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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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BRIEFING ON IMPLEMENTATION OF

SAFETY GOAL POLICY STATEMENT

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PUBLIC MEETING

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Nuclear Regulatory Commission

One White Flint North

Rockville, Maryland

Thursday, April 13, 1989

The Commission met in open session, pursuant to notice, at 2:00 p.m., the Honorable LANDO W. ZECH, JR., Chairman of the Commission, presiding.

COMMISSIONERS PRESENT:

LANDO W. ZECH, JR., Chairman of the Commission

THOMAS M. ROBERTS, Member of the Commission

KENNETH C. ROGERS, Member of the Commission

JAMES R. CURTISS, Member of the Commission

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

SAMUEL J. CHILK, Secretary

WILLIAM C. PARLER, General Counsel

JAMES TAYLOR, Deputy Executive Director, Operations

R.W. HOUSTON, RES

TOM MURLEY, NRR

THEMIS SPEIS, RES

P R O C E E D I N G S

(2:00 p.m.)

CHAIRMAN ZECH: Good afternoon, ladies and gentlemen.

The purpose of the meeting this afternoon is for the staff to brief the Commission concerning the general framework and the revised plan for the Safety Goal Policy Implementation. The staff last briefed the Commission on this subject on October the 19th, 1988.

Today the staff will provide us recommendation for the general approach to the use and implementation of the safety goals and quantitative objectives. The staff should be prepared to point out areas in which it is in disagreement with the ACRS.

This meeting is an information briefing this afternoon, there will be no vote taken.

I understand that copies of the slides are available as you enter the room.

Do any of my fellow Commissioners have any opening comments, before we begin?

(No response)

CHAIRMAN ZECH: If not, Mr. Taylor, you may proceed.

MR. TAYLOR: Good afternoon.

As you indicated, Mr. Chairman, this meeting is

meant to brief the Commission on additional guidance, and to get the Commission's agreement with the staff's ideas on further utilization of the Safety Goal Policy in the decisionmaking process.

You mentioned that the ACRS and the staff has had extensive interaction with the ACRS, and we do intend to outline the similarities and differences in the briefing. And I would note that I believe the Commission is due to hear directly from the ACRS at your May 3rd meeting with the ACRS. So they will have a chance to brief you directly.

With me at the table are Dr. Murley from NRR, Dr. Speis, from the Office of Research, and Wayne Houston. And Wayne will give the detailed briefing this afternoon.

CHAIRMAN ZECH: All right, thank you very much, Mr. Taylor.

You may proceed.

MR. HOUSTON: Mr. Chairman, Commissioners, it is a pleasure to be here this afternoon, after many, many months of effort on our part to bring to your attention our proposals with regard to the further evolution of Safety Goal Policy, and particularly its methods of potential implementation by the staff.

Our purpose today, if I may have the first slide, slide number one -- (slide) -- is, in a sense,

threefold. Perhaps the primary purpose that we have as a staff is to request your approval of additional safety goal guidance to the staff. And when I say additional safety goal guidance, I am recalling that the policy statement that was published in 1986, in Part V of the Policy Statement, does deal with the issue of guidance to the staff.

And what we are saying here, if approved in whole or in part, could lead then to a modification of that guidance statement, and we feel that it would be desirable to actually incorporate that in a revised policy statement itself.

From a more technical point of view, our purpose is to really try to develop better clarification of the role of probabilistic risk analysis and quantitative safety goal objectives as partners in making future regulatory decisions. In part, what this means is to identify what safety goal objectives are, or are proposed to be, and what they are not. And as we will see in the briefing, I think some of these are fairly important considerations to understand.

If I may have the second slide, please. (Slide) The overview of the briefing is sort of three parts. I will discuss, hopefully, with some brevity, and summarize the recommendations that have been made to you by the

ACRS. The bulk of the briefing will be on the staff recommendations, including both the general approach and the principal elements of our recommendations, of which there are four.

Finally, we will have a few words to say about the industry objectives for evolutionary light water reactors that appear to have a relationship to safety goals, although not identified as such, and then, finally, a summary.

If I may have the next slide, please. (Slide) The ACRS recommendations were made in a letter dated May 13th, 1987, and it had three principal elements. They identified the purpose of their proposal was to evaluate the adequacy of rules and regulatory practices.

Secondly, they suggested an approach which involved what they referred to as a five-level hierarchy of objectives, or goals, which reflected a top-down succession of surrogates for the principal goal, which were the qualitative goals expressed in the Commission's policy statement.

Finally, they identified the association of the implement to their proposed method of implementation, with what they referred to as a sampling program of PRAs. This recognized that it may be sometime into the future, if ever, that we have available to us a full scope, full

Level Three PRAs on all of the plants in the United States, so that the sampling program was intended to convey the idea that something less than 110, or whatever the proper number might be, of probabilistic risk analysis for individual plants, should be an adequate basis for drawing conclusions about what they refer to as the adequacy of our rules and regulatory practices.

Basically, what this means is, in the sampling program, is the review of PRAs that are done -- in some cases the effort might initiate PRAs -- but, basically, it is to analyze why, not so much the whether question of whether plants meet the quantitative objectives or not, but if they do, why they do, and if they do not, why they do not.

In other words, it is the insight, as we sometimes say, from the PRAs themselves that are the important things; the comparison with the safety goal objectives is merely an indicator of what kinds of things to look for in terms of why they do or why they do not meet the objectives.

It is our understanding that the -- and with respect to the ACRS hierarchy of objectives, and referring to this as a top-down succession of surrogates -- that the ACRS did intend to admit the possibility of some conservatism being addressed at each successive level,

starting from the top and going down to the bottom level, which they identified as the body of regulations and regulatory practices.

And the purpose of this would be to accommodate uncertainties. In other words, if the quantitative health objectives which have been identified in the Safety Goal Policy Statement, if a methodology were available to make a clear and unequivocal determination as to whether or not those were met or were not met, and that that determination could be made with high confidence, the rest of the quantitative objectives perhaps would be unnecessary, but because there is uncertainty in it, they have identified the possibility that there can be, and perhaps should be, some conservatism, but not so much conservatism as to create what they referred to as de facto new policy, and what we have heard from some recommendations by some, could be interpreted as really creating a different policy than that which the Commission intended.

The program that they have in mind has appeared to us to be what I might describe as a rather global view of the activities of the NRC, the regulatory activities of the NRC, and that it could, in principle, or in practice if one looks at it that way, take a very long time actually to complete the program that is suggested there.

Perhaps, also, of considerable importance--they used the word "adequacy" in their original letter, and we will say a few more words about the word "adequacy" and the words "adequate protection" which, of course, bring to mind the question of the statutory standard.

If I may have the next slide, please. (Slide) Again, summarizing some additional letters that have been received from the ACRS in April 1988, they had some further comments, intending to clarify meanings of some of the things in their earlier letter. It included some thoughts of the ACRS on how a definition of a large release might be characterized. And they suggested that they preferred a definition which treated a large release as an actual release of radioactive material into the environment.

The staff discussion of the disposition of that question is incorporated, primarily, in the Enclosure 1 to the Commission paper which you have received.

Secondly, they went to some lengths to discuss the problem of definition of the word "core melt" or "core damage". And in this particular area the staff has adopted the definition, except the staff prefers to use the words "core damage" rather than "core melt". The problem here is that although there is fairly common usage between those two terms, which does not make any

distinction between them, the ACRS has pointed out quite properly that the initiation of core damage is probably a higher frequency event than a core melt situation, which implies rather complete or substantial melting of material in the core, and actual failure of the pressure vessel, and this is often referred to as a "core on the floor" situation.

In most PRAs that have been done, from a probabilistic point of view, there has been no difference. That is, the assumptions have been made in doing the PRA, that the state-of-the-art of understanding the melt progression phenomenon is such that given core damage, core on the floor was determined to be, or assumed to have, simply a unit probability -- that is, it was going to occur.

The ACRS has observed that, in their view, the likelihood of that occurring is probably considerably less than unit probability. And I might add parenthetically that, in substantial measure, that is a major focal point of the accident management program, to try to get appropriate procedures and, to the extent that it may be necessary, some modifications in the hardware that give operators the best possible opportunity to stabilize or reverse the progression of an event which may start with some initial core damage, before there is melting and

failure of the pressure vessel and, of course, the one example that we have of a rather serious core melt accident, TMI 2, in fact, did result in a reversal of that, and there was not a failure of the pressure vessel.

The next item, the ACRS have recommended something that they call a "plant performance objective", which they characterized as how well a plant is operated. Both the ACRS and the staff seem to agree that we don't know how to do this in a quantitative sense at the present time, and so no such objective was identified in the staff recommendations.

As a result of this, the ACRS has recommended, and I think quite properly so, that there should be some caution expressed by the Commission with respect to the absence of such an objective, to improve the public understanding of what the extent of the reach is of Safety Goal Objectives, and the reach of probabilistic risk analysis to deal with human factor situations, the effectiveness, efficiency if you will, of the management of plants.

Finally, and perhaps in one sense one of the more important recommendations that the ACRS has made is that cost-benefit should have no role when the purpose of making a modification to the rules and regulations is associated with the concept of meeting safety goal

objectives. The interpretation which the staff places on this is that that is tantamount to, or equivalent to, a statement of adequate protection which, in accord with the backfit rule, when changes are made that are necessary in order to assure adequate protection, cost-benefit cannot be part of the argument.

I would add parenthetically at this point, it is certainly not clear to us that the ACRS necessarily had in mind, in using the word "adequacy of the regulations", something that has some sense of minimal acceptability to it. Our view is, and our understanding is, that their view -- and you may get clarification from them in a few weeks -- is that there should be just one standard, one standard set of safety goals which are applicable to all plants, and the regulations when properly structured, and the regulatory practices when properly structured, should be both necessary and sufficient to be able to make a determination that when they are met, then there is adequate and sufficient protection, and no additional protection should be required of plants.

This view was reinforced by an ACRS letter in July of 1988, the subject of which was the DOE sponsored advanced reactor designs. They raised, again, the age old question of how safe is safe enough. And to us it appears that they equate this to the term "adequate protection".

And, again, they state very clearly in that particular letter that the safety goals should be the same for all plants, present and future. The staff recommendations do not make any specific recommendations with respect to most of the classes of potential future plants, particularly those that in the non-light water reactor class.

If I may have the next slide, please. (Slide) Turning now to the staff recommendations, the general approach deals specifically with use of PRA in regulatory decisions. Reminded that the safety goal policy itself was largely created because of the recognition of the potential for the usefulness of the methodology of probabilistic risk analysis in the decisionmaking process.

And you will see that our recommendations very closely align themselves with the characteristics and the state-of-the-art of PRA methodology.

The quantitative objectives that we refer to are proposed to be considered as targets for generic regulatory requirements, rather than criteria for individual licensing decisions. That is, one of the major points we have attempted to make in the paper is that we do not ask a plant to demonstrate that it meets a particular quantitative objective. It is in this sense that the essence of the recommendations being made to the

Commission are guidance to the staff, and not some proposal, or even hidden proposal, to create in some sense, in the future, a specific regulatory requirement that would be couched in the same kinds of quantitative terms that the quantitative objectives we talk about here are couched.

It also is the intent of the staff that in the implementation of safety goal policy, it should play a key role in the implementation of the Commission's backfit rule, 10 CFR 50.109. It provides some additional benchmarks to gauge substantial increase in overall protection.

By additional benchmarks, I mean the following: In the safety goal policy statement two benchmarks have already been identified and approved for use by the staff, approved by the Commission for use by the staff, and these are the two quantitative health objectives that are specified in the policy statement.

In addition to those, as you will see, we propose benchmarks that can be identified with the large release guideline, which the Commission asked the staff to consider for possible incorporation in this process and, in addition, a proposed benchmark for core damage frequency.

Now, as we will see in a few moments, these

coordinate quite nicely with the characteristics of PRA methodology, and we will have a Vu-Graph in a few moments that will demonstrate that.

I'd also bring -- would like to bring to your attention the point that is made in the paper, that the Commission may wish the staff to consider developing a statement on the relationship, if it wishes to identify any, of safety goal policy to an adequate protection standard. The reason for this is that it may be perceived -- and has, in fact, been perceived by some-- that what the staff is proposing here is tantamount to defining the roof of the structure, or the roof of the house, without defining the foundation.

If one perceives of the concept of an adequate protection standard as some minimal level of acceptability, then what we are talking about here is what one might, by contrast, regard as a maximum level of need to require. That is, what we are talking about is a set of objectives which, when the regulatory requirements are suitably adjusted, should be regarded as sufficient and no further regulatory requirements should be necessary and, in fact, it should be impossible for a justification for additional requirements to occur, based upon cost-benefit recommendations -- that is, the benefit would be too small.

COMMISSIONER CURTISS: On this point, I take it from what you've said that the major difference between your approach and the ACRS is that the ACRS top-down approach envisions that the safety goal would be used to define adequate protection, or adequacy, and the staff's proposed application of the safety goal would result in its use primarily in the backfit arena.

MR. HOUSTON: That is correct, yes.

Now, again, I want to say that our reading of the ACRS is such that I cannot say that they are specifically identifying their approach with the concept of an adequate protection standard, with its legal meaning--and this may be a point on which you may wish to seek further clarification from them -- but the way they characterize the process, and given -- if you put that in the context of the existence of the present backfit rule which does identify circumstances in which no cost, for example, would be considered when the objective of a change is to meet adequate protection, and also in conjunction with the backfit rule where there are provisions and requirements imposed upon the staff to properly justify any substantial improvements in safety that do admit cost considerations, when it is placed in that context, one can draw the conclusion that the ultimate effect of adopting the ACRS recommendations would be to

create a definition for the standard of adequate protection.

COMMISSIONER CURTISS: One other question on this point. From the standpoint of the practical day-to-day implementation of the backfit rule then, if the staff's approach is pursued, what you are envisioning, as I understand it, is to proceed with the two quantitative health objectives that the Commission has already approved in the policy statement, the Safety Goal Policy Statement, and to fashion benchmarks for large release and core damage frequency to be applied in that arena.

MR. HOUSTON: That's correct.

COMMISSIONER CURTISS: All right, proceed.

CHAIRMAN ZECH: Proceed.

MR. HOUSTON: If I may have the next slide, please. (Slide) There are four principal elements in the -- not necessarily all of equal importance -- in the recommendations that have been made to you. One is the establishment of a hierarchy of objectives, which bears some similarity to the ACRS proposal but is not identical to it, and does not share all of the characteristics of the ACRS proposal.

The second element is, again, is similar, essentially identical to the ACRS recommendation. They have used the term "a sampling program of PRAs", we refer

here to a review of PRAs to assess the effectiveness of regulatory requirements. And regulatory requirements there can be read to be either existing, or proposed.

Thirdly, the third element is an integration of the risk reduction modifications and the testing of proposed modifications. This, as we will describe a little bit later, can perhaps most conveniently be thought of as an accounting mechanism for keeping track of modifications as they are made in plants, on a plant-by-plant basis, to have some sort of record of how far we have gone towards meeting the safety goal objectives, and how far there may be yet to go.

Finally, we are proposing the use of what we are calling subsidiary targets, particularly for generic safety issue resolution. And the reason for this is that this is actually one of the principal applications of quantitative targets that the staff has already used, and has had a process for. One particular, I think, very noticeable example is in the development of the station blackout rule. The staff set for itself an objective of core damage frequency of 10 to the minus fifth per reactor year, and then created a proposed set of regulatory requirements in a more deterministic sense, to try to meet that goal. And this was the way the station blackout rule was created. So, it is that same kind of process that we

have in mind here.

Most PRAs that have been done are not full scope and most of them are not full Level Three PRAs. And in order to make use of this kind of a philosophy, if you will, it seems pragmatically necessary to break the process down to some extent, so that one can use quantitative objectives that are matched with the information that one has in hand. And that's why we talk about the subsidiary targets.

COMMISSIONER CURTISS: How many of the PRAs cover external events?

MR. HOUSTON: Probably, of those that we have done or that we have available to us, somewhat less than half, perhaps 25 percent, or a third, somewhere in that neighborhood.

If I may have the next slide, please. (Slide) This shows what we mean by a hierarchy of objectives, five levels. And in that sense, there is a similarity with the ACRS recommendations, starting at the top with the qualitative safety goals. At Level Two, the quantitative health objectives which, of course, relate to the individual risk of early mortality and latent cancer mortality.

Level Three and Four are focal points for proposed objectives, with the staff recommendations, a

large release guideline, and something which we would call an accident prevention objective. And, finally, at Level Five, the body of regulatory requirements.

As we have said, Level Three, of course, the large release guideline, was proposed by the Commission for staff consideration. And I might note of some interest, that it is one of the more dominant problems associated with the staff's recommendations, has been to come to grips with how one might best try to quantify what a large release is.

On the next slide, if I may have that -- (slide) -- you will see how these relate to the various fairly well known levels of probabilistic risk analysis. Levels Two, Three and Four which are the quantitative objectives, associate themselves then with, at Level Two, a full PRA, which goes all the way to what we call here "consequence mitigation", in an off-site sense.

Level Three is the accident mitigation, Level Two of a PRA, and, finally, at Level Four -- in the hierarchical level, this can get a little confusing with respect to what kind of levels we are talking about, but it corresponds to a level one PRA, which essentially focuses on the in-plant systems and can be thought of as an analysis of the accident prevention mechanisms -- that is, the things that are present in the plant, how they are

configured which, if used properly, can prevent core damage accidents.

So, the hierarchy here is a little bit different than the ACRS recommends, in that they are not specifically surrogates for successive levels. Rather, what we are proposing is a reduction in the scope of the objective to correspond with these levels of PRA and the information that one has from the PRAs that are available.

To put it another way, if one has only Level Two PRAs available, one cannot draw any conclusions with respect to off-site mortality risk.

If I may have the next slide, please. (Slide) Looking now specifically at the Level Three objective which focuses on combined prevention and mitigation, the proposal in the safety goal policy statement was to have a large release guideline, which is characterized as an overall mean frequency of a large release should be less than one in one million per reactor year.

We are proposing in this paper, although this is not a major part of it, that we ascribe to the word "overall" here the meaning of a collective average over all plants. This refers to a question raised quite sometime ago, I think by former Commissioner Bernthal, I believe it was. And the distinction here is that a fair reading of the Safety Goal Policy Statement itself would

suggest that the only interpretation that one can place on the Level Two objectives, the quantitative health objectives, would be on an individual plant basis because they are characterized and essentially defined in such a way that that is the only interpretation that can be placed on them.

With respect, however, to both the Level Three and the Four objectives, we are proposing to characterize these as collective averages over all plants. Now, the reason for doing this is that it would reflect an expectation of, and a tolerance for, the fact that when particular PRAs are reviewed, they will tend to show some variation about some mean value for them -- that is, they will not all come up the same -- and there would be a tolerance for something being close to, perhaps, without trying to quantify what that means, a particular quantitative objective, and an expectation that this will happen from time to time.

I am reminded of the fact that in the UK, in conjunction with some hearings on a proposed plant, an almost unreachable objective was set, which was not met by the evidence that they had, yet it was a tolerable -- it was an expectation and something which was determined to be tolerable, and I think that same point of view can be recognized here.

One of the key problems with trying to come to grips with this Level Three objective, or the large release guideline, has to do with the definition of what the words "large release" means. And we have considered a number of definitional options. These are primarily discussed in Enclosure 1 to the Commission paper. And we have considered primarily four different possibilities.

One is to define a large release in terms of health effects; one is to define a large release in terms of doses to individuals. We have also considered, although it is not mentioned in the paper, doses to populations. A third one is to consider it as a release, as suggested -- strongly suggested, I should add, by the ACRS -- which is sort of tantamount or equivalent to identifying it as a source term.

And, finally, the fourth option that we have considered and proposed is an option which defines, in effect, a large release in terms of containment failure. And we will discuss that a little bit when we get to it.

If I may have the next slide, please. (Slide) Continuing with this Level Three objective, we perceive that there is something that I have called here a "threshold problem" in coming to grips with the definition, and I think it is a fairly easy problem to understand, and let me characterize it this way.

If one were to propose to define a large release, for example, in some definition of curies of material, a large release would be a very large number of curies -- perhaps a million, perhaps 10 million -- and it seems to me that it would be very difficult to explain why one million or 10 million curies is a large release, and 99 million or 9,900,000 curies is not a large release.

There is no clear-cut knee in the curve, if you will, no clear-cut threshold transition in terms of curie releases, that one could quantitatively define, other than somewhat arbitrarily as a large release, and then be able to explain that something that is a little bit smaller than that is not to be considered a large release.

That problem is really inherent in any definition of a large release. It is somewhat analogous to the problem of defining doses to an individual that might be below regulatory concern, but there you are dealing with small numbers. Here you are dealing with larger numbers. And so although there is an analogous-- it's an analogous situation, I think it is even more difficult to understand, or would be more difficult to understand such a definition.

And this is one of the main reasons that we have departed from the ACRS recommendation, although we studied that quite extensively in various different possible

forums, of characterizing large release as a source term, or as a release of radioactive material.

There is another aspect to creating a definition for the large release, and that is the question of consistency within the hierarchy of quantitative objectives. The safety goal policy itself identified the fact that, which was pretty well known at that time and nothing that we found out in the meantime would dispute it, that the controlling objective here is the quantitative health objective for early mortality risk, and the specification placed on the quantitative health objective for latent cancer mortality is not a controlling objective. That is, if the QHO for early mortality risk is met, there is almost a hundred percent certainty that the quantitative health objective for latent cancer mortality would be well met.

This was rather well demonstrated, for example, in the treatment of the five plants in the draft of NUREG-1150, which was published in February of 1987, for the five plants considered.

Given that the QHO for early mortality risk is controlling, what we have focused on primarily with respect to coming to grips with a large release definition, is a definition that is not inconsistent with that quantitative health objective. As a matter of fact,

this is, in one sense, why in the proposal that was made to the Commission back in early 1987, the one that contained the matrix and so forth, it was recommended that the large release definition be associated with the concept of one or more early fatalities occurring outside the plant boundary.

And, as a matter of fact, a demonstration of that computation was also made in Draft 1150, back in 1987. That has the perceptual problem -- while that is an interesting and potentially useful definition, and the staff would like to continue to explore that as what I'd call the surrogate for our proposed qualitative definition -- it does have the apparent disadvantage that it seems to be a restatement of an objective in terms of specific health effects, namely, early mortalities. And, therefore, it would tend to fight with, and not necessarily be consistent with, the quantitative health objective for early mortality risk, although calculated in a somewhat different way and given a somewhat different definition.

DR. MURLEY: Excuse me, could I make a point here?

MR. HOUSTON: Sure.

DR. MURLEY: With regard to reviewing the advanced evolutionary light water reactors, there is a

proposal that -- it has come to be known as the EPRI large release guideline that we are, in fact, using and have been using for the last couple of years, and it is the following, if I've got it right -- the chances of an accident yielding a dose of 25 rem at a half mile should be less than one in a million per reactor year.

That, I think, is consistent with the proposed definition here, that Wayne is using, but I wanted to interject that there is one that we have been using, that the industry has proposed, and that we have accepted, that seems to be consistent with what we are proposing today.

MR. HOUSTON: I agree, Tom, and I do have this on a later Vu-Graph here.

DR. MURLEY: Oh, okay.

MR. HOUSTON: It is certainly not inconsistent with it, I think, is perhaps a better way -- it is a more stringent -- apparently a more stringent goal that we are talking about here, but it is not inconsistent with our proposed statement, which is a qualitative statement that a large release is any release that has the potential for causing an off-site early fatality.

This statement is made primarily to assure an element of consistency with the controlling quantitative health objective ut, in and of itself, it is a qualitative definition, and requires some further definition in order

to make use of it in a quantitative sense.

And to this end, what we have proposed at this time is two potential, what we call "surrogates", for that definition. And one of them is basically the same as we spoke of a moment ago, what we sometimes refer to as the one or more early fatalities definition, as demonstrated in NUREG-1150 draft, but with a slight variation on it. And the variation would be that because the intent of the large release guideline is to focus on the safety of the plant, and not contributions from site-related characteristics, including emergency planning, the way it would be used for this purpose would be in conjunction with some standardized definition of site characteristics sufficient in order to make the calculation, but that same standard site would be used, a hypothetical site, would be used for any application, regardless of what plant the balance of the PRA might have referred to.

And in that way, you would cut out site-to-site variation, and focus just on those things that affect the safety of operation of the plant itself and the design of the plant itself.

COMMISSIONER ROGERS: What would be the elements in such a characterization of a standard site?

MR. HOUSTON: The principal element would be the meteorology that one assumes here. A second element would

be some characterization of the off-site population. This might be simply to specify that you have -- assume that there is an individual at some specified distance from the plant, such as the mean distance that is characterized in the quantitative health objective, which would be roughly a half a mile from the plant boundary. Those are examples of the way that might be done. Those would be the principal ones.

There would be a residual question as to whether in that calculation you would give any credit for emergency planning, but that would be a washout when you are comparing two or more plants together. It's primarily the meteorology that would be the one.

The other surrogate that we are proposing would be couched in terms of early containment failure. Now, the reason the word "early" is there is because that in general, one of the conclusions that one can draw from PRA studies to-date, it is predominately situations, accident sequences if you will, which lead to early containment failure which, in turn, are predominately responsible for the risk to individuals, the early mortality risk to individuals, as distinct from late containment failures.

So here, again, what we are proposing is something which we believe would be consistent with -- as nearly as we could make it in these terms -- with the

quantitative health objective, but quite possibly somewhat more conservative.

Now, one of the reasons that we say in proposing this as a surrogate at this point in time, rather than, for example, as simply a proposed definition is, in part, because we have not done enough analysis to determine just how conservative it might -- first of all, if it is conservative, and secondly, if it is, just how conservative it might be. And we think this needs some further examination.

To perhaps further amplify the meaning of using this definition as a "surrogate" for a large release, what is intended here is a situation in which an early open pathway is created in the plant for radioactive materials to be transported from a damaged core, through the containment, into the environment -- that is, all barriers to fission product release have been lost at this point. So that is, in a sense, the essence of that.

There are some other definitional problems with applying it, such as how large an opening, for example, in containment, but once you get beyond something that is perhaps a foot or more in diameter, it makes very little difference in terms of what gets out.

If we may turn now to the next slide -- (slide) -- and begin to focus on the Level Four, or accident

prevention objective. I might say that we well recall that a number of years ago, in the proposed version of the Safety Goal Policy Statement itself, it had been proposed to incorporate an objective for core melt or core damage frequency and, of course, that was removed from the policy statement that was published in final form in 1986.

This is, however, a very useful quantitative objective to the staff, and we feel also, to a large extent, to the industry, to designers of plants, for example, for future plants.

We mention here two optional definitions, I've alluded to it before. One uses the words "core damage", and the other uses the words, "core melt".

We prefer to associate the word "core damage" with the definition that it means basically the loss of adequate core cooling. That is, an event has proceeded to the point where water is no longer being delivered to the core. And that's the point of departure, and that is very close then to what one might call incipient core damage.

The term "core melt" is often considered to mean, as we indicated earlier, pressure vessel failure and "core on the floor". Our proposal is to focus on the prevention of an accident, as is done in a Level One PRA, and we recommend the use of the term "core damage", and that it be given a definition understanding that is to

mean loss of adequate core cooling.

Turning to the next slide, 12. (Slide) The quantification that is recommended here is that the overall mean frequency of core damage events should not exceed 10 to the minus 4, that's one part in 10,000 per reactor year. Here, again, we would employ the same connotation to the word "overall" as an aggregate average, over all plants that are operating at any given time.

CHAIRMAN ZECH: It seems to me we have been through this before, sometime ago, didn't we? Hasn't this been brought to the Commission before, the use of this 10 to the minus 4, and we had some discussion on it. As I recall --

MR. HOUSTON: That is correct, that is correct.

CHAIRMAN ZECH: As I recall the Commission policy statement did not contain those elements.

MR. HOUSTON: That is correct.

CHAIRMAN ZECH: You are going to tell us your views on that now, I presume.

MR. HOUSTON: And it's our view that it would be a desirable thing to have in a plan to implement the Commission's safety goals, and that it really should be part of the -- what we've called the hierarchy of quantitative objectives.

It is, in one sense -- the ability of a PRA,

Level One, probably produces the most robust bottom line result of any part of a PRA. The main reason for this is that you are dealing with systems in place, in the plant, when you deal with it. Whereas when you get to a Level Two, you are now dealing with systems that are out of control, you are dealing with phenomenological circumstances inside a vessel with a progression of core melt and uncertainties associated with how that might proceed, and uncertainties in containment performance, et cetera.

This is basically on the grounds that it is a very useful objective to the staff to deal with potential modifications to regulatory requirements that can be associated with the prevention of accidents.

I mention here, perhaps somewhat parenthetically, a subsidiary target for future designs.

COMMISSIONER CURTISS: Let me jump in there, before you get to the future designs. Back to my earlier question on the relationship of this approach to the backfit rule. Applying this approach in the context of what we currently do on backfit, that if this objective were adopted, one times 10 to the minus 4, that would mean that that is the definition for purposes of this -- of core damage, of substantial additional protection?

MR. HOUSTON: Yes.

COMMISSIONER CURTISS: In other words, if a plant were below this --

MR. HOUSTON: If a PRA on a plant reflected a bottom line result for core damage frequency that was considerably below this, an initial observation and the initial conclusion that one might draw, is that one does not need to impose any additional requirement on that plant for accident prevention purposes because that target is already met.

COMMISSIONER CURTISS: And if it is above it?

DR. MURLEY: Wait a minute, I thought we concluded we were not going to use --

MR. HOUSTON: We can't, that's correct.

COMMISSIONER ROGERS: I was getting very uncomfortable.

MR. HOUSTON: I was about to introduce that qualification.

COMMISSIONER ROGERS: Yes.

MR. HOUSTON: Nevertheless, as I had said up front, the comparison of a bottom line PRA result with a quantitative objective in a safety goal hierarchy is inevitable. It is a comparison that anybody will make. And the question would be asked "Does this plant meet that safety goal target?"

Now, it is not a very satisfactory answer to say

with numbers staring you in the face, that I can't answer that question. That would be a logical answer because it may well be that the PRA you are looking at, for example, did not include all external events. And as you will see in a moment, we incorporate in this definition the concept that the PRA, in order to make a fair comparison, it really should be a full scope PRA that deals with internal and external events.

DR. MURLEY: I would enter another reason, and that is that the numbers that go into calculating risk for an individual plant have to make some assumptions about human error rates -- That is, how well a plant is operating.

There is no way that an analyst sitting at his desk cranking out these numbers can assess how well a plant is operating, but he makes some assumptions, based on averages taken from, actually, from Air Force studies. And those are adequate for making generic decisions.

In my judgment, they are not adequate for substituting our judgment on how well a plant is being run. Therefore, I am very skeptical about using PRA numbers for making judgments comparing with a safety goal.

So, Wayne's point about having numbers staring us in the face and how do we deal with them, I have no trouble with that at all because that tells me that

assuming an average way of operating a plant, this is how -- it is an indication of how good the design is, that's how I view it, but it is not necessarily a reason for taking action if they don't meet the goals, or a reason for accepting it if they do meet the goals, in my judgment.

MR. HOUSTON: Yes, that's correct. And I was about to qualify my response to that effect. Again, I will go back to the statement I made near the beginning, that the comparison that one might make is sort of inevitable. The conclusion that you draw from it, though, should go to the effectiveness of our regulatory requirements, and not the plant itself.

But one sample -- one PRA, in and of itself, may be an inadequate sample size to draw, to make a definitive conclusion that would cause one to immediately change a rule, for example.

COMMISSIONER CURTISS: But with those two caveats, the human performance caveat and the generic average caveat, this is not going to be used for application -- or for evaluation of specific plants. If you reached a situation where a group of plants, or all plants, did not meet this standard, and if this approach is going to be used in the backfit arena, once you have made that determination, do you then undertake a cost-

benefit evaluation of whether or not to take additional action?

MR. HOUSTON: Yes. And what we are saying is this would be part, but not all -- this would be part of the evaluation of the benefit, if you will, or the improvement in safety. This would be one piece of evidence, not the only piece, but one piece of evidence that one would cite in that regulatory analysis.

MR. TAYLOR: I would like to mention, I think it was a few weeks ago or so, that the Commission was briefed on NUREG-1150, up through the core damage aspect. And you recall we talked about a particular design issue at Zion that had, by the analyses, showed an outlier, due to a component cooling water issue, which is strictly related to the potential design failure.

Now, that was a tool to show that. And, as a matter of fact, I believe even before the staff got to brief you, Commonwealth Edison had looked at that as a useful thing to work on and, in fact, identified a very simple fix to help to reduce that possibility. And there it is strictly as a stimulant, an understanding that wasn't particularly apparent before this analysis had been done.

CHAIRMAN ZECH: General Counsel, do you have a comment to make? Did you want to enter into this? Did

you have something --

MR. PARLER: Not really, except as I listened to the discussion I asked myself this question: Presumably this document is not going to be equivalent, at least at this stage, to adequate protection as the ACRS seemed to prefer.

I also understand from the discussion that presumably this document, if it is put into effect, would not be used for plant-specific backfit purposes. About the only thing that is left then is for generic purposes, in rulemaking, and I have a footnote to that. Apparently there is some concern that still remains as to whether or not the backfit rule itself should apply to generic rulemaking.

So, I suppose, Mr. Chairman, that's why I looked kind of like puzzled.

DR. SPEIS: If I may add one thing, Mr. Chairman.

CHAIRMAN ZECH: Go ahead.

DR. SPEIS: It is possible that you can utilize the results of the PRA on a plant-specific basis. You look at the numbers and then you will scrutinize the PRA and see if there is something that looks suspicious. And then you will focus on it farther, and then if you think there is merit in pursuing a fix, then you will apply the

backfit rule to that issue.

So, the PRA numbers then will go to the scrutinization of the study itself, and see where you take it from there, but it doesn't avoid using the backfit rule at that point.

CHAIRMAN ZECH: As I recall some of the previous Commission discussions we have had on this subject, one of the things that we try to keep in mind is that the safety goal is one thing, it is a goal. It's a goal that should provide a foundation for our thinking, and our review of our various requirements. We should be able, for example, looking at it as a goal, to test new and existing requirements, to see whether they are consistent with our safety goal.

We also discussed the PRA itself, and the whole process. And I agree, they do get intertwined, but it seems to me that our discussion at that time led us to conclude that although PRA has great value -- and we appreciate the logic process going through in formulating a PRA and in examining the potential weak points in the plant, or the weaker points in the plant, to see whether actions should be taken, and we, I think, generally agree that that's the greatest value you get from a PRA -- but it does seem to me that we all, at least the Commission at that time, felt that we should be very careful about

coming up with a bottom line PRA number and latching onto it, and then using it for regulatory requirements, or other specific actions. Notwithstanding the fact that we recognize the value of the process, it is the bottom line number that I think was a concern to us.

And if I recall when we came up with the safety goal itself, there was considerable discussion about this very issue, whether or not we should include core damage to the extent that we might consider PRA numbers and so forth. And for that very reason, we came up with that statement in the goal, not in the goal itself but in the statement, as I recall that went along with the goal, that said to the effect that we were looking at some number like one in a million, for a large off-site release, which would include, of course, core damage plus containment failure.

Now, that's as close as the Commission at that time at least would come up with any kind of number. And that, again, I think was stated reasonably clearly, to be used by the staff as an objective, if you will, rather than a rigid requirement.

So, I guess the only thing that is important would be to recall some of those previous discussions we had going over this very issue, was that we were trying to focus on our primary responsibility of this agency -- at

least I was at the time -- and that is for public health and safety. And our goal is public health and safety. That's the mission of this Commission.

And I think it is important that we keep that in mind in everything we do. And at that time I know we talked about on-site release and off-site release and so forth, and I understand you are going to talk about that a little bit later, but the only point I am trying to make here now is that if our mission truly is public health and safety, and it is, then we are concerned about damaging the public, hurting the public.

We also had discussions about damage to the environment, you know, from a major release. So, to me, the safety goal is the very broad goal. It should be used in terms of broad thinking. We should, indeed, try to test our requirements to the goal, but I think we must be very careful before we bring in these bottom line numbers.

And I think, as Dr. Murley was pointing out, the greatest use of the whole procedure is to see where we should perhaps take actions to address safety issues, but we should refrain from saying that something is sufficient or is not sufficient, based on the number itself because that number itself can draw us off in the wrong direction.

I believe that is kind of what we discussed.

DR. MURLEY: It was.

CHAIRMAN ZECH: Does the staff have any different thinking at the present time?

MR. TAYLOR: That is staff's thinking.

CHAIRMAN ZECH: All right. Thank you.

COMMISSIONER ROGERS: I would just say a little bit on it. I quite agree with that interpretation and approach. And it seems to me that the way the objective is stated in a sense implies that because it is a mean that is stated, not -- and that implies that there is some kind of a statistical distribution that that mean characterizes, but there is nothing more said about that statistical distribution, namely, a standard deviation or anything of this sort. So, it is not a step to try to really make it, although it implies there is a distribution because we are talking about a mean. It doesn't try to characterize that distribution any further by saying that a number has to have a standard deviation on that number.

Furthermore, the number itself, to those of us who use numbers in the technical sense, is an imprecise number. It is one, 1.0, one, approximately one -- I mean, the one looks like it is a precise number, it really isn't. We are talking about something of the order of one, close to one. There isn't a decimal point involved

there, it is not 1.0 times 10 to the minus 4.

So, there is a certain lack of precision in this statement that is what, in fact, I think we want. It does imply that we are looking at this issue from a statistical point of view. There is a distribution. And within that mean that's what we hope to achieve, but we know that when you have a mean, you will have something above and something below, you don't have a mean. Either you have one number that characterizes every element in that distribution, or you have a distribution about that mean.

So, that's built into the language here to some extent, and I think that is fully consistent with this view of using it that way. It isn't precise. You couldn't take the one to mean .9 fails, and it doesn't say anything about what is acceptable within the distribution.

I would like to, without taking us off in a totally different direction, point out though that we should keep in mind that there is this distribution. And if we had 10 reactors in the country and they met that, and -- by being close to that number, and we created a hundred reactors that still averaged the same number but had a much wider distribution, I think we would be worried.

So, that distribution ought to sharpen up in time, as we learn more and more how to build, construct

and operate safe reactors, not broaden in time, if you know what I mean.

MR. HOUSTON: That's right.

CHAIRMAN ZECH: Shall we proceed?

MR. HOUSTON: Yes. We pointed this out in the Commission paper, that the IPE program itself is intended to move in the direction of narrowing that distribution.

Continuing on page 12, we are suggesting here a subsidiary target for so-called future designs of a core damage frequency of 10 to the minus 5 per reactor year. When we talk about future designs, we are talking about situations which are still in a stage which can, in principle certainly and in fact, are in the design stage, and they can be designed to some specified standards.

So, the situation is a little bit different for future plants than it is for present plants. That number is one that has been suggested by the INSAG Report, the International Atomic Energy Agency, in 1988. Although by no means should it be inferred here that that was suggested as a regulatory objective, or regulatory standard, simply a standard for the plants.

It is also identical to what was proposed by EPRI for advanced light water reactor designs in the ALWR requirements document. And it has been proposed by General Electric Company, and accepted by the NRR staff, for the

advanced boiling water reactor as a target or objective for the ABWR.

DR. MURLEY: Can I make a point in that regard? Here we are not being slaves to the exact numbers, like you mentioned, Commissioner Rogers, .9 or 1.1, but I think it is fair to say that we believe that the advanced reactors can be at least a factor of 10 less likely to have core damage accidents than the current generation, just by improved design.

I think that's a proper use of this kind of numerology.

CHAIRMAN ZECH: Well, I don't know what the right number is, but there is no question that for future designs we should, indeed, attempt to make them improved, as far as safety is concerned, for future designs. And I think that is what you are saying.

DR. MURLEY: And a factor of 10 we think is about right, and the industry thinks is about right.

CHAIRMAN ZECH: Yes, and that is something that I think is something reasonable to shoot for as an objective. And that's what you are labeling it here, and I think that's appropriate.

Let's continue.

MR. HOUSTON: Turning to the next page, 13-- (slide) -- I would like to say a few words about the

process of comparing PRA results -- that is, bottom line results -- to safety goal objectives. First, and we have already alluded to this, is the question of what I will call scope. The objectives that we are identifying here are intended to mean that all initiating events, external and internal, except sabotage, should be incorporated in the concept of the target there.

And this is entirely consistent with, identical with a statement in the Safety Goal Policy Statement with respect to interpretation of the quantitative health objectives. All we are saying here is we want to be consistent with that approach. That is, it is intended that these are objectives, when one has gotten all of the kinds of initiating events, except sabotage.

Finally, I wanted to add on this question because we do have external event PRAs, many of which treat matters of seismic concern. And there is a tendency in external event PRAs to deal with what is sometimes referred to as "bounding treatments of the events" because, in the absence of some detailed historical data, for example. So it becomes a little bit difficult to really interpret very cleanly in a quantitative sense, some of the external event PRAs.

And in a moment I will have another statement that I will make that also alludes to this same problem,

but there is another question regarding making such comparisons, and this has to do with the matter of how uncertainties are treated in a PRA.

As Commissioner Rogers has pointed out, we've defined these objectives, and we are proposing that these objectives be defined in terms of mean values, which implies a distribution. Now, many PRAs are done making point estimates of bottom lines. And there may be discussions of uncertainties in the analysis, but the uncertainties are not propagated through the analysis, so one does not obtain a distribution. And, therefore, by definition, you don't obtain a mean value.

It could be an analyst's estimate of what a mean value might be. It could be an analyst's estimate of what a most likely value would be. But this is a caution on making comparisons. I don't mean to imply that one cannot under any circumstances make the comparison, but it can be something like an apples and oranges comparison because they are not stated and defined on the same basis.

On the other hand, if mean values are used, it implies that uncertainties have been propagated through analysis and this would be, theoretically, the correct way to make the comparison.

Going on to the next slide -- (slide) -- page 14, I will say just a few brief words about -- the next

element, I think was identified as the third earlier -- on the integration of risk reduction modifications. I referred to it, in introducing it earlier, as an accounting tool. We have had under development in the Office of Research for a number of years, some codes that can actually be run on a personal computer, which appear to have very great utility in dealing with PRA information, in part, as simply a filing system for compiling information from a PRA, which has been done, which can then be readily accessed on a PC by members of the staff, as they gain experience with the tool.

The information contained therein on file can be updated from time to time, either with new PRAs, or when plants have actually made modifications that would change some of the results of the PRA, then the file can be updated on that.

Then at any given time, that file and whatever number of plants are available, and it is a growing number in the data base that we have, one can use that as a means of testing the potential for risk reduction modifications. As you can, if you will, play "what if" kinds of games on the computer to determine what kind of reduction in core damage frequency, or reduction in health effects, or reduction in large release frequency -- one can query the system in that fashion.

So, what all this is is an element that we feel that it is very appropriate, and desirable to continue work on the use of this kind of tool. And it has very definite application in the implementation plan.

Proceeding to the next slide -- (slide) -- we identified a key element of the plan to review PRAs, to assess regulatory requirements and, again, a few more words on what this means. It is still basically a sampling process. The size of the sample will be expected to grow in time. At any given time if a decision is made, a particular regulatory decision is made, it will be made on the basis of some particular sample size, which may be small, it may be large, depending on the number of relevant PRAs one has available.

We expect NUREG-1150, in its ultimate final--currently revised form and ultimate final form, to have utility in this process. It would be a PRA which, after the completion of the peer review, we feel that one could have very high confidence in the conclusions and the insights that one can draw from it.

We are hopeful that we will be able to apply this in the further evolution of the Containment Performance Improvement Program, the CPI program, particularly with respect to the use of perspective definitions of a large release and the large release

guideline, to try to demonstrate the impact upon that number as an objective with respect to any proposed changes, or modifications, or improvements that the staff might suggest for various containment classes.

We would expect to also be able to consult and review PRAs that have been produced by industry. There are a number of them that are presently in-house that have been voluntarily submitted by licensees, for the most part, for the purpose of support for license amendment applications that they may be simultaneously requesting, but these also have useful information, which we propose to draw on, and ultimately, when IPE results are made available to us several years from now, a larger sampling of PRA, or PRA-like results will be available to the staff for use in this process.

A word about the general use of PRA in safety issue resolution. This is an activity in which the staff has engaged in for a number of years. It has been utilizing PRAs in the process of resolving generic safety issues. And in a sense what we are talking about here is suggesting that this process might receive some sort of formal acknowledgement or acceptability on the part of the Commission, provided it is used in a manner which is consistent with safety goal policy and any authorized quantitative objectives.

CHAIRMAN ZECH: Why don't you come to the Commission with recommendations, so you can word it carefully and we can look at it carefully, if that is what you want?

MR. HOUSTON: We can certainly do that.

CHAIRMAN ZECH: Let's do it. If that is what you want us to do, word it carefully and let us review it carefully, and we will get back to you.

MR. HOUSTON: Turning to the next slide, if I may -- (slide) -- the subsidiary objectives. A key point that I alluded to a little bit earlier was the use of internal event only PRAs, since they really do constitute a majority of PRAs that we have available. And it would seem not particularly constructive to say we can't use them because they are dealing only with internal events.

And what we are proposing here and suggesting is that we use the same numerical objectives. This creates an apparent anomaly, a philosophic or a logic anomaly, and it has the effect which is sometimes called the one plus one equals one syndrome. We choose to suggest it this way on the grounds that we would prefer not to partition the safety goal objectives and give the appearance of allowing so much for internal events, and allowing so much for external events. So that's a major reason for it.

The other is that in the context of the

uncertainties associated with PRAs, it does not make sense, for example, to take an objective of, say, in terms of core damage frequency, half of it be allowed to be initiated by external events, and half of it be allowed to be a target for internal events because the PRAs themselves have uncertainties which sort of swamp that kind of division by two, or by any other number, the distinction that one might make between the two.

DR. MURLEY: In other words, one plus one does equal one, which was as accurate as we can measure --

MR. HOUSTON: In PRA space that's a true statement, one plus one equals one, right.

And another one which is not a major point, is that we would propose to use subsidiary objectives, or formalize the use of subsidiary objectives, for limited range initiating events PRAs. For example, in dealing with the station blackout rule mentioned earlier, the initiating events, by definition, were associated with station blackout events. It did not incorporate when the PRA work was done, insights drawn from them, so that the bottom lines and core damage frequency, or health effects if they were calculated, would not correspond precisely to the -- definitionally to the objectives that had been set up. These, of course, should be consistent with the principal objectives that are approved.

Turning to the next slide -- (slide) -- Dr. Murley has mentioned some industry objectives. The ACRS has addressed this, should they be identical. The ACRS view, of course, is that they need not be identical. The staff does not disagree with that. What the staff is doing with respect to proposed industry objectives is simply to recognize that they are laudatory objectives and the staff is quite willing to measure the results of the design in terms of the proposed objectives that have been set by EPRI or General Electric Company. They are not, however, requirements placed on those designs.

In the case of the EPRI ALWR requirements document, they have identified what they call a quantitative investment protection goal, which is the core damage frequency. They see this in terms of protecting a utility's investment, and quite properly so.

They have also identified another goal, which is the one that Dr. Murley alluded to several minutes ago, which they characterize as a quantitative public safety goal. This is the one which conveys a sense of association with the idea of a large release, although they do not use that characterization of it, but it is the one that they propose to be 25 rem in a half mile, at a mean frequency of 10 to the minus 6 per reactor year.

In the case of the advanced designs by DOE,

they've proposed a goal that really relates to off-site emergency preparedness, in particular, an even more stringent goal which would, if met, in fact, and with high assurance, could give the appearance of alleviating the need for certain aspects of off-site emergency preparedness.

(Slide) In the last two slides, I attempted to summarize the principal recommendations and the principal things that we are asking for Commission authorization or approval. These are the proposed statements and definitions associated with the quantitative objectives, at what we call Level Three and Level Four in the hierarchy, the large release definition and the core damage definition at Level Four.

(Slide) On the last page, we are proposing also that it is probably appropriate if the Commission were to approve, in whole or in part, the proposed recommendation for implementing the safety goal policy. We believe that probably the best method for doing this would be to construct and bring back to you a conforming amendment to the safety goal policy statement itself, which would primarily be part five of that policy statement, the subject of which is guidance to the staff.

Although not having mentioned previously in the briefing today, the matter of cost-benefit is something

that still bears some association to the safety goal policy statement. It was part and parcel of the original intent on the part of the Commission to deal with cost-benefit issues.

The staff has indicated that we associate the implementation plan to a very large extent with matters associated with implementing backfit policy which, of course, applies to existing plants, but we did want to add here that another recommendation of the staff is that in accordance with the advice of the General Counsel, that approval be given to the incorporation of diverted on-site costs as the net cost trade-off, in the fashion that they have suggested is not only legitimate, but virtually required, if I recall the --

CHAIRMAN ZECH: Perhaps it would be appropriate for the General Counsel to make a comment.

MR. PARLER: The question was asked several years ago, as I now recall, by a Commissioner who is no longer a member of this collegial body. The response was provided. The response essentially was that if a licensee incurs on-site costs to protect the licensee's property and things on the site, that should, in effect, for cost-benefit purposes be viewed as a benefit to the licensee and, therefore, the overall or the net cost should take into account. It was not something that we recommended in

connection with this particular paper. It was something that we were asked to provide advice on by former Commissioner Bernthal several years ago. We did, and I haven't heard any negative reactions to it.

CHAIRMAN ZECH: It is the same position, though, you have taken before?

MR. PARLER: Yes, which we stick by.

CHAIRMAN ZECH: All right, fine.

MR. PARLER: It is really a common sense position, which --

CHAIRMAN ZECH: I just wanted to make sure it wasn't some new approach you were taking.

MR. PARLER: No, sir.

CHAIRMAN ZECH: Thank you.

All right.

MR. HOUSTON: I would just say in conclusion that the specific requests being made to the Commission are identified in the Commission paper itself, the things that we think are most important for your attention.

CHAIRMAN ZECH: All right, thank you very much.

MR. HOUSTON: Thank you.

CHAIRMAN ZECH: Any questions from my fellow Commissioners? Commissioner Roberts?

COMMISSIONER ROBERTS: I don't have any questions, I sure want to hear from the ACRS. And at this

point I am certainly not prepared to accept a number of the staff recommendations.

CHAIRMAN ZECH: All right, fine.

Commissioner Rogers?

COMMISSIONER ROGERS: Just a couple of things. I thought this was a very helpful briefing. It helped me to put things in a perspective. It has been difficult for me. Some of these things seem to float around in a way that it is tough to pin down, but I think there were a good many clarifications came out of this briefing. It still requires a great deal of thought, though.

Could you just review very briefly again, because I am not sure I got them point by point, where the really substantive differences are between your proposal and the ACRS? If you could just go over those once again.

MR. HOUSTON: All right, the principal one -- I think one could say the principal one deals with what we have called the adequate protection issue. It would appear that although the methodology we are talking about bears very much similarity -- as a matter of fact, it is essentially the same, but the ultimate object with respect to what any modifications to rules, or regulations would mean in terms of adequate protection, is different, that's the main one.

A second one is that the hierarchy -- what we

have called the hierarchy in the staff recommendations, does not -- it is really not the hierarchy in the same sense, or in the sense that the ACRS properly used that term.

The reason I say that is that what we have done in the hierarchy is to really reduce the scope of the-- as one goes down the levels, so that one can no longer regard the successive levels as surrogates for the level above. And they stand somewhat independently, but related to one another and tied into the characteristics of doing the PRA. In other words, we have associated it more strongly with PRA methodology than has the ACRS.

A third one is the large release definition. We've spent a great deal of time interacting with the ACRS on that particular point. It was primarily, I must say, at their suggestion and recommendation that led us to the proposed qualitative definition because they made the point that it really should be consistent with the quantitative health objectives, but we think we have created arguments that we don't think it is appropriate to try to define it as a release. So, that's another major difference.

The fourth major difference is that -- and the final one, I think -- is that the -- well, there are two more. They felt very strongly that there should be some

identification in a hierarchy of safety goal objectives, of a need to come to grips with trying to, in some sense, quantify what is meant by the term "how well a plant is operated". These are things that include the human factors considerations that Dr. Murley mentioned a little while ago, and they agree, and we agree that we don't know how to do this, but they are concerned about its omission from the general framework of safety goal policy.

COMMISSIONER ROGERS: Well, I guess we are concerned about it, too, but we just don't know how to do it.

MR. HOUSTON: That's correct. And that's what we say. It is not that we disagree with it in principle, as we don't know how to do it.

DR. MURLEY: That seems very strong in principle.

MR. HOUSTON: And, finally, one thing that I have not mentioned in the briefing, but the ACRS may consider it to be very important, particularly in the light of recent correspondence between the Commission and the ACRS, they did suggest that there was potential usefulness for an objective of what I will call "conditional containment failure probability". And we discussed that with them extensively. They didn't call it quite that, but that is basically what it was, that

containment should -- to try to bring some quantification to the concept of defense in-depth, between prevention and mitigation, they felt it was desirable to establish some sort of a target. They suggested 10 percent, or .1.

And there is discussion of that in the paper, and we decided, at least for the time being, that we don't really know a good way to do that, to make it generically applicable to all plants. And we feel in the meantime that if the large release guideline can be put into effect, that that goes a long way toward achieving a recognition of the full plant performance, including the containment, without putting any arbitrary, or possibly even artificial limitations with respect to how much should be mitigation and how much should be prevention.

COMMISSIONER ROGERS: All right. Here in the SECY you mention, or used the word "further testing of potential surrogates". What do you mean by testing in this? What does that mean?

MR. HOUSTON: Well, what it means is, basically, we call it reviewing, and it might be -- in many instances, it might have to do with a little bit of supplemental analysis from existing PRAs, to associate it with the definitions that we are performing. PRAs that-- typically, PRAs that have gone all the way to Level Three, for example, have presented consequence results in terms

of so-called complementary cumulative distribution functions.

They may have used -- they may have presented, for example, information on early fatalities that doesn't recognize the definition of the quantitative health objective in the safety goal policy statement, which deals with the individual risk within one mile from a plant.

So it would be supplemental analysis to bring the results to bear in the specifics of the definition. It also means that we would like to see the plants that are currently being treated in 1150, dealt with in this same framework, with a consistent set of definitions to see how they compare.

COMMISSIONER ROGERS: How long would this testing take?

MR. HOUSTON: Well, it depends on -- if we were able to devote appropriate resources, I would say probably six months, something of that nature.

COMMISSIONER ROGERS: All right, thank you.

CHAIRMAN ZECH: Commissioner Curtiss?

COMMISSIONER CURTISS: Just three or four questions. In the section on recommendations at the very end, last paragraph, page 16, you are asking for the Commission's guidance on whether to proceed as you have described in this paper, with the safety goal and what you

call a clear relationship between the policy and the statutory standard of adequate protection.

I must say I am not sure I understand, based upon this discussion, what the relationship is between the safety goal policy statement and adequate protection.

MR. HOUSTON: At the present time there is no apparent relationship, and that's the issue really, should there be.

DR. MURLEY: Do we want to quantify adequate protection is really the question.

COMMISSIONER CURTISS: What you are really saying here is you are proposing this approach, the use of a safety goal as an alternative to the ACRS approach, which would use it for the question of adequate protection?

MR. HOUSTON: That's correct. Which can be construed as implying a definition.

COMMISSIONER ROGERS: They would just connect the two together. I mean, they could substitute into each other --

DR. MURLEY: We are not prepared to do that.

COMMISSIONER ROGERS: -- and you are saying no.

MR. HOUSTON: We are not prepared to do that. They are not so concerned, I think, with the idea of establishing a standard for adequate protection. And I

think this may come out in your briefing with them. They are concerned with just having a level -- I would prefer to use the word -- something is acceptable and something is unacceptable. And they are concerned with just having one set of goals for it, and not deal with cost-benefit.

COMMISSIONER CURTISS: The ACRS would use the policy statement to define adequate protection, is that a fair statement?

MR. HOUSTON: I think what they have said, it can be drawn -- that conclusion can be drawn by a reader. They have not said that that explicitly.

COMMISSIONER CURTISS: If they are saying that, and we will ask them that in May, or I will, then I have two questions. One, why are you not prepared to do that?

And, two, in the absence of an approach like that, how do you define adequate protection?

MR. HOUSTON: The answer to the second question is, we don't have a definition as such. And there was extensive discussion with the publication of the recent revised backfit rule on this question. What the staff and what the Commission have done heretofore is make a finding that there is adequate protection, without defining it. It is presumptive evidence of adequate protection, when compliance with the rules and regulations can be stated to be the fact.

But in terms of giving it a real definitional attribute in some quantitative sense, is the question here. And the Commission -- as a matter of fact, the Union of Concerned Scientists seems to be suggesting that this would be a desirable thing to do. And we are simply making this a decision process for the Commission, as to whether the Commission feels that it would be desirable to make a statement with respect to what the perception should be, or is, between the safety goal policy and a conceptual adequate protection standards. It does not now exist, that's the point.

And it could be done -- what we are saying in the paper is, here is a perspective way that it could be done, but there are, I think, some pitfalls associated with it.

We tend to think of the concept of adequate protection in the sense that if we make a finding that for a particular plant there is not adequate protection, it seriously raises the question as to whether that plant should be allowed to continue to operate without making some change.

I believe it doesn't have to, but it does raise that question, certainly in the minds of the staff.

COMMISSIONER CURTISS: To shift gears a minute, you have elected not to establish a containment

performance objective. Could you expand upon the reason for that?

MR. HOUSTON: As I said a moment ago, one reason is that we found it very difficult to define it in what I would call a suitable generic fashion. The ACRS recommendation for point one, for example, may have merit for some classes of containment, but it may be a not sufficiently stringent standard. We think some containments can be better than that, for example.

This raises the question as to whether you have, rather, just one containment performance design objective, expressed in probabilistic terms, or some set of them, two or more. And we have decided at this point in time that we don't see any real advantage to doing that. We don't see any real advantage to trying to quantify in the sense of defense in-depth policy, just how far one should go with prevention, and how far one should go with mitigation.

We think it is far better to leave some flexibility between those two, as, in fact, exists among present designs.

COMMISSIONER CURTISS: How would the policy apply then in the CPI program?

MR. HOUSTON: What is intended in the CPI program would focus primarily on the use of the large

release guideline, which you did not see in the MARK I paper. It was not used there. That's what we would like to do.

COMMISSIONER CURTISS: Okay. I just have another question. On your second to last chart you summarized the staff recommendations, and on the question of the main core damage frequency, as I understand it, you are asking us to approve 10 to the minus 4 per reactor year for the present plants, as the Level Four criterion to use here.

MR. HOUSTON: Yes, that's correct.

COMMISSIONER CURTISS: You are using, or EPRI is using 10 to the minus 5 for future plants, and you allude to 10 to the minus 6 for plants without containment, in answer to the Bernthal questions. Are those numbers numbers that you are asking us to approve, or how would those be treated?

MR. HOUSTON: All three of them? Right now we are just asking primarily for the 10 to the minus 4. Remember, the way it is defined is, it's an aggregate, over all existing plants. Now, if that same number were put into effect and remained as part of the implementation policy planning, or as part of the Commission's guidance to the staff and were not changed, 25 years from now, for example, if we had some plants in existence and this

safety goal policy implementation plan were in effect, they would be part of the grouping of then operating plants. And you would still have this same 10 to the minus 4 objective, which is the aggregate average.

So, the future plants would, as they would come into existence, if and when, would tend to improve the appearance of the average value for plants out there.

COMMISSIONER CURTISS: That's all I have.

CHAIRMAN ZECH: Yes? General Counsel?

MR. PARLER: Mr. Chairman, in connection with the earlier discussion about the lack of a general, or a generic definition for adequate protection, this Commission is probably aware, that issue is now pending before United States Court of Appeals, although it is true -- and you were asked this question in a congressional hearing, I believe, a couple of years ago, whether or not there was a generic definition.

Although there is none, we argued before the court that the adequate protection finding is made on a case-by-case basis. And in making the finding on a case-by-case basis we have an abundance of objective criteria in the regulations to decide whether or not that judgment can be made.

The point that I want to make is the absence of a generic definition does not mean that we have no

criteria at all. Now, whether or not there should be a generic definition at this point is a policy question. It may well be that if we get an adverse decision from the court, that court decision is sustained up the appellate route, that we may have to think more about this, rather than just in policy terms.

CHAIRMAN ZECH: Thank you very much.

Well, let me thank all of you for a very informative briefing on this important subject. Your efforts to provide a general approach to implementation of the safety goal continues to have the support of the Commission, as you can see by this meeting today.

Based on today's presentation, and the staff's previous interactions with the ACRS, it is clear that you have gone a long way towards developing an acceptable framework for implementation of the safety goal policy. However, as we know, there are still some areas of disagreement between the staff and the ACRS. And we will look forward to hearing from the ACRS on the 3rd of May of this year, which is just a few weeks away.

The staff has indicated that you have used the safety goal objectives in the process of resolving generic safety issues, and intend to use them in the closure process for severe accidents, which encompasses the individual plant examinations, the IPE program and

containment performance improvements, the CPI program.

Since the staff is using these safety goal objectives, it seems to me that the Commission should consider approving some kind of an implementation plan to formalize and institutionalize this process. The ACRS and the staff have put considerable effort into trying to define and agree on an implementation process, and perhaps we have gone about as far as we can go at this time.

After we hear from the ACRS on the 3rd of May this year, I suggest that the Commission consider at that time whether or not we should approve those parts at least of the staff's recommended implementation safety goal policy that they have presented us here in order to meet the Commission's objective of assuring that our regulations are appropriate.

So perhaps the Commission, after we have heard from the ACRS, wants to take that suggestion under consideration.

Are there any other comments from my fellow Commissioners?

General Counsel?

MR. PARLER: I would just like to point out, on a low key at this point --

CHAIRMAN ZECH: Please.

MR. PARLER: -- a potential concern. And that

is, if these policy objectives eventually are approved in a policy statement, one would have to be careful to make sure that if there are any conflicting requirements, in existing regulations or in applicable precedents, I would have to make it quite clear, you know, what the situation will be; otherwise we are liable to have more litigation, such as Limerick, which would be more difficult to deal with if that kind of question is not clearly answered by the Commission when it adopts -- when it decides whatever it is going to do with these objectives.

CHAIRMAN ZECH: A very important point, and we want to, of course, do what is correct, as well as appropriate, as far as our process is concerned, too, but I do believe that the staff is telling us that since they are already using these, at least for guidance in some in their determinations, it would be appropriate for the Commission to at least voice our approval, or disapproval of what they are doing, or at least let the staff know whether they should proceed or not, and the form we do that in, of course, as the General Counsel points out, is very important. So, we will take that into consideration when we do give you that Commission guidance.

Are there any other comments?

COMMISSIONER ROGERS: Just to stress, again, the point that even though the safety goals, as they are being

formulated here, are being stated in numerical language, they still are not an exact or precise definition, a numerical definition. They are a guide, and a very useful guide. And I think that we should recognize that even approximate numbers are very useful guides, and that it is sometimes best to not try to make them too precise because then they bind us to something that we are not ready, because of the state of our knowledge and our skills in making analyses, to be that precise. And yet an approximate numerical guide is still a very, very useful device to have.

So, I think we should try to keep this whole thing in that perspective, that while the safety goals, as they are formulated, do have numbers in them, they are not precise, exact numbers. They have a certain degree of roughness to them because they reflect the state of our ability to make these analyses.

CHAIRMAN ZECH: Well, let me just emphasize, again, we look forward to hearing from the ACRS on the 3rd of May on this. And then after that time we will reflect on your presentation today, and what we have heard from the ACRS, and determine whether or not it would be appropriate for us to give you any further guidance.

All right, anything else?

(No response)

CHAIRMAN ZECH: Thank you very much for an excellent briefing.

We stand adjourned.

(Whereupon, at 3:44 p.m., the meeting 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 IMPLEMENTATION OF SAFETY GOAL POLICY STATEMENT
PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: APRIL 13, 1989

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.

Reporter's name: Phyllis Young

IMPLEMENTATION OF SAFETY GOAL POLICY

PROPOSED STAFF RECOMMENDATIONS TO THE NUCLEAR REGULATORY COMMISSION

APRIL 13, 1989

R. W. HOUSTON
OFFICE OF NUCLEAR REGULATORY RESEARCH

INTRODUCTION

PURPOSE:

TO REQUEST COMMISSION APPROVAL OF ADDITIONAL SAFETY GOAL GUIDANCE TO THE STAFF

TO CLARIFY ROLE OF PRA AND QUANTITATIVE SAFETY GOAL OBJECTIVES IN FUTURE REGULATORY DECISIONS

WHAT SAFETY GOAL OBJECTIVES ARE - AND WHAT THEY ARE NOT

IMPLEMENTATION OF SAFETY GOAL POLICY OVERVIEW

- ACRS RECOMMENDATIONS

- STAFF RECOMMENDATIONS

  GENERAL APPROACH

  PRINCIPAL ELEMENTS

- INDUSTRY OBJECTIVES FOR EVOLUTIONARY LWRs

ACRS RECOMMENDATIONS

THREE PRINCIPAL ELEMENTS - ACRS LETTER MAY 13, 1987

1. PURPOSE: TO EVALUATE ADEQUACY OF RULES AND REGULATORY PRACTICES

2. APPROACH: FIVE LEVEL HIERARCHY

   TOP DOWN SUCCESSION OF SURROGATES

3. METHOD: SAMPLING PROGRAM OF PRAs

   ANALYSIS OF WHY PLANTS MEET OR DO NOT MEET OBJECTIVES

ADDITIONAL ACRS COMMENT

ACRS LETTER APRIL 12, 1988

- DEFINITION OF LARGE RELEASE - AS A "RELEASE"
- DEFINITION OF CORE MELT - LOSS OF ADEQUATE CORE COOLING
- PLANT PERFORMANCE OBJECTIVE - HOW WELL PLANT IS OPERATED
- COST-BENEFIT - NO ROLE IN USING SAFETY GOALS

ACRS LETTER JULY 20, 1988 - DOE SPONSORED REACTOR DESIGNS

- HOW SAFE IS SAFE ENOUGH? EQUATED TO "ADEQUATE PROTECTION"
- SAFETY GOALS SAME FOR ALL PLANTS, PRESENT AND FUTURE

NRC STAFF RECOMMENDATIONS

GENERAL APPROACH

- USE OF PRA IN REGULATORY DECISIONS
- QUANTITATIVE OBJECTIVES AS TARGETS FOR GENERIC REGULATORY REQUIREMENTS - NOT CRITERIA FOR INDIVIDUAL LICENSING DECISIONS
- IMPLEMENTATION OF BACKFIT RULE
    - PROVIDES ADDITIONAL BENCHMARKS TO GAUGE SUBSTANTIAL INCREASE IN OVERALL PROTECTION
    - STUDY POSSIBILITY: RELATION TO AN ADEQUATE PROTECTION STANDARD

NRC STAFF RECOMMENDATIONS

PRINCIPAL ELEMENTS:

1. ESTABLISH HIERARCHY OF OBJECTIVES

2. REVIEW OF PRAs TO ASSESS EFFECTIVENESS OF REGULATORY REQUIREMENTS

3. INTEGRATION OF RISK REDUCTION MODIFICATIONS AND TESTING OF PROPOSED MODIFICATIONS

4. USE OF SUBSIDIARY TARGETS FOR GENERIC SAFETY ISSUE RESOLUTION; USE OF LESS THAN FULL SCOPE PRA INFORMATION

SAFETY GOAL OBJECTIVES

LEVEL ONE - QUALITATIVE SAFETY GOALS *

LEVEL TWO - QUANTITATIVE HEALTH OBJECTIVES *

LEVEL THREE - LARGE RELEASE GUIDELINE

LEVEL FOUR - ACCIDENT PREVENTION OBJECTIVE

LEVEL FIVE - REGULATORY REQUIREMENTS

* LEVELS ONE AND TWO SPECIFIED IN SAFETY GOAL POLICY STATEMENT

RELATIONSHIP OF SAFETY GOAL OBJECTIVES TO PRA LEVELS

SAFETY GOAL HIERARCHICAL LEVEL	PRA LEVEL
ONE	N/A
TWO	I / II / III (CONSEQUENCE MITIGATION)
THREE	I / II (ACCIDENT MITIGATION)
FOUR	I (ACCIDENT PREVENTION)
FIVE	N/A

LEVEL THREE OBJECTIVE

- FOCUS ON COMBINED PREVENTION AND MITIGATION
- OVERALL MEAN FREQUENCY OF A LARGE RELEASE
  LESS THAN 1 IN 1,000,000 PER REACTOR-YEAR
- MEANING OF "OVERALL" - COLLECTIVE AVERAGE OVER
  ALL PLANTS
- DEFINITIONAL OPTIONS FOR "LARGE RELEASE"
  - HEALTH EFFECTS
  - DOSE
  - RELEASE (SOURCE TERM)
  - CONTAINMENT FAILURE

LEVEL THREE OBJECTIVE (CONTINUED)

- THE THRESHOLD PROBLEM
- RECOMMENDED DEFINITION

  A LARGE RELEASE IS ANY RELEASE THAT HAS A POTENTIAL FOR CAUSING AN OFFSITE EARLY FATALITY

- QUANTITATIVE SURROGATES PROPOSED FOR FURTHER TESTING:
  - ONE OR MORE EARLY FATALITIES

    (DEMONSTRATED IN NUREG-1150 DRAFT)
  - EARLY CONTAINMENT FAILURE

LEVEL FOUR OBJECTIVE

- FOCUS ON ACCIDENT PREVENTION
- OPTIONAL DEFINITIONS

  CORE DAMAGE (LOSS OF ADEQUATE CORE COOLING)

  CORE MELT (PRESSURE VESSEL FAILURE)
- CORE DAMAGE RECOMMENDED

LEVEL FOUR OBJECTIVE (CONTINUED)

- RECOMMENDED OBJECTIVE:

  THE OVERALL MEAN FREQUENCY OF CORE DAMAGE EVENTS SHOULD NOT EXCEED 1×10^{-4} PER REACTOR YEAR

- SUBSIDIARY TARGET FOR FUTURE DESIGNS

  1×10^{-5} PER REACTOR YEAR

  - SUGGESTED BY IAEA (INSAG) REPORT, 1988
  - PROPOSED BY EPRI FOR ALWR DESIGNS

COMPARING PRA RESULTS TO SAFETY GOAL OBJECTIVES

SCOPE:

- OBJECTIVES INCLUDE ALL INITIATING EVENTS, EXTERNAL AND INTERNAL, EXCEPT SABOTAGE
- CAUTION ON BOUNDING TREATMENTS OF EXTERNAL EVENTS

TREATMENT OF UNCERTAINTIES:

- POINT ESTIMATES
- MEAN VALUES

INTEGRATION OF RISK REDUCTION MODIFICATIONS

CONTINUED DEVELOPMENT OF PLANT SPECIFIC DATA BASE FROM PRAs - AN ACCOUNTING TOOL

UPDATING RISK SIGNIFICANT PLANT MODIFICATIONS

TESTING POTENTIAL RISK REDUCTION MODIFICATIONS

REVIEW OF PRAs TO ASSESS REGULATORY REQUIREMENTS

ROLE OF NUREG-1150

APPLICATION TO CONTAINMENT PERFORMANCE IMPROVEMENT PROGRAM

REVIEW OF INDUSTRY PRAs INCLUDING IPE RESULTS

GENERAL USE OF PRA IN SAFETY ISSUE RESOLUTION

SUBSIDIARY OBJECTIVES

- USE OF INTERNAL EVENT ONLY PRAs

  SAME NUMERICAL OBJECTIVES

- USE OF LIMITED RANGE OF INITIATING EVENTS PRAs

  APPROPRIATE FOR RESOLUTION OF GENERIC SAFETY ISSUES (E.G. STATION BLACKOUT RULE)

  CONSISTENCY WITH PRINCIPAL OBJECTIVES

INDUSTRY OBJECTIVES VS REGULATORY OBJECTIVES

- SHOULD QUANTITATIVE OBJECTIVES BE IDENTICAL?
  - ACRS AND STAFF VIEWS
- EPRI - ALWR
  - QUANTITATIVE INVESTMENT PROTECTION GOAL
  - QUANTITATIVE PUBLIC SAFETY GOAL
- DOE - ADVANCED DESIGNS
  - GOAL RELATING TO OFFSITE EMERGENCY PREPAREDNESS

SUMMARY OF STAFF RECOMMENDATIONS

A. ADDITIONAL QUANTITATIVE OBJECTIVES

- LEVEL THREE
  - LARGE RELEASE DEFINITION - QUALITATIVE
  - QUANTITATIVE SURROGATES FOR TRIAL USE
  - OVERALL MEAN FREQUENCY - 10^{-6} /R-Y
- LEVEL FOUR
  - CORE DAMAGE DEFINITION
  - OVERALL MEAN FREQUENCY - $1X10^{-4}$ /R-Y

SUMMARY (CONT'D.)

B. PREPARATION OF CONFORMING AMENDMENT TO SAFETY GOAL POLICY STATEMENT

C. COST - BENEFIT

- INCORPORATION OF AVERTED ON-SITE COST AS NET COST TRADEOFF (OGC ADVICE)