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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE

(ACNW)

142nd MEETING

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WEDNESDAY,

MAY 28, 2003

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 1:00 p.m., George M. Hornberger, Chairman, presiding.

COMMITTEE MEMBERS:

GEORGE M. HORNBERGER, Chairman

B. JOHN GARRICK, Vice Chairman

MILTON N. LEVENSON, Member

MICHAEL T. RYAN, Member

ACNW STAFF PRESENT:

JOHN T. LARKINS, Executive Director, ACRS/ACNW

SHER BAHADUR, Associate Director, ACRS/ACNW

NEIL M. COLEMAN, ACNW Staff

TIMOTHY KOBETZ, ACRS Staff

HOWARD J. LARSON, Special Assistant, ACRS/ACNW

MICHAEL LEE, ACRS Staff

RICHARD K. MAJOR, ACNW Staff

RICHARD SAVIO, ACRS Staff

ALSO PRESENT:

FRANK CARDILE

CARL FELDMAN

ROBERT L. JOHNSON

CHRIS McKENNEY

ROBERT A. MECK

GEORGE POWERS

CHERYL TROTTIER

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

(1:03 p.m.)

CHAIRMAN HORNBERGER: The meeting will come to order. This is the first day of the 142nd meeting of the Advisory Committee on Nuclear Waste.

My name is George Hornberger, Chairman of the ACNW. The other members of the committee present are: John Garrick, Vice Chairman; Milton Levenson; and Michael Ryan.

During today's meeting the committee will: 1) hear presentations and hold discussions with representatives of the NRC staff on a potential regulation on the control of solid materials containing no or very small amounts of radioactivity; and 2) hear presentations and hold discussions with representatives of the NRC staff on its evaluation of issues related to making the restricted release/alternate criteria provisions of the LTR more available for licensee use; and 3) prepare ACNW reports on recent committee reviews.

John Larkins is the designed 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 requests for time

to make oral statements from members of the public regarding today's sessions. Should anyone wish to address the committee, please make your wishes known to one of the committee staff.

It is requested that the speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume, so that they can be readily heard.

Before proceeding, I would like to cover some brief items of interest. Members and staff regret to note that this is the last meeting during which the committee will enjoy the services of Barbara Whitaker and Tim Kobetz. Well, Barbara anyway.

(Laughter.)

No. Oh, rats. That's on the record now, Tim.

(Laughter.)

Barbara reports Monday to her new position in Research, while Tim reports to NMSS. Both will be missed, and we wish them well.

Gibran Hamdan -- this is an unbelievable note to me. Gibran Hamdan, Indiana University quarterback, and son of Latif Hamdan, NMSS, who was on rotation to the ACNW last year, was picked by the Washington Redskins on the seventh round.

(Laughter.)

And that's on the record, and I think quarterbacks now are always at least 6'3" and 230. Oh, well, I haven't met Latif's son. He is 6'3" and 230, huh? Okay.

(Laughter.)

Where am I? I better hurry up here.

(Laughter.)

Three, the Conference of Radiation Control Program Directors held their annual meeting and awarded Commissioner Dicus their highest award -- the Gerald S. Parker Award, named after one of the founders of CRCPD. Congratulations.

George Dials, former WIPP Manager and President and CEO of LES, the Urenco-led uranium enrichment consortium that hopes to build a plant in Hartfield, Tennessee, resigned May 13th. LES's press release cited Dials' interest in pursuing other business interests and ventures now that the enrichment project was up and running.

Five, DOE's nuclear waste program must receive at least 460 million in fiscal 2004 in order to have a chance of meeting its December 2004 target for submitting a repository license application to NRC, DOE Deputy Program Director John Arthur III said

at the May NWTRB meeting

Six, DOE must be confident the repository project meets nuclear QA before it submits a repository license application to NRC, DOE Waste Program Head Margaret Chu told the Nuclear Waste Technical Review Board during this month's meeting.

John Arthur III, Chief Deputy at Yucca Mountain, later told reporters that DOE plans to submit a schedule to NRC in roughly two weeks that outlines the Department's schedule for determining QA compliance. Arthur indicated that the schedule would include a date by which DOE must decide there is full QA compliance in order to be able to meet its December 2004 target of sending a license application to NRC.

Seven, Australia has selected a repository for low-level and short-lived intermediate radioactive waste in the state of South Australia. The selection process concluded May 9th when Federal Science Minister Peter McGauran chose a site 20 kilometers east of Woomera. Reason cited for the selection of the site over two other candidates were that it offered better security, less environmentally sensitive access route, and is more saline.

The site selection process began in 1992

and included both scientific assessments and community consultations. McGauran said in a statement that he hopes the repository will open next year. The waste is now stored at more than 100 temporary sites around the country.

Okay. And now back to our regularly-scheduled programming. We have several presentations, as I mentioned. The first discussion will be on control of solid materials, and Mike Ryan is going to chair the meeting for this portion.

MEMBER RYAN: Thank you, Mr. Chairman. I guess our first presentation is Frank Cardile. Where is Frank? Ah, there he is, hiding behind the pillar. Do we have copies of your slides?

MR. CARDILE: Yes, I believe so.

MEMBER RYAN: All right. Thank you.

MR. CARDILE: I think we're just going to go from the handout material rather than going to overheads.

Okay. Thank you. I guess I'm going to --

MEMBER RYAN: Please proceed.

MR. CARDILE: -- walk through the overhead material or the handout material, rather than go with slides.

Thank you. We're here to discuss our

rulemaking effort on controlling the disposition of solid materials -- basically, jumping over to page 2. The task lead for this rulemaking effort rests in NMSS, specifically IMNS. We are supported by NMSS's Division of Waste Management in preparation of a Generic Environmental Impact Statement, and by the Office of Research in the preparation of technical information in a number of areas.

What we'd like to do today is give you a status of our rulemaking effort and also, as I've noted, how the technical information support is being developed. You'll see as I go through my remarks some of the questions that have come up in our rulemaking effort, and, therefore, then how some of the technical work will hopefully support that.

What I'm going to go through today is the solid materials that we're dealing with, why we're doing a rulemaking process, the information-gathering efforts we've conducted, the workshop that we just held last week, and what we're doing now.

The range of solid materials -- we're basically covering solid materials that are no longer needed at the facilities we license. This slide shows the spectrum of the materials at our facilities, the broad spectrum of facilities -- reactors,

manufacturing facilities, laboratories, medical facilities, etcetera.

Despite their presence at these facilities, much of this material has no radioactivity from license operations because it didn't come in contact with radioactive materials. For example, some of the furniture, some piping or electrical equipment, some packaging, material like that.

Other materials have very small amounts of radioactivity from license operations, because they just have limited contact with radioactive materials. This can be some of the tools or equipment, some structural materials, that type of thing. All of this is from the restricted or impacted area of a facility.

The levels we have discussed in our issues paper that might be on these kinds of materials are -- and the doses that one might receive from them are at levels that could be 1/100th of the dose that's in natural background. Other materials have larger amounts of radioactivity at a facility. As we well know, these are kept separate from the ones I just mentioned, and they are required to be sent to license disposal.

These are not part of our rulemaking effort. We are not changing our approach for these,

and all our discussion in the following slides and remarks don't apply to them.

On page 4, our current approach for controlling the disposition of the solid materials that have no or very small amounts of radioactivity involves separating it from material with larger amounts, conducting a radiation survey to see if radiation is detected, and, if so, how much.

In making these detection determinations we use existing guidelines based on survey instrument capabilities. These are contained in Regulatory Guide 1.86 and in other documents that the agency uses.

Basically, if radiation is not detected, or if the amount meets these existing guidelines, material is allowed -- solid material is allowed to be released. On page 5 --

VICE CHAIRMAN GARRICK: To what level are you able to conduct these surveys, what radiation level?

MR. CARDILE: Well, our current approach is basically guided by the levels that are in Regulatory Guide 1.86, which are 5,000 disintegrations per minute per square centimeter for surface contamination. That's been an issue that -- and

you'll see as we talk some more perhaps that different detectors can detect different levels, obviously, and can detect below that.

And so while our methodology, while our approach is based on a detection standard rather than a risk-based standard, that's a whole, or that's an issue.

MEMBER RYAN: I just want -- just for clarification, you say "released," do you mean released without regard to radioactivity for further disposition or whatever --

MR. CARDILE: Yes. Once the material either is -- passes because it's not detected or because it meets the levels at -- in the 1.86 type levels, they are released without regard for radioactivity levels.

MEMBER RYAN: Okay. And I guess just to further --

MR. CARDILE: In other words, there are no more conditions or restrictions on it.

MEMBER RYAN: Right. I mean, as far as you're concerned, it's not within regulatory control at that point.

MR. CARDILE: Yes.

MEMBER RYAN: Is it fair to say that --

when you say "licensees," do you mean both NRC and agreement state licensees, or --

MR. CARDILE: Yes. Agreement state licensees, to a large degree -- I don't know for every state, but they to a large degree use 1.86 or --

MEMBER RYAN: Right.

MR. CARDILE: -- similar standards.

MEMBER RYAN: Okay. Thanks.

MR. CARDILE: I guess on page 5, kind of getting into the remarks on page 5, is that we generally do a rulemaking when we want to review an existing approach. What's interesting is that a recent study by the National Academies reviewed our existing approach and indicated that it does protect public health and is workable.

So one would ask, well, why are we doing a rulemaking? Well, the National Academies report, and as we've kind of just touched on now, we're looking to make our approach more consistent as well as more risk-based. The National -- we're looking to that, and that's what the National Academies report also did.

The National Academies report, while saying our report does -- our approach does protect public health noted that it could be improved to make

it more consistent and to make it more dependent upon risk or more risk-based.

So they all -- the National Academies report also went on to say that NRC should, therefore, proceed with a process to evaluate alternatives and invite public input. That's our rulemaking process, so that's where we're at now is in the rulemaking process, with the goal of establishing a consistent way to decide on what material needs continued regulation to protect the public and that which does not because it is clean or poses insignificant risk.

We've been engaged and involved, and continue to be, in a number of information-gathering efforts. This included publication of an issues paper in June of 1999 and receipt of over 800 stakeholder letters with a diverse set of views. We held six meetings to hear from stakeholders in '99 and 2000.

The stakeholders, as you can see, listed here represented a range of organizations and views. What was interesting is we got a lot of strong input from the metals and cement industries. We'll talk about those in a minute. They are the recipients, to a large degree, of the material we would release, so their views are important.

We also heard from citizens groups and

individuals, licensees, federal, state, and local agencies, tribal governments, scientific organizations, and the solid waste industry, by which I mean the landfill operators and associations.

Going to page 7, following this public comment period, the Commission requested a study by the National Academies to obtain an independent review of the issues and the alternatives involved with disposition of solid material. As part of this information-gathering, the National Academies held three additional meetings open to the public in 2001 and submitted their recommendations to us in March of 2002.

We're also conducting a number of technical studies -- you'll hear about them in a few moments from our research staff -- on possible impacts and practicalities associated with different alternatives. And we've also gotten input from various scientific organizations, including a recent study or a recent technical report by -- on alternatives by the NCRP. I have a copy of that here. It's NCRP Report Number 141.

That's all been put together over the last two, three years. Where we're at now is that we've got a large bank of that information. I'm just going

to jump ahead. Information, those comments, those views can be viewed in a SECY paper that we prepared a couple of years ago. It can be reviewed on our -- or viewed on our website and also reviewed in a NUREG report which summarizes the various comments.

So we've tabulated and are continuing to bring those comments forward, even though, as you can -- I didn't really get into the timeline, but our timeline was is that we held a number of the public meetings in late '99 and 2000, and then we had the National Academies conduct their study in basically 2001 and 2002.

But all of the comments that we received, both in our process of gathering information, and in the -- and from the National Academies' input and the NCRP input, they're all in our data bank, so they're all part of what we're working from as we move forward.

From the information we gathered we get now into some specifics as to where we are and what we know and what we've heard from different views. Preliminary alternatives can be divided into two broad categories. One is those alternatives involving some further use after radiation surveys verifies that the health and safety is protected. This could either be

for unrestricted use, either by continuing the current practice or through -- by passing or by issuing a dose-based regulation, or the further use could be some conditional use.

The alternatives also involve the broad category of no further use, either because the material is sent to an EPA-regulated landfill disposal or because it's disposed of in a licensed NRC or agreement state low-level waste site.

Most of the comments, most of the information gathered focused on unrestricted use, and most of the comments we received, although not all, and some of the important ones are not -- were in the area of health and safety. What I've listed here is just a few of the diverse information and comments we have received. As I mentioned, they can be viewed in much more detail in material that's on our website.

Some information gathered, most notably or including from the National Academies and the NCRP report, noted that the radiation levels in our issues paper for possible release are in the range of other health-based standards -- for example, similar or less than the EPA drinking water standards. They pose negligible risk, and they're a small fraction of natural background.

On the other hand, the commenters have noted that the risks are uncertain, that they're not accurately modeled, that they can't be accurately measured, and that no dose above background is justified.

On the next page you get to the -- page 10, we also got important comments on the regulatory or economic burden that could result from a rule in this area. In particular, as I mentioned earlier, the metals and cement industries noted there could be a very large impact on them because consumers would not buy products made with material recycled from licensed facilities.

Commenters also noted that there wouldn't be any liability for material that was released into the -- into consumer products in the public sector, and the burden for this could fall on the public. On the other hand, commenters also noted that disposal of not allowing release and, rather, disposing of the material and licensed low-level waste would use up resources for material that is essentially clean, and that, in particular, small licensees such as medical facilities could face severe economic impact if all of their materials and routine trash materials needed to go to a licensed low-level waste.

We also got -- received quite a bit of information on alternatives that would restrict where the material would go. These are in particular, as I just noted, the conditional use option, which restricts material to only certain uses. For example, perhaps it could go to a bridge or a sewer line or someplace where the public is not as intimately associated with it perhaps as in a consumer product.

Another restricted alternative, or limited alternative, is disposal at an EPA landfill. An advantage of these alternatives, of course, is that they can minimize potential radiation dose to the public by restricting material to only certain authorized destinations that have limited public exposure.

There are some issues raised regarding the safety of landfill disposals. Despite a potential positive of limiting public exposure, there were concerns expressed in all our public meetings, and, again, at the meeting we held with the Commission in 2000, that it might not be viable economically to set up a specific conditional recycle process for the limited quantity of material from NRC licensees. And it also wasn't clear that restrictions would work to limit where the material goes.

So where are we now? What are we doing now? Well, that's a quick snapshot of a lot of the information we gathered. We haven't made any decisions about the alternatives. They're all part of our consideration. In October of 2002, the Commission directed us to conduct a rulemaking process to evaluate alternatives, including one of which would be a rulemaking process, retaining the current approach, to give fair consideration to these alternatives and ensure stakeholder input.

We are also directed to build on these previous efforts and to focus on solutions, as I have gone through this -- quite a bit of information that we've got there. And, in particular, we were directed to focus on the feasibility of these restricted alternatives. We also were directed to increase web use to interact with stakeholders.

If we go on to page 13, we've kept our website up to date. It has information on our current activities, what's going on now. You can link to a variety of information, a variety of documents, and all of the comments we have received. And also, it provides information on when additional comment opportunities exist.

We issued a Federal Register notice in

February, which invited additional comment, invited new comment in this area, and announced an EIS scoping process for this rulemaking. And we held a workshop on May 21 and 22, last week.

Going to page -- what I'd like to do over the next couple of pages is give a very early summary of that meeting, or of that two-day workshop. As I mentioned on page 14, the agenda of the workshop, the first three bullets, we -- allowed us to talk with -- a little bit with stakeholders about our rulemaking process, about our information-gathering efforts, and about our environmental review process.

Most of the next -- rest of the two days was involved in stakeholder discussion on the stakeholder's perspectives on all of the alternatives, with a particular focus on conditional use and landfill disposal.

The next few pages, as I mentioned, give you a very quick and very brief summary of what we heard. We got a lot of input. We're still digesting the comments. There will be a more detailed summary and a transcript on our website very shortly, but I want to -- but these slides give you some idea of some of the points made at the workshop.

The first page, page 15, talks about some

of the views we received on unrestricted use and was useful because it allowed us to give some updated views and current views from the different stakeholders.

With regard to economic issues, the metals industry reiterated their concern that consumer perceptions could cause product deselection, and they also noticed that there could be business interruption if an incoming load of solid material, particularly metal, sets off alarms at their steel facilities, because in that case it must be rejected because of continuing concerns about orphan sources.

What we were told is that you can't -- you must check for the orphan source if you see a radiation alarm go off. You can't just assume it's just cleared material at very low levels. So this is a -- these are two continuing economic concerns to them that we've heard before and that they restated.

We also heard radiation protection concerns expressed in the meeting. Despite information developed in the National Academies and NCRP reports about the levels involved here and the fact that they're in the range of other risk levels that are used in -- by government agencies and their comparison to background, we still hear -- concerns

remain that there is no safe level of radiation that can be released and that we don't know the health effects of radiation at low doses.

Concerns were also expressed that -- continue to be expressed that we can't measure the releases accurately. And also, basically, that we can't do environmental monitoring of consumer products. We don't go out and monitor a particular chair or Ford Taurus, which is the example that the steel industry always bring up, for radioactivity. So those are a number of the concerns we heard there.

We did also hear from a representative of the American National Standards Institute, who issued ANSI N13.12. I don't know if you're familiar with that. That was a document that the ANSI issued I believe two years ago, which contains dose criteria for control of solid materials and screening values for those materials.

It contains a one millirem dose criteria. And what the gentleman from ANSI, who was representing ANSI I guess as well as the Health Physics Society, indicated is that the NRC should adopt the levels in the ANSI standard, which -- because they are levels that can be used to set standards in a protective way and are consistent with international standards being

worked on.

We also heard a statement by the NEI that, despite the fact that they still believe that safe criteria for clearance and release can be set, they had modified their position somewhat to note that metals suitable for recycle should only be released on a case-by-case basis to assure that they don't wind up in consumer products. So those were some of the views we heard last week on unrestricted use.

With regard to conditional use, we heard a fairly consistent or similar discussion from a number of the participants or stakeholders. The metals industry continued to note that conditional use may not be viable or economically feasible, noting that a dedicated melter wouldn't -- would probably likely not be feasible economically because of the small amount of NRC material.

We heard from the states that a conditional use option would be too much of a burden, because it's hard to control where material goes. We heard from ANSI that the ANSI N13.12 did not address conditional use generically, because conditional use possibilities and possible uses are unknown and unlimited.

And basically, kind of what we heard --

and we heard this from a couple of people, including an NEI representative -- was that a rule should, therefore, not define specific requirements for conditional use, but rather outline a process by which someone could come in and propose for a particular set of materials and a particular scenario and location to which they might go, propose that to us and we could review it on a case-by-case basis, and perhaps do an environmental assessment.

Such a process would be -- they noted it would be similar to the 20.2002 process. So that was what we heard in that regard.

On page 17, we had more discussion on landfill disposal than we had had three years ago, and that was good, because it brought us a little more up to speed. We had some discussion about -- that reviewed the types and designs and post-closure uses and liquid and gas testing in RCRA C and RCRA D landfill sites.

We heard pros and cons of a number of discussions on landfill sitings, the fact that it can already be somewhat difficult to site landfills, in particular RCRA D landfills, whether or not you have -- you know, even without radiation, so this could make that more difficult.

We heard pros and cons on whether you can model landfill disposal successfully. We heard that you can, because it's been done in RESRAD modeling, and we heard concerns that landfill scenarios are pretty diffuse and may be hard to model.

We heard discussion about costs that should be considered, who should have the authority for the landfill disposal, and other issues, including the potential that the material going to a landfill could be diverted to other uses, and whether the design for a landfill can accommodate this material.

And we also heard discussions about that -- with regard to conditions on releases that this shouldn't be considered a conditional release, in the sense that any material in a RCRA D landfill should be at clearance levels or whatever is defined as a clean or safe level, and that additional conditions or extra limits or conditions or constraints should not be placed on RCRA D landfills at any rate because the landfill should not -- the landfill should be seen as an unconditional release rather than some kind of thing that can have further design conditions have to be placed on it.

So we heard a spectrum of views, and we are working to digest them.

On page 18, we also heard some other views. We heard a call for a task force of industry licensees and consumers, convened with NRC assistance, that would focus on specific materials and what industries might take what. And they were looking to maybe get more involved in the specific materials and, as I said, who -- where it might go in a particular case.

We heard requests for extension of our comment period from its current June 30th date, and requests for additional public input in this process. We heard a request that there be -- or comments that there be more complete records needed to let an end user know the source of the material. And we heard a number of suggestions on what should be specifically included in the scope of a GEIS.

On the last page, on page 19, are where we are now. Our scoping comment period runs through June 30th of this year, which is about a month away. As I mentioned, we heard requests that that comment period be extended. Our schedule for our rulemaking process and our NEPA processes are on our website, and it calls for providing a recommendation to the Commission in mid-2004 on how to proceed, whether to go to a rulemaking and what that rulemaking would be.

So that's where we are on the schedule.

And I guess that pretty much completes my remarks, and my research colleagues will now describe the technical work that they're doing to support the rule and this rulemaking process and answer, as you can see, a number of these questions that have been raised.

MEMBER RYAN: Thank you, Frank. That's a great overview.

A couple of quick questions. One is with regard to sources of radioactive material that -- as within your scope. I assume this is just Atomic Energy Act materials, correct? And not NORM or T-NORM or --

MR. CARDILE: That's right.

MEMBER RYAN: Okay.

MR. CARDILE: We've been -- that was a question in -- a scoping question asked in the public meeting, but at the moment we're focusing on them, although we have looked at the breadth of the inventory of those types of material that might be at DOE or that might be at -- controlled by the states. But at the moment, our GEIS will -- is focusing on AEA material. But, again, that's a scoping question that was raised and we'll --

MEMBER RYAN: It's still under consideration, yes.

MR. CARDILE: -- work with you.

MEMBER RYAN: And the second, as you mentioned, RCRA subtitles C and D landfills is a disposal option. And it just raises a question in my mind -- have you been coordinating at all with EPA who has kind of principal regulatory authority over those facilities?

MR. CARDILE: Yes. Well, as a matter of -- in two ways. We talked -- we have -- we worked with them, or are working with them, on the ANPR effort that they have now on the mixed waste facilities, which is the last draft I saw that was discussing possibly extending questions of putting -- of having, you know, radioactive material in both RCRA C and RCRA D landfills. I haven't seen a draft of that in a month or two.

Also, the representative from the EPA's Office of Solid Waste came to our workshop and gave an overview at the beginning of, you know, what was a RCRA C landfill, a hazardous waste landfill, and what was a RCRA D landfill. Obviously, as we now go forward, we'll work with them some more.

MEMBER RYAN: Thanks. Do members have

other questions? Milt?

MEMBER LEVENSON: Two questions. One, I know the steel and scrap industry has had a few incidents. Have any of those resulted from released material, or have all of the cases been from lost or foreign sources?

MR. CARDILE: I believe that most of the -- I believe that probably all of the problems that have cost them a lot of money have been from lost sources that got into the melt and contaminated material. The material, the levels of material that we're talking about in a clearance or released at a millirem is already low and diffuse. And so it would only tend to diffuse more. Yes, I think -- I don't know that they've -- they've not identified to us that they've had any problems with melted material.

MEMBER LEVENSON: Yes. I think that's probably the case. That seems to be getting mixed up, though.

MR. CARDILE: Well, the point that they made to us at the workshop and at other places is that -- and I'm not an expert, but when a load comes in, when a rail car or whatever comes in and it's full of metal, and it sets off an alarm on their detector -- I guess they have very sensitive detectors -- that

it's -- they don't know, of course, whether that's because there's a buried -- there's an orphan source or a lost source buried in amongst this big load, or because the -- you know, just the general radiation level.

So to some degree, they have to treat it as if it's a -- and it's not economic for them to dig through that rail car and find the lost source. So sometimes they'll just reject the whole shipment, which means that's a business interruption. That's the word that they use. That means that while they had some material coming in, and now they have to turn it around. So we heard that they'd just as soon not get any of this material. That way they don't have to worry about the pedigree or any of that.

MEMBER RYAN: There's another category, too, that's not just the orphan source coming in the gate. There's also a few of those cases, Milt, where it's been a level gauge that's been melted, you know, within the plant.

MEMBER LEVENSON: But what I'm saying is that I -- at least the cases I've heard of, none of them have been because of release of low level of material. They've all been because of a source problem.

MEMBER RYAN: Yes, I haven't heard of a case of other than a source problem.

MEMBER LEVENSON: Yes, okay. The other question I had -- and when people talk about not above background, are we talking about the background in Denver or in San Francisco, or, you know, in Washington near a building that's out of granite?

Because if it's absolutely local background, then you've got probably thousands of standards, because at the level we're talking about -- one mr per year or something -- probably every city in the country is different, and many different places even within each city it would be different. So what are people talking about when they say "not above background"?

MR. CARDILE: Well, I think you're right. As you mentioned, even in Chicago you can walk down the street past I guess their post office, and, you know, the granite buildings have a high -- higher exposure level. And, of course, there's a large variation in background between what's in Denver and what's in the coast.

I think the comment -- so that's what, for example, the National Academies report noted was that there's a variation -- that if background is high or,

you know, is a certain level, then it can vary. I think the concern we've received, though, is that while it's in the noise of -- what's noise between different areas, or while it's less than what can be between the coast and Denver, for example, it's an addition which shouldn't be added. That's the comment that we received.

VICE CHAIRMAN GARRICK: Just a simple clarification. On slide 9, I've got a radiation balance problem here. The third sub-bullet says small fraction of natural background, and then the sixth one says no dose above background justified. Is that -- are those compatible statements?

MR. CARDILE: Well, I think they're from -- yes, I apologize. This is a slide that summarizes the views from a range of commenters, and I guess the first three I think I would characterize them as those were comments from -- that were -- or statements that were made in the National Academies and NCRP reports that a level like one millirem is a small fraction of natural background.

And then, the lower three ticks or bullets, whatever, are concerns about even a level like one millirem, that no dose above background is --

VICE CHAIRMAN GARRICK: These are just

different sources.

MR. CARDILE: These are different sources of comments.

VICE CHAIRMAN GARRICK: Okay. Thank you.

MR. CARDILE: Yes, I should separate them so that it's a little clearer, but --

CHAIRMAN HORNBERGER: For the alternatives involving no further use -- for example, your disposal in licensed low-level waste disposal sites -- have people calculated the cost of going to that kind of option?

MR. CARDILE: The National Academies report had a chapter comparing the cost of EPA regulated landfill -- I think it was either RCRA C or RCRA D, I forget which -- to disposal in licensed landfill. And it was -- they noted one of their findings was that it was substantially lower.

That will be one of the items in the environmental impact statement or regulatory analysis that we do will be compare those and tabulate those, as well as the cost of a clearance option. So to answer your question, specifically, yes, the National Academies report did tabulate the cost of disposal and licensed low-level waste burial.

CHAIRMAN HORNBERGER: And will the GEIS --

again, we all commented on the comment "no dose above background," which is not possible. But in the EIS, will the dose be compared for unrestricted or restricted release versus disposal in a landfill? Disposal in a landfill is not zero dose. Zero --

MR. CARDILE: Right.

CHAIRMAN HORNBERGER: -- above --

MR. CARDILE: Right. There would have to be -- I think our thoughts would be, well, there would be a similar dose criteria placed on disposal in a landfill.

MEMBER RYAN: No other questions or comments from members? Thank you, Frank. I think we'll move on to our other presentations, and Cheryl Trottier is going to introduce those presentations.

MS. TROTTIER: Good afternoon. I'm Cheryl Trottier in the Office of Research. What we're going to try and do this afternoon is talk to you about all of the work that we're doing to support the effort that the agency is undertaking on this rulemaking.

Our main task is to develop a technical basis that would support rulemaking. I have three project managers who are working in this area. The first one you'll hear from is Dr. Robert Meck. He is working on a NUREG, which we have previously published

as a draft. We are currently in the process of finalizing it, which will provide individual dose estimates for some materials. It doesn't include all of the materials that we will eventually analyze. It includes metals and concrete and reuse of equipment.

He will be followed by Dr. Carl Feldman, who is doing some of this follow-on work, which will include looking at some of this other material such as just average trash that would be released during normal operations. He is also working on the collective dose analysis that will be used to support the rulemaking.

And then the third person will be Dr. George Powers, who is working on the survey methodology. And he will actually be able to answer your question about, you know, how low can you go. I mean, today's technology does go very low. Thanks to 9/11 it's getting -- the capability is getting better all the time.

Anyway, one thing I want to say about the work that George Powers is doing, this work is broad work in that it supports decommissioning decisionmaking as well. If you are familiar with the times we've come and talked to you about the MARSSIM techniques for decommissioning, it doesn't deal with

subsurface contamination. That still has to be analyzed in a more cumbersome manner.

What this survey methodology will eventually do is enable us to design surveys to have high assurance that we have adequately characterized subsurface situations. So it will be handy for this situation where you may have large amounts of material going out in huge canisters. You want to make sure you've accurately characterized it, but it will also be useful in the soil environment.

And with that, I'll shut up and let Bob start.

DR. MECK: Thank you. Good afternoon. I'd like to acknowledge my co-authors who are doing technical assistance in parallel with us and assisting staff on the assessments that this presentation is about. And before we go to the next slide, I'd like to make a distinction for you, a definition and distinction, so that it might make the presentation a little more understandable.

Clearance by international agreement definition is the cessation of control from -- with respect to radiological properties. And so if I speak of something being cleared or clearance, we're not talking about any conditions whatsoever with respect

to the radiological properties of the material or the equipment.

And in the previous presentation you heard a broader consideration, which was the control of solid materials, and a subset of that control is clearance. Okay? So --

VICE CHAIRMAN GARRICK: Has that definition been generally adopted? Is that --

DR. MECK: Both the European -- the EC, European Council? Commission, thank you. The European Commission and the International Atomic Energy Agency use that definition and have defined it in that way. And that's the way that we're using it here this afternoon.

Let's see. Okay. Well, we'll go up here.

The report's official number is NUREG-1640, and you saw the title on the title slide. This report assesses doses to people potentially associated with the processing and the use of materials and equipment released from licensed facilities.

The doses are normalized to the amount of radioactivity in a gram or a square centimeter of the surface. Just as a reminder, NUREG-1640 is limited in scope of materials that are assessed, and that equipment for reuse is also assessed in this report.

Over 80 scenarios were analyzed for this report. In other projects, soils and ordinary trash are being analyzed. With the addition of these other materials, most of the material that realistically would be candidate for release are covered. Dose assessments were performed using Monte Carlo techniques to take into account the variation of parameters.

As you can imagine, in each of these 80 scenarios the amount of time, for example, that a worker or a process would take could vary, and so this is one of the advantages of taking into Monte Carlo techniques.

Let's see, comments on the draft came from the NRC staff, peer reviewers, including the National Academies report, and public meetings, and also in written submissions. They concerned improving the accuracy and completeness of the models used in the assessments. The final version will have a better description of the basic oxygen furnace processes and will add consideration of induction and cupula furnaces.

The potential for mixing of cleared materials with like materials in general commerce will be treated in more detail and in a probabilistic

sense. Considerably more research has gone into the partitioning of elements in the various melt products.

The representations for the transportation of materials and the copper and aluminum industries have been almost entirely reworked. These responses were aimed at improving the realism, and often lead to less conservatism than in the draft assessments. However, in some cases, more restricted concentrations are the result.

The geometries for trucks hauling scrap and other processing products was made much more realistic. For example, the distance between the load and the truck driver was increased to the actual dimensions as compared to the draft. Disposal in a landfill was added, and drinking water down-gradient from a landfill was also added in the final document.

More radionuclides were added, and both ICRP 26 and ICRP 60 based models were assessed to provide more complete comparisons with international assessments.

The results are complete. For steel, most critical groups are workers or persons reusing large equipment -- for example, processing scrap or melt products. Use of consumer products does not rise to the level of identifying any critical group.

Criticals groups, for a very few radionuclides, result from atmospheric or drinking water exposures.

For the volumetric or becquerel per gram radionuclides, 63 percent are less restrictive than in the draft. Most of these are a factor of one to 10 times less restrictive. Sixteen percent are less than a factor of three more restrictive. For the surface or surficial radioactivity, the becquerels per square centimeter, 74 percent of the ICRP 26, which is also the basis for Federal Guidance Report 11 from EPA, 74 percent from that model, and 78 percent from the model of ICRP 60, results are less restrictive than Regulatory Guide 1.86 levels.

So the bottom line is that defensible and robust dose assessments are ready for use in rulemaking. We've been turning the crank, as you can see illustrated here, and a publication is expected in June of this year. We're working hard to complete that.

And that concludes my presentation. Thank you.

MEMBER RYAN: Thank you very much. A quick question. You mentioned surface contamination and volumetric contamination. And how about in between? Do you have a methodology to look at

something that might have some volumetric contamination but not uniform or --

DR. MECK: I think that would have to be examined on a case-by-case basis, and it would be, in my mind, analogous to a sum of the fractions sort of approach. You know, how much -- what fraction of it -- the activity, on a nuclide-by-nuclide basis, would be involved volumetrically. And then the remainder assumed --

MEMBER RYAN: As you bring that drafting to closure, that might be something to think a little bit about, because that's practically speaking, you know, a common situation -- to have some material that is surface contaminated and other that is volumetric. And how to deal with a mixture might be a helpful thing to think about.

DR. MECK: All right. Thank you.

MEMBER RYAN: Any other questions from members? George?

CHAIRMAN HORNBERGER: Just a quick one. So obviously all of this is done through calculation. I mean, there are assumptions about the surface contamination, but then the doses or potential doses are all done through calculation. Is that right?

DR. MECK: Right, right. All of this is

done through calculation. The assumption that we made for modeling purposes is that the associated radioactivity was normalized. It was uniformly distributed either in the surface or throughout the volume.

Now, we know that in the real world that is not the case, and the idea in terms of implementation is that this is a suggestion -- that if a licensee wanted to verify, on a case-by-case basis, that he had, say, 10 percent of the surface of the material was -- had associated radioactivity, then, you know, he would have to come in on this case-by-case basis and say, "We would like to release this based on an average," and allow, then, for this 10 percent, perhaps even at a higher level than if it were uniformly -- than the same concentration if it was uniform, just because the total surface would average out to what we had calculated.

CHAIRMAN HORNBERGER: And the scenarios, as you say, mostly job-related and reuse scenarios are the key. And you mentioned things like, what, the melters or the equipment?

DR. MECK: Well, actually --

CHAIRMAN HORNBERGER: Is the equipment fabricated? Large equipment fabricated from recycled

material?

DR. MECK: Not really. Not really. I think the intuitive approach is probably revealing in that, you know, where would the most radioactivity, most concentrated radioactivity occur, and where would it be in the greatest group? Well, it would be in the initial load --

CHAIRMAN HORNBERGER: Right.

DR. MECK: -- that the truck driver would take away from the licensed facility and also in the scrap yard where it got dumped. And so that turned out to be, maybe not too surprisingly, the higher groups of exposures.

CHAIRMAN HORNBERGER: And so a lot of those exposures would occur regardless of where the trucker was delivering the material, whether it be to a RCRA landfill or to a melter.

DR. MECK: That's correct.

MEMBER RYAN: Any other questions? Cheryl, next up is Dr. Feldman?

DR. FELDMAN: Good afternoon. I'm basically taking the 1640 material that Bob Meck spoke of and going the next step. Anyway, what I'm going to do is give you an overview and status of the follow-on effort after 1640.

And this effort is for purposes of information for the -- for purposes of supporting the GEIS to estimate the collective dose for the clearance of solid materials, and for the possible rule option considerations, things like what if it were 10 millirem release limits, one millirem, etcetera.

What we have so far is we haven't actually done the collective doses. We're in the process of concepts for calculational methodologies and developing information bases. And we have something called a draft blueprint letter report that we got from our contractor, SCNA. And it was reviewed by our staff for comments and adequacy.

In addition, we are also going to take into consideration the recent workshop we just had as to any comments they may have that we would also incorporate into the collective dose reports. Based on the review so far that we have looked at, we think that the blueprint methodology concepts is -- can do what we need to do to get the information for collective dose for the GEIS development.

Okay. The collective dose evaluation itself, the data that goes into it is obviously the inventory of the materials that we have from the NRC licensed facilities, things like metals, concrete,

trash. We're also looking at soils. That's under development; it's not as fully developed as these other -- metals, concrete, and trash.

The other thing that's looked at are the possible scenario pathways developed starting with the release of the material from the facility, and follows the path through all the various steps, through to the consumer -- to development of products to consumer use.

At each of these scenario pathways there's a vast amount of this layered data that's been developed by the contractor using something called Geographic Information System, which is a coordinate-type system, a map of, say, the United States. And it has all of the reactors laid out and has all of the distances to melters and all kinds of things of that sort.

And we can simply, depending upon what -- how we choose to combine this material, select enormous amounts of data and use various kinds of Monte Carlo techniques to average the different -- for different realizations of these different pathways scenarios.

Okay. The collective dose methodology, as you might expect, parallels, as appropriate, the

methodology that was used in NUREG-1640, and it uses the dose conversion factors which are normalized doses per unit mass.

Again, we use a statistical approach, and what we get for the collective dose are average values and then a two sigma or 95 percent confidence interval.

Oh, status of the effort is -- we think the present effort can easily accommodate various kinds of information requirements and format presentations. We're at the stage now where we're doing the programming. We have the information in -- say, in matrices-type structures, and we can format it to whatever needs the GEIS development requirements are. We can add different considerations. It's very flexible at this point in time, so that's why we're trying to get useful input right now.

The recommendations from the NRC staff who reviewed the blueprint paper, as well as the workshop, are coming in and we're going to input those to our contractor. And the soils effort is, again, early but proceeding. And I guess I'm done with that.

I also want to mention I'm going to give out a draft Chapter 2 of this blueprint, because I think it will give a better feel than I was able to

give in this quick presentation.

I'm done.

MEMBER RYAN: Thanks very much. Just a question. The collective dose at the kind of levels that you generally talk about is a small fraction of background, whether it's individual or collective. So, you know, I guess it's a question -- is the real use of collective dose in this modeling exercise to identify critical groups? Or what's its goal?

DR. FELDMAN: No. Its goal -- we have to do cost-benefit analysis, and the cost is the collective dose and the way we do NEPA analysis.

MEMBER RYAN: Okay. That's fine. I understand. Any other questions from members?

VICE CHAIRMAN GARRICK: In your cost-benefit analysis, if you look at different clearance levels, such as one, 10, something, did you also attempt to compare the risk impact with the cost for different clearance levels? Was that in NUREG-1640? Is that --

DR. FELDMAN: Well, 1640 did the maximum individual dose. We're not doing that. We're doing the collective dose.

VICE CHAIRMAN GARRICK: Yes.

DR. FELDMAN: And this part of the

contract doesn't do the cost. It just does collective dose. ICF is another contractor that has come on board -- is going to be doing the actual cost. But what we intend to do is basically look at different risk levels like, say, millirem, do the collective dose for that particular inventory of materials --

VICE CHAIRMAN GARRICK: Right.

DR. FELDMAN: -- and the associated cost will be a comparison a ratio of cost-benefit. And then it'll be compared with, say, 100 -- just the way we normally do impact analysis.

VICE CHAIRMAN GARRICK: Now, is the cost -- what's the cost going to -- what's the scope of the cost analysis going to be? It's the cost of what?

DR. FELDMAN: It's the cost of the dose with some conversion. We usually convert it to money, like $2,000 per man-rem or $3 million per fatality averted to one of those kinds of numbers. And we basically follow through on the risk part -- portion of it converted to money, and then the cost that it costs to transport things, and so on, all of those things are balanced and we come out with a ratio of cost-benefit greater than one, etcetera. We did that in the license termination, same idea.

VICE CHAIRMAN GARRICK: Right. Okay.

MS. TROTTIER: Can I just -- one clarifying -- the Commission has come forward with a reg analysis handbook, guideline handbook, that the staff uses in rulemaking. And so that's really what they're going to be using this for, to, you know, come up with the alternatives and be able to compare one alternative against another. So it's pretty prescribed in that every rulemaking basically follows the same approach.

VICE CHAIRMAN GARRICK: Okay.

DR. MECK: And just to add a little bit more detail, in this reg analysis handbook there are 18 attributes. You're asking about the scope of cost-benefit, and these 18 attributes are intended to cover all reasonable attributes that one would consider for a range, and certainly risk is underlying each of these attributes.

However, the mechanism for normalizing things that are qualitatively of a very different nature is to monetize them. And so that's the approach, but the scope is actually quite broad then.

VICE CHAIRMAN GARRICK: Thank you.

DR. FELDMAN: I just wanted to clarify something. What we're also looking at in a collective dose -- differs from the maximum individual doses --

we are looking at what maximizes that type of thing. And, of course, things like how long somebody is exposed to something, aside from just -- and the number of people exposed, and then looking at things like bedsprings as an example of that, where people sleep on beds for long periods of time, things of that sort and iterative aspects of it, and how much of the inventory we have taken into account when we make these kinds of products, and how much is left over, and just to try to get some kind of an estimate of bounding.

VICE CHAIRMAN GARRICK: Yes, okay. Thank you.

MEMBER RYAN: Milt, did you have a question? George?

Okay. Thanks very much.

And our third presenter is Dr. Powers.

DR. POWERS: I'm George Powers. I'll be talking to you about the performance-based radioactive materials control. In essence, this is probably one of the more fun parts of this entire rule process, because we're trying to improve, or optimize if you will, the process of determining the presence or absence of radioactivity for the requirements or the conditions present, requirements referring to

regulations, what have you. Conditions present would refer to pretty much everybody else -- spatial geometry, the isotopes, the instrumentation.

I'll be looking at four aspects of it from the perspective that we use it. It's necessary, before one gets into any form of magnitude, to actually understand the requirements of whatever the pending decision is going to be. Is it going to be recycled? Is there going to be reuse? Is there going to be disposal? Is it going to be radioactive metal turned into a waste container that's going to hold higher levels of radioactivity?

And, finally, you're going to want to identify explicitly the uncertainties that could lead to the decision errors that you might run into. And this turns out in some cases to be quite a process. One person might think that there will be an error associated with one form of measurement or technique. Somebody else might be more concerned about whether it's surface or subsurface.

The little discussion that's been going on on whether to look at subsurface or surface material -- Frank mentioned 1.86 and something like 5,000 d per m on a surface. Well, imagine a large piece of tinfoil, and find it can pass the 5,000 d per m, but

go ahead and roll it up into a 5,000-foot roll and put a detector up against it. You've got a completely different situation. So the configuration of what you are going to be measuring is going to be quite important.

What is accomplished? The last time that I was in front of the ACRS we had just completed NUREG-1505, which was the transformation from a document called 5849 to MARSSIM. And the transformation primarily led with the concept of moving from parametric statistics toward non-parametric statistics. And in the world of the non-parametric statistics you do not need to know what the distributions are that you're working with.

In the parametric world, you've got to have a pretty good handle on that to get reasonable results. But in any event, sampling uncertainties and so forth were worked out in MARSSIM, and it came out in around August 2000. Analytical uncertainties, material sending to the laboratory, is due out this December.

It's a document called MARLAP, which is the Multi-Agency Radiological Laboratory Analytical Protocol Manual, and it's being headed up by John Griggs at EPA. And it turns out that's going to be a

very, very good document. To date, the textbooks on radiochemistry, radiation chemistry, are old, pretty much out of date. This could very well become a college textbook. It's headed that way. It's been reviewed in that manner.

We have target for next year a materials-specific document, which they are referring to as MARSAME, just basically more pages, Multi-Agency Radiation Survey Assessment of Material and Equipment. This will probably be the heart of the regulatory guide or whatever might come out of the NRC.

They have been working on this for a couple of years now. It was initiated when we published July last year a NUREG-1761. Some of you may or may not have this. It's the Radiological Surveys for Controlling the Release of Solid Materials. It was issued to get the ball rolling in that area.

And then, we're moving into the subsurface area. This will be accomplished, we hope, within the next couple of years. And to pull this all together, one of the things that has happened as you move from the two-dimensional world -- the surface surveys, the land surveys, to getting into subsurface, subsurface meaning below 15 centimeters, or inside waste

containers, anything that gets volumetric, the mathematics gets a little more complicated

So we've set up a program called SADA, and I'll mention that a little bit later.

Finally, we get into the instrumentation side of it. Selecting the proper instrumentation for surveys was pretty well covered under NUREG-1507, which came out some time ago. We later updated some of that information with the advances that have occurred in instrumentation, and part of it is in the Appendix B of this thing here.

And we put these out as letter reports internally, because of the changes that are occurring. Since 9/11, in the area of instrumentation, there has been quite a bit happening. Before everybody was pretty much interested in handheld meters, you had some NC-2 meters, projects like ISOX that Ken Berra put together for monitoring, has advanced quite a bit since then.

We've gotten into the capabilities of data logging. Instruments make readings. You don't have to write it down on a piece of paper. It'll take care of it for you. We're getting into live-time analysis where partial results are available at the site where the measurements are being made.

We're getting into GPS, location of where samples are taken, and this has all happened within the last couple of years. And probably one of the more exciting ones as far as subsurface is concerned, and related to things like partial contamination, subsurface contamination, is the world of computer tomography is starting to get involved now a little bit. So they can actually generate 3-D diagrams of what is in a container.

So these problems of facilities like smelters, and so forth, they might be able to identify and locate this material without having to completely empty out a vehicle. But that does lead to a problem, and I think it's worthy of bringing it up, making aware of it.

A lot of the analysis is moving toward the integration of the instrumentation to analytical softwares coming together. That begins to open up all sorts of areas in the area of quality. There's a lot of software that's being generated to go into, let's say, a little handheld instrument that's being used onsite.

And they assume it works one way, but does it? This is going to be I think something that's going to have to be worked out. NIST is interested in

this also.

We've gotten into the sampling designs. As I mentioned earlier, the so-called 5849, which uses a uniform grid, you take a sample at every square, collect your samples, and go for it. Simple, straightforward, everybody likes it. Doesn't require any brains. You apply a little brains to it, move into MARSSIM, you might be able to do the same thing with only 10 percent of the samples and get better results.

When we moved into MARSSIM we moved into the non-parametric random-type sampling. And applying things like the minimum detectable concentrations that instruments can detect, the more sensitive an instrument is to it, the fewer samples you're going to need, if we're talking that type of material. So this would be considered the active form of surveys that's being done today.

A few other little things have come out. We've set up double-sampling beyond MARSSIM. A lot of utilities or situations come up where a site or materials are being released. They expect, yes, we're going to take a survey, but if it fails we want to resurvey. Some of the criteria that's been set up is a bit harsh on the licensee, but they can plan ahead

for it.

One of the other items that has come up dramatically in the materials side of it is, what is a survey unit? Well, there's been quite a bit of time spent on that. Once the answer kind of got worked out, it turned out to be fairly simple. MARSSIM you have surface area that you apply.

Well, it so happens when you get into materials, a survey unit can range anywhere from a hammer that a guy is carrying out of a powerplant, just one hammer as a survey unit -- that's it, the results -- you aren't going to sit and do 15 or 20 measurements on it, maybe one going through. Or it may be an entire carload if you're able to make sufficient statistical samples against it to allow that to occur.

In the subsurface world, we're going toward the Bayesian concepts. This I think is going to have an impact also on the previous work that had been done in the area of 2-D. We're doing all of this to assure that what we are putting together is defensible. A lot of these techniques have been used helter-skelter. Depending upon the knowledge of the people that are in the field doing the work, it varies from place to place.

But I think we're bringing enough of it together to where we're -- by using things like Bayesian sampling, there's another one called adaptive sampling, and, in particular, co-sampling, especially in materials where you're measuring more than one item and you're going to compare to them and do things like a covariance-type analysis on them.

VICE CHAIRMAN GARRICK: Now, why wouldn't you use Bayesian sampling, for example, on surface?

DR. POWERS: You can. That's why I said it's going to start beginning to impact the MARSSIM as it was designed. Case in point -- MARSSIM was put together for a regulator. He knows nothing about that site. So he has to -- when he gets done -- let's say he chooses his alpha at five percent, he wants five percent of the -- you're willing to accept five percent of the material getting past you as the regulator.

So it's based on a national basis. You don't know anything about any sites you go onto, so you set up this type of sampling. And you set your alpha five percent, and you'll be 95 percent sure that you collected whatever you wanted to.

Now, you move toward Bayesian, now you're starting to take credit for some site-specific

information.

VICE CHAIRMAN GARRICK: Right.

DR. POWERS: Which is being done by the people that take care of the so-called license termination plans today. They know more about that site than the MARSSIM gives them credit for. And so where we're talking of an alpha of like five percent, probably in reality we're looking at maybe one percent or a half a percent. And we don't -- that doesn't show up. It just -- it was done by a fraction of a percent.

If you have a washout area, you would want to sample primarily where that area is to find the boundaries of it. That's adaptive sampling. There's no sense in sampling the rest of that site.

The SADA program that's doing this is from the University of Tennessee. It's a free program that can be downloaded. And the DOE and the EPA have already dumped over $2-1/2 million into this program. We're contributing to it now on its shirttails by adding to it Bayesian sampling/resampling capabilities.

It has built into it an excellent visualization package. The areas up there that are described that we're spending time in now are in the

statistical analysis area. We're spending time in the secondary sampling design. And we're spending time in the geospatial uncertainty analysis.

We have other people in the research group that are working on uncertainty analysis of the modeling. We've got a pretty good handle, we think, on the surveying and the sampling statistics. The poor modelers, they've got it tough. We have also utilized as many technologies as we can from other fields. As I mentioned, computer tomography, from astronomy, decon pollution analysis, all of these techniques are turning out to be quite useful, and we keep looking around.

Why? To support this rule. We want to be sure that when we do go out with guidance for this regulation, if it occurs, that it is going to be totally defendable, as much as we can possibly make it at this point.

If you're interested in it more, on June 3rd to 5th we're going to have the University of Tennessee -- and the Environmental Measurements Lab will be here for three days, and the Professional Development Center, discussing the -- and showing SADA to the NRC personnel as a training issue.

And that concludes my presentation.

MEMBER RYAN: Thanks very much. Just a quick question. Will this SADA capability ultimately be tied back to the dose performance requirements? And how do you link those two together? Is that a goal? I mean, for example, if I'm a user, and I want to show that something complies with the requirement, will that be kind of laid out in the implementation guidance, how to get there?

DR. POWERS: Yes. One of the features that SADA has is it has an incredible number of sampling styles and capabilities, some of which we have not approved as an agency.

MEMBER RYAN: Right.

DR. POWERS: But they are available, and they are in there. We're bringing in a new one, which is a MARSSIM-type sampling, and then going into three-dimension --

MEMBER RYAN: I see.

DR. POWERS: -- with it. And as we go through this development and through this workgroup that we've got, we'll be getting to say, yes, this one -- these are valid, acceptable survey situations that can be used.

MEMBER RYAN: Great. Questions from members? Milt?

MEMBER LEVENSON: Yes. If I understand what you've said, the radiation measurements in this program have no discrimination in the sense that you don't determine anything about either half-life or energy of the source, is that correct?

DR. POWERS: Well, you would be using the energy of a source to determine what it is, if you're getting into -- if you need that capability. A lot of the instruments that occur today are like multi-channel analyzers that are portable, and they do utilize the energy.

From the half-life, one should determine what the thing is, and then you probably have a pretty good idea of what the half-life is.

MEMBER LEVENSON: Okay. So in this program you will be discriminating, or will not be?

DR. POWERS: I'm afraid I don't quite follow the question.

MEMBER LEVENSON: Instrument -- you know, spectrometers, there's incredible capability in instrumentation. But in this program, when you're monitoring materials for releases, etcetera, will you be looking at -- numbers were quoted like so many counts per square meter or something, whatever is -- are those kinds of things in the regs -- will they be

independent of half-life or what the source of the radiation is?

DR. POWERS: Well, given the source of the radiation, most people are familiar with surface measurements. When you start getting into subsurface measurements, you start looking at other parts of the spectrum. Like there's a Compton edge on the spectrum that will begin to move, and that will give you some idea of its depth, until you finally reach a point of electronic equilibrium or something like that, where you can't read the --

MEMBER LEVENSON: No, that's a slightly different kind of thing. What I'm trying to get at is that what's on a material -- it incredibly complicates the issue and the problem -- of what you might be willing to release. If the material had a half-life of 20 hours, it might be quite different than if it was 20 years. So --

DR. MECK: If I can clarify -- the criteria from dose gets translated to the concentrations that I spoke of earlier, and this is on a nuclide-by-nuclide basis. And so the presumption is that the nuclides present will have to be identified, and then this translation to dose through concentration can be accomplished.

MEMBER LEVENSON: That makes the monitoring instrumentation significantly more complicated.

DR. MECK: Yes.

VICE CHAIRMAN GARRICK: With all the users for SADA, I assume it's -- and maybe you said this, that it has gone through some sort of a formal code verification program.

DR. POWERS: That's the other beautiful part of this. EPA has a pretty nasty QA program for programmers, and this has gone through the EPA QA program, which does exceed, I think, in this particular case that of the NRC's as far as --

MS. TROTTIER: George means rigorous.

VICE CHAIRMAN GARRICK: Rigorous?

(Laughter.)

MS. TROTTIER: Nasty could mean ineffective.

(Laughter.)

MEMBER RYAN: One other instrumentation question I had is it really -- it sort of implies that the bar is raised a bit, and I'm following up on Milt's comment, that, you know, a simple GM measurement of counts per minute or disintegrations per minute without process knowledge probably isn't

going to be enough.

That's not a bad thing. I'm not criticizing that. I'm simply saying that radionuclide-specific measurements will really be the focus of how to demonstrate compliance rather than what is kind of the 1.86 of -- you know, world of disintegrations per minute, and so on. Is that a fair statement on my part or --

DR. FELDMAN: I'm not sure.

DR. POWERS: Yes. I think --

(Laughter.)

MEMBER RYAN: We'll come back to the "I'm not sure" in a minute.

(Laughter.)

DR. POWERS: On the very first slide I mentioned that one would want to know the reason for what the release is going to be and what the intent is, what isotopes you're going to use. And that's going to have a lot to do with whether or not you're going to need to use the GM counter.

If you're working with something that's going to have fairly high concentrations, but when done it's going to be somewhat diffuse, you can use simple equipment. It's going to depend upon your goal for what you are going to release.

MEMBER RYAN: Sure.

DR. POWERS: The comment was made earlier about backgrounds differing on the east coat versus the west coast, and my favorite comment to that is usually take the waste from the east coast, take it to Colorado, and reduce the background in both places.

MEMBER RYAN: Well, I guess my point is a little different. If, for example, you've got a single radioisotope licensee, and you have cobalt-60, it's a very simple detection question.

But if I have a reactor facility and my question is releasing material that's been in the neutron-activation field of some kind 20 years ago, that's a whole different matter, and, you know, what steel and concrete may be there and what activation parts are there and what concentrations, and all of that. That's a whole different matter requiring a much more complicated detection scheme to make assessments of samples or represented samples and all of that.

So I guess what I'm hearing is is that you're aiming to address that broad range of detection complexities in this effort. Is that correct?

DR. POWERS: Right.

MEMBER RYAN: Okay. Good.

DR. POWERS: In the last 10 years or so, I think I could probably safely say that you could measure anything that you want. If you go to the MARLAP manual, let's say you've got a background of one count per week. You put a sample in, you have a count in the second day. What is the probability that that has radioactivity in it?

MEMBER RYAN: Sure.

DR. POWERS: That is the level that we have been able to go to. You can go to mass spec, and you can take stuff down to separate out the individual atoms. It's a little expensive, but it's doable.

MEMBER RYAN: No, I understand.

DR. POWERS: If you want to go there, I'm --

MEMBER RYAN: No, that's fine. Thanks for the answer. That's great.

Any other questions or comments?

DR. MECK: Could I just --

MEMBER RYAN: Please.

DR. MECK: I'd like to point out that in our current practice, the implementation of Reg Guide 1.86 does require some process knowledge, and it does categorize according to radionuclides of various kinds. And so --

MEMBER RYAN: It's not individual, though. It's grouped.

DR. MECK: Yes, they are grouped. And so, yes, this is going to be a sophistication of what -- compared to what we do now.

MEMBER RYAN: It may, in fact, be a good one because it might clarify, you know, what applies when, and so on perhaps, so that's great.

MR. CARDILE: Can I just remind everybody, though, that we're at the stage again of developing a technical basis, developing information to feed into the process. When we get to a rulemaking, if we get to a regulation that we would discuss with you, and supporting guidance, we'll come back, and we'll say -- we'll talk about, you know, where we are -- how we're taking all of this and implementing it.

This is -- we're not yet at -- this is exactly what we're doing or we're going to be thinking of doing.

MEMBER RYAN: Sounds like good questions.

MR. CARDILE: Well, yes, these are -- and this is good discussion, and it's good -- and you're seeing that this type of improvement is -- as a matter of fact, some of the comments we heard the other day at the workshop were, you know, you need to be able to

measure it better, you need to be able to have better records, etcetera, etcetera, and this is the type of thing. But we're not at the finalized stage by any means.

MEMBER RYAN: Thanks very much. Cheryl, any other last comments? Are we --

MS. TROTTIER: No. I just want to thank you. And as we move forward, we'll be back to brief you on our status at that time.

MEMBER RYAN: Great. Thanks very much.

VICE CHAIRMAN GARRICK: I'm a little curious as to what Dr. Feldman's differing view was.

(Laughter.)

DR. FELDMAN: I was basically -- when I said I'm not sure, I was basically saying what Frank Cardile was. I was thinking of saying what Frank was saying. We haven't come to a criteria. Depending upon how low you want to go, you know, conversion from millirem to concentrations of dose, then the methodologies change.

MEMBER RYAN: Sure.

DR. FELDMAN: And that's -- and we also know, you know, some of the ways we've done other things before is we have a pretty good idea of the dose-contributing nuclides for a number of the

materials we're dealing with. Most of them come from reactors. It's cobalt predominantly, cesium comes next. And depending upon -- so those are the major dose dominant contributors, and then those would probably be more of a concern than looking at each specific nuclide in many cases.

MEMBER RYAN: Sure.

DR. FELDMAN: So --

VICE CHAIRMAN GARRICK: Thank you.

MEMBER RYAN: Mr. Chairman, I guess we're through with our first group of presentations on control of solid materials.

CHAIRMAN HORNBERGER: Thank you, Mike, for not only keeping us on time but actually getting us ahead. I think we'll maybe take a break now. Is that all right with everyone? Let's return at 3:00. Okay? We'll take a break until 3:00.

(Whereupon, the proceedings in the foregoing matter went off the record at 2:37 p.m. and went back on the record at 3:01 p.m.)

CHAIRMAN HORNBERGER: Okay. We're going to reconvene now. The second part of our afternoon has to do with the License Termination Rule. And, again, Mike Ryan is going to chair this portion of the

meeting.

MEMBER RYAN: Thank you, Mr. Chairman.

Our speaker is Robert Johnson on the results of License Termination Rule analysis. Good afternoon. Welcome.

MR. JOHNSON: Good afternoon. It's nice to be here. I haven't been here for a few years I guess. So this will be a good reentry maybe.

I'll give a talk today, an overview of the License Termination Rule analysis, and talk more about restricted release, and Chris McKenney will talk more about scenarios.

Let me try this little mouse out. Okay.

So the talk today will really focus on kind of two parts. The first part that I'll give is an overview of the analysis of the License Termination Rule -- LTR I'll call it from now on -- and just kind of give a real quick summary of the background, evaluation process. And, in particular, there are nine issues, and so I'll just summarize very briefly each of those nine issues, just to give you a flavor.

You all have the papers, so you can read -- you know, pick and choose, because it is a long document, so pick and choose where you really want to look at. In talking with your staff, we figured that

the second part we would go into two issues in particular that might be of more interest to you.

And, in particular, I'll talk about restricted release, institutional controls, and then Chris will talk about more realistic exposure scenarios. So that's sort of the game plan. We can proceed, then.

I am happy to say that -- well, let's see. How should I start? I'm happy to say that many of the team members that helped me on this analysis are in the audience. I'm looking around for them. Hopefully, they will be. So if there are questions, you know, they might be able to help in that regard.

Let's start a little bit on the background and start with the Commission direction. In June 2002, the Commission gave us an SRM that had directed us to conduct an analysis of the LTR implementation issues. In particular, they wanted us to focus on restricted release and institutional controls, and with the goal of making those provisions of the LTR more available for licensee use.

And in part this SRM, you might say, worded it -- what happened to it? Oh, okay. Sorry about that. I think this is the only one that does the fancy fade in. The rest are just right there.

Where did this SRM come from? In part, it probably came from the fact that we had been working with DOE for a few years. As a matter of fact, I briefed the committee a few years back on our attempt to seek an MOU with DOE to take over ownership of some of our restricted release sites under the Nuclear Waste Policy Act.

And this had been sort of the path that the LTR, when it was finalized, had envisioned. And so we were working diligently, you know, with DOE on that, but that did not -- that was not successful at the time. And meanwhile a couple of sites like Sequoyah Fuels were still trying to find a way to deal with that provision, and they weren't successful. So there was pretty good visibility that this provision of the LTR wasn't working, and so the SRM in particular wanted us to find some ways, make some recommendations, to make it work.

In addition, you know, there were other issues related to the LTR, and we thought it would be good, because many of these issues sort of interact. They should be looked at at one time by a team, but try to look at the interactions possibly that might exist between those issues.

In response to the SRM, the staff prepared

a Commission paper in October, and this was an initial analysis of these issues. It identified eight issues, and it also laid out the plans for the issues. But it was important because it scoped what the issues were.

Based on that plan, we worked through the next many months and completed the results of our analysis in SECY-03-0069 May 2nd, and the Commission recently approved the release of this Commission paper last week. And let's keep in mind, however, the Commission will be obviously reviewing the paper and the recommendations that we have made and giving us direction some time in the future.

So today what I'll be going over are just results and what our staff recommendations consist of.

Regarding the evaluation process, it was pretty straightforward. We put an NMSS/OGC team together to evaluate the eight issues that were identified in that October paper. We also identified a ninth issue, a new issue on intentional mixing. And because that came late in the process, we're just in this paper only putting together the plans for evaluations of that new issue.

The team, as I mentioned, were made up of a number of people. And we assigned people to each of the issues, and the Commission paper has an attachment

that gives the results of each of these issues. So I just wanted to recognize the team members here for their diligent, persistent work, and they'll be able to maybe answer any questions that you might have.

I'll be going over these issues in a minute, so we don't have to talk about them or read them off here.

Going on to this next page, I just want to go ahead and just talk about most of the issues were evaluated in sort of a parallel fashion. We first thought it was important to find out what experience we may have had with other NRC regulations or just implementing the regulations.

And then we also wanted to look beyond NRC and look at what other experiences other agencies, EPA, DOE, Corps of Engineers, other groups may have had that would reflect on our issues. And, of course, this was more or less important depending on the issue. And I'll get into that in a little bit minute -- in a little minute.

After we collected this information, we identified a number of options, and then, as usual, laid out pros and cons for them, and then made recommendations. We also put together a matrix of all of the current decommissioning sites and how they

might be applicable to each of the issues, and that's in the Commission paper.

So that gives you a little more tangible feeling, you know, site by site rather than just, you know, issues and not knowing exactly how relevant they might be.

Now I'll start into a real brief summary of the issues. On restricted release, just in brief, since the issue itself was, like I mentioned, difficulties in arranging institutional controls that are required for both the restricted release and the alternate criteria provisions of the LTR.

And the outcome was basically what the Commission asked us to do -- make some recommendations to make these provisions viable. And I'll talk -- when I get into more detail later, I'll talk more about what those recommendations are.

Now, the next four issues are various questions about the relationship of the LTR criteria to other criteria that are out there. And the first one here -- unimportant quantities -- is a good one to start with. The issue can be viewed as there's an unclear relationship between the LTR unrestricted release criteria and the unimportant quantities in 40.13(a) -- that's the .05 weight percent criterion.

And, really, what that criterion is for in 40.13(a), it's the level to exempt from regulation if source material is less than .05 weight percent. So you can see that the purpose of this criterion is more of an entry into regulation, you know, rather than for the purpose of license termination.

And the .05, from what I've been told, was originated more from a safeguards purpose, you know, rather than, you know, a decommissioning purpose.

The desired outcome -- and when we say "desired outcome," what we did in the October paper was put down our objectives, so people would know not only what the issue is but what the objective of the staff's evaluation would be. And in this particular case, you know, we just wanted to describe the relationship here for all of the sites, because this originated from a formerly licensed site AAR that had proposed the use of the unimportant quantities as a decommissioning criteria for their site.

Both the staff and the Commission did not approve that, and so this led to this paper looking at the issue generically.

Okay. The next issue, again, is another form of relationship. And it was observed that in some cases the LTR unrestricted release criteria for

uranium and thorium could result in a higher -- well, there could be some other standards for uranium and thorium that are higher than the unrestricted release level.

Also, cleanup to the unrestricted release level could, in some cases, result in below natural where uranium and thorium occur in nature. So we thought that it would be important to look at the appropriateness of developing a separate unrestricted release standard for uranium and thorium that's higher than 1402.

And a number of regulations -- NRC regulations were looked at. EPA's use of Part 40, Appendix A, in their ARARs or applicable requirements was looked at. And in general, what I'll focus on here is particularly the Part 40, Appendix A, the equivalency criterion, which you may -- it may be called.

And this allows for the higher unrestricted release standard for mill tailings sites, but it was meant when it was put together, and the guidance for implementing it, it was meant for a few isolated sites with small areas. And more important, as I understand it, it's for where the uranium and thorium is a small component of the overall dose, and

small concentrations.

And so this particular use at mill tailings sites is in contrast to, you know, our decommissioning sites, our uranium/thorium sites, where uranium and thorium, you know, would be the primary, if not the sole, you know, source of dose.

Similarly, this sort of ties into EPA's use of a few ARARs that they have approved. They reference back to Appendix A, and also their guidance mentions Appendix A and exactly, you know, the same constraints on using it. And so our conclusion was that it really wasn't applicable for our kind of sites.

While the desired outcome was to determine or decide if a separate standard would be appropriate, our recommendation in the paper is that it's not appropriate. And there's a couple reasons, you know, here. We felt that the LTR, when you look at all the provisions, the unrestricted in 1402, the restricted release in 1403, and then even the alternate criteria in 1404, give a lot of flexibility.

It may not satisfy everybody, but if a particular licensee has difficulties because of volume and cost in meeting the unrestricted, then there is the restricted release option, and even the alternate

criteria option. So there's a degree of flexibility provided in the existing LTR.

And the second point here is that to implement -- obviously, to implement a separate standard you'd need a rulemaking, and there really are a few sites really that could benefit from this. There is roughly 18 uranium-thorium sites, and 14 of those are thinking of unrestricted release. And by the time you think about four years for a rulemaking to be finalized, the schedules for most of these sites, you know, they will have been mostly decommissioned by that time.

So the bottom line is it really isn't that cost effective, we didn't think, for a rulemaking which is a labor-intensive, you know, for so few sites.

Moving on to another issue -- again, it's sort of the relationship -- it's a question of the relationship between the onsite disposal approval standard and the LTR unrestricted release. The 20.2002 does not establish a clear standard for approving onsite disposals, but it allows agency discretion on a case-by-case basis and up to 100 millirem.

And so there is some flexibility there,

but part of the problem is is that at the time of the license termination all onsite disposals would need to be evaluated, of course, from a dose standpoint and meeting the unrestricted release criterion. So if one were approving over 25 millirem disposals and you did many of them, you know, you would -- a licensee may have great difficulty meeting the 25 millirem standard later on.

So we felt that what this was doing was -- well, our staff practice has been, therefore, to approve onsite disposals at a few millirem level. And so what this does is it helps confidence that, you know, by the time a licensee gets to license termination, you know, they will be more able to meet the 25 millirem.

However, the regulations permit, like I said, up to 100 millirem approvals. So we thought, well, we could approve above a few millirem if the licensee provided enough financial assurance to pay for the cleanup. And the problem here is that we don't want to create sites that might have more waste than they are able to pay for later on during decommissioning, particularly if they go bankrupt.

MEMBER RYAN: Sure. A quick question, though. By having that financial assurance

requirement for eventual decommissioning, you're really signaling that disposal other than at a few millirem isn't really disposal.

MR. JOHNSON: That's right, yes.

MEMBER RYAN: I mean, it's not a disposition of the material. It's just a temporary fix until you want to terminate the license.

MR. JOHNSON: Yes, it is a temporary fix at a few millirem. But if you're going to be doing it much more, then you're at risk of being stuck with it or not able to pay for it. And that's what we're trying to avoid.

MEMBER RYAN: Sure. No, I understand that part. I mean, it really signals the licensees that this isn't, you know, a final disposition.

MR. JOHNSON: Yes, right. I understand. You'll see this issue referred to in a few minutes on the financial assurance side. It's an indicator of increasing cost, so we're trying to link some of these issues together.

Next one, controlling disposition of solid materials. The issue here is that there's an unclear relationship, for some anyhow, between LTR's 25 millirem for unrestricted release and the existing guidance of a few millirem for controlling disposition

of solid materials. And one of the questions is the potential removal of residual contamination after license termination from an unrestricted release site.

You know, when you're -- before license termination, if you want to release materials, it's a few millirem. After license termination for unrestricted, you know, it's 25, so the question is, what's the difference here?

So the evaluation and the desired outcome described a relationship. So in this particular attachment, a lot of things are described, comparing/contrasting these two standards, and some of the recommendations here that I listed. There's a different purpose, obviously, for release of materials before termination. It's releasing usable materials for reuse, possibly reuse quite a lot, in contrast to the LTR where, you know, you don't expect release of material, because most of the valuable material has already been taken away as part of decommissioning.

You may have contaminated soils or building materials left, but the type of material is different, and, of course, the scope and the timing is different. Release of material is before license termination, and, of course, after license termination material is after decommissioning.

Also, we felt that another important factor was during decommissioning the ALARA part of the LTR will, in actuality, for some sites reduce well below 25 millirem for some sites. In addition, if material is removed from a site after termination, obviously, if it's like soil you're going to get a lot of mixing, you know, in the activity of removing that material, and then putting it elsewhere, wherever it's being reused.

So the combination of ALARA and mixing, you know, is going to really, in fact, close the gap between 25 and a few millirem, and the difference may not be that much. So the staff feels that the LTR is protective if materials are removed from a site after license termination.

In any event, as part of alternate scenarios, if removing materials after termination for reuse is considered important, then it can be analyzed as one of the scenarios.

Speaking of scenarios, I won't go into it here because Chris will tell you all about it.

The next one, we have two issues that relate to preventing future legacy sites. The first one here is changes to financial assurance. In particular, the issue relates to a lot of staff

experience with sites, some sites in bankruptcy, has led us to be able to identify various financial risks that could result in shortfalls in decommissioning funding.

And I've listed a few here. The paper goes into many more of these financial risks. It's sort of a risk-informed approach. You want to -- it's a little different, you know, than you might be usually talking about, but what we are trying to focus on here is areas of high financial risk from our experience.

And the first one there, underestimation of decommissioning costs, initial underestimation, some licensees have assumed restricted release, which is a lot cheaper than unrestricted release, with maybe no way of knowing if they're going to be able to achieve it.

Another example, operational indicators of increasing costs, like spills, for instance, or like the onsite, you know, disposals would be another example. Things can happen during operations that indicate there's going to be a higher cost of decommissioning, and, therefore, the cost estimate and the fund amount may need to be adjusted.

Also, there could be accidental releases

that could increase cost. And then, something entirely different, you could have inadequate financial disclosure by the licensees that could lead to not really knowing their financial well being well enough.

So these are examples of some of the financial risks, and in this particular attachment for each of them options are evaluated for dealing with them, and then recommendations are made for dealing with them.

VICE CHAIRMAN GARRICK: What would the incentive be for a licensee to go to anything more than a restricted release? What would be the incentive to pay the extra cost to go from restricted to unrestricted?

MR. JOHNSON: Well, I don't think there is an incentive for them to do it. There's an incentive for us to do it, because it could be a difference between, I'll say, ten and tens of millions of dollars. Okay?

And so if they assume restricted release in their cost estimate, and then five or 10 years from now get to the point of trying to make those arrangements and it doesn't work, and they are financially in trouble or close to bankruptcy, then

they won't have the funding to pay for the decommissioning to unrestricted release.

Naturally, there's no incentive for them, because they'll have to pay more for a higher amount of financial assurance. So it's not an incentive. And that's really one of the reasons why we're recommending here rulemaking.

We're recommending changes to the requirements and, in particular, this leads right into the answer I think here is that -- two things. We would require the decommissioning cost estimate to be based on unrestricted release, unless the licensee can demonstrate they can arrange for restricted release.

Secondly, we will require that the staff review and approve the decommissioning funding plans, which right now we don't. So these two things will help deal with this initial underestimation problem.

MEMBER RYAN: How many sites have actually been terminated, or licenses have been terminated with restricted release?

MR. JOHNSON: None.

MEMBER RYAN: See, that's my experience and point is that I don't think that's going to happen, I guess practically speaking. You know, if it's a restricted release, is it really released is my

question.

MR. JOHNSON: That's --

MEMBER RYAN: You know, I mean, it's not really released. It's still a site that has some control to it.

MR. JOHNSON: I think the perspective was in the license termination rule that originally the -- it was released from NRC involvement. The license was terminated, so, therefore, the site was no longer under license. Probably that was viewed as released, and I'll talk a little bit --

MEMBER RYAN: Okay.

MR. JOHNSON: -- when I get to mine about, you know, we have some different views now that may help be able to achieve restricted release in a few cases.

Also, just a couple of other recommendations briefly here. We would require reevaluation of cost estimates and fund amount when certain indicators occur. We would also require property damage insurance for major accidents, and certification of financial statements. These are all examples.

And there's a lot more detail in the paper, if you're interested, that all kind of aim at

trying to fix some of these problems and make the funding more robust and have -- give us confidence that there will be adequate funding.

Now, this next issue is similar, kind of parallel to the financial assurance one, and it deals with changes to licensee operations. And the issue was that looking at our experience we looked at where there were -- the problem sites today, why they occurred.

And looking back historically we found that often times there was chronic releases to subsurface over time. None of these releases were safety problems, but they may have been small, some of the groundwater contaminated, but they were environmental contamination problems, which in some cases built up over years, and then your result is a complex and costly decommissioning problem.

Kind of associated with it was, believe it or not, late identification of contamination by licensees, late recognition that there had been an event, and the extent of the contamination. Reporting, therefore, wasn't happening, you know, to NRC, and so this was another major problem that we found looking at our staff experience.

Also, looking at the regulations and

guidance, it didn't really cover these things specifically and explicitly enough. You know, we have -- they are covered in general, but we feel that to be stronger, to aim at this problem and focus better, the requirements would need to explicitly call out some things, which I'll mention here in a minute.

So we are thinking of rulemaking and guidance to mitigate some of these high operational risks, and we're also kind of taking another form of risk-informed, you know, review here, in that we're looking at trying to -- we will be identifying high-risk sites, sites that would have high risk of contamination, maybe have large volumes of liquids.

We also will look at their higher risk activities, and this would allow the licensees and the staff inspections to be focused on these areas of high risk.

We're also looking at minimizing the -- requiring a minimization of contamination through procedural changes. Right now, the LTR requires minimizing contamination only for new licensees, and what we want to add to it is existing licensees.

We would also be --

MEMBER RYAN: A quick question.

MR. JOHNSON: Yes.

MEMBER RYAN: I'm sorry to interrupt.

MR. JOHNSON: No, that's fine.

MEMBER RYAN: It raises an interesting speculation, I guess, on my part. You know, sometimes licensees might have a tendency to keep material on their facility in inventory as licensed material, which all has -- you know, and let's say it's just not in ready use today. It's in storage for all practical purposes. Is there any way to incentivize licensees to minimize the amount of material they actually have on hand and encourage them to dispose as you go, so to speak, through this financial assurance mechanism?

In other words, if I really need 10 curies of something, but I have 100, just because I had it for some other purpose, is there a way to incentivize them to get rid of the 90 they don't need any more, so that it doesn't become a potential problem or those kind of things?

And I just throw that out as something to think about, that very often they -- you know, licensees might say, well, we have a health physics program, so having 100 is no big deal. We can watch that just as well as we watch 10. But that may not always be right. You know, there may be other problems like leakage and ubiquitous kinds of problems

over 10 years or 20 years that ultimately become much bigger issues at termination.

MR. JOHNSON: I guess reaction would be, like you're saying, you have to look at the bigger picture and maybe what risk that extra, you know, amount of inventory might pose. And if it is a risk, then maybe financial assurance would have to be increased, and that would be --

MEMBER RYAN: And, conversely, if they don't have the material onsite, they could potentially reduce their financial obligations, because they have a reduced inventory, that kind of thing.

MR. JOHNSON: Right.

MEMBER RYAN: So it's sort of a two-way street on that.

MR. JOHNSON: That's right.

MEMBER RYAN: Yes.

MR. JOHNSON: But it would certainly be -- you'd probably have to look at a lot of factors to see if that --

MEMBER RYAN: Oh, no question.

MR. JOHNSON: -- inventory was really at risk or not.

MEMBER RYAN: Yes. Is it at risk, or is it not? Or, you know, if it's liquids and

dispersibles, obviously it's much more important than if it's a solid and encapsulated, and so on and so forth, but yes.

MR. JOHNSON: The next issue is the new issue that we added. It deals with the appropriateness of allowing intentional mixing of contaminated soil to meet release criteria. This has generally not been permitted by the staff. However, I think everybody can understand there's potential financial and exposure reduction advantages to possibly doing this under certain circumstances.

So the idea here is, you know, there's no results, you know, in this paper on this issue right now. But there are some planned evaluations listed to look at what NRC policy has been to look at our experience, also to look at policy and experience of others -- EPA, Corps of Engineers, and DOE, and international -- and then make some recommendations based on doing that homework.

Now, very quickly, kind of wrapping up this overview, is what are the recommended actions and the schedules that the staff have in this paper? Well, the first one here is to prepare the Commission paper on mixing, and that will be done this September. And then the rest of the actions here, and the dates

that you see, are really assuming -- we had to make an assumption for planning purposes that we would hear back from the Commission, get an SRM, maybe in September, let's say.

And based on that assumption, we're saying the first thing we want to do is prepare a regulatory issue summary, and that's to get information out to the broadest audience, to the stakeholders, licensees, and others about what the issues are, what we recommended, and what the Commission directed us to do, so that people will understand what changes might occur, and what the plans are for rulemaking or guidance or whatever.

So it's really to quickly -- kind of beyond this Commission paper, you know, beyond an SRM, which not everybody is looking for all the time, is to provide a simpler, easier, briefer document that's more user-friendly to read than this paper and get it out as quickly as we can.

Then, the other items there is the rulemaking and its supporting guidance for -- again, for preventing future legacy sites. That rulemaking is a single rulemaking. It focuses on only those two issues that I talked about -- financial assurance and operational changes. And we're looking for a proposed

rule in '06 and a final in '07.

Many issues that I'll talk about next, like restricted release or the onsite disposal or the scenarios that Chris will talk about, will eventually come out in revised guidance. The decommissioning consolidated guidance would be revised where it needs to be done.

And then, lastly, revised inspection and enforcement guidance. That's a companion to the operational changes issue, so that we can focus our inspection program appropriately and where there might be enforcement actions that -- or tools that need to be made available, then the guidance there can be adjusted in the same way.

These dates are out in the future, '05, '06, '07.

Lastly, for the overview, just a quick idea on outcomes. What are we getting for all of this? Okay. And I broke this up into two bins sort of like. We're faced with existing decommissioning sites. These are sort of our legacy sites. These are the sites that have been problems, that are challenges right now to make progress on in decommissioning.

And so we think by addressing some of these issues that decommissioning will be facilitated

for some maybe more than others. In some cases, more economical decommissioning will result as a use of a realistic scenarios.

Restricted release/alternate criteria should help provide new options for some licensees that they might be able to use where they haven't been able to make arrangements so far. And, in general, we'll clarify a number of these questions about relationships that I just talked about, you know, for those that might be very interested in some of those questions.

And lastly, the matrix of sites and issues, this gives you in the paper a more tangible feeling for where we think there might be some benefit, you know, to specific sites. And that can vary a whole lot. We didn't do a real careful, in-depth analysis here. But, you know, some sites might benefit quite a bit from scenarios, and maybe others not much at all, you know, so it's a range of outcomes there.

The next is, of course, we're also looking at the lessons we've learned today and to apply them to future licensees, so we can prevent future legacy sites basically, reduce the potential for them in any event. And we think that some of the issues may

actually reduce the need for using restricted release or alternate criteria.

We may use these provisions for a few sites that we have to deal with today, but we don't want to encourage the use of this -- these particular pathways.

And then, lastly, we think it contributes to the Commission's preference for unrestricted release, and that maximizes the opportunity for reuse of some of these sites.

Any questions on this overview before I get into the restricted release one in more detail?

MEMBER LEVENSON: I have one question. The .05 for uranium and thorium is a number that came into being, I think, as a strategic issue way back when. If it arises here, I assume it's only relevant to unirradiated material, is that correct? If it's been irradiated, probably something else controls rather than the uranium or thorium concentration. So it's probably just unirradiated material.

MR. JOHNSON: Unirradiated, okay.

MEMBER LEVENSON: And the question is, if it's only unirradiated material, and the way the law is structured, doesn't this end up being NORM material, and, therefore something that we don't worry

about? I'm confused as to why it's sometimes NORM and sometimes not NORM.

MR. JOHNSON: I can't answer that question. Is there someone that may want to volunteer from my team in the audience? I see a volunteer coming to the microphone. Jim Lieberman.

MEMBER RYAN: Just give your name, please.

MR. LIEBERMAN: Hi. I'm Jim Lieberman from the Office of General Counsel. This is a very difficult question. We have the definition of source material, which is ore, of less than a certain concentration the Commission adopts, and they adopted the .05. We have unreported quantities of source material. That's source material which is less than .05 percent uranium or thorium.

NORM is clearly ore which is less than .05, but where the unreported quantities of source material is NORM or material NRC regulates and exempt is just not clear. In fact, the staff just prepared a Commission paper to the Commission on joint jurisdictional working group to address potential ways we can clarify that very issue. So I don't have a clear answer for you.

MEMBER RYAN: Milt, it's even a more interesting question when you look at states handle

it. States who are authorized under the agreement state rule tend to just lump both together and regulate them all under one umbrella within the state.

But you're right, if you go back to the Atomic Energy Act of '46, the original definitions are clearly strategically- and security-based. I mean, control of the material was the focus not from a health and safety perspective so much as a safeguards and security question.

So, you know, and then when you kind of --

MEMBER LEVENSON: The question I'm sort of asking is, I think the law -- it's still on the books, I think -- differentiated the .05 into --

MEMBER RYAN: Well, the definitions have survived through the Atomic Energy Act of '54 as amended today.

MEMBER LEVENSON: Right.

MEMBER RYAN: With a few wording changes.

MEMBER LEVENSON: Right. And, therefore, shouldn't the regulations conform to what's in the law?

MR. LIEBERMAN: Well, the challenge is that there's no way to read the Atomic Energy Act as a whole and the Commission's regulations as a whole in a logical way. The way they've been amended, both by

Congress and by the agency over time, it just doesn't hang together perfectly.

And the question is: is the cost to change the regulations to make it into a more uniform way -- what's the best way to do that? And that's the purpose of that Commission paper I referred to.

MEMBER LEVENSON: I guess my point is that leaving out the legal, the regulatory, and all the rest of it, from a standpoint of risk, of the uranium/thorium that's below .05, this must be a very small fraction of the total involved. And should it be treated separately, or shouldn't it be treated like NORM, which is probably the biggest --

MEMBER RYAN: That's probably not a good assumption, because it may be less than .05 percent by weight, but it may be large in volume. So --

MEMBER LEVENSON: But it's still NORM.

MEMBER RYAN: Well, the secret is focus on the radioactive material if you want to regulate the risk or manage the risk, not the percentage by weight.

MEMBER LEVENSON: But we do --

MEMBER RYAN: If you have a concentration of uranium or thorium, that's where the risk is focused.

MEMBER LEVENSON: I agree with you

completely. I have never understood the differentiation between NORM and T-NORM and stuff from accelerators. I mean, if it's radioactive, it's potentially the same risk. But legally we differentiate. I don't understand why, but --

MEMBER RYAN: Well, it's historical origin.

MEMBER LEVENSON: I know. But the point is it is differentiated.

MEMBER RYAN: Go ahead.

MR. JOHNSON: Shall I continue?

MEMBER RYAN: Yes.

MR. JOHNSON: Next part. Restricted release/institutional controls. The issue -- we've had a number of difficulties arranging institutional controls required by restricted release and alternate criteria. On this slide, I've just given a couple of examples.

Governments and tribes have been unwilling to accept ownership of our private sites and take over, you know, a stewardship responsibility, and in part due to the liability concerns. You know, what if there's failure? You know, what if some repair or major replacement has to occur? It's going to cost a lot of money.

And I mentioned our attempts with seeking a DOE MOU. Another site in Michigan -- have talked to the State of Michigan about taking over controls of the particular site, and Michigan is undecided right now. So that's a big question. We haven't had a lot of success there.

Similarly, lack of independent third parties to take on the role in the LTR. And also, you might question about the long-term continuity of the third parties. And then, long-term effectiveness of more conventional institutional controls -- deed restrictions, and so forth -- particularly when we expect a change of ownership over the time period of concern.

And I probably should have mentioned earlier -- I mean, all of our sites are uranium/thorium sites that are considering restricted release. So we're talking about long term.

And then, lastly here, unclear flexibility of the existing LTR's risk-informed graded approach to institutional controls. I'll talk more about that in a minute, but sometimes there's a perception that federal ownership of a site is the only solution. And so part of clarifying the graded approach was to not only show the structure for it, but, you know,

examples other than just federal ownership.

CHAIRMAN HORNBERGER: What's the incentive, or what -- is there an incentive for governments or tribes to step forward and say, yes, we'll do it?

MR. JOHNSON: I don't see the incentive for that, other than good government, you know, feeling like they have a responsibility or can contribute to solving a problem. Or it's in their state, and so, therefore, they should, you know, bear some responsibility of protection for something in their state.

CHAIRMAN HORNBERGER: Yes. But I mean, still, even as a state -- somebody concerned about a state, if your option is to hold, you know, the responsible party's feet to the fire to get the problem fixed, and let the liability with them or take it over yourself, I just don't see what the incentive would be.

MR. JOHNSON: No.

CHAIRMAN HORNBERGER: I don't see why it would be a surprise that there has been difficulty in getting institutional control of restricted release sites.

MR. JOHNSON: The only observation I would

make is that our discussions with Ohio on agreement state that it does have a possession-only license. They were more comfortable, you know, using their licensing authority to control the site. They felt it was more effective. They knew what licensing was about, deed restrictions. They didn't know -- they didn't have much confidence in that for the long term.

So the incentive was, I believe, from hearing them talk that they could provide more effective protection.

Well, looking at the evaluations, one of the things I think the committee recommended a few years back when I briefed you on stewardship was look at what EPA is doing. In other words, look at what others are doing.

And, of course, in the past couple of years a lot really has occurred in this institutional control and stewardship arena. So we did look at EPA's guidance, talk to EPA, looked at some of DOE's major reports, and followed the evolution of their long-term stewardship program.

We also looked at agreement state experience, in particular had discussions with Ohio, as I mentioned. We looked at National Academy reports, ASTM standard, you know, on site --

restricting site use.

And then, most recently ECOS, the Environmental Council of States, set up a subcommittee on long-term stewardship, maybe a year or so ago, and so we became involved with that committee about a year ago. And that's a good mechanism, it looks like so far, to exchange information and try to deal with common problems that federal governments, states, and tribes have in this area.

We also looked at other NRC regulations. In particular, Part 40, Appendix A, the mill tailings experiences is a good model in many respects. It has a lot of good lessons learned there by what they require and what they have worked out with DOE over the past decade or so.

And also, the West Valley Policy Statement has some nuggets in it that, you know, are useful insights. So we looked at our regulations.

And then, we looked at the existing decommissioning sites that are considering restricted release, so we have a context. What problems actually at what sites do we have to solve, in the near term at least? And as a matter of fact, this list of restricted release sites has diminished over the years.

You know, we started with 15 about two years ago, and we're literally down to three right now. And they all have long-lived radionuclides, as I mentioned. They are all very specific and unique situations.

We've been having ongoing interactions with them. We have a phased report -- approach to the decommissioning plan development, and that means talk with the licensees prior to development of the decommissioning plan, and focus on this particular issue first in concept before you get too far investing in a particular pathway that may not work.

So we did a lot of homework that way to try to get some background and get some insights. And I've just highlighted here -- there are so many insights that are in the paper that are useful, but I've just highlighted a few of these. Some of these were kind of a repeating theme that you heard in National Academy documents, DOE documents, you know.

Some major themes are you really need to plan for failure of -- potential failure of institutional controls, particularly in the long term. You need to think about how they could fail and make your plans accordingly, so that you can anticipate and maybe help reduce or mitigate the possibility of

failure.

So that the second bullet here is that you need to select the right types of controls, implement them rigorously. Then, you have to monitor them, and you have to enforce in some cases. They aren't just controls you put in that are self-perpetuating at all. You need to work at them over the long term, and then you may have greater success.

In some cases, you may need federal -- an ongoing federal role. And then, lastly, it seems like flexibility is one of the big words. You know, of course, I think we all realize each site is a particular story and a case, and so the solutions are very particular, you know, to the site's situation or the legal jurisdiction that the site is in. So flexibility to tailor your controls is an important theme that's repeated.

Let's look at our recommendations, our key recommendations. This is a busy slide. Right in back of this slide I've put a table right out of the Commission paper that you can kind of look at if you want side by side, and it might help a little bit.

But the first thing we recommend is to clarify the LTR risk-informed graded approach for restricting use. First, we wanted to define the risk

framework I'm calling it, and it's really based on the rule in 1403, the statement of considerations, and guidance.

Putting all these things together --

VICE CHAIRMAN GARRICK: Who is going to do this? Who is going to make that clarification?

MR. JOHNSON: We would clarify -- number one, we would clarify this. What you read in the Commission paper would be -- appear in the risk, the regulatory issue summary.

And then, secondly, it would be clarified in guidance space, revised guidance --

VICE CHAIRMAN GARRICK: So somebody is working on how you're going to risk inform or adopt a risk-informed graded approach. Somebody is working that out.

MR. JOHNSON: Yes. The initial work is in this paper. As you read it, it's the concept. It's the approach that we see. It's based on -- you know, it's based on what exists in the rule and the statement of considerations, as they walk through it. You know, it's not something really new. The problem I think we had is that there were pieces scattered about, you know, and nowhere was it just described in one place, so people could try to understand it and

see the various pieces.

So that's what we've attempted here in the Commission paper, and welcome any suggestions. You know, it's sort of an exercise in risk communication, too. You know, did we explain it clear enough? Is it a simple enough framework that the licensees can use? And so, in any event, that's where we're at. Yes, guidance would have to be -- further guidance would have to be developed, but I think you see a bulk of the approach explained in the paper.

But the framework here is twofold. It's based on hazard level, the dose without institutional controls, and that's what the LTR calls for in 1403. You have to calculate dose, assuming -- they say sometimes assuming failure of institutional controls. So in other words, how bad can it be without any restrictions? So that's the hazard level.

The second part is the likelihood of hazard occurrence, and we're kind of looking at that as the hazard duration. If you have long-lived radionuclides, your duration of controls has to be long, and the longer your duration of controls, the greater your likelihood of failure of controls.

So that's kind of the logic of the framework. Hazard level -- that's dose; likelihood of

hazard occurrence -- that's duration, short-term versus long-term radionuclides.

So we used that logic and came up with two bins -- lower risk sites and higher risk sites. The lower risk sites are at less than 100 millirem, and that's public dose limit. And this is what's in 1403, the LTR. So it's less than 100 millirem or -- I'll emphasize "or" -- short term.

Similarly, higher risk sites are greater than 100 millirem, greater than the public dose limit, or long term -- over the long term.

Now, we recognize that, you know, this structure isn't in concrete. The boundaries aren't absolute. There could be flexibility, because some of our sites could literally be long-lived radionuclides, and you might have 30 millirem. You might have five millirem above 25. And so there's going to have to be consideration, you know, if there cases like that.

Okay. That's the framework, but now the second part is look at the grades. There's two general grades, and, again, this is based on the existing LTR. The lower risk sites, legally enforceable institutional controls, like deed restrictions. That's right out of the existing LTR right now.

Higher risk sites -- again, out of the LTR and out of the statement of considerations, it's legally enforceable controls and more durable controls. What does that mean?

It might mean government ownership. It might mean government control in some way, government having a part, a local or a state or the federal government having a part of the responsibility for control. Or it could mean DOE ownership under the Nuclear Waste Policy Act, or in a minute, as I'll mention, it could mean NRC possession-only license or NRC monitoring. That provides the durability.

But in any event, you have these two general grades. But the specific grades really amount to flexibility. What are you really going to pick for a particular site, given the particular site's legal jurisdiction and circumstances?

Okay. Moving on to this one, some of the new options The risk-informed graded approach was sort of like based on the existing rule. Well, now we're proposing some new options to involve NRC. The first recommendation is that NRC monitor and enforce after license termination. We have two ways of doing this.

Number one, under the existing regulation,

1401(c), allows NRC to come in after license termination, if there's new information that leads to a concern about a significant safety threat. Granted, the LTR envisioned finality. It envisioned NRC not involved after license termination.

This particular provision allows us to come back in only if there's a significant safety threat. So we are proposing that we use this regulation for those sites that might pose a significant safety threat if the institutional controls fail, if the land use changed, and you would have maybe an adverse land use like a residential --

MEMBER RYAN: How would you monitor for those kind of developing safety threats?

MR. JOHNSON: We would monitor a couple of different ways. We described in the paper you may require, as part of the condition for license termination, that the owner provides an annual letter of certification explaining that the institutional controls are still in place, that the land use is, you know, as agreed to.

Or it could in this case, 1401(c), NRC may on occasion go out and do an inspection of that facility -- again, looking for new information to check on it. Again, it would depend on the

circumstance, probably the site, local --

MEMBER RYAN: There's another example somewhere that it really isn't terminated, then, it's just in a state of quiet.

MR. JOHNSON: It's a -- yes, a monitoring role you might say.

The second way to monitor and enforce is under a legal agreement and an institutional control, where NRC would be written into an actual deed restriction to have the authority to come in and monitor, to have the authority to come in and possibly enforce or put institutional controls back in place.

The Commission asked us in the SRM to look at this monitoring role and use the formerly licensed site AAR as a pilot, and we have been doing that. Discussions with AAR, and in working on a settlement agreement as well as a restrictive covenant that would include NRC -- that's just work ongoing, and we've had some meetings with them on this particular way of doing it.

Another new option on this next slide is NRC possession-only specific license after completing remediation. So the key point here is that all the requirements for 1403 must be met. The site dose criteria must be met. Cleanup, in other words, needs

to be completed. The possession-only license, therefore, acts as an institutional control, similar to how EPA looks at their permits and orders as a form of institutional control. And that's how we would view it also.

It provides the legal enforceability, and it provides the durability of the controls, and it's similar to Ohio's decommissioning and possession-only license.

MEMBER RYAN: Well, that's clearly a case where there wouldn't be a termination.

MR. JOHNSON: Right. It would not be a termination; it would be an amendment to the license. And the amendment then would contain the conditions for restricting use.

It would also contain any conditions for maintenance and monitoring, reporting. This is where the annual letter of certification might be used, if we felt that would work, and --

MEMBER RYAN: Those can involve a lot more, though. I mean, they can be even as complicated as entry and egress requirements, and monitoring, and --

MR. JOHNSON: That's right.

MEMBER RYAN: It could include, you know,

entry and egress requirements, health physics monitoring, and all that sort of stuff, too, so --

MR. JOHNSON: That's right.

MEMBER RYAN: -- I see this as significantly different than termination. Possession-only to me is a whole different --

MR. JOHNSON: That's right.

MEMBER RYAN: -- category.

MR. JOHNSON: And we're not saying it's termination.

MEMBER RYAN: Right.

MR. JOHNSON: You know, I mean, we're just saying it's an amendment to the license, and yet we still want cleanup to the restricted release levels. And we still would need the appropriate financial assurance to be put in place, because that will pay the bill for us and any other maintenance that goes on in the future.

MEMBER RYAN: That's confusing, though. Restricted release and possession-only are two different things.

CHAIRMAN HORNBERGER: It's restricted release without the release.

MR. JOHNSON: That's right.

(Laughter.)

MEMBER RYAN: I just throw that out as a caution because that could be very confusing to folks. You know, there is now very clear provision about how to have a possession-only license.

And whatever conditions you wanted to impose to make it a possession-only license could involve any kind of structure of contamination limits or cleanup requirements to get there, and health physics, or whatever all else you -- you know, you want to put in environmental monitoring, air sampling, water sampling, whatever it might be.

And that to me has a different flavor than restricted release where there is some notion that, ah, that stuff isn't going to happen.

MR. JOHNSON: Well, we clearly say in the paper that this is different than what the LTR envisioned for restricted release.

MEMBER RYAN: Yes, it sure is.

MR. JOHNSON: And which envisioned, of course, being done, NRC out of the picture, and this is a recognition that for some cases you may need to do this.

MEMBER RYAN: Yes. I'm not disagreeing with it. I'm just simply saying that communicating that forward and outward might be something that might

need a little bit of noodling to make sure you don't confuse things.

MR. JOHNSON: That's right. The choice of a word could throw thinking off and --

MEMBER RYAN: You bet.

MR. JOHNSON: Yes, that's a good point.

I was saying that the amount of involvement that NRC would have would vary. It would be flexible. It would be tailored to site-specific factors. It could be based on risk. It could be as simple as a letter each year certifying that the land use is the same. You know, nothing has changed, you know, it's industrial use, period. Or a letter coming in saying ownership we expect to be changed, and then you would have to reissue a license to the new owner.

So it can vary quite a bit. It could be very much like some of the mill tailings sites that we have, you know, where we just visit them on occasion.

In addition to these new options, we just also noted and concluded to the Commission that we wanted to continue monitoring and participating in some of these cooperative interagency efforts. A lot has been happening over the last year or two anyhow, and it seems like when we were trying to finish this paper it was like a moving target.

The National Academy Phase 2 report came out May 1st, and our paper is dated May 2nd. So we couldn't get anything in there about that. And the ECOS memorandum of understanding was signed. It was draft when we were preparing the paper.

So a lot is happening here, and we see some benefit from, you know, being involved and exchanging views with some of the other agencies. We share some of the issues, although our regulatory schemes are different. You have to work within them, of course.

To end here, we're envisioning implementing these recommendations in guidance space. And so like you mentioned, the possession-only license guidance, you know, would be modified so that there would be guidance for this kind of possession-only license. Likewise, the decommissioning consolidated guidance would be modified, you know, to mention this -- these various options that are available, as well as the risk-informed graded approach.

And also, the risk would be sent out, you know, soon so that parties can have an understanding of that approach.

Lastly, outcomes. We feel that these recommendations provide more effective restrictions

that will protect public health and safety over the long term. The sites, like I said, we're thinking about are all uranium/thorium sites. And so they are likely, depending on dose and all that, going to need more durable controls. And so these options, short of some of the other ones that we've pursued, these options we think can be more effective at protection of public health and safety.

There are -- also, these options we feel can be implemented quickly and not through a rulemaking process, which would be another three or four years. So they are available. These options would make the provisions of restricted release and alternate criteria more available and immediately available. The approach is more consistent with EPA and National Academy and ASTM suggestions in many ways.

And lastly, it should increase public confidence in restricted release. There is still maybe lack of preference or objection to actually doing it at a particular site, but the way of doing it might -- there might be more confidence in the way of doing it.

We have noted that from one site in New Jersey where the local people said they would feel

more comfortable with a possession-only license approach, because they would prefer NRC stay in the picture, and they would feel that the approach is safer with us in the picture.

That's the end of my particular summary of this issue. Before we move on to Chris and realistic scenarios, if there are any further questions?

MEMBER LEVENSON: I have one. I want to commend you for what I think you said, and that is that you are addressing the method of failure of institutional controls. This is an issue that I've been doing a little work on recently, thinking about. In the reactor safety field, you know, a number of decades ago we talked about something failing or not failing.

And there wasn't a lot of progress made until we began to look into the details of how it failed, and I think the same thing is true in institutional controls. There is more than one way that institutional controls can fail. The institution can be intact, but it's short of money. There's a whole series of things.

Do you intend to pursue this and identify different methods or different ways that institutions could fail? Because I think that can have an impact.

MR. JOHNSON: I think that's important in a particular site's case to understand the site you're working with, the community that may be wanting to be involved, or the whole circumstance of a site, I think, would help focus on what the needs are at that site.

And a lot of, well, our guidance, as well as some of the suggestions from various studies have said to do this type of planning up front, and understand what the needs of the site are and what things, you know, you need to protect and how things can fail.

And then design your conditions or your financial assurance, for instance, you know, to provide the funding over the long term, or the monitoring, the reporting. You know, what parties need to be involved in that, you know, should be based on how things can fail.

MEMBER LEVENSON: Well, not how the site can fail, how the institutional controls can fail.

MR. JOHNSON: Yes, right.

MEMBER LEVENSON: For instance, yes, one institution might be intact and might have enough of a budget that it could continue its monitoring, but not have money to do remedial work. And that would be

quite a different kind of thing, if it is being monitored, even though they can't correct it. So there are a number of different ways institutional controls can fail.

MR. JOHNSON: Right. Right.

Okay. Thank you. I will turn it over to Chris to complete the last issue on realistic scenarios. Do you want to take the chair?

MR. McKENNEY: This issue was not actually raised in SRM down from the Commission, but was self-identified by the staff. Since we were doing the analysis of the LTR anyways, that this was an issue that could not only help restricted release sites but also unrestricted release sites.

And mainly it's an issue of, how can we provide clear direction for licensees to actually use as realistic of scenarios as they need? And I think that's the important thing is, how much do they need? Obviously, the conception -- the perception is is that the LTR requires licensees to use the resident farmer. And it's the perception both in-house and outside.

For evaluation, we looked at the existing guidance. It's flexible, it provides flexibilities, it allows -- in large part it says, "This is a way to do it. If you want to do something different, justify

it."

It may be flexible, but the tone really discourages licensees, because it doesn't tell them what they have to do to justify it. It just tells them to justify it. It's in some -- some forms of bring another rock.

The analysis for the viable scenarios, the discussion of those for long-term radionuclides, was anything that could be -- any scenario that could be viable over 1,000 years. Obviously, that tends to drive you from the fact that you can't foretell the future and you can't foretell land use reasonably over a few decades to a lot of people reverting to resident farmer, because you just couldn't justify anything else.

We also looked at staff and licensee experience. One of the issues in this is that there -- this is -- scenarios are licensee-initiated and justified. It does lead to a catch 22. Licensees aren't likely to come in if they don't think the staff is going to approve things. But if the staff doesn't get anything, they can't approve anything. And so there can become the perception that we wouldn't approve anything, but we're not getting any requests in the first place.

We have had very few that have come in for realistic scenarios, and we have worked with most of those.

Because of the few number of sites, there is not a broad vision of how flexible the guidance is or how vision -- how flexible the LTR is within the staff itself. And that may lead to licensee and others to getting a false impression of the level of flexibility allowed in the LTR. That's not as flexible.

VICE CHAIRMAN GARRICK: Now, what is the licensee -- what's the licensee's role in this?

MR. McKENNEY: The licensee's role is to look at their site and decide what scenarios they want to use at their site. They've got to decide what scenario is appropriate for their site.

VICE CHAIRMAN GARRICK: But do they do -- okay. Do they do that on the basis of very site-specific considerations, or do they --

MR. McKENNEY: They can.

VICE CHAIRMAN GARRICK: -- pick and choose from a set of scenarios that you would provide?

MR. McKENNEY: Usually, they pick from what we have, because they don't want to have to develop it all themselves. They can. The guidance

does allow you to make site-specific analyses. In a few cases, we've had very site-specific analyses, such as Watertown GSA in Massachusetts. That used a CERCLA process.

But most licensees are falling back because the work has already been done for like RESRAD and others for the resident farmer. If they use something like that, they don't have to provide any justification. They don't have to do land use planning and other things that may be required. And they didn't know how successful they'd be in the first place.

So because of the uncertainties, they tended just to say, well, NRC has developed this screening approach or this screening scenario, and you know what? I'll just do that, because that's the easy way out.

VICE CHAIRMAN GARRICK: Yes. The problem with that is how -- is specificity.

MR. McKENNEY: Well, the problem is is the third bullet right there, which is that we only have the resident farmer sitting out there. We don't have well-developed examples. If there was well-developed examples of alternate scenarios, I believe that there would be more use of them, because if they had some

sort of template to work off of, they would know where to go.

You know, we're just showing them -- and basically, in a lot of the guidance we're just showing them the door, you know. Here's one way, but you can take this door until it's closed and nobody knows what's beyond. And you can go that way, though, and you might get to the -- you might get decommissioning.

MEMBER RYAN: Isn't part of that question, too, a practical matter that a licensee is trying to get something accomplished?

MR. McKENNEY: Yes.

MEMBER RYAN: And I think that's really the drivers. If they have a scenario that they know is, within some degree, favorable for review --

MR. McKENNEY: Right.

MEMBER RYAN: -- then they're going to look at that. And, you know, even though that may cause them to say, "Dispose more material at a higher cost than not," they're balancing that against, well, you know, if we work for three years on a scenario of our own and spend XYZ dollars, you know, we may end up at the same or a worse place.

So I think -- I guess my own feeling is sometimes it's very practically driven.

MR. McKENNEY: Yes. That's what I mean, that it's practically driven. That they don't want -- that there is too many -- there is a lot of uncertainties on whether you can --

MEMBER RYAN: And often under a time constraint.

MR. McKENNEY: Right. That's another thing is is that -- for the licensee-initiated and justified is is that the last thing a licensee wants to become is a case study. They don't want to become the test case for the staff. They want to find out that somebody already -- somebody else has already done what they want to do, and they want to take that approach. And so you have a hard time finding that first person to come in and become the test case, because of the practicalities involved.

They have the timeliness rule. They have a want just to get this over with. Decommissioning is not a profitable section of their operations.

VICE CHAIRMAN GARRICK: The reason I raise this question is you put quite a bit of emphasis on the word "realistic" --

MR. McKENNEY: Yes.

VICE CHAIRMAN GARRICK: -- scenarios. And one of the important lessons we learned in doing

nuclear powerplant risk assessments was how site-specific risk really is. And the underpin of that whole specificity are the scenarios --

MR. McKENNEY: Right.

VICE CHAIRMAN GARRICK: -- associated with the risk. And this is quite a different situation in many respects, but, nevertheless, it is something that has to be looked at in terms of, well, can you really deal with this in a generic sense? That's kind of what you're doing and what the licensees are doing.

Given that risk in all other places where we've gotten very quantitative, gotten very detailed, have discovered how site-specific it really is, and just trying to --

MR. McKENNEY: Right.

VICE CHAIRMAN GARRICK: -- connect this with the lessons learned.

MR. McKENNEY: Yes. I mean, you know, activities such as how much gardening is done in a certain area is definitely site-specific.

VICE CHAIRMAN GARRICK: Right.

MR. McKENNEY: But it's a standard form. We also look to our case size in the CERCLA approach. The CERCLA approach does bring in a lot more of site-specific analysis as it's a -- you bring in the local

planning boards, you bring in the local governments and other ones to get aid, and you do some roundtable discussion of what are the appropriate scenarios for a site, rather than this generic approach of using a resident farmer or just an industrial worker, or what have you.

As part of the thing -- we looked at a couple of options, and the -- one is to continue with the current guidance but just emphasize current flexibilities that are in the guidance. That would be staying with the fact that scenarios have to be viable over 1,000 years. That would be staying with -- well, mainly that.

The other one was to bring us in line with what -- partly in line with what CERCLA was doing, which is that they're using more foreseeable future scenarios. The scenarios are based on these discussions with local planning boards, with really site-specific issues, to try to make sure that you aren't like having to always assume that civilization is going to end, and then there's going to be residential farmers here.

And in the end, that's our recommendation is that licensees should be allowed to go that route. They should be able to use local planning boards.

They should be able to set up this process of consensus-building on what are the viable scenarios that should be used, even for long-lived radionuclides.

But that's not -- but in cases of that, while the compliance scenario may be based on this, what is the reasonable future land use scenario, there would be still done as a risk -- to risk-inform it, you'd still do the analysis of what other -- what are the possible doses from other land uses? Just so that you have an understanding of, well, this is the reasonable land use. This is what is likely, and this is what compliance is for unrestricted release.

But are we really -- is there things that could go really wrong at the site? It's within -- it's in the view of the robustness analysis by SERP that they've suggested, and it's been -- it is actually modeled on one of our sites, which is at Watertown GSA, which the U.S. Army Corps of Engineers went through a CERCLA building process of scenarios in the state and -- the state environmental and radiation departments got together and decided to use a park as the scenario, as the land use for a site with uranium, because that's pretty much the only thing this land could be used for.

So any questions?

MEMBER RYAN: Chris, is there any way to look in all of the CERCLA approaches that involve the CERCLA sites that have gone through this process and get some assessment as to how many end up as parks or farm land or housing or industrial sites, or that kind of thing? I mean, it would just be interesting. I mean, it struck me as you were talking that --

MR. McKENNEY: Right.

MEMBER RYAN: -- how many ended up as resident farmers, I'll bet you it's a small --

MR. McKENNEY: No. The actual guidance on land use for EPA actually acknowledges that they, too, have been accused of being way too conservative in that way. And in 1995, they put out guidance to do this foreseeable future, because of that, that they've been --

MEMBER RYAN: Is there any way to align with that in a more complete way or --

MR. McKENNEY: Well, I mean, that's what we're suggesting is actually that alignment. But as to a database of what the results are, we can only ask EPA for that --

MEMBER RYAN: That might be a great question to ask. I'd be curious to see how that

washed out.

VICE CHAIRMAN GARRICK: In California, this is an easy take. It's all going to be houses.

(Laughter.)

MR. McKENNEY: Yes, again, site-specific. Okay. The foreseeable land uses -- even without our primary justification, which is in our rule right now, is that based on the scenario's modifications, or the scenario on the half-life of the material -- in other words, you know, short-lived radionuclides we're really only worried about -- like cobalt-60, we're really only worried about what's going to happen in the next five to 10 years at that site, because that's when the peak dose is. And it's going to drop off really fast.

The physical features of the site, which also forbid land use, and that the -- I already mentioned the robustness calculation.

On our outcomes, well, this all depends on how much the licensees use it. But we feel that it would lead to more economical safety, because you would have higher allowable concentrations by having less onerous scenarios. But you'd still have to maintain the level of risk, because you are just not being ultra-conservative.

And there would be fewer restricted use sites, because some of the -- some sites that are on the edge of being restricted use, you know, in the 30 to 35 millirem range, if you use a residential farmer, would be able to get below 25 by possibly doing a site-specific realistic scenario.

Any questions? Thank you.

MEMBER RYAN: Any questions?

VICE CHAIRMAN GARRICK: Well, I sure like the idea of trying to develop realistic scenarios. I guess it's a matter of how realistic they are and how they're done.

MR. McKENNEY: Yes.

VICE CHAIRMAN GARRICK: But I think as far as the general approach is concerned, this makes a lot of sense.

MR. McKENNEY: Yes, a lot of it is bringing it more prominent -- I mean, as -- since the Army Corps of Engineers did work within our regular guidance right now, and was able to bring in the Watertown GSA approach the way they did it, and that's all we're basically suggesting. We're going to bring it much more prominent, and bring it much more -- for uranium especially -- that we're not -- we're saying we need shorter timeframes.

But that's true. It's all in actually how it -- it's great now to see how it actually --

VICE CHAIRMAN GARRICK: Right.

CHAIRMAN HORNBERGER: Isn't there something between the site-specific realism and the resident farmer? Because the resident farmer, as you said, is a pretty stylized calculation. Why can't there be a more or less stylized calculation for an industrial usage scenario?

MR. McKENNEY: Well, that's one of the things is that it may be able -- a way to do some stylized alternative use ones.

CHAIRMAN HORNBERGER: Right.

MR. McKENNEY: So that they don't have to go fully site-specific, but they could go to like some general land use. So you just have a general idea of what the land use is. They don't have to do a real specific thing of, "This is exactly what the land use would be."

And maybe our guidance can get developed so that we can have some well-developed examples that they can say, "Well, we're just using this scenario, scenario B from your developed stuff, as our" -- and this is why we can use that, which would assist the licensees a lot in using the alternate scenarios.

MEMBER RYAN: Chris, what's the schedule and forecast for this work and development? I'm just curious.

MR. McKENNEY: It's with the rest of the guidance, and it would --

MEMBER RYAN: You may have had it in your slide, and I just --

MR. McKENNEY: Yes. '06 is -- September of '06.

MEMBER RYAN: So it's out there on the horizon a bit.

MR. McKENNEY: Yes. Well, a lot of it is because of resources.

MEMBER RYAN: Say again?

MR. GREEVES: John Greeves, NRC. You saw the guidance slide. We need to get an SRM back deciding how much buy-in we have on this. But what's also important is we're already doing this. The staff is already doing realistic scenarios, and we might like to, you know, visit with your staff and explain -- there's a whole handful of cases where we're doing this, and those are probably ones that would be illustrative to the kinds of questions you're asking here.

MEMBER RYAN: Right.

MR. GREEVES: The guidance will be useful for our external stakeholders. It's also useful for our staff, because, as Chris said, the staff was defaulting to these conservative scenarios. We've got to kind of work that issue. But we're already getting pay off just by thinking this thing through already.

So I want you to go away with an understanding that a lot of these recommendations we're actually doing in terms of realistic scenarios. It isn't just Watertown Arsenal that we've looked at this type of an approach. We've done some work at NFS. We've got a couple of other cases where we're looking at this.

It affects the people with large inventories of soil, a little bit of groundwater, who, you know, are faced with that Envirocare, $10-, $20-, $100 million ticket. Those are the people who are getting affected by this. So --

MEMBER RYAN: Thanks. That's so much help.

MR. JOHNSON: The other observation is that when we meet with licensees prior to their developing a decommissioning plan, we talk through a lot of the major issues or questions that they have. And, you know, whether it's institutional controls,

for instance, or, you know, this is a prime opportunity here to talk about what scenarios are appropriate for their site.

MR. McKENNEY: I mean, between the risks -- well, now we might not have the guidance until September of '06, but the staff will definitely be using most all of these issues except for the ones that -- if these were approved to -- except for the one that requires rulemaking, on a case-by-case basis while the guidance is being developed. It would not be we'll wait until the guidance is developed.

MR. EID: This is Bobby Eid. I would like to add that something -- in between, that in the dose impact analysis, the staff they do something between -- what normally we do, we try to eliminate certain pathways, like, for example, certain sites.

The drinking water is not viable for drinking, so we do not need that pathway. In some cases, the drinking water source, although it is good aquifer, so we could eliminate that, because we know the source is not directly from the aquifer, it could be somewhere else. It could be municipal water supplied, you know, on the site.

So there are different ways we do eliminate the pathways, although specifically we may

not call it different scenario. But we do, at the end, when you eliminate the pathways, you end actually with different scenarios. So we do something in between because there was a question if there is anything in between or not, yes, we do have something in between.

MEMBER RYAN: Okay. Thanks.

Any other questions?

MEMBER LEVENSON: Yes, I have a question. You mentioned that essentially the sites you are currently involved with are pretty much uranium and thorium type sites. But how does this work relate? Some years down the road we're going to start having license termination on reactor sites. How does that relate to your current program?

MR. McKENNEY: Well, we are currently having license termination plans coming in. We've had three in the past six months that we've approved.

All of these things could be used by reactors. There are -- in this review, a lot of the more restricted release issues especially, which is what the focus of the SRM was on uranium and thorium sites. No reactor that I know of is thinking of restricted release as an option.

The realistic scenarios, though, on the

other hand, could definitely be used by them, especially for the fact that they have short-term -- relatively short-term -- from a decommissioning point of view, the half-lives are short, 30 years or less. But they could take definite advantage of that.

MEMBER LEVENSON: There may be some reevaluation of that that it costs so much money to get a powerplant site environmentally approved as a powerplant site, it seems to me that people start -- that are out decommissioning nuclear plants, even if they don't build another nuclear plant, they're probably going to find it only makes economic sense to keep that site as a powerplant site, because it has an incredible value for that. So you may find that, in fact, restricted release is the thing that makes sense.

MR. McKENNEY: There may not even be restricted release under some of those conditions even then. It depends on how, again, under a restricted release -- in a realistic scenarios point of view --

MEMBER LEVENSON: Right.

MR. McKENNEY: -- do you really need a deed restriction to have them control -- make that industrial site for the next 10 years? Or how likely is it to not still be a powerplant in 10 years? That

may be an argument that a licensee could make.

MEMBER RYAN: Well, I mean, that would be a case where a possession-only type approach might be real workable.

MR. McKENNEY: Exactly.

MEMBER RYAN: Thanks. Any other questions?

Mr. Chairman, I'll turn it back to you. Are there any staff comments or questions at this point?

CHAIRMAN HORNBERGER: Anything from the audience?

MEMBER RYAN: Audience comments/questions?

CHAIRMAN HORNBERGER: Any comments or questions? Okay. Thank you, Mike. Thank you, Robert.

So we're not going to need the recorder after this. So I think what we'll do is let's take a 10-minute break and reconvene and we'll finish up our business for today. We're adjourned for 10 minutes.

(Whereupon, at 4:30 p.m., the proceedings in the foregoing matter went off the record.)

CERTIFICATE

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

Name of Proceeding: Advisory Committee on Nuclear Waste
142nd Meeting

Docket Number: n/a

Location: Rockville, MD

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.

Rebecca Davis
Official Reporter
Neal R. Gross & Co., Inc.

Controlling the Disposition of Solid Material

ACNW Meeting

May 28, 2003

Overview

- Solid materials
- Why do a rulemaking process
- Information gathering efforts
- May 21-22, 2003 workshop
- What we are doing now

Range of solid materials

- No radioactivity from licensed operations
  - No contact with radioactive materials
- Very small amount from licensed operations
  - Limited contact or material cleaned
- Appreciable amounts of radioactivity
  - Kept separate
  - Licensed disposal

What is done now

- Conduct radiation survey
- Existing guidelines based on survey instrument capabilities
- Allow material release if radioactivity:
  - Not detected, or
  - Meets existing guidelines

Why we are doing rulemaking process

- Review existing approach
  - Existing approach protects public health
  - Improve to make more consistent
- Evaluate alternatives and invite public input
- Establish consistent way to decide on disposition of solid material

Information gathering efforts

- Issues paper: >800 stakeholder letters
- Six stakeholder meetings in 1999-2000
- Stakeholders:
  - Metals and cement industries; citizen groups and individuals; licensees; Federal/State/local agencies; Tribal governments; scientific organizations; solid waste industry

Information gathering efforts

- National Academies Study
  - 3 information gathering meetings open to the public - 2001
- Technical studies
- Input from scientific organizations

Information gathered - Preliminary Alternatives

- Alternatives involving further use
  - Unrestricted use (no action or dose-based)
  - Conditional use

- Alternatives involving no further use
  - EPA regulated landfill disposal
  - Disposal in licensed LLW disposal site

Information gathered - Unrestricted use

- Impacts on health and safety
  - In range of other health-based standards
  - Poses negligible risk
  - Small fraction of natural background
  - Risks uncertain and not accurately modeled
  - Releases can't be accurately measured
  - No dose above background justified

Information gathered - Unrestricted use

- Regulatory/economic burden
  - Consumers won't buy recycled products
  - No liability for released materials
  - Disposal in LLW uses resources w/o health benefit
  - Small licensees would face economic impact

Information gathered - Restricted alternatives

- Advantages/disadvantages
  - Limited public exposure
  - Issues regarding landfill disposal
- Concerns about viability
  - Limited quantity of material from NRC licensees
  - Would restrictions work?

What we are doing now

- No decisions on alternatives
- Commission direction - Oct 2002
  - Rulemaking process – range of alternatives
  - Stakeholder involvement
  - Build on previous efforts; focus on solutions
  - Feasibility of restricted alternatives
  - Increase web use to interact w/stakeholders

What we are doing now

- Website: www.nrc.gov/materials.html
- Feb 28, 2003 FRN
  - Invited comment: secy@nrc.gov
  - Announced scoping
- May 21-22, 2003 workshop

May 21-22 Workshop Agenda

- Rulemaking process
- Information gathering efforts
- Environmental review process
- Stakeholder discussion on:
  - Perspectives on alternatives
  - Focus on conditional use and landfill disposal

May 21-22 Workshop Summary

- Unrestricted use
  - Economic issues
  - Radiation protection concerns
  - ANSI N13.12
  - Modified position

May 21-22 Workshop Summary

- Conditional use
  - May not be viable or economically feasible
  - Concerns about burden
  - Difficult to apply generically; should be case-by-case
  - A rule should outline process

May 21-22 Workshop Summary

- Landfill disposal
  - RCRA C and RCRA D sites
  - Landfill siting, modeling, costs, regulatory authority, other issues
  - Conditions on releases

May 21-22 Workshop Summary

- Other
  - Public involvement
  - Recordkeeping
  - GEIS scoping

Current actions

- Comment period through 6/30/03
- Rulemaking and NEPA processes
- Supporting technical bases

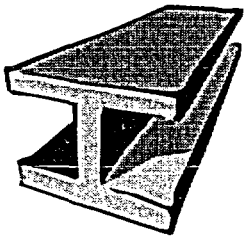
FINALIZATION OF NUREG-1640

Radiological Assessments for Clearance of Equipment and *Materials from Nuclear Facilities*

[Technical Support for Rulemaking]

Robert A. Meck, NRC
Robert Anigstein, John Mauro, William Thurber, SC&A

MATERIALS AND EQUIPMENT



ASSESSMENT OF POTENTIAL DOSES TO PEOPLE FROM CLEARANCE OF:

- STEEL
- ALUMINUM
- COPPER
- CONCRETE
- EQUIPMENT FOR REUSE

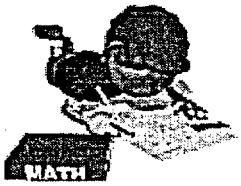
RESOLVE COMMENTS

COMPARED TO DRAFT:

- Realism for industry
  - Basic Oxygen Furnace, Induction Furnace
  - Mixing
  - Partitioning
  - Representations of transportation, copper, aluminum industries
- Less conservatism

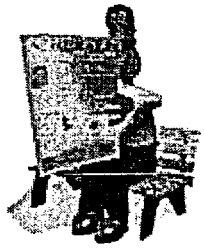
RESOLVE COMMENTS

COMPARED TO DRAFT:



- More accurate geometries
- Landfill disposal
  - Well water down-gradient
- More radionuclides
- ICRP 26 and ICRP 60

RESULTS FOR RULEMAKING

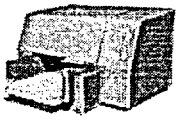


- Mostly job-related and reuse scenarios are key for standard setting
- Realism often resulted in less dose per unit concentration of nuclides
- ICRP 60 gives generally lower exposures per Bq

Defensible and robust dose assessments are ready for use in rulemaking.

Work is in progress!

JUNE 2003 IN PUBLICATION



PERFORMANCE BASED RADIOACTIVE MATERIALS CONTROL (MEASUREMENT)

Improve the process of determining the presence or absence of radioactive material for the requirements and conditions present.

- *Planning*
- *Instrumentation*
- *Sampling*
- *Analysis*

Planning

- Understand requirements of pending decisions
- Explicitly identify and manage uncertainties that could lead to decision errors
  - Sampling uncertainties - MARSSIM (Aug 2000)
  - Analytical uncertainties - MARLAP (Dec 2003)
  - Materials specific – MARSAME (Target 2004)
  - Subsurface specific – MARSASS (TBD)
- Implementing the intent of "performance based" (sampling & analysis) – SADA

Instrumentation

- Selecting the proper instrument for surveys
- Advances and improvement
- Exploiting field analytical capabilities
  - Data logging
  - Live Time analysis
  - GPS
- Integration of instrumentation to analytical software

Sampling Designs

- **Surface Sampling**
  - Uniform: NUREG-5849 – Replaced by MARSSIM
  - Non-parametric random & MDCs: MARSSIM - Active
  - Double Sampling – Some use
- **Sub-Surface Sampling**
  - Bayesian – In testing
  - Adaptive Sampling – In testing
  - Co-Sampling – in development
  - By Exception – in development

Analysis

- Parametric to non-parametric
- When is enough, enough?
- Iterative Methods - SADA
  - Infill
  - Adaptive Sampling and Analysis Program (ASAP)
  - Markov/Bayes
  - Co-Variance/Co-Kriging
  - Minimize Uncertainty of Exceedence
  - Minimize risk of misclassification

SADA

Spatial Analysis and Decision Assistance

Windows based freeware designed to integrate scientific models with decision and cost analysis frameworks in a seamless, easy to use environment.

- Visualization
- Statistical Analysis
- Geospatial Interpolation
- Geospatial Uncertainty Analysis
- Human Health Risk Assessment
- Ecological Risk Assessment (Version 2.0)
- Remedial Design Frameworks
- Cost Benefit Analysis
- Secondary Sampling Design

SADA has the support of both the DOE and EPA and has over 850 users (2000) world wide. A number which grew to over 1000 by the end of (2001) the calendar year. There have been 8000 downloads and expect 2000 to be users by end of 2003.

2 DESIGN OBJECTIVES AND OVERALL APPROACH

2.1 Design Objectives

The overarching design objectives of this investigation are realism, clear and complete presentation, accuracy, consistency, and full disclosure of uncertainty in the derivation of the collective doses associated with each clearance alternative. In addition, the approach is required to be consistent and compatible with the methods used to derive individual dose factors, as described in NUREG-1640, as applicable to the derivation of collective doses.

The specific objective of this report is to derive a table that has the following basic form:

Table 2-1 Form of the Final Product

Clearance Alternative	Time-Integrated Collective Doses (person rem+/- 95% confidence level) Associated with Clearance	
	Undiscounted	Discounted
10 mrem/yr		
1 mrem/yr		
0.1 mrem/yr		
0 mrem/yr above background		
Prohibition		
Restricted Use No. 1		
Restricted Use No. 2		
No action (R.G. 1.86)		

Nested within this table is a fine structure that further subdivides the time-integrated collective doses into a broad range of categories, as follows:

(1) Category of material (e.g., ferrous metal, concrete, copper, aluminum, other)

(2) Category of facility (e.g., PWRs, BWRs, fuel-cycle facilities, material licensees)

(3) Category of worker occupational exposure (i.e., radiation worker versus non-radiation worker)

(4) Category of non-radiation worker occupational exposure (e.g., truck drivers, scrap yard workers, steel mill workers, etc.)

(5) Category of public exposure based on exposure scenario (exposure to automobiles, structural steel, appliances, agricultural fill, others)

Since the number of categories and subcategories into which the collective doses can be grouped is virtually unlimited, the number of categories is limited to those that are required to achieve the following:

- Capture enough of the time-integrated collective doses associated with each clearance alternative, including uncertainties,[1] to support NRC decision-making pertaining to the alternatives. For the purpose of this report, this objective is accomplished if there is a high level of assurance, based on the peer review process, that the majority of the collective doses has been captured.

- Disclose which categories of NRC licensees and which materials are anticipated to be responsible for most of the collective doses.

- Create a mosaic of exposure categories that reveal the population groups that are anticipated to experience the largest collective doses.

- Disclose how the collective doses change as a function of time so that both discounted and undiscounted collective doses can be estimated.

2.2 Overview of Technical Approach

Figures 2-1 and 2-2 present simplified schematic diagrams of the potential exposure scenarios that could result from clearance of scrap metal and concrete from nuclear facilities. Scrap metal and concrete cleared from an NRC/Agreement State-licensed facility could follow one of three paths: disposal in a licensed low-level waste (LLW) disposal facility, clearance for recycling/reuse, and clearance and disposal in a landfill. Collective doses are affected by which pathways are selected, and the pathway selected will be influenced by the clearance alternative.

[1] Unlike the derivation of dose factors in NUREG-1640, which are concerned with the variability and uncertainty in doses among individuals comprising different critical population groups, this report is concerned with the anticipated real but unknown collective doses associated with each clearance alternative. As a result, this report is concerned with the uncertainty in the collective doses. However, the concept of individual variability does not arise, because the analyses are concerned with the time-integrated collective doses associated with each clearance alternative.

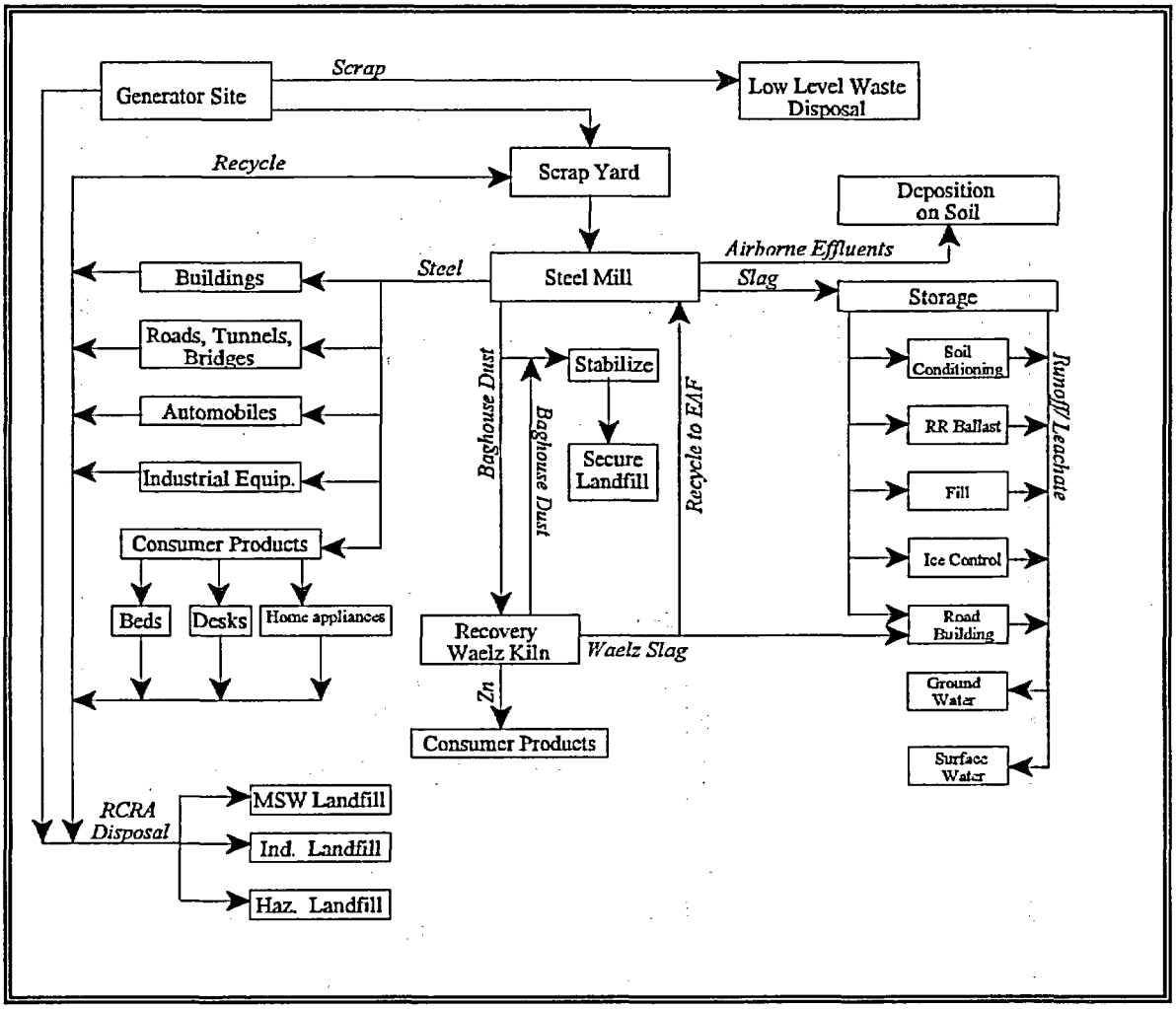


Figure 2-1 Potential Collective Exposure Scenarios Associated with the Clearance of Scrap Metal

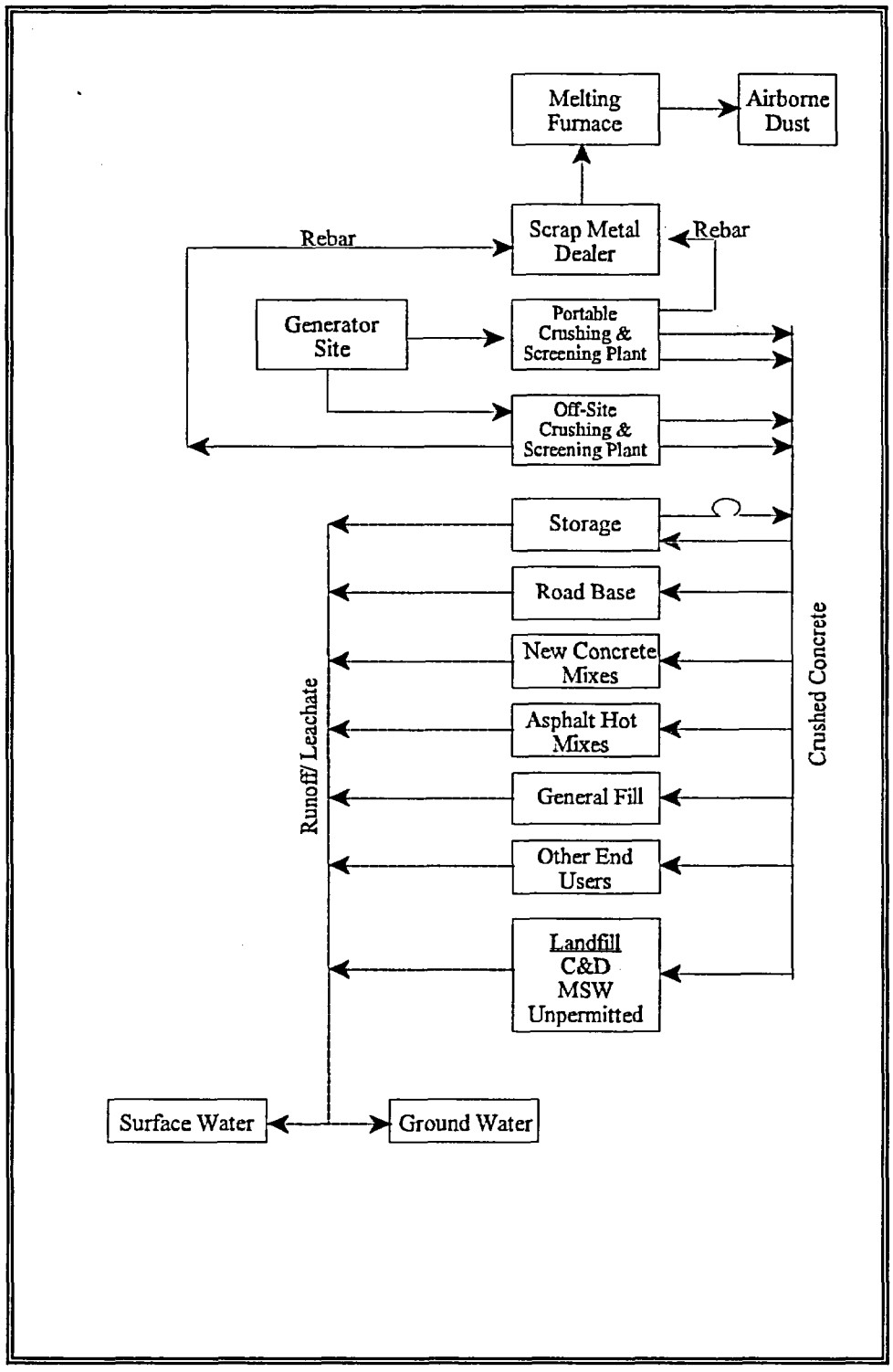


Figure 2-2 Potential Collective Exposure Scenarios Associated with the Clearance of Concrete

The methods and models used to derive collective doses for the recycling of scrap metal are divided into the following subdivisions, each of which addresses a key step in the dose assessment process for radiation workers, for non-radiation occupational exposures, and for members of the general public:

(1) Characterization of clearable material

(2) Exposures associated with the transport and disposal of clearable material at LLW disposal facilities

(3) Exposure to radiation workers in support of the clearance process

(4) Exposures associated with the transport and disposal of cleared material at landfills, including RCRA-permitted facilities

(5) Exposure from the transport of cleared material for recycling and reuse

(6) Exposure to cleared material at scrap yards and material processing facilities

(7) Exposure to cleared material at metal melt facilities

(8) Exposure to effluents from metal melt facilities

(9) Exposure from transport of products and byproducts from metal melt facilities to facilities for further metal processing

(10) Exposure to industrial workers at metal processing and manufacturing facilities using recycled metal

(11) Exposure to workers at baghouse dust processing facilities

(12) Exposure to workers at slag process and handling facilities

(13) Exposure to the public from recycled concrete

(14) Exposure to the public from products made from recycled metal

(15) Exposure of the public from products made from recycled slag

(16) Exposure of the public from the disposition of baghouse dust

Items 2 through 16 represent different population groups anticipated to experience exposures associated with the clearance alternative. Each group is addressed separately because the exposure scenario and levels of internal and external exposure are anticipated to be fairly homogeneous within each group, but differ substantially among the groups. As a result, the range

and average exposure rates to the members of each group, the number of individuals comprising each group, and the duration of exposure among the different population groups are anticipated to differ substantially and, therefore, warrant individual attention. In addition, by structuring the analysis in this form, there is a high degree of assurance that all population groups that may contribute significantly to the collective doses are included. This approach also helps to achieve the design objective of transparency.

2.2.1 Characterization of Clearable Material – The Starting Point

The Inventory Report presents a compendium of information characterizing the inventory of clearable material at NRC/Agreement State-licensed facilities. This information serves as the starting point for constructing the clearance source terms. The process begins by creating a database representing each of the approximately 21,000 NRC/Agreement State licensees. The database assigns to each facility, or category of facility, a quantity of potentially clearable carbon steel, concrete, and other material (as appropriate to achieve our objectives) produced by each facility or category of facility as a function of time during anticipated D&D. A separate database is developed characterizing the potentially clearable material generated during facility operation. Due to unavailability of data, the database characterizing potentially clearable material generated during facility operations is not subdivided into types of material, but is simply defined as mixed trash. These data are used as the bases for deriving the collective doses associated with each of the clearance alternatives. Table 2-2 presents an example of the format of the database for carbon steel generated during the D&D of PWRs.

Table 2-2 Structure of the Clearance Source Term Database for Carbon Steel from PWRs (metric tons)

Year of Clearance	Facility # 1	Facility # 2	Facility # n	Total
2003				
2004				
2005				
.				
.				
.				
2050				
Total				

For commercial nuclear power plants and fuel cycle facilities, the time periods are designed to capture the production of clearable material during the D&D and the license termination process. However, in the case of large hospitals, it is assumed that hospitals operate indefinitely, but routinely decontaminate and clear rooms or sections of the hospital where radioactive materials are used or stored.

Each entry includes a best estimate and, where possible, a range of values. The database contains similar tables for other categories of licensees and types of material, grouped in a manner that is compatible with the limitations of NUREG/CR-_____. For example, each light-water reactor (LWR) and fuel cycle facility is individually represented in the database. However, it is neither necessary nor possible to provide entries for each of the thousands of material licensees. Nevertheless, it is possible to group the material licenses by major category (and according to size) and provide individual entries for each major category.

These entries are then used to represent "pulses" of material cleared from each licensee or category of licensee as a function of time under each alternative. These pulses of clearable material (expressed as metric tons of a particular category of material, containing a particular quantity and mix of radionuclides, including uncertainties) serve as input into the collective dose assessment modules for each exposed population group.

Because we are interested in deriving the undiscounted and discounted collective doses, the date when each pulse of material is released is indexed against a reference year, i.e., 2003. In addition, since each pulse of cleared material can deliver exposures over many years (e.g., the Co-60 cleared in a given year and finding its way into automobiles can be expected to deliver exposures for many years thereafter), an accounting is maintained of the collective dose as a function of the year following the reference year.

For the purposes of this analysis, the time when an exposure occurs is assumed to be the time when the dose is delivered. In fact, for inhaled and ingested radionuclides, the dose conversion factors, which are expressed in units of committed dose equivalent per unit intake, reflect the 50-year committed dose. For some radionuclides, those with either a short half-life and/or short biological half-life, the dose from a give intake is delivered over a relatively short period of time (e.g., < 1 year). However, for radionuclides with long radiological and biological half lives, the dose from a given intake is delivered over a period of 50 years following intake. The discounted collective doses derived in this report do not take into consideration the time-varying nature of the dose following intake.

2.1.2 Conceptual Models

The conceptual models used to derive collective doses associated with the pulses of cleared material differ among the different population groups based on whether the population group experiences a one-time exposure to a pulse of cleared material moving through the group (e.g., exposure to scrap yard workers, steel mill workers, and transporters of cleared material), or the population group is chronically exposed over long periods of time (up to 1,000 years), as is the case for exposure to the various products and byproducts associated with clearance (e.g., exposure to recycled steel in automobiles and structures, slag used as agricultural fill, or material disposed in landfills). For the first category of exposure, we use what we refer to as the "Dose Factor Approach." For the second category, we use the "Reference Population Approach." In addition to these definitive analyses of collective doses, screening analyses are used, which show that the collective dose for a given group is very small as compared to other groups.

The Dose Factor Approach

Ideally, we would like to be able to calculate the doses to each person comprising a population group and then sum up the doses. In principle, this approach can be used for population groups where the distribution of the dose factors for the individual members of a population group is known, or can be derived, along with the number of people in the group. For example, if we know that there are 10,000 people in a given population group and the dose factor distributions reported in NUREG-1640 (expressed in units μSv/yr per Bq/g) apply to this group, it is possible to derive the collective dose to this group, along with uncertainty, in the following manner:

Step 1: Sample once from the dose factor distribution (μSv/yr per Bq/g) and once from the radionuclide concentration distribution (Bq/g) and multiply the two values to obtain one realization of individual annual dose for one randomly sampled member of the population group (μSv/yr).

Step 2: Repeat step 1 10,000 times and sum the results, yielding one realization of the collective annual dose to that population (person Sv/yr).

Step 3: Repeat step 2 1,000 times to obtain a distribution of collective doses for that population group, thereby generating an best estimate and 95 percent confidence level for the estimate of the collective dose for that population group.

Because the NUREG-1640 dose factors apply to critical population groups and include consideration of dilution factors, the actual calculation is somewhat more complex. In addition, uncertainty in this estimate must consider uncertainty in the number of people in the group, and consideration must be given to the time-varying nature of the exposures in order to discount future exposures. Later in this report, where this methodology is used to derive collective doses, a detailed description of the method is provided for each population group.

Reference Scenario Approach

For those population groups where NUREG-1640 dose factors are not readily available or applicable to the derivation of collective doses, it is convenient to employ reference sites, reference population groups, and/or reference scenarios as a means to derive collective doses. For example, population exposure to automobiles from recycled metal is more amenable to modeling using the reference automobile approach, as opposed to the dose factor approach because the population exposures associated with the clearance of a pulse of metal in a given year can extend over several generations. The reference automobile scenario approach involves a six-step process, as follows:

Step 1: Construct a reference automobile that represents the collective average automobile in the U.S. A reference automobile can be designed or selected based on a review of the designs of all automobiles.

Step 2: Derive the average external exposure rate per unit activity in the reference automobile, expressed in units of Sv/hr per Bq of a given radionuclide in the reference automobile, along with uncertainty due to uncertainty in the mass and geometry of the real, but unknown average automobile.

Step 3: Determine the collective exposure duration in units of person hours per year. For example, based on documented usage factors, we can determine the number of person hours per year of automobile occupancy in the U.S., including uncertainty.

Step 4: The product of these two parameters (Sv/hr-Bq x person hours/year) yields a type of normalized collective dose rate (person Sv/year per Bq of a given radionuclide in the reference automobile), including uncertainty.

Step 5: Given this parameter, a normalized collective dose per Bq cleared is derived based on information characterizing the fraction of recycled metal in the U.S. that is directed toward a particular end use (in this case an automobile as opposed to other end uses for recycled metal) and the fraction of the radionuclide in cleared metal that partitions to the metal melt.

Step 6: The product of this normalized collective dose with the amount of a given radionuclide cleared yields the annual collective dose associated with clearance of that material (person Sv/yr).

The time-integrated collective dose is determined by integrating over the exponentially declining collective dose rate over 1,000 years. The depletion coefficient reflects radioactive decay and the removal rate of automobiles from the pool of automobiles (a type of depletion coefficient, λ_e).

The overall word equation takes the following form:

Undiscounted time-integrated collective dose = (Sv/hr-Bq in an automobile)
x (person-hrs/yr of automobile occupancy in the U.S.)
x (Bq of a given radionuclide cleared by a given facility in a given year)
x (fraction of the cleared radionuclide that goes to melt)
x (fraction of melt that goes to automobiles)
x $\int \exp(-\lambda_e t)dt$

The discounted time-integrated collective dose can be determined by replacing the environmental depletion coefficient by the sum of the environmental depletion coefficient plus the discount rate (e.g., 0.07/yr).

All these parameters, along with their uncertainty, can be determined.

This approach involves the derivation of several different types of normalized collective doses, including the following:

- Person Sv per Bq in the product causing the exposure (normalized collective dose type 1 as derived in Steps 1-4 above)
- Person Sv per Bq deposited in the melt in a steel mill (normalized collective dose type 2 as derived in step 5 above)
- Person Sv per Bq cleared from the nuclear facility (normalized collective dose type 3 as derived in step 6 above)

The derivation of collective doses for particular end-use products begins with the derivation of type 1 normalized collective doses (e.g., given 1 Bq in a reference product, such as an automobile, what is the time integrated collective dose to the U.S. population?). Type 1 times the fraction of recycled material that goes into a particular product (such as the fraction of all recycled carbon steel that is used to make automobiles) yields type 2. Type 2 times the fraction of the radionuclide in the cleared material that partitions to the product or byproduct during recycling (such as the fraction of a given radionuclide in cleared carbon steel that partitions to the metal melt during recycling) yields type 3. The last category is the "official" normalized collective dose for a given radionuclide and end-use product, while the first two are intermediate versions of the collective dose that have their uses.

Once the type 3 collective dose is derived, the product of the actual quantity of a given radionuclide that is cleared times the type 3 normalized collective dose, yields the collective dose due to the clearance of material containing that particular radionuclide from a particular end-use product.

Screening Analysis

Several methods are available for quickly screening the collective dose to a given population group to determine whether it has the potential to contribute significantly to the overall collective dose. The first method makes use of the dose factors, such as those in NUREG-1640, with appropriate adjustments to account for dilution already incorporated into the dose factors. Specifically, the dose factor distributions in NUREG-1640 characterize the exposures to a number of critical population groups. By definition, they represent the distribution of dose factors for relatively small homogenous groups within a larger group, and not the entire group. For example, NUREG-1640 dose factors for scrap yard workers do not represent all scrap yard workers, but only a smaller, critical group within the scrap yard worker population that will experience high-end exposures. As such, using scrap yard worker dose factors from NUREG-1640 to derive collective doses to the scrap yard worker population will result in an overestimate of the collective dose to this group. The implication is that if, after performing realistic collective dose estimates for other population groups, we find that the conservative estimate of the collective dose to the scrap yard workers is small as compared to other population groups, we can conclude that the scrap yard worker contribution to the collective dose is small and can be disregarded.

The second screening method takes advantage of the fact that collective dose is a function of (1) the average exposure rate per unit activity in the reference product, expressed in units of Sv/hr per Bq of a given radionuclide in the reference end-product and (2) the collective exposure duration to the end-product, expressed in units of person hours per year. The product of these two parameters is an index of the relative collective dose for a given radionuclide for a given end use and can be used as a basis for screening among the vast number of different end-use products.

Databases

As a means of facilitating screening and the derivation of collective doses, a geographic information system (GIS) database is employed. The GIS-based system involves the creation of a base-map of the U.S. with layers of relevant information incorporated into its database. The database includes the following:

- The locations of LWRs, scrap yards, EAF and BOF steel mills, RCRA landfills, and each currently licensed low-level radioactive waste disposal facility
- Data characterizing each facility with regard to pertinent parameters (e.g., quantity and characteristics of cleared material and time of clearance for LWRs; scrap processing rate, number of workers, worker hours per metric ton of material processed, etc., for scrap yards and steel mills)
- Data characterizing the land use and demography in the counties in which each facility is located (e.g., percentage of land used for agriculture, residences, and commercial/industrial use)
- Data characterizing ground water and surface water uses and characteristics in the vicinity of each site
- Major transportation routes connecting the various facilities

The GIS-based information is used to construct reference sites/facilities/population groups, which are then used as input to models for deriving collective doses.

Exposures Associated with the Transport and Disposal of Clearable Material at Low-Level Waste Disposal Facilities

Assuming the prohibition alternative, it is assumed that all of the clearable material is disposed at a licensed LLW disposal facility. For each pulse of material for each facility or category of facility, this module predicts the collective doses to transport workers, to members of the public on the roadway from the licensed facility to the LLW disposal facility, to the workers at the LLW disposal facility, and to the public in the vicinity of the LLW disposal facility. The method used to derive these doses is to extrapolate the doses from previous NUREG and NUREG/CR reports that address these topics generically. The extrapolations take into consideration the quantity and radionuclide composition of the clearable material and distance to the LLW disposal facilities.

The results of these extrapolations are normalized collective doses expressed in terms of person rem per metric ton of each category of material shipped for LLW disposal. The product of the normalized doses with the quantity of each category of material cleared yields the collective doses associated with this scenario.

This report is interested in the collective doses, not the doses to particular individuals. As a result, the calculations are simplified because we are not concerned with individual variabilities. For example, for this scenario, we are interested in the collective dose to workers that transport the clearable material from the licensed facility to the LLW disposal facility. There is enormous individual variability in these doses based on the quantity and types of material shipped, mode of shipment, and distance to the disposal facility. However, by researching the types, quantities, and composition of the clearable material produced, the modes of transportation, and the distances to the LLW disposal facilities for a given licensee or category of licensee, it is possible to construct a reference scenario that represents the average set of conditions for this scenario for a given facility or category of facility and for a given category of material. With this information, a best estimate is derived, including uncertainty, of the normalized collective dose attributable to the shipment of the clearable material to an LLW facility, expressed in units of person rem per metric ton of clearable material representing a given facility or category of facility and a given category of material.

United States Nuclear Regulatory Commission

Results of License Termination Rule Analysis

Advisory Committee on Nuclear Waste
May 28, 2003

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Washington, DC 20555

Outline

- Overview of LTR Analysis
  - Background
  - Evaluation Process
  - Summary of Issues and Recommendations
  - Recommended Actions and Schedule
  - Outcomes
- Restricted Release/Institutional Controls
- Realistic Scenarios

Background – Commission Direction

- SRM-SECY-01-0194 - June 2002
  - Conduct an analysis of LTR implementation issues
  - Emphasis on resolving the restricted release and institutional control issues
  - Goal is to make the restricted release and alternate criteria provisions more available

Background--Staff's Initial Analysis

- SECY-02-0177 - October 2002
  - Identified and described 8 LTR implementation issues
  - Identified plans for evaluations

Background—Results of Staff's Analysis

- Results of staff's LTR analysis are given in SECY-03-0069, May 2, 2003
- Commission approved release of the Commission paper to the public
- Commission will consider staff's recommendations and provide direction

Evaluation Process

- NMSS/OGC team evaluated 8 issues and developed plan for 1 new issue
- Restricted Release/institutional controls (Johnson)
- Relationship between LTR and other release limits
  - Unimportant quantities (Banovac)
  - Separate U/Th standards (Comfort)
  - On-site disposal (Pogue)
  - Controlling disposition of solid materials (Huffert)

Evaluation Process (cont.)

- Realistic exposure scenarios (McKenney)
- Measures to prevent future legacy sites
  - Changes to financial assurance (Fredrichs)
  - Changes to licensee operations (Shepherd)
- Intentional mixing (new issue)(Widmeyer)
- Evaluated
  - Experience from NRC and others
  - Options
  - Matrix of potential applicability of issues to each decommissioning site

Restricted Release/Institutional Controls

- Issue: Difficulties arranging institutional controls required for restricted release/alternate criteria
- Outcome: Make restricted release/alternate criteria provisions viable
- Recommendations:
  - Clarify risk-informed graded approach for institutional controls
  - New options for ongoing NRC involvement

Unimportant Quantities

- Issue: Unclear relationship between LTR unrestricted release criteria and unimportant quantities (0.05 wt %) in 10 CFR40.13(a)
  - Exempt from regulation if source material less than 0.05wt%
  - Criterion for entry into regulation NOT criterion for license termination
- Desired Outcome: Describe appropriate relationship
- Recommendation: Clarify in a RIS that 10 CFR40.13(a) should not be used as a decommissioning criterion

Separate U/Th Standards

- Issue: Appropriateness of developing a separate unrestricted release standard for uranium and thorium, higher than 10 CFR 20.1402.
  - 10 CFR Part 40 App.A "equivalency" criterion allows higher unrestricted release standard.
  - Meant for few isolated sites with small areas and small component of overall dose
  - Not applicable to LTR decommissioning sites
- Desired Outcome: Decide if developing a separate standard is appropriate
- Recommendation: Not appropriate
  - LTR provisions allow flexibility: 1402, 1403, 1404
  - Rulemaking not cost effective for few existing sites

On-site Disposal

- Issue: 10 CFR 20.2002 does not establish a clear standard for approving on-site disposals; Agency discretion for case-by-case
- Desired Outcome: Clarify appropriate standard
- Recommendations: Clarify in a RIS to continue the current practice of using a "few millrem" for approving onsite disposals. Permit requests up to 100 mrem/yr along with additional financial assurance for eventual decommissioning

Controlling Disposition of Solid Materials

- Issue: Unclear relationship between LTR's 25 mrem/yr for unrestricted release and existing guidance of a few mrem/yr for controlling disposition of solid materials. Potential removal of residual contamination from an unrestricted release site.
- Desired Outcome: Describe relationship
- Recommendations: Describe relationship
  - Different purpose, scope, and type of materials
  - ALARA, mixing would reduce dose from offsite use
  - LTR is protective if materials are removed after license termination
  - Analyze off-site use scenarios

Realistic Exposure Scenarios

- Issue: Clear direction and guidance needed for selecting realistic exposure scenarios
- Desired Outcome: Implement dose assessment exposure scenarios that are realistic, risk-informed, and reflect a logical extension of existing and foreseeable site-specific conditions
- Recommendation: Clarify guidance that more realistic exposure scenarios can be justified by assuming reasonably foreseeable land use for 1,000 year analysis time period

Changes to Financial Assurance Prevent Future Legacy Sites

- Issue: Financial risks could cause shortfalls in decommissioning funding
  - Underestimation of costs
  - Operations indicators of increasing costs
  - Accidental release increase costs
  - Inadequate financial disclosure

- Desired Outcome: Make regulatory changes so future sites will have adequate decommissioning funding

- Recommendations: Rulemaking/guidance to mitigate financial risks
  - Staff approval of Decommissioning Funding Plan
  - Re-evaluate cost estimate and fund amount when indicators occur
  - Property damage insurance
  - Certification of financial statements

Changes to Licensee Operations Prevent Future Legacy Sites

- Issue: Licensee Operational risks could cause decommissioning problems
  - Chronic releases to subsurface over time
  - Late identification of contamination and extent
  - Existing regulations/guidance are not specific
- Desired Outcome: Make changes to minimize contamination
- Recommendations: Rulemaking/guidance to mitigate high operational risks
  - Existing licensees should minimize contamination through procedural changes
  - Focus licensee monitoring/reporting on high risk of subsurface contamination
  - Focus staff inspections on high risk sites and operations

Intentional Mixing

- Issue: Appropriateness of allowing intentional mixing of contaminated soil to meet release criteria
  - Generally not permitted by staff
  - Potential financial and exposure reduction advantage under certain limited circumstances
- Desired Outcome: Determine appropriateness and recommend action
- Planned Evaluations:
  - NRC policy and experience
  - Policy and experience of others (EPA, DOE, Corps)
  - International

Recommended Actions and Schedules

- Commission paper on mixing: 9/03
- Regulatory Issue Summary (RIS): 3/04
- Rulemaking/guidance for preventing future legacy sites: 9/06 proposed, 9/07 final
- Revised guidance for other issues: 9/06
- Revised inspection/enforcement guidance: 9/05

Outcomes

- Existing decommissioning sites (complex, long-lived radionuclides, financial difficulties)
  - Facilitate decommissioning
  - More economical decommissioning with use of realistic scenarios
  - Restricted release/alternate criteria provisions more available with new options and clarification of graded approach to institutional controls
  - Clarify/answer questions about relationship of LTR to other NRC regulations
  - Matrix of potential applicability of issues and each decommissioning site (Attachment 11)

Outcomes (cont.)

- Future decommissioning sites
  - Reduce the potential for future legacy sites
  - Reduce the need for using restricted release/alternate criteria provisions
  - Contributes to Commission preference for unrestricted release and greatest opportunity for productive reuse

Restricted Release/Institutional Controls

- Issue: Difficulties arranging institutional controls required for restricted release/alternate criteria
  - Governments/Tribes unwilling to accept ownership of private sites due to liability concerns
  - Lack of independent third party and long-term continuity
  - Long-term effectiveness of institutional controls
  - Unclear flexibility of existing LTR risk-informed, graded approach to institutional controls

Restricted Release/Institutional Controls

- Evaluations
  - EPA, DOE, Agreement States, NAS, ASTM, ECOS LTS Subcommittee
  - Other NRC regulations: Part 40 App. A, Part 61, Part 63, West Valley Policy Statement
  - Existing decommissioning sites
    - 3 sites with long-lived radionuclides
    - Ongoing interactions under staff's phased approach to Decommissioning Plan development

Restricted Release/Institutional Controls

- Key insights
  - Recognize potential for failure of institutional controls, particularly over long term
  - Appropriately selecting, implementing, monitoring, and enforcing will help minimize or mitigate potential failure
  - Some cases may need ongoing Federal role
  - Flexibility is needed to tailor institutional controls that address site-specific characteristics

Restricted Release/Institutional Controls

- Recommendation: Clarify the LTR risk-informed, graded approach for restricting use
  - Risk framework (see Table 1, Attachment 1)
    - Based on 10 CFR 20.1403, Statement of Considerations, and guidance in NUREG-1757, but not specifically described
    - Hazard level (dose without institutional controls)
    - Likelihood of hazard occurrence (hazard duration)
    - Lower risk: < 100 mrem/yr OR short term
    - Higher risk: > 100 mrem/yr OR long term
  - Grades (see Table 1, Attachment 1 for examples)
    - Two general grades
    - Lower risk: legally enforceable (e.g., deed restrictions)
    - Higher risk: legally enforceable and durable (e.g., government ownership or control)
    - Specific grades: flexibility to balance site-specific factors

TABLE 1. NRC'S RISK-INFORMED GRADED APPROACH FOR INSTITUTIONAL CONTROLS TO RESTRICT SITE USE

Lower Risk **Lower Hazard Level (25-100 mrem/year)** **Shorter Hazard Duration– Lower Likelihood** **Shorter Half-Life (less than 100 years)**	**Higher Risk** **Higher Hazard Level (100-500 mrem/year** **Longer Hazard Duration– Higher Likelihood** **Longer Half-Life (greater than 100 years)**[1]
<u>General Grade</u> Legally enforceable institutional controls <u>Specific Grade</u> Tailor specific type of institutional controls and land use restrictions to site-specific circumstances <u>Examples</u> Single conventional "deed restriction" such as a restrictive covenant (less control) Layered/redundant controls such as restrictive covenant, deed notice, and State registry (more control)	<u>General Grade</u> Durable and legally enforceable institutional controls <u>Specific Grade</u> Tailor specific type of institutional controls and land use restrictions to site-specific circumstances <u>Examples</u> Layered/redundant controls that includes a State government control (less durable) Conventional institutional control with NRC monitoring and enforcement after license termination using legal agreement (less durable) Conventional institutional control with NRC monitoring and enforcement after license termination using regulatory authority under 10 CFR 20. 1401(c) (more durable) State or Federal government ownership and control (NWPA 151(b)) (most durable)

[1] It may be appropriate to treat sites with longer half-live contamination but doses close to 25 mrem/yr as "Lower Risk" sites.

Restricted Release/Institutional Controls

- Recommendation: New options involving NRC
- NRC monitoring and enforcing after license termination
  - Under regulation (10 CFR 20.1401(c)) if there is a potential for significant safety threat
  - Under legal agreement and institutional control that includes written NRC authority

Restricted Release/Institutional Controls

- New option of NRC possession-only specific license after completing remediation
  - All 10 CFR 20.1403 requirements must be met
  - Possession-only license conditions act as the legally enforceable and durable institutional control similar to EPA permits or orders and Ohio's decommissioning possession-only license
  - License conditions would address land use restriction, maintenance, monitoring, reporting
  - Flexibility tailored to site-specific factors

Restricted Release/Institutional Controls

- Continue to monitor and participate with cooperative, interagency activities to share information and develop solutions (ECOS LTS Subcommittee, DOE LTS Roadmap)

- Implement approved recommendations using revised guidance and describe in a RIS

Restricted Release/Institutional Controls

- Outcomes
  - Provide more effective restrictions that will protect public health and safety over long term
  - Make LTR restricted release and alternate criteria provisions more available
  - More consistent with EPA, NAS, ASTM
  - Should increase public confidence in restricted release

Realistic Scenarios

- Issue: Clear direction and guidance are needed for selecting realistic exposure scenarios for both unrestricted release and restricted release without institutional controls

- Common perception: LTR requires licensees use residential-farmer scenario

Realistic Scenarios

- Evaluation
  - Existing guidance
    - Flexible, but tone discourages alternate scenarios
    - Analysis of viable scenarios for 1,000 years
  - Staff and licensee experience
    - Licensee –initiated/justified scenarios
    - Staff's lack of "corporate" knowledge
    - Lack of well developed examples of alternate scenarios
  - Case studies
  - EPA's CERCLA approach

Realistic Scenarios

- Options evaluated
  - Continue current approach with additional emphasis on current flexibility
  - Allow scenarios based on reasonably foreseeable land uses (next few decades to possibly 100 years)
- Recommendation: use reasonably foreseeable land uses

Realistic Scenarios

- Reasonably foreseeable land uses
  - Consistent with LTR's Statement of Considerations about institutional controls
  - Similar to EPA's CERCLA approach
  - Primary justification remains physical features of the site, radionuclide half-life, and time of peak exposure
  - Considers less likely alternates to reasonably foreseeable land uses for robustness/risk-informed analysis

Realistic Scenarios

- Outcomes
  - More economical decommissioning, while maintaining safety
  - Few restricted release sites