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UNITED STATES NUCLEAR REGULATORY COMMISSION'S
ADVISORY COMMITTEE ON NUCLEAR WASTE

MAY 20, 1997

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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92nd MEETING
ADVISORY COMMITTEE ON NUCLEAR WASTE (ACNW)

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TUESDAY
MAY 20, 1997

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ROCKVILLE, MARYLAND

The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Paul W. Pomeroy, Chairman, presiding.

COMMITTEE MEMBERS:

PAUL W. POMEROY	CHAIRMAN
B. JOHN GARRICK	VICE CHAIRMAN
WILLIAM J. HINZE	MEMBER
GEORGE M. HORNBERGER	MEMBER

ACNW STAFF PRESENT:

JOHN T. LARKINS	Exec. Director
MICHELE KELTON	Tech. Secretary
RICHARD K. MAJOR	
HOWARD J. LARSON	
LYNN DEERING	
ANDREW C. CAMPBELL	
RICHARD P. SAVIO	
MICHAEL MARKLEY	
CAROL A. HARRIS	
SAM DURAISWAMY	
THERON BROWN	

ACNW CONSULTANT PRESENT:
MARTIN J. STEINDLER

ALSO PRESENT:
MARK THAGGARD
KEITH McCONNELL
NORM EISENBERG
MIKE BELL
JIM KENNEDY

C O N T E N T S

P R O C E E D I N G S

8:36 a.m.

CHAIRMAN POMEROY: The meeting will now come to order. This is the first day of the 92nd meeting of the Advisory Committee on Nuclear Waste.

During today's meeting the committee will first discuss the Generic Methodology for Decommissioning Performance Assessment; secondly, prepare for and meet with the Commissioners from 2 to 3:30 this afternoon, is the time for that meeting in the Commissioner's Conference Room; and thirdly, begin to prepare ACNW reports to the Commission.

Mr. Howard Larson, third to my right, is the designated Federal Official for today's initial session. This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act.

We have received no written statements from members of the public regarding today's session. Should anyone wish to address the committee, please make your wishes known to one of the committee staff.

It is requested that each speaker use one of the microphones, identify himself or herself, and

speak with sufficient clarity and volume so that he or she can be readily heard.

Before proceeding with the first agenda item, I'd like to cover some brief items of current interest. To us, the most important item of interest is the fact that this is Dr. Hinze's last meeting with the committee as a member of the committee. Dr. Hinze will continue to serve as a consultant to the committee and will attend our meeting in San Antonio in July and our Las Vegas meeting in September.

I'd like to take the time to read into the record a letter from the members of the committee to Dr. Hinze.

MEMBER HINZE: In public?

CHAIRMAN POMEROY: There will be other opportunities to provide comments, but we would like to have this officially in the record. And this is a letter to Dr. William J. Hinze from the other three members of the Committee.

"Dear Bill: As you leave the Advisory Committee in Nuclear Waste we want to express our most sincere appreciation and gratitude. Your experience and the expertise in the geosciences has been immensely valuable to us. Your dedication,

Intellectual curiosity, and hard work has helped us meet many challenging deadlines.

"Over the past eight years you have helped resolve numerous issues involving the geosciences. Your technical insights have improved the regulatory process and your understanding of high quality science has had a major impact on the Nuclear Regulatory Commission's high and low level waste programs.

"Your advice has guided us in formulating committee comments and recommendations on numerous, complex, technical matters, including the Commission's direction-setting issues, time of compliance for high level and low level waste disposal, coupled processes, and NRC's high level waste pre-licensing program, igneous activity and high level waste disposal, unsaturated zone hydrology for Yucca Mountain -- this is a long sentence, isn't it -- groundwater age dating techniques, natural resources in the vicinity of Yucca Mountain, the effects of climate change on waste disposal, and geologic dating methods in natural analogs."

There should be a verb at the end of all that.

"You were our leader in reviewing the high level waste research program and key technical issues. Your distinguished service, hard work, and outstanding technical leadership has helped us immensely in our mission of providing valuable and timely advice to the NRC on many highly complex, technical issues.

"Your collegiality and enthusiasm for science, as well as your diplomacy in dealing with many challenging issues, sometimes on short time schedules, is deeply appreciated.

"Above all, it has been a pleasure and a privilege to serve with you over the years. Working with you has enriched us all. You have brought out the best in all of us, and that is of course, true leadership. We wish you the best in your future endeavors, and look forward to a continuing association with you."

Sincerely, the members of the committee. Thank you, Bill.

MEMBER HINZE: Thank you, Paul, and I thank the past and present members of the committee for their collegial support. I couldn't understand why I was tired but after hearing you read that letter, I understand why I am.

CHAIRMAN POMEROY: I was tired. Thank you, Bill. More opportunity for that later.

The second item of interest, a lawsuit just heard in a U.S. court, could delay the opening of the Waste Isolation Pilot Plant for two to five years if it's successful. The Attorney Generals of New Mexico and Texas, along with citizen's groups and private citizens, claim the Environmental Protection Agency's present compliance criteria for WIPP are insufficient to protect public health and the environment.

A third item of interest, as everybody knows, I believe, the tunnel boring machine broke through the south portal at Yucca Mountain on April 25th, 1997, at 11:05 a.m. And now I understand the argument is continuing about the east-west tunnel.

Let me turn now to the first item on our agenda which we have scheduled through 10 o'clock today. And Dr. Garrick is our lead member for this item. John?

VICE CHAIRMAN GARRICK: Thanks, Paul. This is a subject of course, of continuing and of long-time interest to the committee. As a matter of fact, this is a subject of interest to both of the Advisory Committees. And as I looked at the past

record concerning it, there seems to be a couple points that were emphasized.

One has to do with the desire to take a systems approach with respect to decommissioning. And of course, the other and the one that we're going to get an update on today, is the use of performance assessment and how in fact, it will be employed in decommissioning.

So I think that we will look at today as a matter of getting an update on the approach taken by the staff in the application of performance assessment to decommissioning. And we have Mark Thaggard here to provide us with that update, and if there are other people he will introduce them. Mark?

MR. THAGGARD: Good morning. Can everyone hear me? I'm going to begin the presentation today. I do have Dr. Eisenberg here from my office, along with Dr. McConnell, kind of backup support.

Dr. Garrick has already introduced me. My name is Mark Thaggard; I'm from the Division of Waste Management. This presentation is in response to an earlier request by the committee to find out how the Division is using its performance assessment capabilities and PA tools used in the low level

waste area to support the decommissioning program.

What I'd like to go over today is, first of all I'd like to give you some background information on performance assessment. The purpose of this background information is to show some of the commonalities in performance assessment, whether it's done for high level waste, low level waste, or for decommissioning.

In addition, I want to show how performance assessment has evolved within the Division, to provide a comparison between the regulatory framework between low level waste and decommissioning. Our understanding of the difference in the regulatory framework provides some insights in some of the differences in the proposed approach for performance assessment in low level waste versus decommissioning.

Then I'd like to briefly go over the proposed low level waste performance assessment approach in the draft branch technical position. This was previously presented to the committee so I'm only going to lightly touch on it today.

Then I'd like to provide an overview of the decommissioning performance approach, and this is going to be the main focus of my presentation.

And then I will conclude by briefly talking about some of the computer codes that we're using in performance assessment, and some other related ongoing activities.

Some common elements in performance assessment, whether it's done for high level waste, low level waste, or decommissioning, includes: a description of the natural and engineered system; an understanding of likely and unlikely events; a description of processes for waste transport; an estimation of potential release and human exposure; and some type of evaluation of uncertainties in the results.

Three components in a performance assessment analysis include: trained and experienced analysts; quantification tools; and data. Some of the trained and experienced analysts and quantification tools that were used in the low level waste program are now being used to support the decommissioning program.

The performance assessment analysis should be driven by the characteristics of the waste disposal system -- and I've given some examples here -- and the characteristics of the compliance framework; that is, the regulatory framework.

Performance assessments was first developed to support high level waste programs back in the mid-1970s. It provided some insights into the repository, and also helped with the formulation of 10 CFR Part 60. Demonstration of staff capabilities in implementing the performance assessment identified key research needs and showed the need for integration among the disciplines.

We are still using performance assessment in the high level waste program, and some of the approaches, staff capabilities and PA tools used in the high level waste program has been adapted for use in the low level waste program, and now we are adapting them for the decommissioning program.

Performance assessment is used in the Division to support decommissioning to carry out NEPA analysis. It's used in the low level waste area to develop guidance and provide technical support to States, and in the high level waste program to assess the viability of the proposed repository, and also to analyze site-specific regulation.

And as I stated before, one of the characteristics of a performance assessment analysis is that it should be driven by the compliance

framework. Understanding differences in the regulatory framework between low level waste and decommissioning provides some insights into some of the differences in the proposed performance assessment approach between the two programs.

In low level waste, the regulation has four performance objectives: a dose standard for protecting the general public; provisions for protecting inadvertent intruders through waste classification and intruder barriers; requirements for protection of individuals during operation; and requirements for long-term stability.

The proposed rule in decommissioning, on the other hand, really only has provisions for dose standards as the primary performance objective. And there are two situations: one is for an unrestricted release and the other is for restricted release. The reason I point this out, because you're going to need to understand this a little bit as we start going through the framework.

When we look at the situation of the restricted release there are two situations that have to be analyzed in the performance assessment analysis. One case involves looking at the dose to somebody offsite, because there's a 25 millirem

standard, assuming that institutional controls are effective in keeping somebody from moving onto the site.

The second case involves looking at the impact to somebody onsite, assuming that the institutional controls fail at some point.

Several key points to consider when comparing performance assessment for low level waste and decommissioning are that decommissioning sites are not sited for waste disposal, so some of the pathways that may be less important in the low level waste performance assessment may become very important in decommissioning.

Also, there's no waste classification or intruder barrier requirements, and so this aspect of somebody getting onto the site becomes a real important aspect of a decommissioning performance assessment analysis. In low level waste this is largely taken care of by the waste classification and intruder barrier requirements within the regulation.

There's also a proposed 1000-year timeframe in regulation so if a licensee is proposing barriers such as covers, their performance may be important in terms of demonstrating

compliance.

There are also some key differences in the source terms that you typically have between low level waste and decommissioning. At most decommissioning sites you have a small number of radionuclides that you're dealing with, and you usually don't have waste containers to contend with.

But on the other hand, you may have to deal with hazardous chemicals if you're looking at -- if you're dealing with NEPA. There also may be the possibility that you have existing groundwater contamination at the site, so you may be -- in the performance assessment analysis you may be analyzing the release of contaminants to the groundwater.

In addition, you may be modeling transport of existing contamination, which is something you wouldn't have to deal with in low level waste.

Now, what I wanted to was, I want to briefly go over the proposed performance assessment approach that's recommended in the draft branch technical position for low level waste performance assessment. And this will allow you to see some of the similarities and some of the differences in the proposed approach that we're recommending for decommissioning.

And as I indicated before, since this has already been presented to the committee, I'm going to go over this kind of briefly.

The main point is that it is an iterative approach. You begin by analyzing the data, develop the conceptual models and your parameter distributions, formulate your mathematical models and select computer codes to implement the mathematical models, carry out the analysis, do some sensitivity analysis, and then you ask the question, do you meet the dose objective? If you meet the dose objective then you're basically finished.

On the other hand, if it turns out that you do not meet the dose objective based upon the analysis, the sensitivity analysis will have helped identify the key parameters and assumptions that's driving the models.

So you can possibly go out and collect data to update your parameter distributions or change your conceptual models, reformulate your mathematical models, select new computer codes if need be, and run through and do your consequence analysis again. And you may go through this several times and for that reason it's an iterative approach.

CHAIRMAN POMEROY: Mark, before you go on with your next slide, maybe this is the right place to begin to ask this question. We're really talking about two things here: the low level waste performance assessment approach that was developed for low level waste --

MR. THAGGARD: That's correct.

CHAIRMAN POMEROY: -- versus the one that is being developed at this point in time for decommissioning.

MR. THAGGARD: That's correct.

CHAIRMAN POMEROY: If I understand you correctly you're saying that there are pieces of the low level waste PA program as it was developed, that are being used in decommissioning?

MR. THAGGARD: That's correct. Where we can carry over we've done that, but I'm trying to highlight that there are some reasons that there are differences in the approaches. One of the reasons is that there are some differences in the regulations.

CHAIRMAN POMEROY: One of the things that I wanted to ask was, is there -- and perhaps you're not the person to answer this but one of your two compatriots are I'm sure -- are there any plans to

continue with the development of a low level waste performance assessment package that might be useful, for example, for us in the future, or for the States -- in their development work?

MR. THAGGARD: Well, Keith can answer that.

CHAIRMAN POMEROY: Good morning, Keith.

DR. McCONNELL: Good morning. Keith McConnell, NRC staff. We basically are continuing with the low level waste BTP. It should go out for public comment today or tomorrow, I would expect -- be signed out. Beyond that, there is some minor assistance to the States when they call in, but that's about it in the low level waste program area at this point.

CHAIRMAN POMEROY: So we're anticipating that anybody that needs a low level waste performance assessment package will develop that or will find it in the external community?

DR. McCONNELL: We would hope that they would look at the BTP as kind of a guidance document for them to develop their own program, and for an implementor to develop their own programs. But I think that's basically it.

CHAIRMAN POMEROY: You know what I'm

looking for here today. How much of the low level waste performance assessment development is useful? Mark has pointed out that there are models and so forth that are taken. Is this basically a new initiative, or does this have a significant component that's drawn from the low level waste performance assessment?

DR. McCONNELL: I'll let Mark speak to the specifics, but in general I think a large part of the low level waste effort is being harvested into this decommissioning PA strategy and guidance. And we've also used a low level waste test case and some of the supporting work as a basis for some of our analysis in high level waste.

So I think it's a fairly well integrated effort where we're using some of the techniques developed in high level to apply to low level and decommissioning and vice versa. So I think it's pretty well integrated and we're trying to be as efficient as we can.

MR. THAGGARD: Yes, one of the things, to answer your question, is yes to both of them. It's somewhat new but we're also using what we can that's already been developed. The people that are developing this are Sandia National Laboratory.

They were, obviously, very instrumental in developing the performance assessment methodology for low level waste. Some of the same people -- some of the same staff members are involved so there's some continuity from that standpoint.

CHAIRMAN POMEROY. Okay. We may want to return to that later, but let's go on.

MR. THAGGARD: Okay. Now what I want to get into is the proposed approach that we're recommending for decommissioning. As I indicated, this is going to be the main focal point of my presentation. What I'd like to do is, I'd like to go through this flow chart one time fairly quickly, and then come back and touch on some of the individual elements of it.

The approach begins with the assimilation of existing data and information, which leads to defining scenarios and pathways, developing a system conceptualization, doing an analysis, and the question this time is: can the site be released? If, based on the analysis the site can be released, then you need to determine whether or not the ALARA requirements have been met. If so, then you can basically terminate the license.

If on the other hand, you determine that

the site cannot be released based upon the analysis, then you need to go through and define a set of options that would allow the site to be released. And also options that would need to be considered under the NEPA requirements.

Once you've defined the various options that possibly could allow the site to be released, you analyze these options in terms of the costs to implement the option, the time it takes to carry out the option, and the probability of being able to release the site.

Based on that information, you select a preferred option, then you collect data to verify that your assumptions about the probabilities are correct. You may also need to do some remediation, and then collect data, update your assumption, parameter values, pathways, and go back, redevelop your conceptualization of the system, do your analysis, and ask the question again: can the site be released?

And of course if it can't be, you have to go back in here and redefine your options. If it can, then you go down here, determine whether or not you met the ALAR requirement, and terminate the license. So again, it's an iterative process.

When you get over here, when you select your preferred option, if none of the options would allow the site to be released then there's a provision that the license will have to be maintained.

And now what I'd like to do is, I'd like to walk you through some of the elements. In the first step we are talking about the assimilation of existing data and information, and the key point here is that we're only talking about existing information. No new data is collected at this step.

And some of the examples of the type of information that may be available when we get into these sites; at some sites there's only information on the source term; at other sites there's extensive amount of site characterization data that's already been collected. But the key point about step number 1 is that you use the existing information; no new data is collected.

In step number 2 you define your scenario, which is basically the future state of the system. This can either be generic or site-specific. We've been working with the Office of Research to try and come up with generic scenarios that should be used in these analyses, or identify what type of guidance

is needed to select site-specific scenarios. The main point is that the doses should go down, even if the scenarios are changed as you iterate through the process.

The pathways are basically the source to human receptors. And these can change based on site-specific information. What I mean by that is, an example is that if we recommend as a generic scenario, that everybody looks at the residential farmer scenario, at a specific site there may be some information that indicates that the groundwater is not usable.

Well, for that particular site, based on that information, you would turn off the groundwater pathway in your analysis. You would still use the residential farmer scenario because it would be the defined generic scenario, but based on the site-specific information you would turn off the -- you wouldn't consider the groundwater being used.

In step number 3 you develop your system conceptualization to be based on a specific scenario and set of pathways. You define your process and parameters to use in the analysis, and your code selection should be based on your system conceptualization. Some of the information about

the parameter uncertainty I'm going to get to in a minute.

In step 4 you do the consequence analysis. This is basically where you calculate the dose from all the pathways and scenarios. Under the approach that's recommended, you can use the bounding conservative deterministic analysis, or prudently conservative deterministic analysis, or probabilistic analysis.

In step number 5 is where you get to the question, can the site be released? The first time through the process the question is, can the site be released for unrestricted release? According to the regulation, that needs to be looked at, so the first time through that's the question.

Subsequent times through the process the question becomes, can the site be released? So you may be asking, can the site be released for unrestricted use or can it be released with restrictions?

In step number 6 you need to determine whether or not the ALARA requirements are met for unrestricted release without remediation. This will probably involve some type of cost benefit analysis to determine whether or not additional contamination

need to be removed.

For the unrestricted release following remediation or for restricted release, the goal and intent of ALARA should be met when you identify your various options and consider the costs associated with implementing those various options.

And now I'd like to go through steps 8 through 10. At this point you've done your analysis and you've determined that the site cannot be released. In step 8 you define various options, and these could include collecting data that would allow you to be able to release the site for unrestricted release.

Maybe your initial analysis was too conservative and there might be some data you can go out and collect that would allow you to be able to demonstrate that the site could be released for restricted use.

Another option might be to remediate the site and then release it for unrestricted use. Another option might be to remediate a part of the site and put restrictions on the other part of the site. Another option might be to collect data and then remediate. Another option might be just to place restrictions on the site. And then the no

action option needs to be looked at for NEPA.

VICE CHAIRMAN GARRICK: Excuse me, Mark. What about the option of just improving your model? Maybe the model is just too simple.

MR. THAGGARD: Well, that would probably be similar to collect data. These are just examples, but yes, that could certainly be one of them.

VICE CHAIRMAN GARRICK: Because I can imagine situations -- well, matter of fact, experience indicates that very often the recycling is more of a turning up the microscope on the model than it is actually collecting data or what have you. But that is an option -- that is an acceptable alternative?

MR. THAGGARD: That's correct. But similarly, if you're going to change your model, you will have to have some justification --

VICE CHAIRMAN GARRICK: Sure.

MR. THAGGARD: -- or some data, something to justify that. But yes -- I mean, these are just examples, but the main point is that in step 8 you would identify the various options.

In step 9 you analyze these options in terms of the cost to implement the option and the

time to carry out the implementation, and some probability that you will be able to release the site by carrying out that particular option.

Step 10 is just a selection, or the preferred option. Now, one of the main points I want to make to you is that this process is designed to optimize your selection over a preferred option. A lot of these sites, we don't have a lot of money to deal with, so we don't want to -- the main idea is, we don't want to drive somebody into bankruptcy, especially without even knowing what is an appropriate means of remediating the site. So there's consideration of cost and time involved in this.

CHAIRMAN POMEROY: Mark, help me out with the logic a little bit here.

MR. THAGGARD: Okay.

CHAIRMAN POMEROY: As I understand it, you're dealing -- you're using the concept of a critical group here, and an average member of the critical group. Forget about the average member for a moment.

MR. THAGGARD: That's correct.

CHAIRMAN POMEROY: In this case, if you're talking about unrestricted or restricted release,

you're really talking about some person -- some hypothetical person or persons being on the site, is that not correct?

MR. THAGGARD: Well, if the -- we deal with restricted use of the site then there are provisions that you need to have institutionalized controls. But presumably, those institutional controls could fail, and for that reason there are two dose standards for somebody under that scenario, and you need to assess that as part of the performance assessment.

CHAIRMAN POMEROY: Right, but if, in the case of, if you're contemplated an unrestricted use you're looking at the question of some person being on -- physically located on --

MR. THAGGARD: That's correct.

CHAIRMAN POMEROY: -- the site.

MR. THAGGARD: That's correct.

CHAIRMAN POMEROY: So it's certainly a different kind of definition of a critical group; somebody will almost certainly be there and receiving whatever maximum dose that there is on the site.

MR. THAGGARD: That's correct, and we've been working closely with Research to try and figure

out how to define these average members of the critical group. It's not a trivial task.

CHAIRMAN POMEROY: No, we found that certainly to be true in our work on high level waste. I'm just curious though, I'm a little lost why it's so difficult here, if we're thinking of unrestricted use, you just put somebody right on the site and expose them to whatever maximum dose there is available on the site. Is there something wrong with that thinking, Norm?

DR. EISENBERG: I'm sorry, say that again?

CHAIRMAN POMEROY: Well, aren't you dealing with a question of, in a case of unrestricted use, you're going to put the member of the critical group on the site and expose them to the maximum dose on the site? It's almost a deterministic -- do you need a critical group for that, is I guess what I'm saying?

MR. THAGGARD: Well, you've got to define what that person does. See, that's the problem. You've got to -- I mean, is that a residential farmer? Is that the critical group, is that the member? Or is it somebody using the site as an industrial use? So you've got to put some definition to that.

You're right in terms of location. I mean, obviously location of it is on the site, but in terms of defining what that person does or what that person -- I mean, you know, that's the difficult part of it, and you need that in order to do the assessment. I don't know if that gets at the heart of your question.

CHAIRMAN POMEROY: Well, it helps me, certainly. Why don t we go on? Maybe I can frame it better later.

MR. THAGGARD: Okay. This just provides an example of what the output from the analysis could look like. On one axis you've got time, another you've got cost, and then the probability of being able to release the site. And these things that are defined as activity sets are basically the various options. This is just an example what the output could look like. We haven't gone through the process yet.

MEMBER HINZE: Mark, you have a time threshold. What's your cost threshold? Can you give me any more definitive way of evaluating the cost threshold?

MR. THAGGARD: Well, there are no cost thresholds within the regulation.

MEMBER HINZE: That's what I see on your diagram here.

MR. THAGGARD: Yes. Now, the reason the cost is on there is because, what I'm saying is, obviously cost is a consideration. I mean, it may cost you $200 million to clean up the site and carry all this stuff off the site, versus $50 million to leave it on site. And so you've got to weigh that in your consideration.

Especially if there's only $75 million available within the company, then to require that they carry out $200 million option, you know, you've got to -- the cost is there so that the decision-maker can consider it, but there's no set thresholds as to what that could be. It's just another piece of information for the decision-maker.

I mean, it will have to be something that will have to be included in an EIS anyway, as part of the NEPA requirement. You need to look at the cost, so it will just be another piece of information for the decision-maker. But there are no set thresholds within the regulation for cost.

MEMBER HINZE: It's an evaluation of each independent site and the owners of the site and the operators?

MR. THAGGARD: That's correct. Just to highlight some of the similarities between the proposed approach for the low level waste and decommissioning, as I indicated, both are iterative approaches where the performance assessment is used to identify data needs. Both approaches account for uncertainties, either through the use of bounding deterministic or probabilistic analysis.

And both approaches are designed to present a defensible assessment of long-term performance. That is, the intent is not to try and calculate a real dose.

MEMBER HORNBERGER: Mark, I don't understand the last bullet.

MR. THAGGARD: Okay.

MEMBER HORNBERGER: If the intent is not to calculate doses -- real doses -- what is the intent?

MR. THAGGARD: Well I mean, it's not a dose that somebody -- we anticipate -- is really going to get. Because there's a lot of assumptions that's being made into this. We can't go out and verify that -- if we come up with a dose of 25 millirem, you know, there's no way for us to assess whether somebody in the future is going to get that,

and in all likelihood, they're not.

It's just some information so that the decision-maker can have some gauge as to the likely impact, but it's not a -- I mean, we don't know for example, who's going to be at the site, we have no -- I mean, all this conjecture about the scenario, it's all conjecture.

We can assume that it's going to be a residential farmers; it may actually be an industrial use at the site 1000 years from now. And so if we estimate the dose for a residential farmer, somebody is using the site for industrial use would get a much less dose. But we would use maybe the residential farmer because it helps bound -- put some caps on the potential impact that somebody could get.

DR. McCONNELL: Yes, it's more of an estimation of a dose, not a prediction that some residential farmer will receive a specific dose at year 999 in the future.

MR. THAGGARD: And I'd like to talk about some of the computer codes that are available for us to use in performance assessment analysis. The first one listed here is a code called DandD. It's a code that's being developed by Sandia National

Laboratory for the Office of Research. It's a screening code and possibly could be used to implement steps 1 through 4 of the diagr .

The DandD code is a deterministic code but it's got somewhat of a probabilistic basis to it in that the default parameters in that code are designed so that there's only a five percent chance of getting a higher dose if you place one of the default parameters with a site-specific parameter.

Another code that's commonly used is RESRAD code. As I indicated before, assessing the impact of somebody getting on the site is a key component in the decommissioning performance assessment analysis. That's what the RESRAD code is designed to look at. It can be used even in a deterministic or probabilistic analysis.

Another code is the NEFTRAN code. This code was originally developed to support the high level waste performance assessment work. It can be used to analyze the release from a source area transport through the vadose zone and transport through the saturated zone.

The NEFTRAN code is also a -- was an integral part of the performance assessment code used in the low level waste test case analysis.

And another code I menton here is the MEPAS code which was developed by Pacific Northwest Laboratory. It can be used to analyze impacts from both radiological and hazardous chemicals.

The code that we're hoping to use in the future for most of this work is a code that's under development right now by Sandia National Laboratories, called SEDSS. At some point we would like to maybe give you all a demonstration of it.

Some of the attributes of SEDSS are that it automatically feeds the output from one module into the next, so therefore, setting up the inputs for the various computer codes is somewhat transparent to the analyst. It was originally designed to help in site characterization, risk assessment, and remedial design. SEDSS has been supported by EPA, DOE, and the NRC.

Its main focus right now is in terms of the risk assessment. One of the other key attributes of SEDSS is that it documents the implied and explicit assumptions that are made in the analysis.

And I'd like to go with some of the other activities that are being worked on right now. The decommissioning rule as I indicated, is a proposed

rule. It is currently with the Commission. The Office of Research is working on developing guidance on implementing the rule. We've been trying to work with them on that.

We are in the process of testing out the methodology on a real SDMP site, and we hope to finalize the methodology sometime next year. There's continual work being done on the SEDSS code. We should get a UNIX version of this code sometime this month, and a Windows version sometime next year.

That basically concludes my presentation. Be happy to try and answer any questions that you have.

VICE CHAIRMAN GARRICK: Thanks, Mark. I'm sure we have a few. I guess I'd like to start with a vaguely familiar man on my left here. Consultant, Dr. Steindler, do you have some questions?

DR. STEINDLER: Yes. You did indicate that there was a time threshold. What is it and why is it?

MR. THAGGARD: You mean in the proposed regulation?

DR. STEINDLER: No, no, in your little diagram that apparently comes from Sandia.

MR. THAGGARD: Oh, that time is not a threshold. What it is, is it's a -- you're estimating the cost it would take to implement a particular option, and also the time it would take to implement it. For example, if it takes ten years to build a cover and some other engineering features at the site, well, we may not want to select that particular option.

On the other hand, it may only take a year to dig up all this stuff and cart it offsite. So the time listed on that diagram is the time it would take to carry out the particular option. And again, this is just another piece of information for the decision-maker so that, you know, he can weigh the cost, the time it would take to implement the option, and the probability of being able to release the site. He has those three information.

DR. STEINDLER: In your step 9 where you analyze the options in terms of cost, time, and likelihood of site release, I fail to see the role of risk in whatever decision process comes out of that step. What am I missing?

MR. THAGGARD: Well, there's an element of risk in terms of the probability of being able to release the site.

DR. STEINDLER: I'm sorry, I'm not talking about that risk; that's the risk of success --

MR. THAGGARD: Yes.

DR. STEINDLER: -- or the risk of failure. I'm talking about the kind of risk that is generated by a 25 millirem number, for example.

MR. THAGGARD: Well, you get a measure of risk when you calculate the consequence analysis in step 4. I mean, you're going to get a dose right there, and if you want to convert that to a risk you can certainly do that. But that's where you're actually calculating the impacts.

DR. STEINDLER: I'm not making myself clear. You've already passed step 4 and you've identified the fact that you can't release the site.

MR. THAGGARD: That's correct.

DR. STEINDLER: And so your next two steps are, you try to define as best you can, the site characteristics and what kind of options that presents to you, and now you, having enumerated those options in step 8, you begin to try and analyze them.

The absence of discussion of the risk factor to the residential farmer or however you structure your scenario, is puzzling. I mean, isn't

that -- I mean, it seems to me that that ought to be a non-trivial issue.

MR. THAGGARD: Well, as I indicated, you're going to select a preferred option. When you select the preferred option you've got to go back and reanalyze it.

DR. STEINDLER: The preference process doesn't seem to include --

MR. THAGGARD: Well it does -- that's correct, it doesn't. But it does include the probability of being able to release the site, which is the main goal of the regulation -- is being able to release the site. I mean, that's the main focus of decommissioning.

I mean, I understand where you're coming from. I mean, you're going to get one option here that you're going to run back through and do an analysis on, and so presumably you will have some measure of what the impacts are going to be to people based on implementing that particular option. You won't have it for all the options that you didn't select; you're correct about that.

DR. STEINDLER: That's the point. You listed four or five separate codes. How would one choose between them, and have any of those been

validated in the real world so that their applicability to an unanalyzed site is obvious? Four codes.

MR. THAGGARD: I can't really speak on the degree of verification that's been done on these codes, to be honest with you. I'm not that familiar enough with them to be able to answer that. But obviously, the selection of the code is going to depend upon what type of analysis you're doing.

If you're going to analyze impacts to somebody onsite, if your intent is like to analyze whether or not the site can be released for unrestricted release and the possibility, as Dr. Pomeroy indicates, somebody getting on the site, then one code you possibly will consider using is the RESRAD code, because that code is specifically designed to analyze somebody getting on the site.

On the other hand, if you're concerned about the potential impact to somebody offsite, assuming that you're going to have some restrictions on the site, then you will probably want to use a code like NEFTRAN, because you can analyze the transport, at least through the groundwater pathway, offsite.

So the code selection is going to be

dictated to some extent by what you're trying to analyze. You can also use the DandD screening code as an initial code to just assess what the impacts would be from releasing the site for restricted use. So the code selection, I think to a large extent, is going to be basically geared toward what you're trying to do.

I don't know. Maybe --

DR. STEINDLER: I've got one other point -- I understand what you're saying. You spoke of ALARA as though it were in fact, a goal of some sort. The ground rule that I thought we all were operating under was that ALARA is a process. Where have we diverged?

MR. THAGGARD: Well, it's specifically that in the rule as a requirement; that you've got to demonstrate that you meet ALARA.

DR. STEINDLER: Okay, that's a process.

MR. THAGGARD: That's correct. Maybe I'm missing --

DR. STEINDLER: What's the goal -- I thought those were your words. Let me see if I can find them someplace in here. Yes, on your, almost last slide there -- on slide 19 you indicated that the goal and intent of ALARA is already

accomplished.

MR. THAGGARD: Oh.

DR. STEINDLER: Does that imply a numerical standard of some sort --

MR. THAGGARD: No, no, that just --

DR. STEINDLER: -- with you --

MR. THAGGARD: No, it's just that the -- the intent there is just to state that the requirement for ALARA -- maybe that would have been a better choice of words -- the requirement for ALARA should be met by going through the process of looking at the various options and the costs associated with those. That would be a better --

DR. STEINDLER: That's what you meant?

MR. THAGGARD: Yes.

VICE CHAIRMAN GARRICK: George?

MEMBER HORNBERGER: Mark, I was wondering if you could tell me a little more -- on slide 16 when you were talking about the conceptualization, defining process and parameters, and you have a note in there that it includes explicit treatment of parameter uncertainty, and then you have three subheadings: bounding, prudently conservative, and probabilistic data distribution.

MR. THAGGARD: Yes --

MEMBER HORNBERGER: Are all three of those used?

MR. THAGGARD: No, no, the idea there is you can use any one of those. As I tried to allude to on the next overhead, is in doing step number 4 where you actually do the dose analysis, you can either use a deterministic analysis or you can use a probabilistic analysis.

If you use the deterministic analysis that can either be through the use of a bounding type analysis or prudently conservative analysis, or you can use the probabilistic analysis. So you can use one of those, but the ideal is not to use all three.

MEMBER HORNBERGER: And typically, how do you decide which approach to use?

MR. THAGGARD: Well, to a large extent it's decided based on again, the site. I mean, if you can get away with doing a bounding or prudently conservative analysis, ideally you would do that. But in some cases you may do that and determine that you're being overly conservative and so you may need to use some other means to try and account for uncertainty.

But there are no set guidelines as to which one you would select. If you use the DandD

screening code as the first cut to check to see whether or not the site can be released for unrestricted use, you're probably using a prudently conservative analysis, because it's got that built-in set of default parameters that are designed to be conservative.

On the other hand, there may be a site where you really have some fairly good idea that this site is okay. You might be able to just make some real grossly conservative assumptions, do some quick analysis, and be done with it. So again, it's going to be really up to the analyst to make that decision.

MEMBER HORNBERGER: They see this almost as a sequential process. If you use the screening analysis and everything is hunky-dory --

MR. THAGGARD: That's correct.

MEMBER HORNBERGER: -- then it's okay.

MR. THAGGARD: That's correct. And to the extent that you can get away with it, you want to do that, because as I indicated, most of these sites you're not dealing with companies that have a lot of money available to clean up these sites. And so if you can make a decision based on somewhat simple analysis and be done with it, you want to do that.

MEMBER HORNBERGER: On that line, could you give me some quick picture of the diversity of sites that you envision applying this method to?

MR. THAGGARD: Well, the way the methodology is set up right now is, we've tried to make it as a continuum from all decommissioning sites, so that you may have some sites where you have just building contamination, you're using the same logic to analyzing those sites as opposed to some sites where you've got massive amounts of contaminated dirt, sludge ponds, contaminated buildings, groundwater contamination.

So you have the whole spectrum of decommissioning sites out there, and we've tried to make this approach consistent so that -- well, we tried to make the approach so that you can use a consistent logic in analyzing that whole spectrum. And so we've tried to work with some of the work that's being done in Research in terms of development of the DandD screening code. We've tried to embody that logic into this framework.

DR. LARSON: Mark, I think this is Dr. Hornberger's first general presentation on the SDMP program, so when he asked that question I don't know if he really understands that there are actual sites

and what their nature is. I think that would help him understand what you're trying to --

MR. THAGGARD: Oh, okay. I apologize. Basically, in terms of decommissioning, you've got a real broad spectrum of different sites out there. I mean, as I indicated, some sites you have just building contamination, other sites you've got a whole range of multiple contamination sources out there.

At other sites you may have contaminated slag, you've got contaminated dirt, you've got contaminated groundwater. I mean, it's a real mixture of what we may be facing. And that's one of the reasons that we've tried to design this methodology to be somewhat flexible.

A lot of the questions that you're asking I think, are things that the analysts -- and that's why you've got to have experience in training analysts doing these analysis -- a lot of it's going to be based on their intuition as to what's the appropriate approach to follow.

MR. BELL: Mark -- this is Michael Bell. I'm the Acting Chief of the Performance Assessment High Level Waste Integration Branch. And I guess I found Mark's response just somewhat repetitive of

what he had already said, and he didn't get into enough specifics.

The spectrum of SDMP sites ranges from things like fuel cycle facilities, fuel fabrication, plants where they have large volumes of, say low and rich uranium in a sludge pond that needs to be cleaned up. They may have had onsite burials of low and rich material.

The other end of the gamut is there are contaminated ammunition artillery ranges at defense sites where you essentially have depleted uranium in the soil. Well, we have ore processors where, you know, they were recovering some rare earth minerals and the ore they were using had natural uranium in it, and so you've got slags with low concentrations of natural uranium.

I'd say the common denominator here is, most of these difficult sites, the ones where you're going to need the SDMP methodology, have large volumes of low levels of contamination, so it makes it very difficult to, you know, and very expensive to essentially, remove all contamination, take it away.

There are situations where the radioactivity in many cases, is going to have to be

stabilized on the site and you're going to have to look at the option of, if this material is left in place then what are the impacts on the environment and the future residents?

VICE CHAIRMAN GARRICK: Thanks, Mike. Bill?

MEMBER HINZE: Mark, I'd like to go back to my cost question again.

MR. THAGGARD: Okay.

MEMBER HINZE: I'd like to go back to your decision point number 9 in the decision framework. Presumably, the analyze options in terms of cost, time, and likelihood of site release. These are criteria that are used in the decision making of the option that is going to be used, is that correct?

MR. THAGGARD: That's correct.

MEMBER HINZE: Are there any other criteria that are used by the analysts?

MR. THAGGARD: Well, there will probably be some other consideration used by the decision-maker. The decision-maker may not necessarily be the analyst. But there may be some other NEPA consideration that need to be thought about like environmental justice, for example.

You know, if you want to leave this stuff

onsite, this framework doesn't consider things like environmental justice. You may have some minority groups, low-income people living near the site and so you may not want to leave it there because of that reason. So there's some other things in NEPA that you would need to -- that you will have to think about in terms of selecting the preferred option.

MEMBER HINZE: You might want to include some caveat to provide for those. My next question is, what is the weighting given to these and who provides that weighting? Through these criteria.

MR. THAGGARD: Well, right now I think they're equally weighted. We really haven't thought that through. I mean, as I indicated, this methodology has not been tested yet and that's one of the reasons that we're testing it now.

MEMBER HINZE: Well, what do you envision? Do you envision that these will receive equal weight? Well, that's not a fair question perhaps.

MR. THAGGARD: I really can't say right now. I mean, we hadn't really thought about it, to be honest with you.

MEMBER HINZE: As a person looking at this for the first time, I find your third criteria to be

less than satisfactory. This likelihood of site release sounds like it's -- the perception is that it's a rigged setup. I would suggest to you that you consider some other nomenclature rather than likelihood of site release, because it sounds like it's being set up.

I would suggest to you that the site status or the site conditions, or some other criterion be used rather than likelihood. I know what you mean by that, but I think it gives a wrong perception to the person that approaches this for the first time.

And I really think that there is a need to help all of us out in terms of deciding how these are weighted. Because it seems to me that what you could have is a very uneven weighting from site to site, by the analyst or the decision maker. As a result, there would be the subjective nature reigns when we're trying to make this as quantitative as possible.

Let me ask you, in terms of your experience with this, what are the percentages of the decisions regarding these options that have been made to-date? Are most of these -- do most of these fit under, the site can be released, yes, and fall

off the page? Or, you know, do 90 percent of those, of the sites fall off the page and don't have to go into the righthand portion of your flow diagram?

MR. THAGGARD: Well, I think -- well, we really don't have any experience with this yet. I mean, as I indicated, this is draft methodology and that's one of the reasons we're testing it out. But in terms of decommissioning sites, I would say the vast majority of the decommissioning sites -- not the complex SDMP sites as Mike alluded to, but just decommissioning sites in general -- the vast majority of decommissioning sites should appear to go down the left side of this diagram.

MEMBER HINZE: Do you have any feeling about what will be the experience in the -- for example, collect data versus no action options?

MR. THAGGARD: I don't think the no action is going to be much of an option. It's put in there because we've got to consider it under NEPA. I can't really say whether or not there's going to be a greater percentage of the site -- choosing to collect data versus choosing to just put restrictions on the site, for example.

I can't differentiate as to which of those various options are going to pop out as a greater

percentage. I don't really have any feel for that. If I had to guess it would probably be, collect data. You know, if you can get away with collecting additional data you probably want to do that.

Let me just point out one thing about your comment about the likelihood. The thinking that went into that is that, in terms of the data collection, as a perfect example, is that you're relying somewhat on professional judgment on trying to come up this likelihood of success.

But the thinking was, if you're going to go out and collect data, you probably have some feeling in your mind, at least the person -- the expert in that area -- as to whether or not they're going to be able to collect data that's going to give them a certain range of values. And based on that range of values you have some feel as to whether or not it's going to improve your analysis.

And so that's kind of the logic that went into the --

MEMBER HINZE: Yes, I appreciate that, but I think there are factors that you are going to consider, there are criteria you are going to consider in terms of that likelihood of site release. And perhaps those criteria, in trying to

specify those, I realize you want the flexibility here, but you may want to consider the factors that lead to that decision regarding the likelihood. That's all that I'm saying.

DR. EISENBERG: Mark, isn't it true that a minimum requirement for release of the site is that you meet the regulatory standard?

MR. THAGGARD: That's correct.

DR. EISENBERG: So part of this is this consideration of the dose impact of following one of these options, and the likelihood is the idea that if you did do a particular option, whether it's getting more data or some remediation action, that you would be able to then find compliance with the regulation.

MR. KENNEDY: That's what I wanted to address. I'm Jim Kennedy from the Staff. Mark and I have been working together on the shield alloy site for about two years now, and one of the things I want to point out is, there are two things going on here in that chart and in the whole SDMP process involving performance assessment.

And one is NEPA and the other is compliance with our regulations for protecting public health and safety. I don't want to give a

primer on NEPA, but NEPA is very different from our regulations which are designed solely to protect public health and safety. NEPA has no firm criteria; you're simply to look at all of the environmental impacts; you're to look at a range of alternatives for decommissioning a site which would include offsite disposal say, in Utah; would include onsite disposal with restricted release; it might include recycling.

And there are no firm criteria. In other words, the environmental impacts include, as Mark said, environmental justice, impact on cultural resources, impacts on schools and local traffic, in addition to health and safety impacts from radiological contamination.

You know what -- they might be with a onsite alternative versus offsite. But there are no firm criteria whereby you can say, well, if the environmental justice impact is this, then that's inadequate. What a decision-maker does, what we do, is take all of the impacts and look at them in a combined fashion and weight them against the costs of the various alternatives.

Like for example, in the case of shield alloy, the cost of onsite disposal is around $3 to

$8 million, and the cost of offsite disposal is some $140 million. So that cost differential is looked at in terms of what the environmental impacts would be for onsite disposal versus offsite disposal, if that makes any sense.

Now, as Norm was saying, which is very important, the other step beyond that is that any option that's chosen has to meet the requirements in 10 CFR Part 40 for protection of public health and safety, and all of the criteria that are contained in our regulations for decommissioning are the criteria that we use to evaluate whether health and safety is protected from radiological hazards.

But within this framework here, decision framework that he's showing, both things are going on. You know, we're looking at cost in terms of NEPA. The cost is really not a factor for us in terms of our regulations. You know, either it meets it or it doesn't, and if a licensee doesn't have the money to adequately decommissioning a site and meet the regulations, then the site may go on Superfund.

I hope that helps, but both are going on up here.

MEMBER HINZE: That's helps. Thanks very much. My interpretation of what you're saying, is

the likelihood of site releases are garbage -- is a catch-all kind of criteria.

MR. KENNEDY: Another way of saying it might be likelihood of -- you know, any alternative that we look at in NEPA has to be a feasible alternative, and if it's not feasible to release the site in accordance with our regulations, then it gets thrown out.

MEMBER HINZE: I'm very sympathetic to what you're saying. I'm going to suggest to you again, though, that the likelihood of site release may be conveying the wrong impression.

VICE CHAIRMAN GARRICK: Okay. Paul, do you have any further questions?

CHAIRMAN POMEROY: I have a number of questions but I think I'll limit them to just a couple here. One is that as we know -- because you presented to us, Mark, some time ago the work on shield alloy -- there are presumably other evaluations of SDMP sites going on at the present time, is that correct?

MR. THAGGARD: That's correct.

CHAIRMAN POMEROY: And can you give me some idea of -- according to your time schedule here and the near term activities, you plan to test this

methodology on an SDMP site, and you plan to do that by the summer of '98. So there are a number of SDMP sites, I presume, starting from shield alloy and going through the summer of '98, that are going to be evaluated under some set of existing criteria. Do they tend to be the simple cases, in general? Shield alloy didn't sound particularly simple to me.

MR. THAGGARD: Well, I've done a lot of the work; I would agree it wasn't particularly simple. But the problem we have is that, we're trying to develop a methodology. At the same time we have casework that's got to be done --

CHAIRMAN POMEROY: That's right, yes.

MR. THAGGARD: And so we -- ideally, this would have been developed, I don't know, ten years ago, and we would be implementing it on all the sites. So we're in somewhat of a catch-up mode in trying to develop this for future work, but at the same time we've got existing casework that's going on, and so there's really no set criteria or procedures for doing those, and so again, it's going to kind of fall back on the analyst to use their best judgment as to the appropriate methods to carry out the analysis.

DR. McCONNELL: Dr. Pomeroy?

CHAIRMAN POMEROY: Yes.

DR. McCONNELL: Basically, we're working on three sites now, and that's the shield alloy site, the Parks Township site, and the Sequoyah Fuels site. We're applying this methodology on the Sequoyah Fuels site, and we hope to then, if we get further into some of the other of the 14 SDMP sites that we'd be looking at, apply it I think, after it's finalized, to those sites.

CHAIRMAN POMEROY: Fine. That gives me an idea of the numbers involved. You're perhaps not the right person to ask this, but somebody at the table is, probably.

If indeed, the NRC takes over responsibility for regulating the Department of Energy, is this kind of framework -- if it becomes acceptable to the Commission -- going to be the kind of decision framework that could be used, or will be used to attach some of the DOE decommissioning activities?

MR. THAGGARD: Well, I don't see why it couldn't be used in DOE. Again, maybe somebody else could answer that, but --

CHAIRMAN POMEROY: I guess my question is, is anybody thinking or working on that subject?

DR. McCONNELL: Well, we are I think, both for decommissioning and also low level waste. We would expect that the BTP would provide a framework should external regulation of DOE low level waste facilities become the reality. And the same would go for, I think, the decommissioning. We would hope this framework is flexible enough that it would work for those sites also.

CHAIRMAN POMEROY: Great. Thank you.

VICE CHAIRMAN GARRICK: Thanks, Paul. Marty?

DR. STEINDLER: Yes. Before this framework -- which is a reasonably logical set of steps -- was written down on a sheet of paper, obviously some other scheme was used by the experienced folks in the business. Was that scheme drastically different from what has now been codified on the slide? I view this thing as a fairly logical way to get from 1 to 14, or whatever -- 1 to 7. And all of those steps look like they're necessary.

MR. THAGGARD: Well, I would say that they -- it's fairly similar to what's being used. I mean, obviously, as Jim alluded to, we're using the NEPA process in terms of looking at the shield alloy

sites. For that particular site we did look at various options. We analyzed all of them, though, so we did an analysis on all of them.

There was certainly some consideration of costs, and this underlining thought process about the likelihood of being able to link the sites. So I would say, although we didn't have this laid out, this has probably been somewhat our thought process. It just hasn't been structured --

DR. STEINDLER: This is basically a codification of what you've been doing anyway?

MR. THAGGARD: That's correct.

DR. McCONNELL: With the addition, Mark, isn't it true, of the unrestricted versus restricted release and the use of institutional controls, which is somewhat new with the new proposed decommissioning standard?

MR. THAGGARD: Well, we considered both of those in the shield alloy site. We had some inkling that that was going to be in the regulation.

VICE CHAIRMAN GARRICK: Mark, what can you say briefly, about the lessons learned from other experience in DandD activities? And I'm thinking particularly of the reactor experience. There's been a substantial amount of activity in the last

five years in this whole arena as it relates to reactors. Has that been a major factor in the formulation of the underpin of the rule and the guidance for the rule?

MR. THAGGARD: Well, I can't really speak on the rule, to be honest with you. If we had some people here from Research I think they would probably be better able to talk about what went into the thought process in terms of coming up with the rule.

One of the things that we're hoping to do is at some point give you a full briefing on a decommissioning program and we could certainly go into more discussions about the rule and have some of those people here. But I'm certainly not the person to answer that question.

VICE CHAIRMAN GARRICK: Who's worrying about the test reactor and research reactor DandD? Is that another group? Better licensed.

DR. EISENBERG: That's NRR.

VICE CHAIRMAN GARRICK: So my question would apply there, too. There's a lot of activity I would assume, going on there. Does that experience -- have you found that experience to be relevant to your work?

MR. THAGGARD: Well --

DR. EISENBERG: Mark, if I can jump in? I would tend to think that there are such sizable differences in the nature of the facilities and the nature of the problems that exist at them, that a lot of that would not be very relevant. But I think your point is well taken. We should take a look at their experience to make sure we haven't missed anything; that we could learn from it.

But I mean, after all, most reactors are kept pretty clean. The radioactivity is very well contained. A lot of these fuel cycle facility sites, it's spread all over, it's contaminated the soil; it's a different kind of problem.

VICE CHAIRMAN GARRICK: Yes, I've heard a couple of presentations on recent reactor decontamination projects. And I guess the thing that sticks in my mind is that in both -- in the several cases that I've heard there was a considerable amount of elaboration on the fact that they believe they have covered every kind of waste handling problem that can be imagined in the course of decontaminating a nuclear power plant in terms of the types of radionuclides involved, the types of materials involved -- everything from resins to

hardware to transuranic waste and so on.

It's true. It's a different problem in terms of magnitude, but the question is just that, given that there's been a lot of activity in that arena, it sounds like a rich and robust source of information.

DR. EISENBERG: I think the point is well taken. Although I would wonder how many reactor site have depleted uranium nitrate in ponds, things like that.

VICE CHAIRMAN GARRICK: Yes, there's other fuel cycle facilities, though, that are also under some DandD activity, even in the DOE arena, that do have that kind of nasty stuff. But yes, the facilities like Sequoyah Fuels, certainly have their own unique set of problems, and I'm quite familiar with those.

All right. Any other questions? Thanks, Mark. Paul?

CHAIRMAN POMEROY: Thank you, John. Right on schedule; that bodes well for the future. Mark, I'd just like to say thank you on behalf of the whole committee also, and you mentioned that possiblly, a briefing on the decommissioning program in the future. We would very much like to pursue

that with you and hope that we could arrange something like that in the future. So thank you again.

The next item on our agenda is a 15-minute break. After that break the committee will be involved, essentially, until 4 o'clock this afternoon in preparing for its Commission briefing and participating in its Commission briefing. We won't require any transcript of that or our meeting at the end of the day, so we're finished with the transcript, and we'll reconvene in 15 minutes, at 10 minutes after 10.

(Whereupon, the 92nd Meeting of the Advisory Committee on Nuclear Waste was concluded at 10:02 a.m.)

C E R T I F I C A T E

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: 92ND ACNW

Docket Number: N/A

Place of Proceeding: ROCKVILLE, MARYLAND

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Corbett Riner

CORBETT RINER
Official Reporter
Neal R. Gross and Co., Inc.

United States
Nuclear Regulatory Commission

STATUS OF PERFORMANCE ASSESSMENT IN SUPPORT OF DECOMMISSIONING

Presented to:

Advisory Committee on Nuclear Waste
Rockville, Maryland
May 20, 1997

By:

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OUTLINE

- ❒ **Background Information (features common to PA and evolution of PA methodology)**
- ❒ **Comparison LLW/Decommissioning Regulatory Framework**
- ❒ **Brief Overview of LLW PA Approach**
- ❒ **Overview of Decommissioning PA Approach**
- ❒ **Codes Used in Decommissioning PA**
- ❒ **Related Near-term Activities**

COMMON ELEMENTS TO PA

- Description of natural and engineered system
- Understanding of likely and unlikely events
- Description of processes for waste transport through the geosphere and into the biosphere
- Estimation of potential release and human exposure
- Evaluation of uncertainties in results

COMPONENTS OF PERFORMANCE ASSESSMENT

- **Trained and experienced analysts**
- **Quantification Tools**
  - **Models**
  - **Computer codes**
  - **Computer Infrastructure**
- **Data**
  - **General**
  - **Site specific (mostly from licensee)**

CHARACTERISTICS DRIVE ANALYSES

- **Characteristics of waste disposal system**

  Depth
  Hazard
  Uncertainty
  Waste Composition
  Engineered Components
  Transport Characteristics

- **Characteristics of compliance framework**

  Time Frame
  Performance Measure (e.g. dose)
  Institutional Controls

EVOLUTION OF PA AS A PROGRAMMATIC TOOL

- **Method development for HLW (1976-80)**
  - Provided insights into repository system
  - Helped to formulate 10 CFR 60
- **Demonstration of capability (1985-92)**
  - Indicated needed research and development
  - Showed need for integration among disciplines
- **Application to HLW (1992-now)**
- **HLW tools and methods adapted for other waste applications**
  - LLW PA Working Group (1990-now)
  - LLW PA BTP and Test Case Development (1993-96)
  - Decommissioning Applications (1995-now)
  - Guidance for residual radioactivity rule (in progress)

PERFORMANCE ASSESSMENT SUPPORTS DWM MISSION

Decommissioning:

NEPA analyses to evaluate adequacy of proposed remediation and decommissioning of SDMP sites

LLW:

Methods, guidance, and technical support for state regulatory authorities; development of NRC review capability

HLW:

Performance assessment of the proposed Yucca Mountain repository

LLW/DECOMMISSIONING REGULATORY FRAMEWORKS

- LLW
  - Protection of the general public (25 mrem/yr)
  - Protection of inadvertent intruder
  - Protection of individuals during operations
  - Long-term stability

- Decommissioning (proposed)
  - Unrestricted release
    - 25 mrem/yr to average member of critical group (AMCG)
    - ALARA
  - Restricted release
    - 25 mrem/yr to AMCG w/institutional controls
    - 100 or 500 mrem/yr to AMCG w/o institutional controls
    - ALARA

KEY COMPARISON BETWEEN LLW/DECOMMISSIONING PA

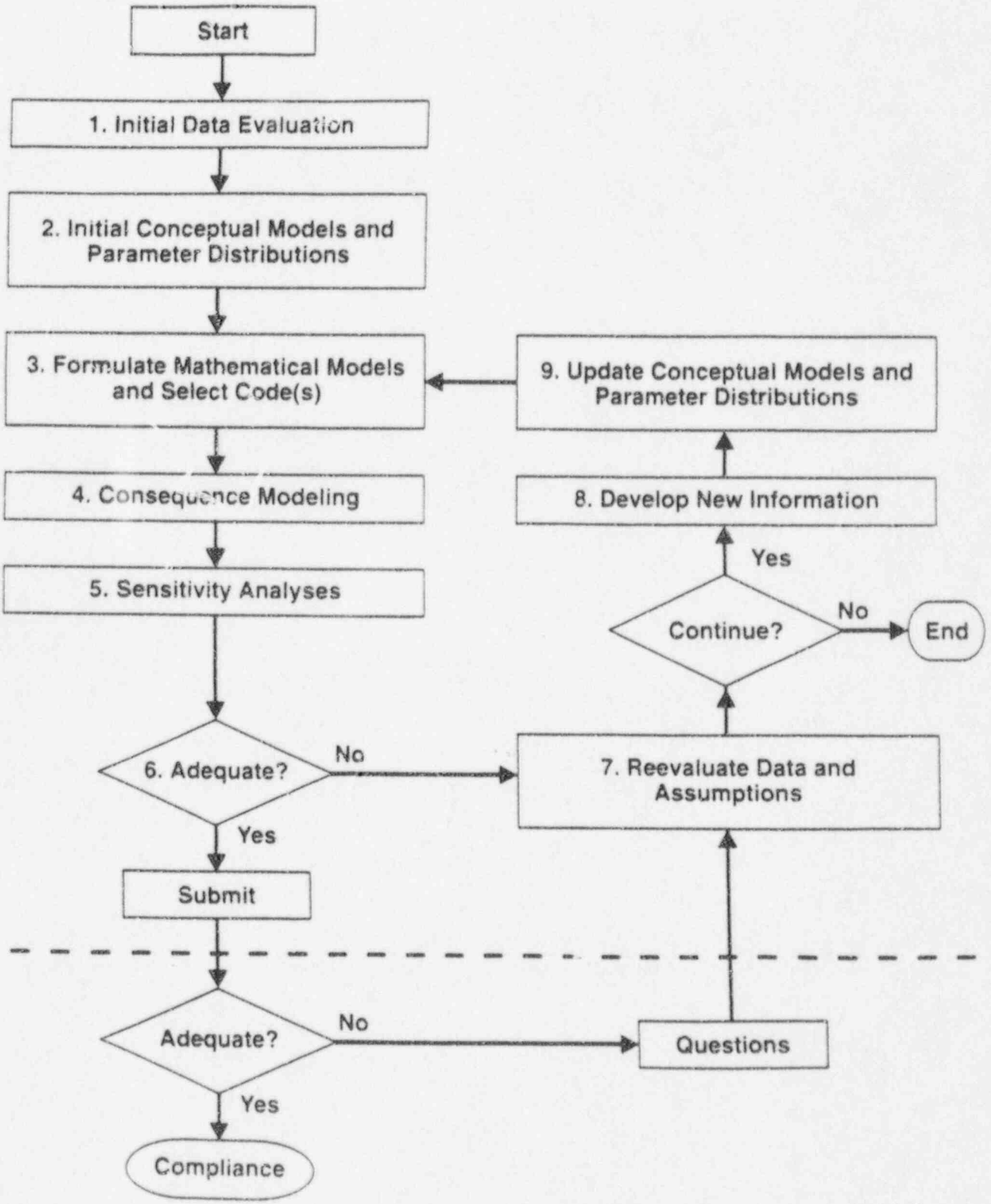
- **Decommissioning sites are not sited with waste disposal in mind**
  - Pathways that are less important in LLW PA, may be important in Decommissioning PA (e.g., Air and SW)

- **No waste classification or intruder barrier requirements in decommissioning**
  - Inadvertent intruder is a key aspect of Decommissioning PA

- **There is a 1000-year time frame for decommissioning PA**
  - Barrier performance may be key to demonstrating compliance

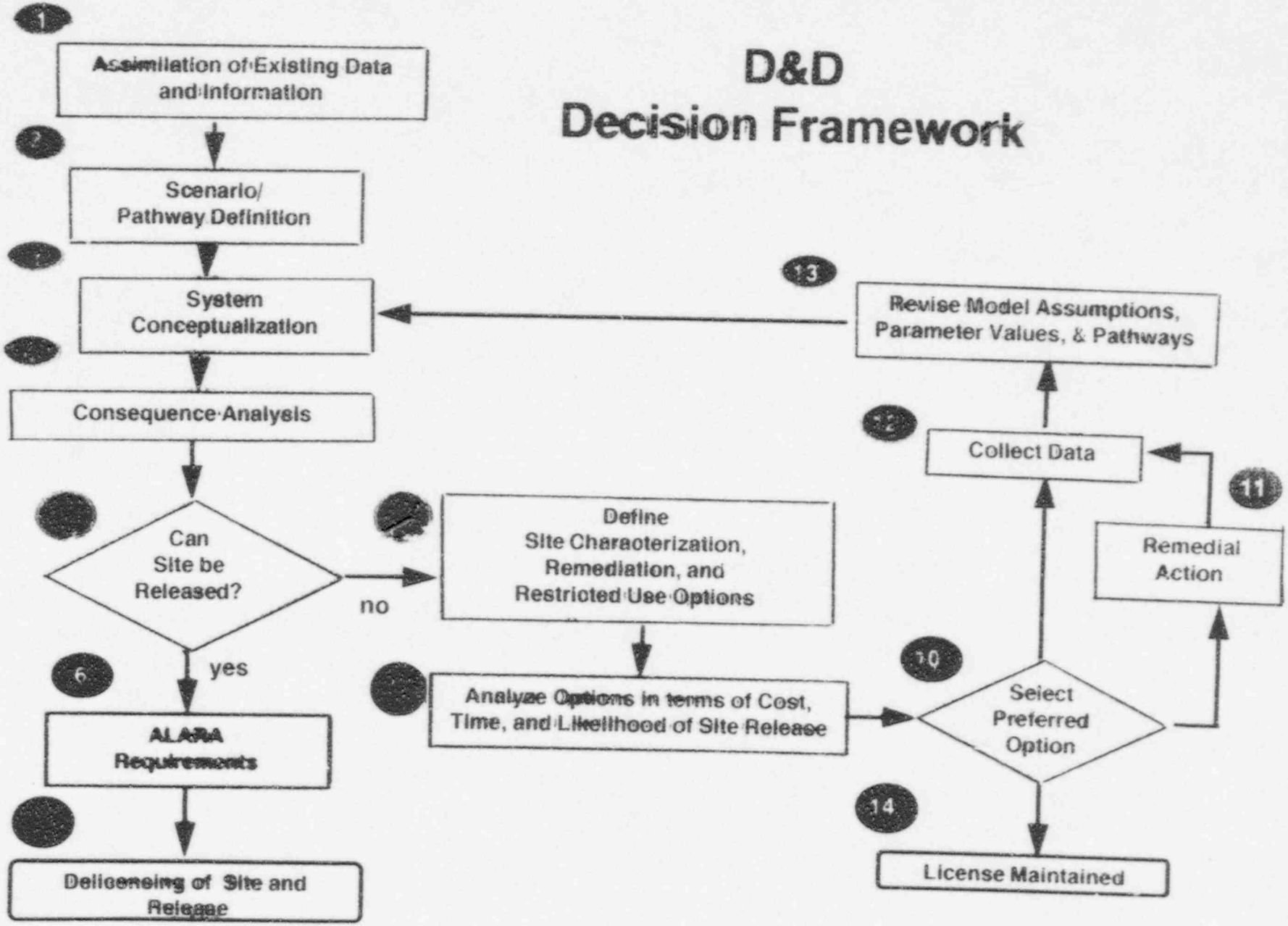
- **Decommissioning PA have different source terms than LLW PA**
  - Decommissioning sites have small no. of radionuclides, may have hazardous contaminants, and have no waste containers
  - Decommissioning sites may have existing ground-water contamination

Proposed LLW PA Approach


Start
1. Initial Data Evaluation
2. Initial Conceptual Models and Parameter Distributions
3. Formulate Mathematical Models and Select Code(s)
4. Consequence Modeling
5. Sensitivity Analyses
6. Adequate?
No
Yes
Submit
Adequate?
No
Yes
Compliance
7. Reevaluate Data and Assumptions
8. Develop New Information
9. Update Conceptual Models and Parameter Distributions
Continue?
Yes
No
End
Questions

Proposed Approach for Decommissioning PA

D&D
Decision Framework



1. Assimilation of Existing Data and Information

- **Key Points**
  - **Existing Information Only**
  - **No New Data Collection at this step**

- **Examples of Existing Information**
  - **Bounded Estimate of Residual Contamination**
  - **Extensive Site Characterization Data**

2. Scenario and Pathway Definition

- Scenario - Future State of the System
  - could be generic or site specific
  - doses are expected to decrease if scenarios are changed based on site-specific data

- Pathways - Source to Human Receptor
  - subject to change with site-specific information for either generic or site-specific scenarios

3. System Conceptualization

- Developed for a specific scenario and set of pathways
- Defines process and parameters used to assess migration and exposure
  - Includes explicit treatment of parameter uncertainty
    - bounding
    - prudently conservative
    - probabilistic data distributions
  - Must be defensible with current information
- Define codes for modeling contaminant migration and exposure

4. Consequence Analysis

- Calculation of Doses from all Pathways and Scenarios
- Deterministic or Probablistic depending on parameter definition

5. Can the Site be Released?

- ❒ **First Iteration - Does the Site Meet the Unrestricted Dose Criteria?**

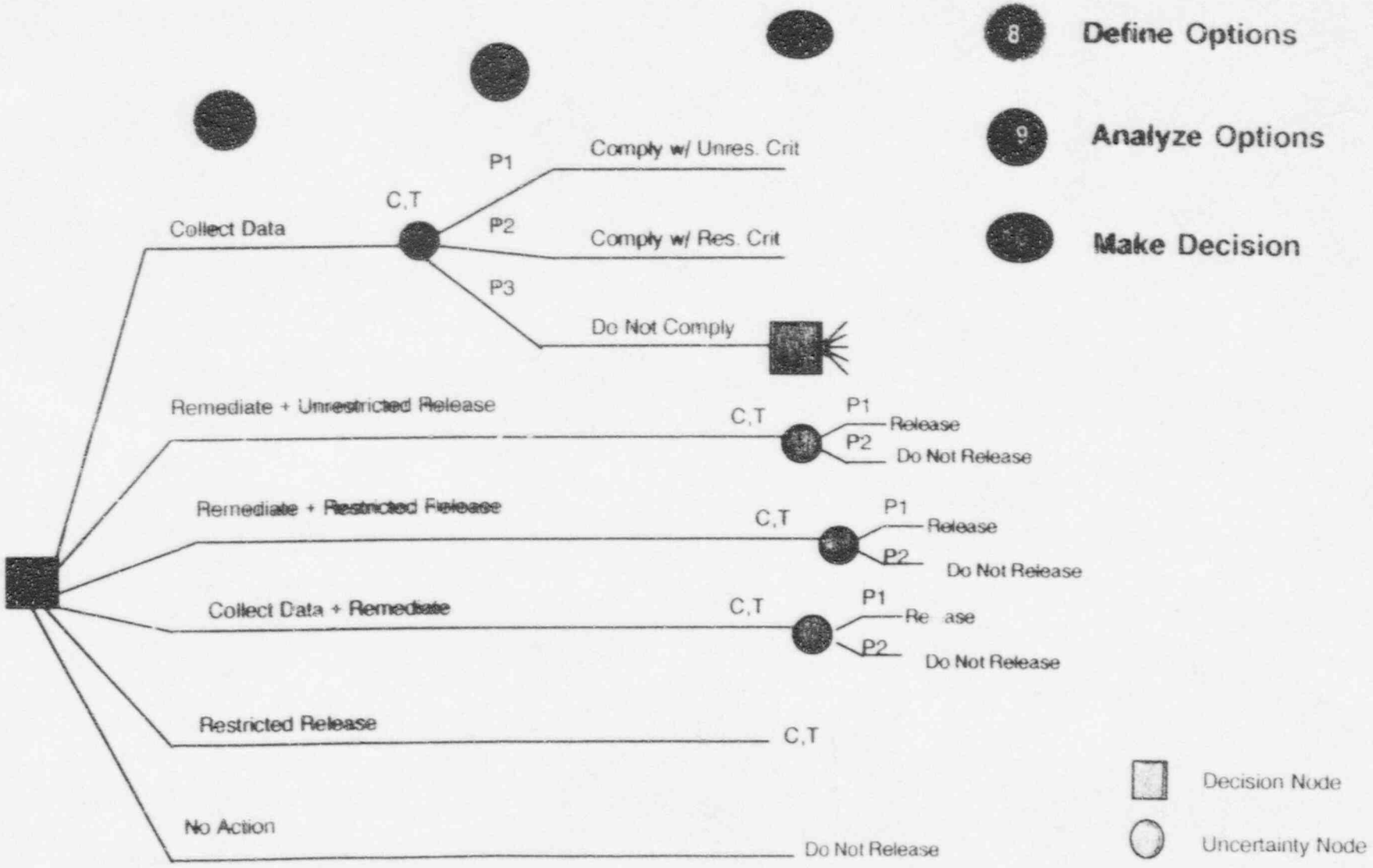
- ❒ **Subsequent Iterations - Does the Site Meet the Criteria Associated with the Chosen Option?**
  - **Unrestricted release following Data Collection and/or Remediation**
  - **Restricted release potentially following Data Collection and/or Remediation**

6. ALARA Requirements

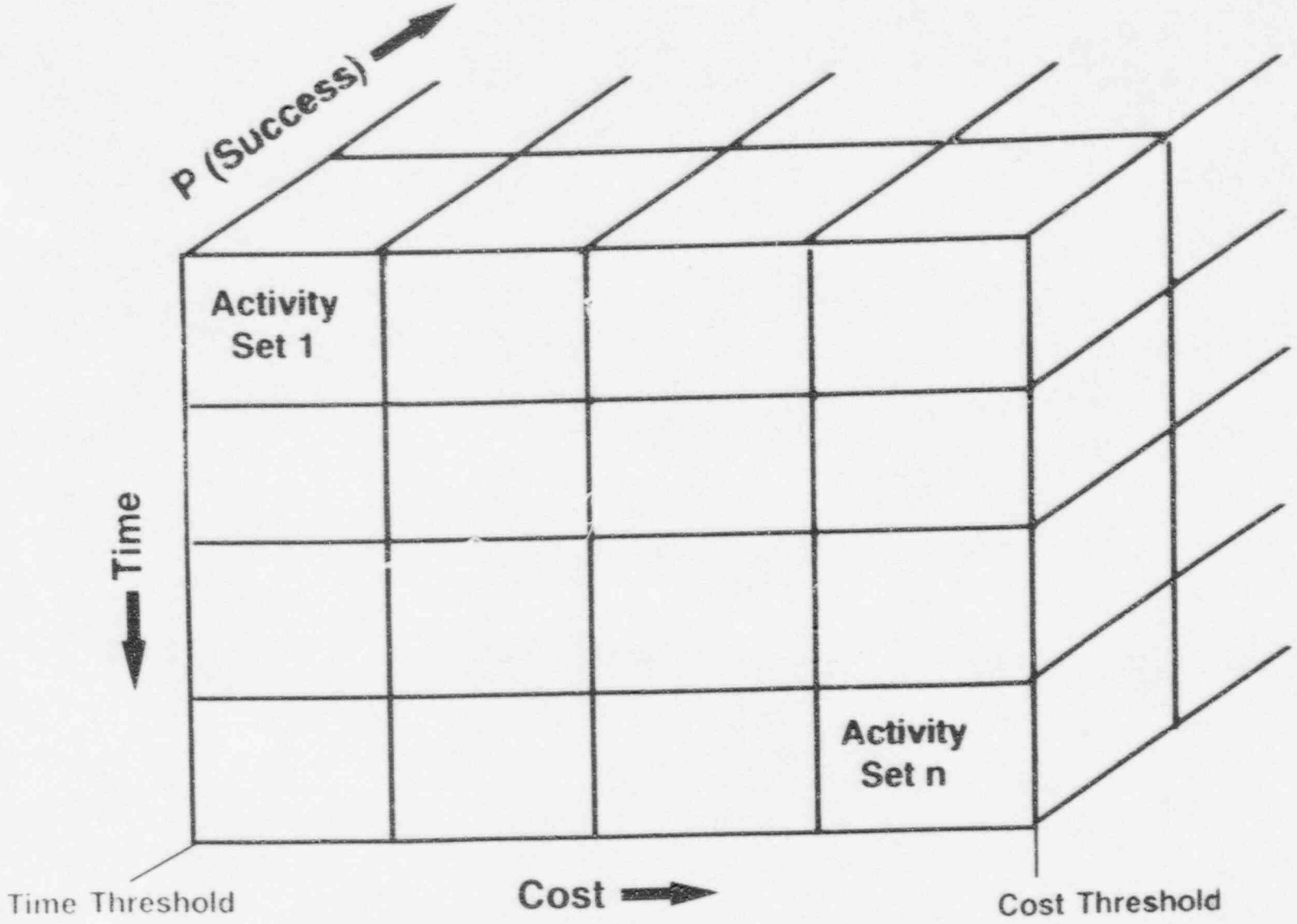
- **For Unrestricted Release without Remediation**
  - **Cost/Benefit Analysis based only on removal of residual contamination**

- **For Unrestricted Release following Remediation or for Restricted Release**
  - **Goal and Intent of ALARA already accomplished**

Generic Decision Tree Example



Decision Matrix



SIMILARITIES BETWEEN PROPOSED APPROACH FOR LLW PA AND DECOMMISSIONING PA

- Both are iterative approaches
  - PA is used to identify data needs
- Both approaches account for uncertainties
  - Bounding deterministic or probablistic analyses
- Both approaches are designed to present a defensible assessment of long-term performance
  - Calculated doses are not intended to represent predicted real doses

Codes Used in Decommissioning PA Analyses

- Current
  - DandD
    - Screening code (*steps 1-4*)
  - RESRAD
    - On-site assessment (*inadvertent intruder*)
  - NEFTRAN
    - Off-site transport
  - MEPAS
    - Off-site assessment (radiological/hazardous)
- Future
  - SEDSS (Sandia Environmental Decision Support System)

Attributes of SEDSS

- Automatic computer based tool
- Guides site characterization, risk assessment, and remedial design selection
- Documents decision process

Near-term Activities

- ❒ **Decommissioning rule (with the Commission)**
- ❒ **Development of guidance on implementing the rule (one-year after issuance of rule)**
- ❒ **Testing the methodology on a SDMP site (completed by Summer 98)**
- ❒ **Finalize PA methodology (by Fall 98)**
- ❒ **Continue development of SEDSS (Unix version 6/97)**