely failure modes and human performance in the use of industrial and medical radiation devices.	* Validate risk analysis methodology developed to assess the relative profile of most likely contributors to misadministrations for the gamma stereotactic device (gamma knife).	* Hold a workshop consisting of experts in PRA and HRA to examine existing work and to provide recommendations for further methodological development. * Examine the use of Monte Carlo simulation and its application to relative risk profiling. * Examine the use of expert judgement in developing error rates and consequence measures.	8/94 6/95 9/95	NMSS
	* Continue the development of the relative risk methodology, with the addition of event tree modeling of the brachytherapy remote afterloader.	* Develop functionally based generic event trees.	Ongoing	NMSS/ RES
	* Extend the application of the methodology and its further development into additional devices, including teletherapy and the pulsed high dose rate afterloader.	*Develop generic risk approaches.	10/96	NMSS/ RES
	* Develop user friendly computerized guidance for materials licensees in risk analysis techniques for industrial and medical radiation devices.	* Conduct a series of HRA benchmarking and cross-validation exercises, including THERP and recent methodological developments in support of LP&S.	10/96	NMSS/ RES

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
4.2 Continue use of risk assessment of allowable radiation releases and doses associated with low-level radioactive waste and residual activity.	* Develop decision criteria to support regulatory decision making that incorporates both deterministic and risk-based engineering judgement.	* Conduct enhanced participatory rulemaking to establish radiological criteria for decommissioning nuclear sites; technical support for rulemaking including comprehensive risk based assessment of residual contamination. * Work with DOE and EPA to the extent practicable to develop common approaches, assumptions, and models for evaluating risks and alternative remediation methodologies. (Risk harmonization). * Work with NCRP 87-2 to develop risk based waste classification recommendations.	6/95	RES & NMSS
4.3 Develop guidance for the review of risk associated with waste repositories.	* Develop a Branch Technical Position on conducting a Performance Assessment of a LLW disposal facility.	* Mixture of deterministic and risk-based engineering judgement.	TBD	NMSS & RES
4.4 Revise SRP.	* BTP to be revised to reflect the Branch Technical Position for a Low-Level Waste Disposal Facility. This is a lower priority effort.	TBD	TBD	NMSS

5.0 HIGH-LEVEL NUCLEAR WASTE REGULATION

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
5.1 REGULATION OF HIGH-LEVEL NUCLEAR WASTE	* Develop guidance for the NRC and CNWRA staffs in the use of PA to evaluate the safety of HLW programs.	* Assist the staff in pre-licensing activities and in license application reviews. * Develop a technical assessment capability in total-system and subsystem PA for use in licensing and pre-licensing reviews. * Combine specialized technical disciplines (earth sciences and engineering) with those of system modelers to improve methodology. * Identify and prioritize user needs in PA (i.e., the basis for research projects) for RES, and to monitor progress towards meeting those needs.	Ongoing	NMSS & RES
	* Use PA and PSA methods, results and insights to support development of the Licensee Application Review Plan for HLW geologic repository.	* IPA analyses complement the Systematic Regulatory Analysis process used to develop the License Application Review Plan; results of IPA analyses provide feedback into SRA process.	Ongoing	NMSS
	* Use PA and PSA methods, results and insights to evaluate proposed changes to regulations governing the disposal of HLW.	* Assist the staff to maintain and to refine the regulatory structure in 10 CFR Part 60 that pertains to PA. * Apply IPA analyses to 10 CFR 60 (especially to sections 60.111, 60.112, 60.113, and 60.122) to maintain and refine the regulatory structure.	Ongoing	NMSS
	* Continue PA activities during interactions with DOE during the pre-licensing phase of repository development, site characterization, and repository design.	* Provide guidance to the DOE on site characterization requirements,s ongoing design work, and licensing issues important to the DOE's development of a complete and high-quality license application.	Ongoing	NMSS