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ADVISORY COMMITTEE ON NUCLEAR WASTE

June 19, 2007

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE AND MATERIALS

(ACNWM)

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180th MEETING

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VOLUME I

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TUESDAY,

JUNE 19, 2007

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The meeting was held in Room T-2B3 of Two White Flint North, 11545 Rockville Pike, Rockville, Maryland, at 10:00 a.m., Dr. Michael T. Ryan, Chairman, presiding.

MEMBERS PRESENT:

MICHAEL T. RYAN	Chair
ALLEN G. CROFF	Vice Chair
JAMES H. CLARKE	Member
WILLIAM J. HINZE	Member
RUTH F. WEINER	Member

NRC STAFF PRESENT:

CHRISTOPHER BROWN
LATIF HAMDAN
AMY COVIDGE
JOHN FLACK
EDWARD O'DONNELL
WILLIAM R. OTT
JEAN-CLAUDE DEHMEL
BOBBY EID

ALSO PRESENT:

CHRISTOPHER KOUTS
MARTY MALSCH
TIM MENEELY
ERIC ABELQUIST
ERIC DAROIS
ERIC KIRSTEIN
RALPH ANDERSEN
STEWART BLAND

C O N T E N T S

P R O C E E D I N G S

(9:56 a.m.)

CHAIRMAN RYAN: This is a meeting of the NRC's Advisory Committee on Nuclear Waste and Materials. During today's meeting, the Committee will consider the following:

The U.S. Department of Energy briefing on the transportation, aging and disposal (TAD) canister and the total system model (TSM) in support of the Yucca Mountain Repository Effort.

We'll have election of ANCW&M officers for the period of July 1, 2007 to June 30, 2006.

We'll also have this afternoon a working group meeting on the implementation of 10 CFR 20.1406, where we will have practitioners participating in an afternoon long working group meeting.

Antonio Diaz is the Dias is the designated federal official for today's session.

We have received no written comments or request for time to make oral statements from members of the public regarding today's session. Should anyone wish to address the Committee, please make your wishes known to one of the Committee staff.

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

It's also requested that if you have cell phones or pagers that you currently turn them off at this time.

Thank you very much.

Without further ado, the first session this morning will be lead by Dr. Weiner. So, Dr. Weiner, I'll turn the meeting over to you.

MEMBER WEINER: Thank you, Mr. Chairman.

Our first speaker is Christopher Kouts. Ah, there he comes, who holds the position Manager of Technical Public Policy for the Department of Energy, Office of Civilian Radioactive Waste Management, and in that position he's responsible for managing OCRWM activities for transportation of nuclear waste, commercial spent fuel interim storage, and he has supported the Director's office in interaction with Congress on policy matters.

And without further ado, I'd like to introduce Mr. Kouts.

Go ahead, Chris, with your presentation on the TAD canister system status and total system model.

MR. KOUTS: Thank you very much, Dr. Weiner.

CHAIRMAN RYAN: Let me also mention while Chris is getting ready that we have one participant as far as I know on the phone. If you would check your microphone, please, and introduce yourself.

MR. FITZPATRICK: I'm Charles Fitzpatrick, State of Nevada.

CHAIRMAN RYAN: Thank you, Charles.

Anybody else on the phone?

(No response.)

CHAIRMAN RYAN: Okay. I guess that's it.

Thank you.

MR. KOUTS: First of all, I want to thank the Committee for inviting me give a presentation on the transportation, aging, disposal canister system progress and the total system model. I also want to thank you for accommodating my schedule. As you may or may not know, we have a series of management meetings every third week of the month in Las Vegas, and I'll be leaving from this meeting to go directly to those, and I thank you for accommodating me to have this presentation this morning.

Although we usually don't make major announcements at ACN&W meetings, I do want to mention that as of this morning the department is issuing a press release on the issuance of the final TAD specification. That announcement also indicates that we will be shortly initiating a procurement on the final design activities associated with the TADs.

In addition to that, that press release also indicates that the department will be entering into discussions shortly with contract holders, utility contract holders to modify their existing contracts to facilitate the use of TADs in the waste management system.

And that press release, unfortunately I have it on my Blackberry, but I don't think it's too appropriate for me to hand my Blackberry around for people to review it, but it is available on our Website, as well as the final TAD specification, and I'll get into some details associated with that in just a few minutes.

The other thing I'd like to mention before I get into the presentation is that typically when you come before the Committee you provide a rationale as to why you're before the Committee. My interest here is to inform the Committee of the strategy and the approach that the department is taking to implement a canister based system of what we call a primarily canister based system.

CHAIRMAN RYAN: Chris, excuse me for

interrupting your introduction.

MR. KOUTS: Sure.

CHAIRMAN RYAN: If it is available on the Civilian Radioactive Waste Management Website you said?

MR. KOUTS: It should be, yes.

CHAIRMAN RYAN: Could I ask that maybe staff see about downloading it and maybe we could facilitate and help you by making some copies available to attendees here at this meeting.

MR. KOUTS: Sure, that would be great.

CHAIRMAN RYAN: If that would be helpful.

MR. KOUTS: That would be great.

CHAIRMAN RYAN: Okay. Terrific. We'll be happy to do that.

MR. KOUTS: Okay. Again, I've given similar presentations where the staff has ben present. We have not had a technical exchange with the staff for a variety of reasons.

THE REPORTER: Chairman Ryan.

CHAIRMAN RYAN: Yes. I'm sorry?

THE REPORTER: That bad is a little bit problematic.

CHAIRMAN RYAN: Excuse me. I'm sorry. I won't do it again. Done.

MR. KOUTS: Okay. I totally lost my train of thought.

CHAIRMAN RYAN: I apologize.

(Laughter.)

MR. KOUTS: It's age I'm sure.

At any rate, let me get into the presentation, and we'll walk through what I intended to cover today. I'll talk a little bit about the background of TADs, why we're going to a primarily canister based system, and this is, again, for commercial fuel. We're not going to put any defense materials in any of these canisters. They are being designed solely for the purpose of the disposal for the transportation, aging, and disposal of commercial spent fuel, not high level radioactive waste.

I'll talk a little bit about where we are in terms of program implementation, the process for that. I'll discuss the contents of the final TAD specification, which should be now on our Website, and also how we envision TAD operations to occur.

So back in October of 2005, the department made an announcement that we're going to essentially primarily a canister based system. When I say that, what do I mean primarily? Our belief is that our goal is, if you will, that we'll have about 90 percent of all commercial fuel that comes into the system in TADs. There will be a residual, and what our plans are now is roughly about ten percent, which will be bare fuel that we can also handle at our sites and our wet handling facility.

But anyway, back in October of 2005, we essentially announced that approach. We believe that there are a variety of benefits that provide to the department. It standardizes, if you will, the handling of commercial spent fuel for storage, transport and aging purposes and disposal purpose at Yucca Mountain.

We get to utilize the fuel handling experience at utility sites, and in doing some of the packaging for the process, it simplifies our operations and simplifies our facilities, and it reduces our low level waste production, and basically it reduces our cost to a certain extent.

Now, I've already touched on this, but TAD canisters will be a key interface component that we feel will be helpful for the management of spent fuel throughout the utility system and also the transport system and the handling at the repository, and as I've said many times, the TAD canister system will comply with all regulatory requirements, 10 CFR Part 71, which is for transport. Part 72 is for storage at reactor sites and independent spent fuel installations and for disposal purposes at Yucca Mountain.

The philosophy that we use to develop the TAD is actually to use proven industry practices, guidance and experience. I should also note that the Nuclear Waste Policy Act directs the department certainly in the transportation area to use private industry to the maximum extent feasible, and that's what we're doing in this regard.

Back in the mid-'90s, you might remember the department, for those of you who have been around as long as I have, you might remember that the department embarked on a canister based approach called the multi-purpose canister system, and we learned, I think, a lot from that experience, and learning from that experience, essentially we decided instead of selecting one vendor to develop TADs or the canister itself. We wanted as many vendors as possible to do that.

So we did that through the use of a performance specification. We issued a preliminary performance specification back last November, and today were announcing the issuance of the final specification which the vendors will use in their design processes.

In terms of the development of the specification, this was somewhat of a difficult birthing within the program. We spent a lot of time working with the repository components of the system, both the pre-closure and post closure groups. Essentially the canister itself embodies all of the needs that we feel we need for disposal purposes.

If you looked at our historical waste package design, what we essentially did was create an interior canister that would slip into an outer over pack, if you will. It does provide another barrier, if you will, but essentially this is a stainless steel can that goes in an over pack, our disposal over pack, and meets the same requirements that we've historically had for disposal purposes.

In addition to that, in the development of the preliminary specification through the auspices of the Nuclear Energy Institute and also the U.S. Transport Council, we had a variety of meetings with utility industry and vendors to get their input on essentially the utilization of this canister at their sites and what their needs might be.

So we did quite a bit of homework and hopefully we've developed the specification that will fulfill our needs and also be widely distributable to the industry and for use in the industry.

As I mentioned earlier, we issued preliminary specification in November of last year. At that point in time, we energized four vendors, four qualified vendors to develop what we call proof of concept designs. Those were submitted to the department, and we completed that review in March of this year, and the vendors have all been paid, and we thank them very much.

The next procurement process will essentially be for the final design of those canisters.

Let's talk a little bit about TAD implementation and what the department's approach is in that regard. After we've initiated the procurement, our expectation is that the vendors will develop a canister transportation over pack and also an aging over pack which would be used exclusively for the purposes of Yucca Mountain and a repository at Yucca Mountain. Part 72 requirements and the needs at a utility site will be dealt with by the vendors directly with utilities who decide to use these on their sites.

But prior to the time that any SARs are

submitted to the staff, the department will have to review the designs to make sure that they are consistent with our performance specification as we published.

And as the vendors go through the certification process with the NRC, any changes to the canister designs or any of the designs essentially will have to come back to the department for our review to make sure that, again, any changes are still consistent with the specification, and again, our primary interest here is our ability to handle these canisters on site and also that those canisters still will meet our disposal specification.

Let's go on to the next slide.

After a similar -- let's speed forward in time, assuming that the NRC certifies designs for '71 and '72, at some point in time after the certificates are issued we will again review the designs to make sure they're consistent, and we will develop a list, if you will, of certified designs, acceptable designs to the department, those that are certified by the NRC and acceptable to us from the standpoint of meeting our performance specification.

And that list will be updated regularly, and my expectation is that as we move forward in the future, TADs may evolve. The requirements that we put in them today may evolve and change somewhat as we go into the future, and there may be different generations of TADs.

What we would initially use, assuming Yucca Mountain is licensed by the NRC, what we would use on day one may be different than what we use in year 20. And that's something that I think we're flexible enough that as we learn more and if we can demonstrate analytically that these canisters could be made differently, less expensively or whatever, that we will certainly we flexible enough to do that, but at every step along the way, again, the NRC is the regulator of all three aspects, and the department will have to assure as the licensee that any TADs that are used at the repository, again, meet our specifications and also meet whatever disposal requirements that the NRC may make, assuming Yucca Mountain if found suitable for disposal purposes.

So when we get into the fabrication process, again, we're into the same situation where if there are any tweaks that occur during the fabrication process, again, that we will have to review them to make sure that, again, there is no inconsistency with our specification.

Now, this is also an issue that I think we'll discuss further with the staff, but DOE will require -- at least our perspective at this point is that we will require -- that any utilities that are using TAD based systems for reactor certify that those systems are fabricated in accordance with our requirements, approved design drawings, specifications, and of course, they will all be using an NRC approved QA program.

And any modification to anything, to any of those components essentially will again have to undergo a DOE review for us to satisfy ourselves that we are still consistent with the specification.

This gets somewhat into a contractual matter, but utilities that use TAD systems for at reactor storage or at the time of transfer to the department and for taking fuel from a pool which they're putting into a TAD for them to put into a transportation cask for us to move to Yucca Mountain, again, we will require the utilities to certify that they're loaded and prepared in accordance with our needs and also with the qualified QA program.

And as I said earlier, we will require utility certification prior to the acceptance of each of those canisters.

And of course, this is something that should go without saying, but we have no regulatory authority nor do we assert any regulatory authority over the sites that will be preparing these canisters.

Let's talk a little bit about the final specification. It delineates the requirements that we will rely on in order for us to make a presentation in the license application to the NRC that we are complying with Part 63. It also includes other requirements basically associated with the handling on site to allow us to move them through our facilities. Drop heights, leak requirements, those kinds of things you will all find in the specification.

And let's get into what some of the highlights of those are. From the preliminary to the final there has been no change in terms of the capacity of these devices. There will be 21 PWR or 44 BWR assemblies.

The canister length, now this is a change from the preliminary specification, and we got certainly a lot of feedback from the vendors, that where we had a one size fits all concept, which was 212 inches, we're now allowing the length of the canister to drift downward to no less than 186 inches. So the vendors will have flexibility between 186 and

212 inches to develop TADs that will meet fuel types that they're most familiar with.

And our desire is to, again, have as many vendors as possible participate in this because there are a variety of vendors that deal with the industry, and we want to cover the entire industry and feel the best way to do that is to have multiple vendors accomplish that.

The diameter is 66 and a half inches. Maximum weight is around 54 tons, and that's loaded weight. The average dose rate from the top, and this, again, meets our pre-closure needs of 800 millirem per hour. That's an average. There can be slightly higher at certain aspects of the top as long as the average, if you will comes out to 800 MR per hour.

A change from our historical designs as we moved away from nickel gad as the neutron absorber of choice and moved to borated stainless steel. And let me diverge here for a moment because I think this is kind of an interesting area to tell you how everything is kind of interrelated with the TAD and how it works with the system.

When we initially developed and we were developing the specification, we thought we were going to use a nickel gadolinium neutrol absorber for our post closure needs, and essentially what we found from talking to the vendors is that it was unclear that this would potentially work from the standpoint of being able to certify this for other purposes, Part 71 and 72 purposes.

So we went back to look at perhaps something else that might change that, and the other issue that came into play was the use of carbon steel in the waste package. We had used carbon steel in the waste package and the vendors also told us that that was going to be very challenging to use in borated fuels and in spent fuel pools.

So when we pulled out the carbon steel, what we found out is that the pH of the waste package basically went up in the post closure world, which allowed us to look at an absorber, if you will, that did not have the long term corrosion needs that were as extreme as we needed with the nickel gadolinium.

So that's how we basically evolved to borated stainless as the nickel gad. Also, from the standpoint if you don't know where nickel gadolinium comes from, most of it right now is, I believe, mined in Mongolia. So we would have had some very interesting supply issues with that.

But we moved on to borated stainless

steel, and we feel that that will meet our post closure needs, and this has all been addressed with our post closure people, and so that's how, if you will, borated stainless steel got to be the absorber of choice for disposal as opposed to the nickel gadolinium if you followed our designs over the years.

Moving on, the canisters themselves will be seal welded, and there will be a common lifting fixture to facilitate our handling at the repository. All handling and aging at the repository will be done in a vertical configuration. That's not to say that these can't be stored horizontally at reactor sites, and that's up to the vendors if they choose to design it to be also stored horizontally.

And organic, pyrophoric and RCRA materials are prohibited from use in the canister. What you're looking at now is a simulation of how this would work and how you would load a TAD in a spent fuel pool at a reactor site. You're seeing the canisters going into the transfer caskets, going into the pool. We will not go through 21 PWRs or 44 BWRs here, but there will be two assemblies that are pulled out and put into the canister.

We'll go to number two here.

I don't think it will be quite this rapid at utility sites.

(Laughter.)

MR. KOUTS: But nonetheless for the sake of simulation, we'll do this fairly quickly.

Then what will happen is the lid should be placed on this. There's the lid. It is pulled out. It will be drained. Of course, you won't see that step, and it will be inerted, and this is the welder coming over, and it will be welded, and that's schematically how it would work at the spent fuel pool. There it's being drained and so forth.

Let's see if we can go on to the next simulation.

This next one is just transferring that canister through use of a transfer cask into dry storage in a vertical configuration. This could be at a reactor site or it could actually be at the repository. Essentially the lid is going to go on, the lifting device coming over, and lifting devices will be put on the top here, and the transporter will come in and, again, will not go this rapidly, but it will be taken out to the storage location.

You basically go through -- this is transfer to dry storage in a vertical configuration. Okay. This is another similar concept. The lid will come on. Here the lifting device is put on and away it goes.

Let me see if I can get beyond this one. I don't know. I need some IT support.

There we got. This is the horizontal configuration. I think we've seen enough vertical, and the difference with this, it has to be upended and placed on the device horizontally. The truck will take it out, be tipped over here and essentially put into a storage device.

This would be typically at a reactor site. This we're planning on a vertical aging configuration at the repository.

There we go, and this is again just putting it on transportation cask. Here is a transfer cask, into the transportation cask. The lid will be placed on -- it will be upended and placed on a transportation cask, and those are the inflatable impact limiters that were also not working out. But impact limiters will be placed and it will go on the road.

So let's move on to the TAD summary. The final specifications now can be found on our Website. We're going to be initiating a procurement very shortly for final design services and other activities, and the vendors will have to make sure that they are compliant with Part 71 and 72, and of course, the department will have to make sure that every step along the way that in meeting 71 and 72 that it's still consistent with our performance specification for disposal purposes.

That completes my TAD presentation. I can move on to total system models if you'd like. We can do that or I can take question snow, whatever you like.

MEMBER WEINER: I think it would be a good idea to take questions on the TAD now. Dr. Hinze.

MEMBER HINZE: Well, a couple of questions, if I might. In terms of the thermal loading of the repository, the length of the canisters will be variable if I understand correctly.

MR. KOUTS: That's correct.

MEMBER HINZE: And does this have any impact on the thermal loading? And what is the overall effect of the TAD on thermal loading?

MR. KOUTS: Well, regardless of whether you have a TAD in the system or not, we're still going to meet the same thermal requirements that are going to need to be met for our post closure analyses. The advantage of the TAD is that from a standpoint of --

well, let me put it this way. There are no thermal limits on the TAD other than those that are necessary for transportation purposes, and right now that's about 22 kilowatts per package.

Assuming if we had a TAD canister that came in that hot, it would have to be obviously aged at the repository until it was in a configuration or in a thermal environment that it could be emplaced.

When I get into the total system model discussion, one of the things that we're using the model for is to look at, besides the 11.8 kilowatts per package, which you probably heard numerous times and the 1.45 kilowatts per meter, we're looking at other parameters, if you will, in the underground, drift wall temperature, centerline temperature between the drifts, if you will, between the pillars. And we're looking at what flexibility we have potentially in place at a somewhat hotter than 11.8 package that we've historically done that.

In addition, just from learning more about how the mountain works, the ends of the drifts, if you will, just from a thermal conductivity standpoint have a lot more rock that the heat can basically be dissipated in. So it is conceivable that you can put hotter packages toward the ends of drifts and the cooler packages, you know, toward the middle of the drifts.

So what we found with the total system model, and I'll get into this when I go through that section of the presentation, we're learning about what flexibility we might have in terms of still meeting our thermal goals, but not necessarily relying specifically on the 11.8 kilowatts per package or the 1.4.

MEMBER HINZE: That's informative and helpful.

Let me make certain I understand. You are asking several vendors to come up with conceptual designs or specific designs on these?

MR. KOUTS: Let me answer it this way. The solicitation will be a competitive solicitation. I think it would be the department's desire to -- we'll have to wait and see what the proposals look like, but it would be the department's desire to have multiple awards.

MEMBER HINZE: Does this mean that there will be multiple designs then that will be accepted by DOE and brought to the NRC for approval?

MR. KOUTS: That's correct.

MEMBER HINZE: And how much variance in

the designs are you permitting? As long as they meet the specifications that you've --

MR. KOUTS: That's correct.

MEMBER HINZE: -- come up with?

MR. KOUTS: That's correct. As long as they meet specifications. Now, we allowed the length of the TAD to float downward, if you will. Essentially that's what we heard form the vendors through the proof of concept process, which was that if we had maintained the 212 inch one size fits all, that it's likely that it would not have been widely used within the industry.

So we went back and looked at what our needs were, and our facilities could handle it. And we're actually going to ask the vendors. If you look at the specification, they'll have to come up with a spacer. The waste packages themselves will still be the same size, but we will have a spacer. If it's shorter than the 212 inches, we'll have a spacer. So the CD and so forth of the waste package, everything can still be handled in the same method.

MEMBER HINZE: Fine. In terms of the borated steel, borated stainless steel, are the really problematic areas with using a borated stainless steel? This has not been used for this particular application or you haven't specified this in the MPCs and so forth.

Are there any difficult areas with this borated stainless steel?

MR. KOUTS: Well, we'll have to see how the certification process goes. In discussions with the vendors, through the proof of concept phase they felt it was a usable material. There are very precise specifications as to how the borated stainless is to be used in the basket that are laid out in the specification and the vendors will have to look at that and see how they can make that work with also whatever Part 71 and Part 72 needs.

So I think the simple answer to your question is we didn't see any showstoppers on this through the proof of concept design until we get into the certification process with the NRC and the staff has had an opportunity to review it, and we'll find out of there are any issues. But we haven't identified any up until this point.

MEMBER HINZE: On page 3 of your overheads, you state that you worker irradiation has decreased at the DOE facilities. Is there any indication that the use of the TADs will modify the worker irradiation at the utilities?

MR. KOUTS: Well, we don't anticipate that this will be any different than loadings that utilities would typically do for transportation casks either. I think that our expectation is that we're going to be essentially using the same practices that are currently being used.

Now, the issue may come up with the amount of canisters that have to be loaded, and this is, I think, one of the questions that was asked for me to address, and the simple answer to it is that the TADs as we conceive them right now are the capacities 21 PWR and 44 BWR. That is typically less than what you'll see in bare fuel casks today. That's usually 32 PWRs and 68 BWRs.

So my sense is the operations in and of themselves will be no different than what a utility will typically do for loading canister materials at a reactor site, but the number of the loadings and so forth may go up because of the decreased capacity.

But the actual operations in and of themselves should be identical to what they are currently doing now and putting out dual purpose canisters right now at utility sites.

So the actual operations won't be different, but the amount of them may increase.

Again, my perspective is also that as we move into the future, we'll hopefully be able to design TADs that have higher capacities because that was a hard point for a lot of the vendors and the industry themselves. They indicated, you know, why 2144.

Well, at this point in time that's what the design for the repository is, that our waste packages are 21 Ps or 44 Bs. That's not to say that some time in the future if the analytics support it and if we can demonstrate from a total system performance standpoint that we can put larger packages in, then we could use larger TADs.

But at this point in time, we're starting out with 21 and 44.

MEMBER HINZE: Thank you.

One more quick question. In terms of quality assurance and what seems to me that one of the critical areas is in terms of the welding of the lids, is this in any way with the TADs -- is there any difference between that and the curb process in terms of welding of lids, in terms of the quality assurance of the performance of the lids, et cetera?

MR. KOUTS: Again, our expectation is that the same technologies would be used at reactor sites to do the welding for the TADs that currently exist.

The difference might be the leak tight requirement that we may have may be somewhat different than what the reactors are currently dealing with, but again, this is something that the vendors will have to work out in terms of the designs and meeting the requirements of the specification.

But the simple answer to your question is we don't see any difference in the technology that the reactors are using now for storage and transport purposes and the TAD. We're going to use the same technologies.

MEMBER HINZE: And those animated cartoons that you showed u which were very helpful, where does the quality control come in on the checking of the lids?

MR. KOUTS: Well, this is going to be an interesting discussion between the staff and the department. Our expectation is that the quality assurance that this will be done under, which will be part 50, again, that's an NRC qualified QA program just as our QA program is qualified.

I think as I went through my slides, we are going to have utilities certify to us that they have met all of our needs and all our requirements, and it has been done under an NRC qualified QA program.

Again, we are going to be the recipient of the TADs, and we're going to use them at Yucca Mountain, assuming it's licensed. So we do certainly have an interest in that it's done appropriately, but our perspective is that a Part 50 QA program should be acceptable certainly to the department if it's acceptable to the Nuclear Regulatory Commission.

MEMBER HINZE: A final question. Who owns the TADs?

MR. KOUTS: Who owns the TADs? It depends on how -- at the point in time -- for instance, let's assume that Yucca Mountain is operational and we're going to go to a reactor site and pick up fuel from a utility. We will provide the TAD to the utility. If the utility decides to use these on its own prior to the time that the department comes up and they want to use it for storage on site, that's an issue that we're going to be addressing with the contract holders, and I really can't get into that.

I mentioned earlier that the press release indicates that the department will be entered into discussions with contractor holders, and that's one of the issues that we're going to have to deal with

MEMBER HINZE: Thank you very much, Chris.

MEMBER WEINER: Allen.

VICE CHAIRMAN CROFF: Can you give me a little bit more of a feel for what one of these spacers might look like or how it's constructed, what it might be made of?

MR. KOUTS: I believe it's stainless steel. The specifications are in the specification itself, and it has to do with, again, providing -- and I can't remember off the top of my head, but we did look at that very hard, and we provided specifications as to what that specific requirement for the spacer might be, and I can't pull it out of my brain right now, but it's in the specification, and it should be fairly obvious in terms of what the requirements are for.

VICE CHAIRMAN CROFF: Okay. Second, the time line on this, as I understand the way this will work, these TADs will get 71, 70 or 72 license fairly early on, but then they also need to be I guess I'll call it approved under Part 63, in other words, acceptable as part of the repository.

MR. KOUTS: That's the department's responsibility.

VICE CHAIRMAN CROFF: Okay.

MR. KOUTS: The 63 aspects of the TAD

basically are the department's responsibility. The vendors need to do 71 and 72.

VICE CHAIRMAN CROFF: Okay. So someplace in this specification you've included requirements that lead DOE to believe the thing should be acceptable under Part 63?

MR. KOUTS: Correct. The major aspect of the specification is to deal with disposal needs and also our pre-closure and handling at the site. So in addition, I didn't go through this in my presentation, but we're having the vendors essentially design three things. It will be the canister itself, the transportation over pack, and the aging over pack that would be used at Yucca Mountain.

So that aging over pack, the transportation over pack and the canister are the three things the vendors will be designing, and the aging over pack requirements and specifications are contained in the specification itself.

VICE CHAIRMAN CROFF: Okay. So regarding Part 63, I mean, can I expect not having seen this that, I mean, there's limitations on like what materials they can use?

MR. KOUTS: Yes.

VICE CHAIRMAN CROFF: And are there any

other aspects to the specification that are sort of directed at Part 63 compliance?

MR. KOUTS: The post closure criticality needs, the use of borated stainless, how the borated stainless needs to be configured around the basket, if you will. There's very, very precise needs and also the other specification, very precise specification on the type of borated stainless that needs to be used.

So all of those aspects, all the criticality, post closure criticality needs are all contained in the spec, and assuming the vendors can make that work and the department at every step along the way, basically it has reviewed that and is comfortable with the approach the vendors are taking, then it should work.

Now, you mentioned timing. Let's talk a little bit about timing. Assuming the department goes out in the near future and initiates a solicitation, if you will, for the final designs, our expectation would be that some time next year, probably post June 30th, which would be the not to exceed date, if you will, but we would submit the license application; that the vendors would go forward to the NRC and submit SARs for their review under 71 and 72.

When you play that out, our expectation is that potentially TADs could be available in the utility environment, if you will, in the 2011-2012 time frame.

And it's important from the department standpoint that we try to get TADs out there as quickly as possible because ultimately what's happening in the meantime is that devices that are not disposable, if you will, are proliferating, if you will, and that just creates issues in terms of how those have to be repackaged and where those need to be repackaged.

So the sooner we can get that out there, recognizing that there is an element of risk because as we go through the licensing process for Yucca Mountain, there may be changes, and you know, the department is going to have to deal with that risk in discussions with the contractors, and that's what we intend to do.

VICE CHAIRMAN CROFF: Will the license application reflect the specific conceptual designs from these vendors? I mean, will the timing be worked out or will LA be sort of a generic TAD thing?

MR. KOUTS: My expectation is, and there are several approaches we could take, but let me just throw out one that we could march down. We could create an envelope, if you will, of a design for a canister such that if the vendors came in with a design that fell within that envelope, it would be totally consistent with our pre-closure and our post-closure needs. That's one approach.

The other would be to do, you know, a point analysis and do a variation on that, but I think we haven't made any final decisions on how we're going to address that, but, yes, you are correct. The vendors' designs will be submitted probably after we submit the license application. So we're going to have to accommodate that in the license application.

VICE CHAIRMAN CROFF: Okay. Thanks.

MEMBER WEINER: Mr. Chairman.

CHAIRMAN RYAN: Yes.

MEMBER CLARKE: All of my questions have been answered. Thank you.

MEMBER WEINER: I just have a couple. You say that you're looking for another design for the transportation over pack. Don't you have licensed certified transportation over packs that can take these packages?

MR. KOUTS: I think the diameters and the capacities are slightly different. I mean, to the extent that the vendors will utilize existing designs that they may have already certified and modify those to deal with the TADs, I mean, that's within the realm of the vendors to do that, but my sense is the dimensional needs are somewhat different. The lengths may be somewhat different also.

So again, what we saw in the proof of concept phase was that the vendors looked at their existing designs and saw how they might modify their existing designs to meet our needs.

So although they may not be able to use an existing transportation over pack, they may do a modification of an existing one in order to meet whatever TAD requirements they have.

MEMBER WEINER: So you would anticipate that they would start with the existing transportation over packs, and if there is a slight modification because it was my understanding that the TADs would fit into several of the existing certified transportation over packs.

MR. KOUTS: To the extent that they can, that's great. I don't remember in the discussions on the proof of concept designs whether -- you know, I don't remember any vendor saying that. They said they would basically use their existing designs and basically modify them around that, but to the extent they can use an existing one, I think that's great.

MEMBER WEINER: Second question. The five designs, I mean, I realize these are just cartoon designs that are currently on the OCRWM Website. Are those still current? Have the TADs changed markedly from what's there, what people can look at already or is it more or less the same?

MR. KOUTS: Well, we haven't actually made the proof of concept designs available, as I recollect, and they have to go through a public release review, and there's also proprietary information that the vendors provided them that, and I think we're working toward that.

The difference, what you'll see in the difference in the Website is that now as opposed to the preliminary specification, the final specification will be there, and again, that's been modified. One of the changes was the length, and there are other changes in there that have addressed other pre-closure and post closure needs.

MEMBER WEINER: And the final question for now. You talked about the difference between there being more loadings at the utilities rather than less, and I recognize this was a question asked at the dry cask forum. If you increase the number of loadings, doesn't that also increase the probability of a loading accident drop or something like that? I mean, that's a proportionality.

So that in addition to a possible increase in worker exposure, you are also increasing the probability of accident.

MR. KOUTS: To the extent that you are having more operations, if you will, that's true. I don't remember. You know, there were many, many log-ins at utility sites for dry storage purposes and transport purposes, and I don't remember any major problem.

Yes, as we move forward there will be more, but there would be more anyway if we even had a bare fuel system where we were going to 3268. So I think there will be an increase. I think your point is well taken, but I don't think that that's necessarily going to be an issue.

MEMBER WEINER: That was more or less enough said. I'm going to stop now because I recognize you have the rest of your presentation to go. So why don't you? And ask everyone else to hold questions.

MR. KOUTS: That's fine.

MEMBER WEINER: Thank you. Go ahead.

MR. KOUTS: Okay. All right. Well, let's move into the total system model. I'll give a little overview of what the model is. I think the Committee indicated that there was an interest as to how we use the TAD or how we use the TSM to evaluate TADs. I'll go through that and also other activities.

And I mentioned thermal analysis earlier in response to a question, and I'll go through that in a little bit more detail.

Actually, when I assumed this position back in, I guess on an acting basis, in October of 2002, one of the things that struck me was that we didn't have an overall systems tool for our program. We had a variety of models that looked at the repository, that looked at transportation, and that looked at, if you will, the waste acceptance component, but we didn't have an integrated model that kind of pulled it all together and allowed us to look at synergistic effects between the three aspects.

So I commissioned essentially a group of I will say long haired nerds at Oak Ridge National Laboratory, and I say that affectionately, who looked at a variety of different existing copyrighted programs, and they came up with a recommendation that we use a copyrighted tool called SimCat, which has historically been used in manufacturing processes by various corporations, but, again, from the standpoint of how an industrial manufacturing environment would use these, and it's used to optimize processes, et cetera.

One of the advantages of it, and we'll get into this in the presentation, is that it has a graphical user interface, which we call a GUI, if you will, and you can watch the operation of the system. So if the system has a choke point, you can see exactly where that choke point is, and the operator can intervene and say, "Okay. If this one facility is having a problem meeting the needs of our baseline, what can we do to affect that?"

And when we talk about the amount of loading cells that we need in order to make waste packages and so forth, that's kind of the insights that this tool can provide us.

Anyway, we developed a first version in November of 2004, which was a base case of the system. We had a bare fuel handling system at that point, and we utilized it just to see whether or not the facilities that we were contemplating at that time essentially were going to meet our baseline requirements.

Then as we moved to TADs, we modified that bare field handling system and tweaked it, if you will, and our computer programmers looked at ways that facilities might operate in order to deal with TADs and gave us some insight as to what a TAD system might look like.

We now have a version four or I should say we're actually moving on version six. Version four, which we completed in July of 2006, basically adapted all of the different TAD aspects of that initial construct as modified to deal with TADs, and then in version five, we also used it for analyzing what we call our Critical Decision 1 study, which was the formal process internally the department went through to approve TADs and approve the primarily canister based system for commercial fuel.

That version was completed earlier this year, and we're tweaking that version. We're going to have another version six that's out later this year.

Now, before we get too far into this, a lot of people have said, "Well, gee, I'd love to have a copy," and I have to say that this was never intended for external use. It's an internal tool. Although we have strict configuration control on it, we don't have a manual as to how this works. We don't right now, from the standpoint of funding for the program, we don't have that kind of resource in order to develop it.

There are various groups within the program that do utilize it. We do use configuration control on each of the data sets and also the configuration of the model, but it's also not used for QA purposes. This was not developed under a QA program. Again, it's to provide us insight as to how the system might work and how changes might affect the system, and it does give us insights in that regard.

But it was never intended to be used for regulatory purposes. That's not why we developed it, and we have not issued it publicly because primarily we haven't had the resources in order to do that.

And in addition to that, since it is copyrighted, we paid for a license, if you will, every year in order to utilize this software. So there are also licensing issues associated with the use of the software.

So I've kind of gone over all of this in my earlier remarks. We use it to evaluate baseline performance. We can look at alternatives as we did with TADs. We can look at system solutions, how to make the system work better, and we can evaluate major impacts from a policy standpoint, what ifs, if you will, from a policy perspective.

This chart essentially shows you what the inputs are to develop our initial state file. We use spent nuclear fuel characteristic data that we get from utilities through the RWA 59 forms, which we give out on a regular basis for utilities to fill out. We also have a variety of databases, if you will, that we use internally for the purposes of determining the characteristics of the fuel.

We have utility capabilities in it, when reactors are anticipated to close, what shipping might occur, whether it's rail or truck from a specific site; some unit costs and so forth.

From a transportation perspective, we use the routes that were identified in the Yucca Mountain EIS that's being updated, cask capabilities and cask availabilities and so forth. Those are all factored.

Now, I should mention that the way the model runs is we look at operations on an eight hour basis. So each time step is eight hours, and when you're looking at running for 50 years, it takes a little while for it to run through.

But at any rate, and if you run a full inventory case and what that looks like, that will go all the way up to the 2100. So the advantage of this, again, is that we get to see the entire implementation of the repository. Again, there are a lot of simplifying assumptions on how this might work, and we're looking at it from a macro level as to how everything fits together.

From a repository perspective, we're basically followers of the repository design. All of the capabilities of the facilities, what the limits are on lab storage in the individual facilities, as well as age and pad size and so forth. All of those basically we take from the designers and we use those as inputs to the model and then the portion function of the model is to meet our acceptance rates or our receipt rates, if you will, in our baseline documents, and typically that in the first year is 400 metric tons. Next year is 600. The next year is 1,200, then 2,000 and 3,000.

So we have a five-year ramp-up to go to a 3,000 metric ton rate, and then we look at how the system reacts to that kind of forcing function, if you will, to see if it can meet that, and what I'm going to show you in a little bit is that it did.

What we get out of the model basically, we get the truck-rail selection. We get shipping schedules, cask parameters. We get doses, if you will, life cycle dose. We get cost estimates. We use it in our total system life cycle cost projections that we use for fee adequacy every year.

It gives us an insight into how large the storage field needs to be in order to meet specific scenario, and again, it allows the interplay, if you will, between the transportation segment, the repository segment and the waste acceptance segment. So the reactor is the transportation and the repository.

This is kind of a useful slide to show you. Each of these major components has a nested model within it. For instance, if you went to the GROA and you clicked on the GROA, you would see all of the different facilities that we would have in the GROA, and you could click on individual facilities, such as one of our canister receiving closure facilities, and you can see how that is operating, how it is taking canisters, if you will, how it is working through the system and so forth.

So it's not a video game, but again, it allows the operator, if you will, to look at it and see how the system is operating, nd of course, it has a variety of outputs that we use to understand how the system operates.

For the TAD study itself, which we did in fiscal '05, we looked at basically 70 combinations, 70 different parameters, if you will, and 40 different scenarios, and I'll show you one of those in just a few minutes, and the insights that we got from that is that our acceptance rates can be achieved, that the repository age limit, the capacity limit, if you will of the aging pads was not exceeded.

We can complete our 50 years of operations, and get that all done in what we're saying we can do it in, and we can meet our 1.45 kilowatts per meter subsurface thermal line load. So that was the insight. Those are the major insights that that provided.

We also used it for our CD-1, Critical Decision 1 package for internal decision making, and we focused there as to whether or not we could meet the 90 percent requirement or not requirement, but goal if you will, and I'll show you one of those scenarios in a minute, and for the ten percent that are not, if you will, -- does not come in in TADs, whether or not a wet handling facility as we conceive it, if you will and are designing it, whether that will meet that additional ten percent that would come in bare.

And the bottom line is that it's pretty close to that. However, if the percentages go down, if it's down to 60 percent TADs or whatever and we're going to more bare fuel, then it's likely that we will need more wet handling capability for our sites since we're handling that.

But our going in position is, I believe, three CRCFs or canister receipt enclosure facilities and one pool, if you will, that would handle bare fuel assemblies.

What we also found out from this is that the six weld cells that we currently contemplate for two in each, if you will, of the CRCFs would meet our emplacement needs underground to meet our 3,000 ton rate, and that six well cells should work well.

Now, this is kind of an example of some of the graphical output. Let me talk a little bit about what the scenario is. It's a 70,000 metric ton scenario basically using 21 Ps or 44 BWR TADs, with the acceptance of some dual purpose canisters, and that is, again, a contractual issue between the department and the utilities, but we're assuming for the purposes of this analysis that that's worked out.

For this it's about 88 percent TADs by

weight of fuel, one handling facility and six welders, three CRCFs, nd what you see here on the upper left is what we call a valley curve, and that tells us whether or not we're meeting essentially our acceptance rates in any one year, and you can see it's pretty close. We're 100 or two below tonnage in any specific year, but, you know, it is pretty close.

To the right what you're seeing is essentially what the TAD receipt rate is, and that's the upper blue line, and then what the emplacement rate is.

So the difference between those two will tell you how much aging you will have to have at the repository, and you can see from the chart on the bottom that the amount of aging does not exceed in this scenario more than 16,000 metric tons. So where we were with internal planning, which we were somewhere around 21,000 ton aging pad, we're seeing here that the model is verifying that for that scenario, if you will, for 88 percent TADs, three CRCS in one handling facility, that we don't exceed our aging requirements or what we are currently thinking in terms of what our needs would be for aging at Yucca Mountain.

So that's a little bit of the perspective as to how that provided some insights for the CD-1 process. I mentioned earlier that we also can use the TSN to look at different parameters from the standpoint of thermal analysis, and again, instead of looking at a situation where you have 11.8 kilowatt waste package and a 1.45 line load, let's let the model look at different parameters, a 96 degrees C. mid-pillar temperature, if you will.

If you remember, the strategy of our post closure analysis is that there will be drainage between the drifts, and we have a pillar of basically areas between the drifts where the water has not been pushed away. So if we keep that mid-pillar temperature at 96 degrees and we don't exceed a drift wall temperature of 200 degrees C. and we maintain a cladding limit temperature of 350 C. within the waste package itself, what does that look like?

And can we blend through the usages of the larger packages? Can we still meet our thermal goals?

And what this did show is that if you go to those parameters, it provides us a little bit more flexibility, and nonetheless, we can still meet what our thermal goals are. So that's the advantage of it, and this is just a graphical indicator of that same analysis. The dots on the left basically show you that the heat generation rate from the various waste packages, the 11,000, if you will, that would come into the system.

So that's how we address that. Our version six is in progress. We're continuing to use it to scope out thermal issues, and we expect that this tool will still be a key tool as we move forward.

So this is, I think, good summary words in terms of what we use the model for, which I've already gone through, and it is continuing to support scoping analyses, if you will, for our pre-closure and post closure analysis.

And a final summary. I've already talked about TADs, and I think I've already talked about the total system model, and I'll be happy to answer any questions on any aspect of my presentation.

MEMBER WEINER: Thanks very much for a very good presentation. I'll call on Dr. Clarke first.

MEMBER CLARKE: Thanks.

I agree that was a very helpful presentation. Just a couple of questions. I'm a little unclear on what you're varying and what you're keeping fixed, and without going into a whole lot of detail, is it possible to tell us more about that?

You do vary the thermal load as your slide showed. So you're not going with a single value for a line limit or anything like that; is that right?

MR. KOUTS: Right. Well, we initially -- and perhaps my presentation wasn't clear -- but initially we looked at the scenarios of 11.8 kilowatt packages, in other words, aging them until they're 11.8 before we put them underground and putting them in the repository at a 1.45 kilowatts per meter line load, and that works.

But what we wanted to look at is let's forget about those parameters for a minute and let's just look at center mid-pillar temperature. Okay? Let's look at drift wall temperature, and let's look at cladding temperature and how those, as being the limits, if you will, in terms of the constraints, if you will, on the system as opposed to the 11.8 and the 1.45.

And what we're finding is that if you use those different limits or constraints, if you will, it gives you more flexibility, yet it's still consistent with our thermal needs underground. And, again, the more refined analyses will be to take into account things like end effects in the drafts, I mean, putting the hotter packages at the end because of the greater thermal conductivity in the rock, the greater amount of rock.

We're going to be looking at that as we move forward to the future, but in the situation, we've looked at it a variety of ways. The first way was to hold the 11.8 and the 1.45 and see whether that works and it does, but also as to whether or not we get any flexibility by putting in these other constraints and seeing whether that works.

MEMBER CLARKE: Thank you. That was my understanding. I just wanted to confirm that.

So you're going beyond those initial constrains.

MR. KOUTS: Right.

MEMBER CLARKE: It seems that one of the great values of a took like this is you can look at different scenarios and identify pinch points and what could be really disruptive, and I wonder if your analysis to date has identified any events that could cause departures from, you know, what you'd like to see.

MR. KOUTS: Well, one of the things that we found was the amount of weld cells that we need because, for lack of a better term, if waste packages are ready to be or if TADs are ready to go into waste packages and the CRCFs are constipated, if you will, basically because welding will take a variety of time because there's several welds that we have to go through, and what our analyses indicated is that we need in order to meet a 3,000 metric ton per year emplacement rate -- and this is, again, putting it underground -- that we needed six weld cells in order to do that.

And if one of those weld cells goes down or something, then the system will become somewhat more constipated and we'll have to put more into aging. But what we found is that under normal maintenance cycles and so forth, if we have six weld cells operating and three CRCFs, you know, that's helpful.

Now, one of the things that I've given total system model presentation to our Nuclear Waste Technical Review Board, and they have stated a very strong preference that we should look at what ifs with the model. What if transportation route across the country goes down? What happens then?

I guess my response to that is this model isn't far enough along to really look at those kinds of issues. I mean, what the model would do is it would just route it to different routes around the country, and I think what it would find is that we could still meet our throughput needs.

Now, in reality, there are a lot of institutional things that would occur, a lot of issues. You know, we'd have to make sure that the routes -- we trained over them and so forth and so on. If we hadn't, you know, there would be issues.

But the advantage of this is that we look at, for instance, if there's, you know, heavy haul to a railhead. That's all put in. We looked at the transportation system and how it would operate, and again, in accordance with what the routes that we used in the EIS.

The interesting thing about this, and I didn't mention this, is that this model also has a stochastic element to it such that if you run exactly the same scenario again, you may not get exactly the same results because there's a logic, and it's an internal logic about how it makes decisions. So it may make different decisions the second time through, and that's also an advantage to the model because you don't want it really hard wired. You want it to make some logical choices. So we allow the model to make certain choices based on its preferences.

So it may choose to implement a different approach, a slightly different approach. So the numbers that you get out the end may be a little different for exactly the same scenario.

MEMBER CLARKE: Can you do that intentionally? In other words, can you input to the model distributions around certain assumptions?

MR. KOUTS: Sure. We certainly have the flexibility to do that. For instance, we have to set up an initial state for acceptance into the system, and our standard contracts require that oldest fuel first sets up the queue, but in terms of what's acceptable fuel under the contract, it's five years cooled or older. Okay?

So we looked at what we call youngest fuel first, five year cooled. You can look at an oldest fuel first, ten year cooled. I mean, you can look at a variety of different scenarios in terms of what fuel might be out there in order to implement the system, and you look at that and you can do a parametric analysis based on what kind of fuel the utilities might make available to us when we're ready to ship.

So there are variables certainly in the initial state, you know, in terms of what we can get from utility sites. And we have the capability to look at that parametrically.

MEMBER CLARKE: So would it be fair to say based on where you are now that your design approach to the surface facilities has sufficient flexibility to handle variations in input parameters, you know, within reasonable?

MR. KOUTS: We feel that it does. I will say though that if, as I mentioned earlier, if we're looking at a situation where we don't get around 90 percent TADs, you know, that could create some issues for us, but we'll have to look and reconfigure what service facilities we might need.

Now, we haven't initiated those discussions with utilities yet. We're going to be doing that in the near future, and I think as we move forward we'll get a better idea about how much TADs will be used, but the initial input we've had from the industry is that I think the industry is going to work with us on this, and again, you know, we'll see how that comes out after we have these contractual --

MEMBER CLARKE: And you do have a good feel of everything now for what's in dual purpose canisters and might come in that way --

MR. KOUTS: Right.

MEMBER CLARKE: -- and what would be in when the repository were available.

MR. KOUTS: Right.

MEMBER CLARKE: So you can make those assumptions.

Thank you.

MEMBER WEINER: Mike.

CHAIRMAN RYAN: No, I'm fine. I think Jim covered the things I was interested in.

Thanks.

VICE CHAIRMAN CROFF: Do you expect -- I understand the problem with the model, the copyright, and it can't be made generally available. Do you anticipate that the results of your analyses, some organized maybe report or something like this might be published at some point?

MR. KOUTS: Yeah, we plan on making this available. We just haven't gotten around to it yet basically.

MEMBER CLARKE: Okay.

MR. KOUTS: I've been a little busy with other things.

MEMBER CLARKE: Thanks.

MR. KOUTS: But we will get some reports out there.

MEMBER CLARKE: Okay.

MR. KOUTS: To document these analyses.

MEMBER HINZE: Does this include fuel other or waste other than the commercial spent nuclear fuel or is this totally related to that?

MR. KOUTS: The total system model?

MEMBER HINZE: Un-huh.

MR. KOUTS: No, we also model the input or the acceptance, if you will, of vitrified materials from the various DOE facilities and also DOE spent fuel that would be canistered. So it basically looks at -- and our thermal analysis also takes that into account.

MEMBER HINZE: Following up on Dr. Clarke's questions regarding unanticipated events, are they incorporated into this model, a tip-over, a change in the meteorological conditions, extreme weather, et cetera? Is this?

MR. KOUTS: No. That's something we can do. In other words, if there are certain shipping windows at certain sites, we can put that in and that's something that we plan on doing. I mean, you probably don't want to, but trying to deal with meteorological delays at this point, you know, envisioning 20 years into the future or 50 years into the future what they may be, no, but we can look at it from a macro basis, that certain sites, depending on the time of the year, that, you know, there may be refueling outages or whatever in terms of when individual facilities may have access to the pool for shipping.

I mean, we can build those things in, but we haven't looked at individual scenarios about whether issues or things like that.

MEMBER HINZE: Those conditions could also occur with regard to the aging pack, couldn't they, in terms of meteorological conditions, not inhibiting or delaying certain performances?

MR. KOUTS: Nevada test site doesn't have that.

MEMBER HINZE: Yeah, I understand, but it does have the extreme.

MR. KOUTS: There might be a couple of days here and there that you may lose due to weather conditions, but I don't anticipate that they would be, you know, long-term weather delays.

MEMBER HINZE: Thank you.

CHAIRMAN RYAN: I have one minor question if I may. Could you go to your slide where you had the valley curve?

MR. KOUTS: Okay.

CHAIRMAN RYAN: Is that possible?

MR. KOUTS: See if I'm -- okay. I'm almost there. Right.

CHAIRMAN RYAN: The valley curve shows you that you didn't go above what you're allowed to have on the pad; is that right?

MR. KOUTS: The valley curve is acceptance into the system. In other words, if we're looking at on day one or year one, if you will, to get 400 metric tons, that's what that reflects. The aging pad is the difference between the receipt of TADs in the system and our ability to emplace them. So the bottom curve gives you how much of a backlog there would be for whatever reason.

If they haven't met our thermal goals and we have to age them or if we're not in a position where we can emplace them because, you know, the welders haven't gotten around to them yet.

CHAIRMAN RYAN: That makes sense because the valley curve then is just really you haven't exceeded your capacity limit for the total system.

MR. KOUTS: Right.

CHAIRMAN RYAN: That always has to be below your limit.

MR. KOUTS: Right. The valley curve basically reflects what our baseline needs are in the amounts that we would be taking in any one year, and what that reflects is that we're close to receiving what the baseline says we should receive, which is the four, six, 12, two, three, and then three until we get to the 70,000 ton limit, and that's only for commercial. This only reflects commercial. This does not reflect defense materials in that valley curve.

CHAIRMAN RYAN: So it's really not a licensed fund then. It's just your optimization life.

MR. KOUTS: Right.

CHAIRMAN RYAN: Or quantities in process. Okay. Why are you never above that line? If you're optimizing, there should be some times you're above it and some times you're below it.

MR. KOUTS: Well, I don't think we're in the optimizing world yet.

CHAIRMAN RYAN: Okay. Fair enough.

MR. KOUTS: What we're trying to see is are we meeting what we're trying to meet.

CHAIRMAN RYAN: Fair enough. Okay. Thanks.

MEMBER WEINER: How are you going to get a 21 PWR assembly on a truck?

MR. KOUTS: We're not.

MEMBER WEINER: And I'm asking because you have not only in your TSM you have truck as an option, but from the EIS there's some reactor sites that can't load rail casks. What are you going to use, heavy haul for those?

MR. KOUTS: No, we will not be making TADs or we will not be using TADs. We will essentially bring bare fuel onto the site and package it on site in the wet handling facility.

MEMBER WEINER: So you will take a number of assemblies from your truck casks and package them together.

MR. KOUTS: Right.

MEMBER WEINER: Thank you. Thanks for that clarification.

MR. KOUTS: And that's what the wet handling facility is for. It's that ten percent that we'll not be entailed (phonetic), if you will.

MEMBER WEINER: Assuming that it stays at ten, that what you need for the wet handling facility stays at ten percent.

And that leads me to my other question. In your total system model, are you looking at what might happen if the utilities can't or won't or in some way don't use TADs and you have to do more repackaging? Are you looking at that?

MR. KOUTS: Well, what that would -- again, we can look at that, and that would simply mean that we would need more wet handling facilities on site in order to deal with bare fuel, and to the extent that, you know, we need to do that, our going in position is that we'll be able to work this out with the industry, and we're going to start those discussions very shortly and we'll find out.

MEMBER WEINER: Following up on one of Dr. Clarke's questions, you indicated that you can look at different scenarios. Is there any way in this system where you can incorporate a distributed input and sample on it and look at the uncertainties in your model that way, or is that totally internal to the model?

MR. KOUTS: No, we can input a distribution if you will and understand the effects of that distribution.

MEMBER WEINER: Because my final comment is I would encourage you to in some way make the model available. As you know very well, different models give you different answers, and somebody else is going to construct a model that does the same thing and gives very different answers because it's always possible to do.

So this is just an encouragement if there is any way to do this, to do it as soon as you can.

MR. KOUTS: Well, there are a variety of issues that we'd have to work through on that and resources not being the least of them, and also the copyright nature of the software and configuration control, and a variety of other issues, but your point is well taken, and we'll certainly look at that.

MEMBER WEINER: Staff questions?

MR. HAMDAN: I had a question.

MEMBER WEINER: Oh, I'm sorry. Latif and then Chris.

MR. HAMDAN: Go ahead.

MR. BROWN: Thank you, Latif.

MEMBER WEINER: Chris and then Latif.

MR. BROWN: Chris.

The issue of high burn-up fuel has been a plaguing issue in the industry for a number of years. Do you see this as a problem as far as deploying the TAD? I mean, what is DOE doing with respect to this issue? Are they working with industry?

MR. KOUTS: Well, we will certainly look to the vendors to assist us on that issue in terms of seeing how we can accommodate the higher burn-up fuel, and I think if you look at the specification, we go to fairly high burn-ups with the TAD.

So there may be some high burn-up fuel on the drawing boards that aren't in the specification, and we'll deal with that, but we have a fairly broad specification for the type of fuel that would go into this, and I think it does address a lot of the high burn-up stuff, but you know, we'll have to deal with that as we move forward in the future.

MR. BROWN: Because you mention in the TSM that you have a spent nuclear fuel characteristics data. Does that include data for high burn-up fuel? Is it source term, mechanical data? What does that include?

MR. KOUTS: All of the above, and basically every few years we go out with a form to utilities to tell us the type of fuel they're using and what their expectations are into the future, and we build that into our analyses.

So we don't do it too often because we have to go to OMB to get approval of the questionnaire and everything else. As you know, you have to get approval to ask industry any questions, but we do do that on a regular basis, and that information is -- we, of course, make that publicly available.

But that information is what we use. It's information we receive from the utility.

MR. BROWN: And with respect to the borated stainless steel used as the neutron absorber, will that be a structural material or non-structural?

MR. KOUTS: Good question. We're going to let the vendors determine that. We need that for criticality control, and to the extent that they can demonstrate that that can also be used for structural needs for their purposes in the basket, that's something that the vendors will have to deal with, and that's why we want to use private industry, because we want to use people who have experience in dealing with those kinds of issues.

And right now I don't think we have any feeling one way or the other. All we feel is that it has to be there in a configuration that we've identified in the specification in order for us to feel comfortable that we're meeting our post closure needs.

CHAIRMAN RYAN: Just on that, a follow-up to Latif's question, we have printed out your press release and that's available for anybody that wants it in the back. We did not print out the 339 page specification for everybody. You'll have to do that on your own, but the press release with the summary that I think you covered pretty well, Chris, is in the back for everybody's benefit.

MEMBER WEINER: Latif.

MR. HAMDAN: Chris, my question concerns the stochastic components, and when we achieve the flexibility, the advantage that the stochastic analysis would give you, but how do you plan to defend the results and the ultimate model? Because every time you run the program, you get a different number, and to give you a little bit, in the TSB area, for example, you run the model 200, 300, 400, 500 realizations and you have central condensing and you take that as your output and you can figure it that way.

In the TSM model, do you do the same thing?

MR. KOUTS: No. We don't run it two or 300 times. We may run it a few times to see what kind of variation we're getting in the ultimate results, but again, the TSPA is for regulatory purposes. This model is to provide the department insight as to how the system might operate. It's not a QA model. We're using it from the standpoint of trying to understand is it telling us something that is intuitively not obvious to us or is it giving us the results that are anomalous that we would not expect.

It's not being used -- and I tried to make this point clear -- it's not being used for a regulatory purpose. It's being used again to provide us insight as to how the system would operate. If there's slight variations in the output of the model, that doesn't trouble me as much. I think that that that's okay. Ultimately if we were using this for a regulatory purpose such as the TSPA, then I would agree with you. You'd have to run it many different times and get a statistical distribution, you know, show what your mean values are and so forth.

But that's not the intent or the purpose of the model.

MR. HAMDAN: But other variations that you are getting are slight?

MR. KOUTS: Yeah, they are minor variations. They're not large variations.

MR. HAMDAN: Thank you.

MEMBER WEINER: Other questions from anyone?

Identify yourself for the reporter, please.

MR. MALSCH: Sure. Marty Malsch from the State of Nevada.

I had four quick questions. The first one, you mentioned you were engaged in discussions with the vendors and utilities. Is there going to be a rulemaking proceeding, public rulemaking proceeding to modify the standard contract?

MR. KOUTS: First of all, I said we were planning on entering into discussions. We have not entered into discussions as of yet.

MR. MALSCH: Okay.

MR. KOUTS: At that point that would be a modification to the contract. It would have to be mutually agreeable to each contract holder, and the department feels that at this point in time until those discussions occur, we're not anticipating that we need to go through rulemaking on this.

MR. MALSCH: I just asked that question because the current standard contract is in DOE's rules.

MR. KOUTS: It is in DOE's rules. However, the courts have ruled it's a contract.

MR. MALSCH: Okay. Will there be any chance for members of the public or, for example, Nevada to participate or influence the results of these negotiations and discussions?

MR. KOUTS: Well, those discussions will

be between the contract holders and the department. To the extent that the State of Nevada wants to make its views known, the State of Nevada can do that at any time.

MR. MALSCH: Okay. My second question was you mentioned that you're going to have the utilities certify compliance with the specifications and compliance with the QA programs and so forth. Will the department be doing any auditing or otherwise looking beneath those utility certifications?

MR. KOUTS: That issue will be addressed by the department in the license application, and I think that we responded to a March 6th letter from the staff on that because they had several questions, and the department's approach in that regard will be in the license application.

MR. MALSCH: Okay. Third question deals with if DOE files the application in mid-2008 and it's docketed, let's say, late 2008, early 2009, and the proceeding lasts, let's say, three to four years, that brings you up to 2012. So there's the possibility, assuming things move along, of a decision in 2012 that would be different than your procurement specifications on the TAD.

And the question is: how have you

accounted for that possibility in your planning?

MR. KOUTS: Well, as I mentioned earlier, there is an element of risk associated with proceeding on this approach. The department at this point feels that the specification is fairly robust and that we're hopeful that there won't be any changes. If there are, that's something that we're going to have to deal with.

MR. MALSCH: Okay. And just last, a quick question. You mentioned the capacity limit for the aging pad. What is the basis for a capacity limit on the aging pad?

MR. KOUTS: That will be provided in the license application that the department will submit to the NRC next year.

MR. MALSCH: Okay. Thank you. That's all I have.

MEMBER WEINER: If there are no further questions, I'm going to turn it back to our Chairman, and again, thanks very much, Chris.

CHAIRMAN RYAN: Thank you, Chris. We appreciate you spending the morning with us, and now you have a busy travel schedule ahead.

I think on the tables behind you there's the announcements out there for everybody's needs. If you need an extra copy or we run out, we'll make some more.

With that I'd like to adjourn for about ten minutes and take a short break and then we'll reconvene in about, let's say, 20 minutes to 12.

(Whereupon, art 11:23 a.m., the meeting was adjourned for lunch, to reconvene at 1:00 p.m., the same day.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

1:00 P.M.

CHAIRMAN RYAN: Okay, we'll come to order, please.

This afternoon's session I think will be an interesting and informative one and I'm going to turn the meeting over to Dr. James Clarke, who is going to provide an overview of the working group meeting, including a meeting purpose and scope. And he'll introduce our invited speakers.

Dr. Clarke?

MEMBER CLARKE: Thank you, Mike. This afternoon, we will have a working group meeting related to 10 CFR Part 20.1406, minimization of contamination. Specifically, we will focus on the draft Regulatory Guide 4012 concerning license applications for new reactors.

Before we begin the presentations, I do have some comments that I need to provide and that I am sure you will appreciate by way of introduction and clarification.

The Office of Research has been developing a guidance document, a Regulatory Guide 4012, for the use of new reactor licensees to implement this important part of NRC requirements. Draft Reg Guide

4012 will utilize lessons learned from the first set of reactors decommissioned in the 1990s and first part of the 2000s, plus other NRC license facilities by factoring design and operating improvements at the front end of the life cycle of new nuclear facilities to resolve more efficient and less environmentally harmful operations and consequently, less costly decommissioning.

The Commission has asked the Committee to follow these efforts closely. The Committee believes that the development of this draft Reg Guide is an important milestone in the staff's efforts to utilize decommissioning lessons learned and is encouraged by the process of the staff so far. We are pleased to participate in this review of the Reg Guide.

The purpose of the working group today is to assist the Committee in the review of the draft Reg Guide. This afternoon we will hear from the two vendors who have participated in the process for certification of a new power reactor design and we will hear their thoughts concerning meeting 10 CFR 20.1406 prior to the development of the staff guidance.

As such, the presenters from GE nuclear and Westinghouse Electric are basing their presentations today on information they have provided to the NRC addressing this part of the regulation. Nothing about each of their presentations or in response to it should be interpreted as a review or comment on the information submitted by the vendors as to how the information addresses any part of 10 CFR 20.1406 or any of the draft guidance discussed today.

Formal review of the vendor information awaits the Reg Guide becoming final, after the public comment period and formal review of the documents submitted including any revisions or editions that the vendors may decide to make between now and the formal review. The Committee is also following another NRC staff effort that will address decommissioning lessons learned, namely the potential revisions to 10 CFR Part 20.1406 intended to prevent legacy decommissioning sites.

Some questions have arisen regarding whether draft Reg Guide 4012 will need to be revised when the rulemaking effort to revise 20.1406 is completed. Questions have arisen concerning the ramifications on vendors' efforts to meet this version of the Reg Guide. The rulemaking effort is underway so that these questions are at this time premature.

So the Committee asks the indulgence of

participants not to engage in any discussion today of the proposed rulemaking and guidance. We will leave that discussion for future committee meetings when the rulemaking will be formally presented to the Committee by NRC staff. Today's efforts will focus only on the draft Reg Guide.

The afternoon session will be conducted in two parts. The first part will involve presentations from invited speakers on the subject of the working group. The second part will be a round table discussion including the speakers and members of the Committee, as well as invited decommissioning experts, who continue to help the Committee in its activities involving decommissioning.

At this point, I would like to introduce our invited experts to you. On my left is Eric Darois. Eric has 30 years of experience as a health physicist. He has been involved in many decommissioning sites and many other nuclear projects. He is the president of Radiation Safety and Control Services in New Hampshire. He is presently supporting the Connecticut Yankee and Yankee Row decommissioning projects. He has a Master of Science degree in Radiological Science and Protection from the University of Lowell. Eric has been on our expert panels on decommissioning guidance revisions, prevention of legacy sites, decommissioning lessons learned as well. Thank you, Eric. Welcome.

On my right is another Eric -- Eric Abelquist. He is the director of the Radiological Safety Assessments and Training Program at the Oak Ridge Institute for Science and Education. He was a major contributor to the preparation of the Multi-agency Radiation Survey and Site Investigation Manual, MARSIM, and is the author if a book, Decommissioning Health Physics, the Manual for MARSIM Users. Eric has graduate and undergraduate degrees in Radiological Science Protection from the University of Lowell as well. He was also a member of our expert panels on proposed decommissioning guidance revisions. Eric, welcome back. Thank you.

And at this point, I am ready to introduce our first speaker to you. He is Tim Meneely, from Westinghouse Electric Company. Tim is from the AP1000 group at Westinghouse and he will present a brief introduction to the AP1000 design and how the requirements of 10 CFR 20.1406 have been addressed in their documentation so far.

Tim, thank you.

MR. MENEELY: I apologize if I cover basic ground for any of you, but in a group like this one never knows how much you know about AP1000 and how much you know about part 52, so I want to lay some ground work before I get into a review versus 1406.

The other thing I will apologize -- well, not really -- the other thing that I will comment on in your handouts. We are still getting used to restrictions of information that we can give out under security restrictions. Our understanding is that we can't make public any document which shows passageways or doorways in a nuclear power plant design, so there have been a number of figures omitted from your handouts. They will be on the screen and we can discuss them.

MS. COVIDGE: If you are going to put them on the screen, do you need to clear the room of public?

MR. MENEELY: I'm sorry?

MS. COVIDGE: Amy Covidge, Lead Project Manager for ESBWR, Office of New Reactors.

MR. MENEELY: I'm sorry.

MR. FLACK: John Flack, ACNW. Anything that is presented on the screen would end up as a public record, so the issue will still remain.

MR. MENEELY: Okay, well in that case

perhaps I will just skip them on the screen. It is going to be a little tricky for my presentation, but I can revise it. You are going to see less graphics than you would have.

MR. FLACK: I can put the other version up. It will take a couple of minutes.

CHAIRMAN RYAN: Sure, that would be okay.

MR. MENEELY: Okay. I have it on a memory stick if that is quicker.

(Pause.)

I do apologize. As I say, we're still getting used to the new restrictions.

Okay, the AP1000 plant, we have been working on AP1000 specifically since about 2001. It grew out of the AP600 effort. AP600 started in about 1986, so there is a long history on these Westinghouse units. AP1000 is a direct derivative from AP600 to the extent that when we made the transition from AP600 to AP1000, we had to specifically justify any changes we made between the two plants. So to a large extent, the AP1000 design has been going on since 1986.

Our basic design objectives in the AP1000 effort were in compliance with ALWR Utility Requirement Documents. It's often called the EPRI URD. This was an effort during the late 1980s through the 1990s to provide an upfront set of utility requirements to feed into vendors such as us. We committed to meeting the URD in the AP600 and the two, as I say, were developed cooperatively. We had meetings where the utilities would state a requirement. We would come back and tell them the implications of that requirement, so it was a long and very fruitful effort through about 15 years.

Other AP1000 objectives were increased margins, increased operational and safety margins, particularly with respect to accidents. Licensing certainty -- we're pursuing a part 52 license, so undergoing the design certification process here. A major issue that I'll talk about today was a greatly simplified plan. This grew out of former plants of the late 1970s, which we saw as becoming more complicated, more expensive. So we pursued design simplification within the world of improved accident performance, but we were looking for simplified design in order to simplify construction, maintenance, operation, reduce costs.

We brought in modular construction as a big part of our efforts, and we believe that we have achieved a short construction schedule, and as a result of simplifications we see improved availability, maintainability, and inspectability, and occupational radiation exposure.

The other aspect that was sort of a reclamation of something that we had done years ago was this was an integrated plant design. So it was designed to be fully pre-engineered and fully pre-licensed, with a standard plant that includes the nuclear island, turbine island, annex building, radwaste buildings, as much as a we could put into a standard plant design is here.

This greatly limits the site-specific variations. It doesn't eliminate them, but it greatly limits site-specific variations.

Current status of AP1000 with respect to licensing and design. The current issue of the DCD that is referenced in our design certification is revision 15, which was issued in November of 2005. You will see FDA from NRC in 2004 and design certification in 2005. The Rev 15 of the DCD includes a variety of open items, things which were left until later for a variety of reasons, some of them because they are site specific, some because they relate to policies and procedures, some simply because we didn't have enough information at the time of the design.

So we had open items in Rev 15. We

attempted to close those open items on a standard plant basis by the submittal of technical reports. This was worked out with the staff that Westinghouse, or one of our applicants could submit a technical report to attempt to close and open item on a generic basis. And then a combined license applicant could reference that report and have it be already reviewed by NRC and have it be not the same status as the design controlled comment ,but a higher status than new information.

So we have submitted a number of technical reports, and these may be referenced by our combined license applicants in the SARs that they will submit. Much more recently, last month, we submitted revision 16 to the DCD, and we are requesting a design certification amendment as part of that. This rolls in all our technical reports, design changes which have accumulated since Rev 15 was issued, and design changes. We're requesting an amendment, so it's a different status right now Rev 15.

Little bit of technical background on AP1000. This is what it looks like. This is our primary hoop design, steam generators and reactor vessel. The steam generators are large steam generators -- 125,000 square foot heat transfer area.

They are similar to what is used, for example, in the AN-01 replacement steam generator. We have an integrated head package, of course. We have no bottom-mounted instrumentation. The entire plant is designed for 60-year plant life. Our reactor coolant pumps are proposed to be a cam motor design, a large pump, but cam motor with no shaft seals. This substantially reduces the support systems required. And our main loops, as you see, the cam motor pumps are mounted in the steam generator channel head, so we have a substantially simplified main loop, reduced number of welds, reduced number of supports.

I'm not going to talk about safety systems, but this is just to give an example of the way -- the AP1000 approach to safety systems and the consequences of that. This is our cartoon of a standard PWR with high pressure and low pressure safety injection systems, a containment spray system, at least two safety-related diesel generators. The AP1000 combines this all into a series of passive systems which are not dependent on safety-related component cooling water, not dependent on safety-related diesel generators. The refueling water storage tank is moved inside containment instead of being an outside tank. So it's a substantially different approach to safety and it leads to a very significant reduction in the number of components of the plant.

Some other simplification features which we think are important from a waste processing viewpoint particularly. We have mechanical shim core design which forms all load follow and xenon transient operations using rods, break control rod. So we don't make boron changes for load follow. We use boron for moderation, but we start at a high boron concentration and remove the moot boron out as we deplete. We've also made it a real design criteria, design pursuit to have minimal primary leakage, so the cam reactor, motor reactor coolant pumps, the minimization of the valve count, the minimization of component count, use of packless valves, use of enhanced packing valves, so we really made a pursuit of the plant from day one tight primary systems.

Lamp page for plant arrangement. What I was going to show you here, I'll describe instead. I'll have to use sock puppets, I guess, is that we have -- the AP1000 plant design is -- there's a common basemat for the safety-related buildings which are the containment and the auxiliary building. We have observed a rigid separation of clean and dirty in those two buildings, clean and radioactive of the control room electrical, etcetera, on the clean side; rad waste on the radioactive side. So there's a common basemat for the containment and auxiliary building and then we follow the clean-dirty separation out into the annex building which has, for example, the hot machine shop and the rad waste building which it is adjacent to.

Okay, that's background. Specifically, about 1406, the history. As I mentioned, the AP1000 grew very intentionally out of the AP600, including in regulatory space and AP600 was licensed, was certified prior to 1997. We base the AP1000 design certification application on AP600, and we did not pick up 1406. It is part of the AP1000 certification DCV through rev 15.

So there is no discussion of 1406 in the AP1000 DCD.

However, we think that we have complied to a significant extent, a substantial extent with 1406 because we think that many modern design practices are the same as what one we use for 1406. And these include our efforts to be compliant with the utility requirements document. Many of the features in the utility requirements document are lessons learned from the utilities. They come from a variety of bases, but site contamination was certainly one of them. Maintainability and inspectability were others.

A lack of need to maintain things.

Also, we have an emphasis on ALARA and occupational radiation exposure. It's been designed in from the front. Simplification, as I say, and the basic theory of simplification extends to if you don't install a component, the component is not going to fail. It doesn't need to be maintained. It doesn't have to be inspected. It's not there to cause problems, including any kind of contamination or including being removed as part of decommissioning.

We also have had utility sponsors throughout the process of AP600 and AP1000. They've been formalized at different times. Right now, the New Start organization and in parallel with that, the AP1000 buyers group are giving us very specific feedback, but throughout the 20 years we've been working on the passive plants, we've had very specific utility feedback. So as they face different contamination issues, anticipated decommissioning, their input has been incorporated.

The compliance approach for 1406, part 52 licensing, we have design certification on a standard plant basis. We will have a series of utility applicants for combined operating licenses. However, from a viewpoint of design, as well as regulation, construction and operation, it's critical that we maintain standardization through these. If we have a proliferation of 20 different slightly changed AP1000 designs coming in for combined license application, none of us has a resource to handle this. So it's very important to Westinghouse, and we think the entire AP1000 part of the industry, at least, that we maintain a single standard design for AP1000.

There are site-specific decisions, but to the extent possible, we want to maximize the demonstration of 1406 compliance at the level of the DCD, of the design certification plant. We think that many features can be demonstrated in the DCD in a Tier 2 design description and some are site specific which will require commitment via open items and be addressed ultimately in the COL SAR. And some are policy and procedure specific which are also committed in open items.

CHAIRMAN RYAN: Would you give us some examples of site-specific design issues?

MR. MENEELY: I will get to some --

CHAIRMAN RYAN: If you're going to get to it, that's fine.

MR. MENEELY: A quick example is, for example, the design of the liquid rad waste effluent discharge design. Exactly how far that's going, where your licensed release point is can make that different for different sites. So we'll make commitments there, rather than -- geology would be different for different sites.

CHAIRMAN RYAN: More complicated examples might be the basemat or the sill underworks?

MR. MENEELY: The excavation, yes. And especially since these plants are going in almost all of them to sites which have previous excavation done. There are new units on existing sites, so there are some specific issues there.

In order to maintain our standard plant design, we wanted to try to implement this in a timely fashion. As you know, the COL, the combined license applications could begin in fall of this year. The China schedule is even more aggressive. We have four units that are to begin construction in China soon and we want to maintain standardization on those units as well, internationally.

So we were asking for NRC review as early as possible and that resulted in us preparing our technical report on 1406. At the beginning of 2007, we were working with NEI, working with EPRI trying to collect as maximum industry input as we could. Ultimately we submitted this report after several internal and external reviews in April of 2007.

And this includes a discussion of our 1406 compliance and a markup of rev 15 of the DCD. And then we have rev 16 of the DCD that went in last month as a request for an amendment to our certification and it rolls this technical report into the design.

When we did our review with respect to 1406, we had a variety of resources, DG1145, as it was known at the time; industry forums, both NEI and EPRI had workshops and groundwater initiatives in which we participated. There have been a variety of review teams organized by both EPRI and the AP1000 Buyers' Group and we attempted to use those forums as anticipating 1406, what we could expect to review. We also use the lessons learned, in particular. I'm not going to try to read that number, but the lessons learned for decommissioning letter report was a key resource in our review, but ultimately, it was Westinghouse that had to take the lead for compiling the AP1000 position.

I have several slides here that I'm just going to go through examples. If you've had an opportunity to look at our Technical Report 98, it has quite a shopping list in it of different areas that we are revising the DCD or that we don't see a reason to revise the DCD, but I want to go through just some examples pulled out of the report and talked through some of the areas of what we learned as we went through our review.

For example, source term minimization. I think we'd all agree that it's key in complying with a minimization of contamination of a site, that minimizing the source terms is a number one priority. We have included this in the design based on good design practice, also based on ALARA. There's also a great extent of utility requirements document, talk about source term minimization, fuel performance, chemistry performance, etcetera.

When we reviewed our DCD against the concept of source term minimization, we found no places we thought we needed to change the design, but we did find places that we needed to make new commitments in the DCD. So we have now described some chemical control aspects as being important to ALARA and minimization of contamination.

Our utilities would agree they were

important to performance. They're important to meeting ORE guidelines, to participating in NPO top quartile, etcetera of releases, but we've now formalized some of the DCD as being key to part of 1406 compliance.

Overall simplification, we think that simplification is one of the most important ways to comply with 1406. And it's a fundamental concept to AP1000 so we ultimately, although we reviewed against it, we included no changes to the design for the DCD because of 1406.

Using monolith basemats of the auxiliary building in the containment, and this is -- I think this slide is still in there, yes. This is just an example and if I talk too much about this I'm going to get myself in real trouble because I'm neither a civil engineer nor a geologist, but just an example of what our auxiliary building construction is like, that it has two layers of mudmat with an impermeable membrane between them, plus a six-foot basemat underneath the entire auxiliary building of containment, six-foot minimum basemat.

The auxiliary building walls are then designed to be monolithic, single structure. It's not a single pour, but they're designed to be a single structure with the basemat. So we aren't dealing with expansion joints. We aren't dealing with sealed joints. It is designed for the key parts of our building for radioactivity containment are designed with this sort of approach.

So back to here, we pursued this based on what we thought was good design practice and again the utility requirements document, we found that we had no changes to make to 1406, but we think we demonstrate compliance with the intent of 1406 with these regs.

CHAIRMAN RYAN: While you're on that last point, one of the elements of that picture if maybe we could see, certainly the design elements are there with an impermeable barrier and substantial concrete and no seams and so on. This may be reaching past what you're ready to talk about today, but are you thinking about how am I going to demonstrate performance of that system over time?

MR. MENEELY: We haven't made any commitments of demonstrating the performance of the system over time beyond a commitment that the operator will have a procedure in place to mitigate leakage. So if he finds a leak, he's got to establish the procedure to mitigate it.

CHAIRMAN RYAN: How is he going to know he has one if he's not looking?

MR. MENEELY: He has to inspect to mitigate.

CHAIRMAN RYAN: Some of the interesting parts of leakage, and I don't know if this is an outside wall or not --

MR. MENEELY: Yes, this is an outside wall.

CHAIRMAN RYAN: Do some environmental monitoring or at least try and get ahead of it. This Committee has thought a lot about trying to do monitoring and modeling with the idea of getting ahead of issues development kind of thing.

MR. MENEELY: We have put more emphasis to date on the standard plant level in trying to prevent the leakage through the wall, so the emphasis you're going to see is on not allowing liquids to puddle inside here, providing multiple barriers so that we don't have liquids continuously sitting against this wall.

CHAIRMAN RYAN: So that's really your confidence builder is there's no water sitting in that space that could leak out?

MR. MENEELY: That's correct.

CHAIRMAN RYAN: So that is kind of a

proactive control program.

I mean you're controlling it by eliminating the water, not by waiting for it to leak through to a monitoring well?

MR. MENEELY: Right, exactly.

CHAIRMAN RYAN: So that's a good example of what we've been thinking an awful lot about and the idea is at least we're rattling around in our heads is if folks under 1406, whether it's reactors or not, are proactive and do that, maybe there's a benefit of reduced decommissioning costs or funds or those kind of things.

MR. MENEELY: It's going to be really painful, some of the slides I can't show you today.

(Laughter.)

For example, our spent fuel pool is entirely inside the auxiliary building. It has no outside walls and the floor -- it's a suspended pool. It has two floors below it. So if you have a spent fuel pool leak, it would in the auxiliary building and you'd see stalactites or something. So it's not a pressurized wall on the outside of the plant.

We have and I'll get to this in a minute, but there is a portion of the fuel transfer canal that is an outside wall and we couldn't find a way to eliminate that. So we've got a combination of approaches, one is that we've made it, instead of steel liner, we made it half inch steel with full penetration welds done in a factory. It's a module. And the other is we're committing to ground water well monitoring well considerations on that side of the building.

CHAIRMAN RYAN: That's a confirmation of design kind of approach and that seems appropriate for that location.

MR. MENEELY: Right.

CHAIRMAN RYAN: Okay, great. I think that's interesting you using both engineering and prevention and observation, all three, in an appropriate way based on the specifics.

MR. MENEELY: We're trying to use an accumulation approach.

CHAIRMAN RYAN: Thanks and sorry for the interruption.

MR. MENEELY: That's fine. Except for the fact that it will take me a long time to get through, I enjoy taking the questions as they come up.

CHAIRMAN RYAN: Thank you.

MR. MENEELY: Okay, another item that gives a little different spin is prevention of leakage through doorways. Now we have included a substantial amount of areas where we've designed the buildings to have floor drains, to not have very many external doorways in a radiological area. A number of practices which will prevent leakage through doorways, but we have not committed to it until we started reading lessons learned of this being an area of contamination.

So we came back and we put new design criteria into our design to have berming, to have floors sloped away from doorways, to have adequate floor drains to prevent water from going out. That probably would have been put into the design as part of good design practice, but we haven't committed to it yet, and we now have, both in our internal design layout guidelines and in the description in the DCD and rev 16. We've proposed that we commit to some specific design features.

Similarly, restrictions on the application of concrete block walls, a lesson learned of contamination into the tops, the open tops of walls. The utility requirements document had some restrictions on these. We still were looking at concrete block walls as removable shield walls. We have now included more of our internal design criteria to either eliminate or specially design concrete block walls and we have put in a description in the DCD to commit to this to the NRC. So there are some areas where we found some things, mostly at the level of detail beyond what we had really worked on much for AP1000 yet, but where we thought we needed to make some commitments that would directly relate to 1406.

This is a bit what I was just talking about is the AP1000 is designed, as I mentioned, for modular construction and modular construction in terms of buildings, particularly the ops building, means we will make very, very large steel modules which are welded out of half inch plate and entire end of the auxiliary building including the spent fuel pool and many of the rooms will be lifted into place as a left-in-place concrete form.

So places where we either previously have had unlined walls or we would have had a relatively thin stainless steel liner, we now will have half-inch mostly stainless steel plate on the walls. And I have a couple of really good slides that I'm not going to show you because it demonstrates how this works.

Continuing my dry tables, since I'm not showing my graphics --

CHAIRMAN RYAN: You're doing a very good

job of explaining them, so you're okay.

MR. MENEELY: I am not resorting to sock puppets. Design for large component removal, we have the utilities have had enough experience by the time we started AP600 to insist that we provide them detailed demonstrations on how you'll take a steam generator out of this plant, how you'll remove a reactor vessel head from this plant.

We also had the computer tools that our predecessors did not have. So we have by nature of the design done a good job of designing for large component removal and we didn't find that we needed to make any changes.

Minimization of embedded pipes, we have done a pretty good job, but we came back and re-reviewed every embedded pipe that was considered in the plant. I talked just now about the spent fuel pool designing to eliminate leakage to the groundwater and that's a combination of it being entirely inside the auxiliary building and the walls being out of half-inch steel plate.

Upon looking in more detail at this, we committed to leak chases on the welds which we have had a long internal debate about whether leak chases were really a beneficial design. The lessons learned document was enough that we have now committed the leak chases on the welds and to specific areas where our COL applicants will have to review for monitoring welds.

I'm running through my time here, so I'm conscious of that, but another key area and this came directly out of our utility operations, this is somewhat a different philosophy is the AP1000 has installed liquid and gaseous radwaste systems which are adequate to demonstrate compliance with 10 CFR 20, 10 CFR 50, but we also have a large radwaste building installed in the plant which is the bulk of the building is truck bays which allow the applicant or the operator, rather, to configure after market, after design, radwaste systems, skid-mounted systems, so a MWPS or anything like that.

These systems can be installed for a short period of time for use during a refueling outage. They can be installed for a long period of time because the system it's installed is no longer state-of-the-art. Experience has shown that radwaste systems get out of date and if you install only one approach that means that in a generation the operator will be using a less than optimum system. So we designed flexibility in the AP1000 to allow the operator to bring in an after-market system and use it as a supplemental system to what's already installed.

So the primary importance of this is reducing discharges is getting good off-site performance, but the fact that it's engineered in up front means that they don't have to cut out and -- I can't think of the right word, but cut out and do in-field modifications to allow these systems to be used. They're designed up front to allow the use of these systems.

So we did not make any changes to the design of the DCD 1406, but we think realistically for the life of the plant this would be a very significant factor in reducing contamination and off-site releases.

I talked some about this just a few minutes ago as an example of a site-specific issue of liquid radwaste discharge piping design outside of buildings that recent operating experience has obviously brought this to our attention, but the lessons learned document did it also, so we have now made some descriptions and some commitments both in the DCD and outside. This pipe either has to be fully inspectable or it has to be guard-piped with leak testing, leak detection capability. We put in some specific issues on that.

Similarly, we put in a requirement that all radioactive tanks with the extension of the condensate storage tank will be inside buildings, will have alarms, over-flow connections, pipe drains, etcetera and that they're designed for the life of the plant. This was the way our design was before trying to implement 1406, but obviously not having any tanks outside is a great boon in meeting 1406.

That's where I'd be showing our tanks inside the building.

Now these are the three commitments extending beyond the DCD, so these are beyond the standard plant bases that we are making in our -- in rev 16 in DCD. And I think I've probably mentioned all three of these now in our discussion, but one is for the applicant to characterize site subsurface hydrology. That was actually already in the design as a commitment based on prior staff feedback. A second is to establish groundwater monitoring program. Now there's a nuance here of we started off just putting in a requirement for the applicant to establish groundwater programs, but we decided that one of the advantages we have as plant designers, the ability to identify where they need it.

So we identified the key areas of the plan where the applicant will need to pursue groundwater monitoring programs. And we were able to therefore reduce somewhat the scope of this requirement by telling, pointing out sites, for example, the fuel transfer canal which is on that outside wall.

And then finally, to establish a program as we say here, to document events of interest for decommissioning and to remediate leaks with the potential to cause groundwater contamination.

CHAIRMAN RYAN: If you don't mind questions as we go, so I might ask a couple. I understand the second one. That's monitoring at a source for a potential leak, so that's fairly straightforward, but boy oh boy, characterize a site subsurface hydrology. That's a broad statement.

MR. MENEELY: That's a broad statement.

CHAIRMAN RYAN: Now two questions come to my mind. Before you build it or after you build it is going to be real different.

MR. MENEELY: Well, we're into the edges of what I can adequately explain, but my understanding is that we want a -- or the staff will want a characterization of the plant as it will operate.

CHAIRMAN RYAN: Okay. That's a

substantial influence on the -- at least the near-field surface hydrology. And near subsurface hydrology.

MR. MENEELY: And in real life it's perhaps worse than that because all of these plants are going on additional units or almost all of them on sites which have already had disturbed earth.

CHAIRMAN RYAN: Right.

MR. MENEELY: There's already been an excavation done, so --

MEMBER HINZE: Could I follow up with a question on that?

CHAIRMAN RYAN: Let me just plug in one more because I've been learning hydrology from you for years now and I want to show off.

(Laughter.)

I'll run out of things to say.

MEMBER HINZE: I'm waiting.

(Laughter.)

CHAIRMAN RYAN: It's interesting to think about multiple units because it really is a complete system on that site. And I guess I think about a notion of you can put in wells, frankly, and go nuts putting in lots of wells, but if you wait a while for the first few years of the plant and as you gather rainfall data and infiltration data and water level data for the whole site, you can develop a more coherent model as time goes on.

And if you have kind of a combination of the monitoring where the leaks can actually happen with high confidence, and then we're doing some kind of a program that's longer term in nature, we probably can come up with some reasonable plan for how do you build confidence in the understanding of the hydrology over time without putting in a zillion wells.

How did I do?

MEMBER HINZE: Great.

CHAIRMAN RYAN: Next question from Professor Hinze.

MEMBER HINZE: I was just going to ask the question do you ever mitigate the existing site subsurface hydrology, changes of the -- is that ever considered?

MR. MENEELY: I'm going to have to beg off and say this is specifically in as a combined license applicant because it is so site specific and we're beyond -- I'm sorry -- just beyond where I'm confident to answer.

CHAIRMAN RYAN: It is very much site specific, that's a fair answer.

MEMBER HINZE: But the question is whether this can be a possibility that one might do some modification of the subsurface, put in dewatering wells whatever, there are a number of possibilities.

I would assume that the NEI/EPRI workshop on groundwater covered much of this.

MR. MENEELY: Yes.

MEMBER HINZE: And those reports on those workshops are available?

MR. MENEELY: I believe they're publicly available. NEI is nodding, yes.

CHAIRMAN RYAN: Sorry, Jim. Thanks for the interruption.

MEMBER CLARKE: Let's continue too. Time management is always a challenge.

MR. MENEELY: I'm almost done. In fact, I'm sure I am. Just my summary slide.

I shall repeat what I've said that because of our AP600 roots, the AP1000 missed 1406 in our application, but we drew on a number of things which we think gave us a pretty good pedigree with respect to our standard plant design with respect to 1406 and therefore we think that at least on a practical basis, as we view it from the standard plant that we have a high degree of conformance against what we think should be done with 1406.

And we're fairly happy after reviewing its lessons learned and just let me state that the need to maintain standardization, there is not an hour that goes past in our office that somebody doesn't get complaints about that you're diverging from the standard. And I think that timeliness and standardization are really giving Westinghouse some concern over this issue, that if we regulate it on a license -- on a combined license applicant basis fully, it's going to lead to divergence of design and that's something that none of us can really afford.

We're hoping for early feedback, rather than late. And that's all.

MEMBER CLARKE: Tim, thank you very much. The agenda doesn't provide a whole lot of detail on what we're doing this afternoon, although at some point we'll take 15-minute break, so here's what I'd like to suggest. Let's take a round of questions, starting with our expert panel and go from there.

So I think what I'd like to do is at this point and by the way, we're scheduled for an hour roundtable at the end of all the presentations, however, we're asking people to hold their questions until we've gone through four talks I think is a little unreasonable.

So let me suggest a compromise that we go around the room once and see where we end up. So ask your best shot, ask your best question. If you can, save the rest of them for the roundtable.

Eric, would you like to begin?

MR. ABELQUIST: I have a very general question. I'm not sure it might be better saved until the end.

MEMBER CLARKE: Your decision.

MR. ABELQUIST: Well, let me lob it out here. The summary statement, the third bullet, we believe AP1000 provides a very high degree of conformance. All of these items that were presented are very good plant features that will address the objective of minimizing contamination and providing early detection, etcetera.

It just strikes what is good enough? Where is the mark here? How do you know when you have picked enough of these items to address and which ones do you leave on the table that haven't been addressed and say this is as fast as we are going to go? So it's a very broad question, but it is the one that I am struck with at this point.

MR. MENEELY: And I think as a backdrop to that, particularly when one is working with a simplified plant in the first place and a plant where we knew a lot of lessons learned in the background, so that there are a lot of things are happening sort of for free as far as 1406 is concerned. It's just the way that you do it now is better. I have a DCD that describes how far I think you should go.

MEMBER CLARKE: Thanks, Eric.

Eric Darois?

MR. DAROIS: Yes, I had three but I will limit it to one until now.

MEMBER CLARKE: Thank you.

MR. DAROIS: It's really more of a comment than anything. You are focusing on installation of I guess I would qualify it as traditional groundwater monitoring wells as part of the design. I guess my only comment is bear in mind that there is some research going on involved with some of it with EPRI trying to look at more innovative ways of detecting a leak to the subsurface environment, one being soil-gas extraction systems and detection for tritium and what not, but I won't go into the details.

All I would suggest is make room for that in lieu of traditional wells. We don't know how the research is going to come out in early phases of it, but it may be there is a better way to do this. So I don't know where you are at in terms of hard-coding in a traditional groundwater monitoring well.

MR. MENEELY: I think that although orally I talked about groundwater monitoring wells, I think what we have committed on behalf of our COLs is for a groundwater monitoring program. So I think it leaves some flexibility for -- maybe they aren't wells -- some different technology.

MR. DAROIS: Thank you.

MEMBER CLARKE: I just want to make a quick comment and then I will turn it to Ruth, but I think the observations Dr. Ryan made about your focus on putting facilities where you can keep an eye on them and not letting releases make it outside the building or whatever containment they're in is an awfully good approach. If you can't do that for everything, then you are -- you need some of these other things that Mike and Bill were talking about. When you characterize and how you characterize are awfully important, but the gaol is that if you do have the release of significance, and you can't see it, you don't see it happen, then you have got to be able to detect it. The sooner you detect it, the better off you are. The sooner you deal with it, the better off you are. This is kind of where we as a Committee are coming to. I just wanted to share that observation.

Ruth?

MEMBER WEINER: My question -- you may want to wait until the rest of the workshop and others may want to add to that. What if you do have an extrusion? In other words, I'm quite impressed with what you say about the fuel pool and how it is being constructed to minimize the risk thereof, because you can't eliminate it entirely. What is your plan in the event that your system doesn't entirely work?

MR. MENEELY: From an overall basis, you mean?

MEMBER WEINER: Yes.

MR. MENEELY: Not particularly the fuel pool?

MEMBER WEINER: No, not particularly in the fuel pool. I'm just using that as an example.

MR. MENEELY: I think that to keep the dichotomy of the vendor versus the operator here, and to the extent that we have gone in the DCD now is this third point of they have to have a program, they will document and provide for remediating events for the potential of groundwater. That is going to be an important program. We have had some discussions about what that program will look like. That's not only Westinghouse that will rate that, that's our applicants who will rate that.

So because we know that there will be a drip at least outside that's tritiated water, and you can't design that all out. So I'm going to put the onus on that program and say that it is not written yet, so we don't know.

MEMBER WEINER: Well, you just made a very important statement. You can't design everything out and I think that's one of the points I expect we will come back to is what when you get something that you didn't expect.

MEMBER CLARKE: That piece there will be offered site-specific, I think, which is another.

MR. MENEELY: Right, and that's -- I want to make two follow-up comments on that that these, as I said, these are commitments extending beyond the DCD. They are outside the standard design, but the other fact is that there are only three of them. So we have tried to push as much into the standard design as we can and to limit what we do outside.

CHAIRMAN RYAN: Just a second on the comment that I think the last statement that you made, Jim, is very much on target. To me the potential for a leak isn't so much, because there are permitted releases in air and water from nuclear powerplants. It's where does it go? Is it, you know, on into the river and then on into some long care model pollution or is it to a school next door or something else? There's a big site-specific aspect to how releases are managed and viewed. Maybe that's just where we ought to leave it for the moment, but you might do something at one place that's more remote or rural, but if you've got adjacent property owners or other issues, you might take a different view of that same question. Just from a risk management standpoint, not in a rem or millirem, because those are usually pretty small attributionally. But just as an overall plan.

MR. MENEELY: The first company that comes out with a resin that's tritium-specific is going to sell a lot of them.

(Laughter.)

MEMBER CLARKE: Allen, do you --

VICE CHAIRMAN CROFF: I will try one. This may be too site-specific, but does the design say anything about disposal of solid waste onsite?

MR. MENEELY: The AP1000 does not have a long-term waste storage facility as part of it. We have an accumulation area, but we do not, except for fuel and the fuel pool complex of rods, we don't store solid waste on site. We do say -- we talk about minimization of waste. Shall we use, for example, demineralizers, ion-exchanged based systems instead of evaporator based systems? Our gray rod approach to load follow, those are designed to minimize solid waste, but we don't talk about accumulating or storing solid waste on site, because we don't do it. Does that answer your question?

VICE CHAIRMAN CROFF: I think you used the word storing and I was asking more about disposal. Does the design -- do design requirements extend that far or is that a site-specific decision?

MR. MENEELY: That is site specific. You're talking about low-level waste, right?

VICE CHAIRMAN CROFF: Yes.

MR. MENEELY: So it is site-specific because of different compacts. You know, for China, we are pursuing a very specific solution of they want not life of plant, but they want long-term waste storage on the site and so they are pursuing a separate facility, which will be shared by multiple units to store waste on a site, but it is not part of the base AP1000 design.

VICE CHAIRMAN CROFF: Okay. Bill, do you

have a quick one?

MEMBER HINZE: Yes. Quick one, if I might. One of the potential sources of leakage is the frequency, the amplitude, the duration of vibratory motion. Is there anything in this AP1000 that is making the system more robust to vibratory motion?

MR. MENEELY: You are talking about the primary system? The reactor coolants?

MEMBER HINZE: Yes. Right.

MR. MENEELY: Well, I never thought of it in those terms. We have, for example, designed for a leak before break. So we have done extensive fatigue analyses and analyses of supports for the primary loops. I think the answer to your question is we haven't specifically looked at it, but intrinsically the simplified primary loop arrangement and the reduced number of small piping connections, I think are both in the right direction. The fact that we have analyzed for LBB, they show that our fatigue loadings are very low through our support system. I think those are in the right motion.

The cam motor, reactor coolant pumps, I don't think -- the cam motor coolant pumps have an enormous flywheel in them, which is going to tend to dampen things. I'm thrashing around here. I don't have any specific answers.

MEMBER HINZE: Thanks

MEMBER CLARKE: Tim, thank you very much.

Our next speaker is Eric Kirstein, from GE Nuclear. He is from the ESBWR Group and he will present a brief introduction to the ESBWR design and how the requirements of 20.1406 have been addressed in their documentation so far.

Eric, welcome, and thank you.

MR. KIRSTEIN: I think I will get us back on track schedule-wise. I don't think my presentation will be as long.

Quick Summary. The DCD, the ESBWR DCD, was docketed in December of 2005 for revision 0. We're currently, we've issued revision three in February of this year, and we're looking to issue revision four by the end of the summer which will incorporate COL items and various REI responses we've addressed since revision three.

What I'm just going to do here is provide a brief history of the evolution of our compliance of 10 CFR 20.1406 as it pertains to the DCD. We created DCD section 12.6 to specifically address 10 CFR 20.1406. This was added in revision one as a result of some comments by the staff. It essentially consolidates much of the info which is -- we had examples of compliance at 20.1406 in Chapter 12 in the DCD and other various sections and we went ahead and consolidated those items in this newly created section 12.6 of the DCD.

If you've had a chance to look at 12.6, I apologize. A lot of this is essentially pulled straight out of the latest revision of 12.6. 12.6.1 discusses the examples that minimize contamination and so that decommissioning for design features and operational aspects.

To briefly -- to kind of go down these bullets. The first few deal with crud build-up, crud traps, designing the equipment to minimize the build-up of material and facilitate the flushing of these crud traps.

Obviously, our reactor rod cleanup shut-down cooling system and the demineralizers that minimize crud build-up, just a general design feature of the plant. Provisions for -- implementing provisions for draining and flushing and decontaminating piping, mainly piping and equipment. Any penetrations through exterior walls of a building that happen to have radiation sources shall be sealed. General basic practices to prevent miscellaneous leaks to the environment.

The sump vents are going to be piped directly to the rad waste HVAC system to kind of -- to remove the airborne contaminants that occur from the sump discharges. We plan on designing slope floor drains in areas where a potential for a spill exists to limit the extent of the contamination. An important feature we plan on implementing is a provision for epoxy-type wall and floor coverings, which will provide smooth services to use the decontamination process.

The floor and drainage sumps are going to be stainless steel lined. Crud build-up will be reduced as a result. And once again, decontamination. Basic principle of reactor design, areas that have airborne radioactivity. Air flow goes from low potential contamination to high potential contamination, basic feature. Similarly, the reactor building HVAC system contaminated in clean areas, clean area system circulates the air through the clean areas and obviously the contaminated area system circulates the air through the contaminated areas of the building.

Our Fuel and Auxiliary Pool Cooling System has filtered demin. units which will reduce the radioactive contamination in the pools of ESBWR. ESBWR plans to limit the use of the cobalt-bearing materials, which have historically been an -- on moving components, I apologize, that are identified as a major source of bin water contamination.

If I can state too this first cut that I am going through right now was our initial take on our compliance of 20.1406. I'll get in some future slides here sort of the evolution of where we have gone since then. But this was kind of our first cut. We created DCB section 12.6.2 to show that -- to provide examples for design procedures for operation to minimize the generation of liquid rad waste. These bullets are pretty basic. They essentially just discuss the various aspects of the waste management systems.

Liquid Waste Management Systems are divided up into several subsystems, so that the sources are segregated and processed separately, which provides the most efficient process for the specific types of impurities and the chemical contents. The Liquid Waste Management System removes the radioactive contaminants and the bulk of the liquid is purified and returned to either the condensate storage tank or it is discharged to the environment, which minimizes the overall liquid rad waste.

Solid waste management system segregates the wet and dry waste for off-site shipment and burial. And then lastly, for ESBWR being at a BWR, our off-gas is radioactive and our off-gas system with a series of charcoal beds delays the fission products through decay, through hold-up and decay of the various noble gases.

We also stated some examples that minimize the generation of rad waste during decommissioning, and if you'll notice, I think these three bullets have been stated previously. We just sort of restated them to bring them forth. Reduction of cobalt content, minimization of the crud buildup in the drains by use of stainless steel linings, which obviously improve the drainage and help facilitate the flushing. Once again, surface decontamination eased by the epoxy-type wall and floor coverings.

So that was our initial cut at compliance of 10 CFR 26.406. We received an RAI 12.7-1. I'm not sure what the ADAMS number is for that, but in bold you can see -- I won't read through -- it's essentially a request to provide techniques that are stated in NUREG/CR-3587, and to what extent these features were incorporated into the ESBR design.

The basis for the RAI response that we

provided back in -- just last month, May of '07 -- is I believe the same -- yes, it's the same ADAMS numbers my counterpart was discussing, the lessons learned document.

So have not been incorporated into the -- these will be incorporated in revision 4, the DCD. These are markups to the DCD. We will incorporate these in revision 4 that were provided to the staff.

The additions are shown in red font. When we discussed the slope drains, the one item and I apologize. I don't have a graphic to show exactly which of the items in the lessons learned document are addressed as a result of these, but I think you'll see a lot repeat items from the previous presentation.

The floor drains for ESBWR will be a monolithic construction as concerned for contamination to penetrate grout around the drains. The drains for ESBWR will not have grout used in the installation of these drains. And then on top of that, size design features visual -- periodic visual inspections will occur during installation of the floor drains to ensure that no potential pathway exists for leakage around these drains.

Another item to facilitate decommissioning, the various buildings are designed for large equipment removal which consists of large entry doors and various equipment hatches for removal, for movement of large equipment throughout the buildings and out for decommissioning.

Similarly, as discussed for AP1000, ESBWR will have a mobile liquid radwaste system which are skid-mounted and they're located in the liquid waste treatment system bay in the radwaste building to allow easy truck access and skid loading and unloading for operation, obviously, and also for the decommissioning process.

And also, embedded piping in concrete, radwaste piping, minimization of the short sections of the piping to the extent practical will facilitate the dismantlement of these systems and decommissioning.

We've not gotten to the detailed design phase yet where we know the actual runs, but this criteria has been set up to minimize the amount of piping embedded in concrete.

Leak detection. Spent fuel pool will have a liner. This is a note I was going to make at the end, but our spent fuel pool will have a liner and a leak detection system to monitor any leakage during plant operation. And then similarly, there's a concern of the underground tunnels to and from the radwaste building which contained radwaste piping to mitigate seepage of radionuclides into the concrete through these tunnels. The concrete in the radwaste tunnels will be sealed. One is to halt the seepage of radionuclides and also for ease of decontamination.

The tunnels also have floor drains to remove any potential fluid that might leak from the piping, and plant procedure is not from a design standpoint, but plant procedures will require visual inspection of the radwaste piping of these tunnels.

And the criterion of concrete block wall construction, ESBWR will not have concrete block wall construction. Essentially, what will be used in place will be these metal, metallic blocks which are filled with concrete to -- there's no porous concrete that needs to be decontaminated and the outer surface of these walls is steel which is easier, much easier for decommissioning.

This essentially was -- an RAI was issued prior to our issuance of our response to the RAI 12.7-1. You can go ahead and read through it, but I believe the only item here that we addressed on top of that -- on top of what we had addressed in 12.7-1 was the discussion of, as you can see in our response, the underlying text which I had mentioned previously was the single liner of the spent fuel pool and its associated leak detection system.

That's it. It was a lot quicker than I thought it was.

So that's currently, I mean where we stand. We look forward to gaining some lessons learned and some insight through this workshop to be able to take back with us and we'll enter our IDC as we're still analyzing some processing and subsequent revisions to come.

So I told you it was going to be short and it was.

MEMBER CLARKE: Thank you, Eric.

MR. KIRSTEIN: I'll take any questions or comments.

MEMBER CLARKE: Let's start with Eric Darois and we'll follow the same plan. We'll take one round of one question each and see where we go.

MR. DAROIS: In regards to the epoxy coating on floors, some of the newer plants that are in operation today, granted they're 20 years old now, but they did the same thing and 20 years later they're dealing with epoxy surfaces that have worn and I mean they clearly require maintenance.

So the first comment is that maintenance program probably ought to be part of procedures of programs somehow, specifically for those coatings, but I guess the one that I'm curious about more is the radwaste tunnels, given that those are epoxy coated and those are areas that are likely to be radiologically challenging to maintain, to do visual inspections and certainly to recoat if they become worn and what not.

How is that being addressed or is it, how is that detail being addressed here?

MR. KIRSTEIN: Well, epoxy coating, we're not completely married to the idea at present. I'm not an expert by any means, but I've been told by some of our engineers that there's also some sort of additive that can be mixed with the concrete to provide the same similar properties.

So we're not necessarily tied to epoxy at the present, but I believe to address your concern I think that would definitely at present would have to be an operational inspection.

We are considering other -- we're not tied to epoxy at the present. We're kind of looking at other alternatives.

MEMBER CLARKE: Eric Abelquist?

MR. ABELQUIST: I was wondering if you

could share a few additional details about the leak detection system on the spent fuel pool?

How does that work?

MR. KIRSTEIN: I just can't tell you. That's not my area.

I believe it's -- had I brought a copy of the DCD with me, but I believe it's described in another section of the DCD. I don't have anything that I can tell you at the present. I apologize for that.

MEMBER CLARKE: Thanks, Eric. Dr. Hinze?

MEMBER HINZE: Are there any radioactive components that get into the epoxy and thus in the decommissioning -- that the epoxy has to be removed?

MR. KIRSTEIN: In what terms?

MEMBER HINZE: Well, like you would sandblast a concrete wall to remove any of the radioactive materials that have gone into the concrete or the concrete block? Do you have to do that with epoxy?

MR. KIRSTEIN: I'm not aware of that. I'm not sure.

MEMBER HINZE: Thank you.

MEMBER CLARKE: Allen?

VICE CHAIRMAN CROFF: In one of your first slides, you noted penetrations through the walls of the building containing radiation sources are sealed to prevent leaks.

You mean sealed permanently?

MR. KIRSTEIN: Where was that?

VICE CHAIRMAN CROFF: The previous one. About halfway down.

MR. KIRSTEIN: I don't think we're that far along in the process to determine -- I guess we can determine, but we haven't thought through the details of the characteristics, I guess, of the sealant. If that's what you're asking?

VICE CHAIRMAN CROFF: No, my comment is if you're going to seal penetrations permanently, why have a penetration to start with?

MR. KIRSTEIN: This is just a basic design feature of any piping or penetrations throughout the walls. It's not anything, I believe, that's above and beyond what currently exists.

VICE CHAIRMAN CROFF: They're not cutting the pipe off and closing it, the sealing of the pipe isn't past a certain wall?

MR. KIRSTEIN: This is a basic, we're talking bare bones.

VICE CHAIRMAN CROFF: Caulking around the pipe --

MEMBER CLARKE: Mike?

CHAIRMAN RYAN: My question is probably more general and don't feel like you have to answer because it might be more for the roundtable, but I'll let everyone think about it now. There's a lot of common things that you said and we heard in the previous presentation and it sounds like your efforts on addressing 1406 are continuing to minimize the production of radwaste by putting in systems that avoid it. I think that's commonly involved.

Over the years, there's been a tremendous effort to minimize what's produced in an outage and crud management, water chemistry management and all those things that ultimately have a payback on reduced radwaste.

The second is some basic features of design, layout, component selection, all which again help minimize emanating something that otherwise wouldn't be contaminated or minimized in the production of waste.

So there's really those two areas. Am I missing any major area where things could be done or are being thought about differently?

Maybe the third is the environmental part, it's stuff outside the plant, paying attention more to the environment. It's not, oh, it's within tech specs, I'll let it go. Sometimes you can let it go and it's fine. Sometimes you'll let it go and it's a big clean up mess.

MR. KIRSTEIN: Currently, the approach that we're taking is obviously to minimize or not eliminate, but minimize it getting out in the first place.

CHAIRMAN RYAN: Yes.

MR. KIRSTEIN: We're treating it currently, the way it stands right in the DCD, we're just trading it in DCD space and trying to minimize the waste and minimize -- having features to reduce or eliminate the --

CHAIRMAN RYAN: One specific question on the BWR side. Are you doing anything different on the off-gas treatment system?

MR. KIRSTEIN: No, it's pretty much the same.

CHAIRMAN RYAN: It's held up to decay?

MR. KIRSTEIN: Yes.

CHAIRMAN RYAN: Okay, thanks.

MEMBER CLARKE: Thanks, Mike. Ruth?

MEMBER WEINER: Two really divergent

questions. The first is -- oh, I only get one. Okay, I'll take the most important one.

How would you decommission piping that is embedded in concrete? I mean you have to cut up the whole thing and haul it off? What's your plan for that?

And the reason I ask the question is it seems to me that at the decommissioning workshops that we all went to a couple of years ago, this was mentioned as one of the major barriers to efficient decommissioning of a plant or any large facility that has piping.

When you embed in something, with the intent that it's virtually permanently embedded, what do you do then?

MR. KIRSTEIN: Well, I mean, from our standpoint we're obviously trying to minimize it, how it's actually performed, I would assume it becomes part of your waste and obviously to minimize that your goal is to minimize that to obviously reduce the amount of volume of waste that you have in the first place.

How it's physically done I --

MEMBER WEINER: Do you have criteria for what piping actually has to be embedded and minimize it that way? In other words, how do you go about minimizing it?

MR. KIRSTEIN: At the present, I believe that's going to be coming up in the detailed pipe routing phase. We're not even at the point of detailed pipe routing. But by establishing this criterion and through reviews, we plan on keeping that to a bare minimum.

MEMBER WEINER: Okay.

MEMBER CLARKE: Thank you, Ruth. Eric, thanks very much. Appreciate it.

Let's do one more presentation and then take a break.

Our next speaker is Ralph Andersen from the Nuclear Energy Institute. Dr. Andersen has spearheaded efforts at NEI and EPRI to contribute to decommissioning lessons learned and to address these lessons learned in the designs of new reactors.

He'll address the efforts of NEI and EPRI to contribute to the development of Reg Guide 4012.

Ralph?

MR. ANDERSEN: Well, thank you very much. I appreciate the opportunity to be here on a topic that -- this is the microphone. Very good.

This particular requirement is always very interesting to me because although it was a part of the license termination rulemaking, I think that it really is a case of having laying dormant during the front-end process of formulating the new regulatory framework for licensing new plants.

And so I see us as very much on a learning curve in figuring out what we really want to accomplish with this requirement and how best to implement it both from a regulatory point of view, a designer's point of view and an operator's point of view.

So my presentation really is going to focus more on process and going forward than it is on design details, although I appreciate the presentations made by Westinghouse and General Electric.

I think that we've also -- will see and have seen from NRC immense focus on substance and design detail as well, but I fear that we're not paying enough attention to objectives to process. So that's where I intend to go with this.

As a prologue, we've actually had a number of public meetings with the NRC over time on 20.14-06, actually extending all the way back to 2005, when we began having interactions on radiation protection chapter of the FSAR up through the present. And more recently, some of these meetings have been specifically focused on 20.14-06.

We've had the opportunity previously to address the ACNW and I would call to your attention that, in fact, we have provided a considerable amount of detailed information in the past, both to ACNW and NRC staff.

You might recall that last year, we talked about decommissioning lessons learned, tried to make a fairly extensive presentation on lessons learned, many of which apply to 20.14-06. We had an earlier meeting this year with NRC staff on 20.14-06 in which we included a presentation. And by the way, all of these materials that occurs to me for your convenience, I think I'll email these to Derek after the meeting, even though they're in the PDR, it wouldn't necessarily be easy to find.

We actually submitted a technical report to NRC in which we captured the lessons learned out of our groundwater protection initiative that specifically go to the subject of design and operational programs for new plants. And then in parallel to this with the decommissioning lessons learned project of NRC, we have and will continue to provide a substantial amount of information for not only minimizing contamination in radwaste but also more generally for facilitating decontamination.

Just for illustration, I included some of the examples that have been in this previously provided material. Many of these are things that you heard in the previous two presentations and undoubtedly we'll hear in the presentation by the NRC staff.

In terms of thinking of facilitating decommissioning, these are some examples of things that come out of that. I will comment embedded piping always seems to head the list. I confess that I'm conflicted. My areas of work are health physics and radwaste, so when I look at a pipe that is going to carry radioactive fluids, I'm always looking at it two ways. I'm looking at it immediately as something that I want to see embedded. I don't want anybody getting any exposure from it. I want it shielded. I want it not accessible. And then on the other hand, I look at it as a future radwaste problem at the time of decommissioning.

So I would just mention in that for simplicity that I think the key question is to come up with criteria that strike the right balance. But it is a very challenging topic in a plant design where you don't have an infinite amount of space. I do recall one plant I worked at, just as an example, that went out of its way to avoid embedded piping. And so a lot of piping was put in overhead, so we had large spaces in the floors.

What we ended up with were high radiation areas in the overheads, and we actually because of NRC requirements had to do postings. So when you were walking through the building, you happen to glance up and actually saw these horizontal access ropes with high radiation area postings. It was very disorienting in a way. Obviously, people didn't go up into those areas routinely, but it does create interesting challenges to balance this issue of imbedded piping. I illustrated that example because I honestly think that is true of a number of things that come up when you look at them only narrowly through the subject of 20.1406 and decommissioning.

So let me make a comment at this point. We don't actually design nuclear power plants for the purpose of decommissioning them. They actually serve another function in our society. Just as we don't design nuclear power plants for the purpose of seeing how much radiation dose we can reduce. Those are things that we carry into the operation of those plants. They're really there to make electricity safely, economically, and efficiently.

So one comment that I would make about 20.1406, we need to be careful that we don't put this out of proportion as to the overall set of requirements and commitments and obligations that we are trying to fulfill when we employ nuclear energy for peaceful purposes.

I included in my presentation, I'm certainly not going to read it for you, but just a reminder of what the actual requirement says. There are some key words in here that I will summarize in a moment, but I also direct your attention to the Federal Register notice for the final rule which also offers a little bit of clarification. For instance, minimizing generation of radioactive waste during decontamination.

I take that to mean during decommissioning. I don't see this as a requirement to see if I can minimize radioactive waste during operation, but in fact I would contend that NRC regulations generally already have that implication in them. But I don't see it as specific to this particular requirement.

Additionally, as a reminder, the intent really was to take advantage of the fact that we need to back this up earlier in the process at the concept and design stage of plants and then through the construction.

But the license renewal issue was dispositioned as part of that final rule as well, why we wouldn't be trying to backfit this type of requirement into existing facilities. I know that idea comes up once in a while. It will be an interesting debate if the concept ever goes forward.

Some concepts that I personally derived out of looking at both the rule and the background to the rule is the emphasis on the early stage. It really is trying to get things right upfront. That is the correct approach to take. But let's not lose sight that we're talking about minimizing to the extent practical. We're not talking about eliminating. It's a balance. And also what we're trying to accomplish is to facilitate eventual decommissioning. That's the focal point. It's not minimize contamination for the sake of minimize contamination. It's not minimize radioactive waste for the sake of minimizing radioactive waste.

Ultimately, as I understand the basis for the rule coming forward, it represents an expression of a concern that not controlling these things during the operation of the plant might challenge the ability and the options that are available at the time of decommissioning -- a challenge to the resources in terms of funding and in terms of options, not having to go to restricted use options as opposed to furnishing a green field site.

So that's a pretty big concern out there and I worry sometimes that we're really getting down in the grass and wondering how many radioactive atoms of contamination we can eliminate if we do some additional design features. So I think we just need to keep the end in mind. The bottom line is I think cost effectiveness somehow gets lost in some of the discussions. I raise as an analog the requirement for ALARA. We have been dealing with that for a long time in regulatory space.

We've actually dealt with several iterations of it, ranging from a regulatory good idea to a regulatory requirement. So I think we have lessons learned, if we were to look back. I'm not sure we're taking advantage of those. But the industry has gone through a long evolution as a regulator in the ALARA topic.

What I would contend is that the NRC took a very enlightened approach in placing the responsibility for solution development on the licensee, setting broad guidelines and objectives in regulation and then letting this rip. And if you look at the results, as I've discussed previously with the ACNW, I think they are profound in what can happen when you avoid an overly prescriptive approach.

I've included some material from the Reg Guide. It talks about meeting objectives. It talks about what is necessary to provide reasonable assurance for the regulator. It talks about flexibility and basically I've summarized those in the name of again applying lessons learned from a similar process that we went through way back when. I remember when ALAP first came out, as low as practicable and as low as possible, depending on who you talk to.

We all thought we knew what it meant, but it was -- we spent a long time trying to reach a common understanding.

I personally believe that where NRC's guidance should focus is on the approach, not on a prescriptive to do list. I think prescriptive to do lists will tend to become formulaic, a cook book. I think it eliminates innovation. More importantly, I think quite often it leads to unintended consequences. And I think we saw that in the early days of the ALARA, especially in the post-TMI environment, when we were incurring a lot of those, putting in TMI backfits.

Once we moved away from that, let the human mind begin to work on these problems, we really started attaining much better results.

I think it's necessary that the guide provide considerable flexibility and especially, and I think that's come up already, that it recognized differences, not only between plant designs and station operations, but we've also talked about site characteristics.

I honestly thing that what NRC should be looking for, encouraging and supporting is innovation, not okay, here's one hundred things to do. What I view that as is a formula is for an endless series of RAIs that why didn't you do item number 17 and why didn't you do item number 27? I don't really think that that's going to be productive in the process and I don't think it will reach the best possible end result. One suggestion that we would offer is that we shouldn't lose these ideas. I see many of the things

I've seen in previous presentations is a list of solutions. I think we ought to capture those. We ought to have a really well-developed compendium. But I don't see that as the guidance itself.

Some considerations and implementation, I think we need to remember that this is the first time implementation of this regulation, so we can't say well, we do it just like we did before. I think it's important that we understand where we are in time. We already have certified designs. We have another design in process and another one just about to enter into the process. COLs are essentially already in the final stages of development and will be submitted shortly. By the time the guide comes out, some will already have been docketed. We just need to be aware of that. This Reg Guide is going to enter it right into the middle of the process, at all various stages.

I think we need to be careful that we don't end up with seven different levels of standards for plants that have gone into operation.

One of the things we've looked at is in terms of sending the Reg Guide out for review, we've come to understand the actual immense scope of this regulatory guide. It touches virtually every discipline within an organization. And it covers all phases of design, construction, licensing, operation, and decommissioning of the plant. So like ALARA, it's an extremely broad scope.

And also, we ought to recognize that it's still evolving, our understanding and knowledge of smart things we can do. We don't have an answer to embedded pipes yet. We don't have an answer to epoxy coating versus other things yet. But solutions are going to come if people are focused to that. We have to leave room for that to happen. I'd hate to end up with a prescriptive requirement to coat all surfaces and then find out that additives in concrete is a much better solution.

Our suggestions for this is certainly to allow ample time for comment. I noted, however, in NRC's presentation they're already suggesting 90 days. I very much encourage and support that.

I think one consideration is once comments are resolved as rather than issue a final Reg Guide, do something that we've used with some of the other guides in this new licensing framework. Issue it as a draft for interim use and continue to receive feedback. Understand that it's unlikely you're going to get it right or even near right the first time. Let some real humans go out and try to use it and give you some feedback on that.

I would also suggest that NRC consider perhaps several years down the road then having a workshop to try to accumulate the lessons learned that have come out of application of this new requirement and then look at finalizing the Reg. Guide. I think all of those could lend much greater value to the process, because it's not just getting through these first three COLs. As with ALARA, what we're talking about is setting into motion an evolutionary process that should continue on through the life of our industry. And I would contend that ALARA is not only evolving, in some cases it's right back on a very steep curve right now, as we've shifted our focus to source term reduction.

Some structural suggestions with the guide, I think personally that it should -- that the emphasis really should be on performance objectives, what needs to be accomplished and on a systematic process. That's really what ALARA is, it is a cultural process done systematically. It's integrated into all aspects of design and operation. It's not a list of things that if you do these things by definition your plant is ALARA, never has been.

So I'd like to see a shift in what has

been the previous focus away from sort of rote listing of 100 smart things that you can do.

One suggestions is to take those things and create a NUREG. I think of NUREG 0041 and Reg Guide 8.15 for respiratory protection as an example. I think the many numerous NUREGs in the ALARA area and then the Reg Guides themselves really stand at a higher level. So I think there's some good regulatory examples of a way to display that information.

At the outset, I'll comment I'd be disappointed if what we get is a 97 page Reg Guide for review. And then finally, if you went that way, what it does allow you to do with technical documents, NUREGs are much easier to either update or issue a series with periodic updates where we can continue to capture experience and lessons learned again for the lifetime of our industry.

So in summary, I view that what we're talking about is implementing a process, not completing a checklist. Many of us here, and I know many of you, I've known you in regulatory contexts. I've known you in operational context. You'll recall that at one point in the ALARA process, we got hung up on checklists. We just filled out checklists after checklists for review of design or review of operations. Then we moved to something different from that.

So we put in processes, processes that involve people and processes that encouraged innovation. So I suggest to you that that ought to be the focus of where we're going with regulatory guidance.

And then just as a final note, I'd like to disavow those that have not been involved with the notion that this is something new. Embedded in NRC requirements and certainly throughout nuclear power operations, the whole notion of reducing contamination, reducing radioactive waste has been with us since Day 1. The emphasis on dealing with it at decommissioning is somewhat new. It certainly is an enhanced focus, but I hope that we don't get caught up in the idea that we're really starting with something that we haven't been taking care of in the past.

The fact is that we are decommissioning plants within the funds that have been allotted to do. The fact is that we are leaving sites that are not restricted use sites and those have been under very stressful conditions of plants that have shut down early and haven't even yet fully appreciated decommissioning funds.

So we have dealt with issues like leakage into groundwater, but if you consider the primary nexus is health and safety, which I believe it is, ultimately, we've made no challenges whatsoever across any of those areas to public health and safety. In fact, we've been at large margins between limits that are considered adequate protection of health and safety and actual performance and results either in operation or decommissioning.

That concludes my comments and again, I appreciate the time.

I'd be happy to take any questions.

MEMBER CLARKE: Let's do another round and then we'll take a break.

Mike, do you want to start us?

CHAIRMAN RYAN: I appreciate your point This has been going on a long time. I mean, there are INPO measurables and there are lots of other metrics out there that have been used for a long time to improve practice. I can remember outages of many, many months as opposed to many days. So there's been a lot of change in the industry, so that's clearly something that we should take away.

I'm intrigued by your comment about a

longer Reg Guide. What form should you think guidance in implementing 1406 should take? Should it just be the principles of how you should do this? What -- could you expand on that a little bit more?

MR. ANDERSEN: Again, if you talk Reg Guide 8.8, it's just an animal. You know, it suggests structure, process, gives some fairly high level examples, but it doesn't set out to be a complete comprehensive detailed listing of each and every thing that you should consider in either design or operations. But even as such, I would comment that I think it runs a bit long and also I noticed that it hasn't been updated since the 1970s.

CHAIRMAN RYAN: Yes, I was just looking actually at it. 1979 is when Rev 4 was published. 1979.

MR. ANDERSEN: So in my view, yes. What I would see would be principles, a description of a systematic approach. You know, explaining how this should be integrated through all different aspects and then a consideration of objectives that should be met. I've given a simple example in groundwater protection initiative, but obviously these objectives would need to be adapted to this specific issue of facilitating decommissioning.

One objective in the Groundwater Protection Initiative is to assure that monitoring is capable of detecting tritium in groundwater, or radionuclides in groundwater in time to be able to take mitigative action to prevent migration of the material off-site.

Easy to say and hard to do. I recognize that, but it creates an objective for people to fashion their monitoring program around. I was intrigued by a question that Eric asked earlier. You know, how much is enough? Well, my problem here is there are no criteria. There are no objectives. I'm very, very concerned that the Reg Guide could just go on endlessly. So to me, principles, systematic approach, objectives. And if there are key issues from experience that specifically need to be addressed, call those out in the Reg Guide. And I believe there are some. The solutions should not be a part of the Reg Guide.

CHAIRMAN RYAN: I think you're on the right track, Ralph. It sounds very reasonable to me. I think about, and I'm sure our other panel members could help with examples. You know, if you had to pick something that was sort of a sore thumb, we get a lot of very large volumes of soil with a little bit of radioactivity in it. We've got to spend an awful lot of time and resources to dispose of it one way or another, or combinations of ways.

So what I would like to propose for the round table, is there a top five list or a top ten list of issues that have been time consuming, expensive, and have really bogged down decommissioning that if fixed through the mechanisms that we have heard today and design and maybe through some improved monitoring through the life of the plant and others that we could recommend as the things that really ought to float to the top of the 1046 list.

MEMBER CLARKE: That's a good suggestion.

CHAIRMAN RYAN: That would be a huge thing for this collection of folks from both the design side and the operating side and the decommissioning side to put their heads together and say if you guys had just run the pipes this way or that way or had done these kinds of evaluations and the structure as built in the geology or whatever it might be, that's really what I think we're looking to extract out of that.

Are there any real sore thumbs out there that say well, you know, if you address this you really would have avoided, you know, this other problem. It would be interesting to pull the experience together. Is that a fair kind of thing maybe to set the stage for the round table?

MEMBER CLARKE: Let's take that as a homework assignment for the round table. We'll give it a little more time. If I could just make a comment on that, Mike.

What I heard you say, Ralph, is don't give me a check list of 100 things to do. Remember that this is a risk-informed performance-based industry and let's not lose that focus. So we've got design-specific, site-specific factors. Maybe not one size fits all, but you know, if we're going to get the performance out of what we're proposing, what about the probability, what about the consequences? Is that a fair understanding?

MR. ANDERSEN: Amen.

MEMBER CLARKE: Fundamentally, it seems to me, and I think it's because we're all exceedingly good at what we do and that the people involved have a lot of experience. I noticed that we jumped immediately to solutions and it was very exciting for the last six months, EPRI and NEI and INPO and the vendors and the design centered working groups have been generating solutions.

And then we end up with the question that

Eric asks. By the way, how do you know when you're done? And that type of question that's occurred in some of our fora really woke us all up. His point is we don't really know what we're aiming at, except in very broad terms. So yes, exactly.

CHAIRMAN RYAN: If I may. One other point on that, Ralph, that I mean I've seen you show curves a few times over the years of, you know, improvements in radiation worker, average exposure and total exposure and other metrics of that sort of global type that say the industry is doing better. You know, if you've got solutions to me, what's the metric we should attach to them and say let's do these three but not those two? Maybe we can think about that question, too. Is it a metric? Is it a contamination, a voided metric, is it qualitative, is it quantitative, and maybe we can think about that as part of the question as well.

MR. ANDERSEN: But to pick up on that, Mike, a bounding condition that the NRC has imposed on itself as a policy is previously $1000 and now $2000 person-rem in their regulatory analysis. Now, whatever you think of the value, at least there is a number at which one could benchmark decision making. Now, in fact the industry uses values far above that for its decision making. But that's our prerogative. That's what we're willing to invest in workers' safety.

But at least there's something there. As you point out, at least there is a metric to have a conversation about. In this area, there is no metric. I'm not sure how I would measure success.

CHAIRMAN RYAN: That's what I'm reaching for is what is the metric. Is it dollars of decommissioning avoided? I don't know. Again, I just pose it as a question. That's maybe where we ought to spend some time talking.

MEMBER CLARKE: Okay, thanks. I'm going to jump in a little bit and skip over to our panel. I'm going to go to Eric.

Eric Abelquist?

MR. ABELQUIST: Excellent presentation. it really resonated with me. The whole idea that I'm struck with reviewing this draft Reg Guide is the fact that the regulator for decommissioning sets a goal, 25 millirem per year, let's say. And it's not wide open how it is achieved, but there is a lot of flexibility in how it is achieved. To pick up on what Mike just said, should the metric be dollars of decommissioning costs avoided? If it is something like that, is it really the regulator that is concerned with how cost effective the decommissioning is or is it more the applicant who is going to a vendor to say how well did you design this system, because I'm going to have to bear the ultimate cost of decommissioning and I want to make sure that is not going to leak often and when it does, I want to make sure that it doesn't get into the soil, because I know the costs are huge.

So what we really have I think is a situation where yes, the NRC is interested in all of this, but who is really going to pay for it if the plant isn't made as well as could be, is going to be the applicant, the COL, licensee. I think that a lot of these good tips are items that the applicant is more interested in than the NRC. So that sets up for a very interesting regulatory position. How do you fix that?

MEMBER CLARKE: Eric Darois.

MR. DAROIS: I related to a lot to what you said, Ralph, because I came full circle on this issue as well over time. You know, as you know, I was involved in putting together the kind of the hit list that EPRI provided of things we like to avoid. When we first started, we thought we were going down the path of developing the Reg Guide. My mindset was we can't get that specific in the Reg Guide. Well, we slipped down that slope pretty fast and we went into problem solving and talked about berm tanks and all that kind of stuff.

I still don't -- I still struggle with how do you write the Reg Guide to be broad enough to capture all of the intent. And the metrics are important too. Do you deal with dollars saved in decommissioning, you got to look at dollars you spend today to save those. I mean, it is truly cost benefit. And what comes into it is kind of the probability of occurrence of a particular event or a particular condition. We don't want to make all of these decisions a PRA study either.

I don't have anything firm to offer for a solution, because as I've said I've been full circle on that. We'll save it for the round table.

MEMBER CLARKE: Okay, thanks Eric.

Allen?

VICE CHAIRMAN CROFF: No, thanks.

MEMBER CLARKE: Ruth?

MEMBER HINZE: As I have said here --

MEMBER WEINER: Nothing.

MEMBER HINZE: Sorry. I'm sorry.

MEMBER WEINER: I just have something

brief before the round table. I wanted to thank you, Ralph, for making the point that the purpose of building a plant is not to decommission it, but to produce electricity with it. I think we run, we all run a risk to not go into that tired old hammer and nail analogy of missing the focus of where we should be.

Decommissioning is something that will occur, has occurred, and does occur. I think it is important as Eric Abelquist has said, the applicant becomes the one most concerned with cost effectiveness. But I think we have to look at cost effectiveness and general effectiveness also.

We have to set ourselves some kind of goal for decommissioning that balances all of these things. There was a view in the international meeting that I was at recently that oh, costs shouldn't matter -- everything should be cleaned up to background or wherever somebody wants it. That's not realistic. Whatever we do with this Reg Guide and with its implementation has got to be risk informed, and that's all I have right now.

MEMBER CLARKE: Thank you.

Bill?

MEMBER HINZE: Well, I have heard all

these great comments and they are very good. But I am sitting here wondering from your presentation, Ralph, if I've got the focus on nuclear power plants. I've wondered if NEI has considered the decommissioning of other nuclear facilities and how this fits into the decommissioning problem?

MR. ANDERSEN: We have only in a broad sense -- we work very actively with the Test and Research Reactor folks as an example as well as the fuel cycle facilities. That actually goes to one of the comments that I was trying to make. It's not only within the nuclear power plants that it crosses all disciplines and phases. It really cuts across a significant fraction of licensees who deal with different kinds of issues and also have very different expectations about where they are going to be at decommissioning.

MR. ANDERSEN: That's why you need flexibility?

CHAIRMAN RYAN: Right. Absolutely. You know, I can state as a premise that ideally a nuclear power facility is assuming that at the time of decommissioning it will be able to achieve a green field site status, whether in fact it is going to continue to use the property for industrial purposes or not. I think that tempers our decision making. There are other facilities that that's not really a going-in assumption, and it's possible that no amount of good intention and design will avoid that, at least not at a cost that would make it worthwhile to even operate the facility. So we've looked at it only to that extent. I do think that's a community or set of communities that you probably need to solicit some additional information from, but certainly NRC.

I know NRC had a really excellent workshop earlier this year and had a large number of people. It was really on the subject of a potential rulemaking in the future. There was a lot of that kind of information that came out. I was struck then too by the differences. So I don't have an answer to it, but we've thought about it enough to say all the more reason to stay at the 50,000-foot level in the Reg Guide, rather than get buried down in the details.

MR. ANDERSEN: But it is another problem and we've got to be able to face it and make certain that it is incorporated.

CHAIRMAN RYAN: Absolutely.

MEMBER CLARKE: Mr. Chairman, I recommend that we take a break and come back at 3:20, at which time we will hear presentation on the Reg Guide and we will open it up to the round table.

CHAIRMAN RYAN: Sounds great. Thank you.

(Whereupon, the proceedings went off the record at 3:01 p.m. and resumed at 3:18 p.m.)

MEMBER CLARKE: Okay. Our final speaker is Ed O'Donnell from the NRC Office of Research. Ed is the Project Manager heading up the development of Reg Guide 4012, and he's here today to tell us all about it. Thank you, Ed.

MR. O'DONNELL: Okay. Thank you very much, Jim. I'd like to start by saying that I'm just representing a whole group of people who have worked on this. We want to, first of all, acknowledge the ISL. ISL is a contractor to us, and Stuart Bland is here in the room. Stuart helped out tremendously. ISL reviewed existing Reg Guides to see which ones would relate to 20.1406, and, in addition, they looked at Lessons Learned, and they produced for us a letter report, which is more or less in the form of what a draft Guide might look like. We used that for the first draft and everything else. We circulated it to our licensing colleagues, and we got a tremendous number of comments, and I'd like to acknowledge the licensing comment, license people; Roger Pedersen, Jean-Claude Dehmel, who's in the room, Charlie Hinson, who's in the room, Rafael Rodriguez, Jim Shepherd, who is in the room, Bruce Watson, Steve Garry, who's in the room, Jacob Philip, who's in the room, Tom Nicholson. All these fellows participated in the draft which is before the Committee.

Our objective today in appearing before the Committee is, we'd like to release it for public comment, and we're presenting it to the Committee to see if it's worthy to be released for public comment.

Now with that, Bill Ott, who's one of my co-authors, Bill would like to say a few words right now.

MR. OTT: I just wanted to add a little bit of perspective. If you'll note, this is Draft Guide 4012. What that means it's a Division 4 Reg Guide, not a Division 1 Reg Guide.

The focus today in almost all of our discussions has been these new reactors that are coming over the hill. But as a matter of cold hard fact, 20.1406 applies to all new license applications, which means all facilities.

When you look through the Guide, you'll see a whole list of things, many of the things would not even apply to a non-reactor licensee, so this whole list of things is a list of things that might be considered in the application of this Guide, and we tried to address that in our philosophy, as well. With that, I'll just let Ed go forward.

MR. O'DONNELL: Yes. Okay. Thank you very much, Bill.

The color pictures, there are about five color pictures you see. Each one is of a reactor, and we should be aware that it's just not reactors that we should be talking about. Just happens to be it's a lot easier to find a picture of a reactor than it is some other nuclear facility.

Ralph has done us a favor. He's explained to us the contents of 1406. And as we see on this slide here, on the left side it says "Facilitate decommissioning." On the right, "Minimize contamination of the facility, contamination of the environment, and generation of waste."

The draft Reg Guide, which the Committee is considering, and I'm holding it up here, is divided in four sections based on that, and we'll come to that in a few minutes. Contamination of the facility, the environment, et cetera, et cetera, et cetera. It's structured accordingly.

The principles embodied in the Guidance prevent, detect, correct - those words, I think I heard Ralph Andersen use a while back. I think that's the first time I heard them, they came from Ralph. And if you prevent, detect, correct; prevent unintended release through design and operation; detect, early detection, there's an unintended release; correct unintended releases of radioactive contamination by prompt and aggressive action. You've gone a long way to meeting the requirements of the regulation.

One of the questions we had from our licensing colleagues was, how do I know that I've implemented it and everything else, so we've added a little -- towards the bottom of the first page, in the paragraph down through there, we tried to address this particular thing; that if you use good engineering, good science, in combination with these Guidance principles, you should go a long way towards meeting the requirements. And the slide here, number 4, illustrates this good engineering science, application of Guiding principles, prevention, early detection, prompt correction.

Now, as I said, the Reg Guide, it's structured in four sections, and this would be the first of the four sections; minimization of facility contamination. And, again, we tried, at least for the discussion today is to pull the requirements into prevention, detection, correction as much as we could. Prevention - turns out there's both design things you could do to prevent, and there are lots of inspection maintenance things you can do.

So at the beginning of this section, and I think this is what Ralph said, if you could set us up kind of performance objectives, we have a little introductory paragraph. And the introductory paragraph, then the performance objectives, and then a series of suggestions, an applicant could do this, or should do this, such and such should be considered. So in the Section 1 introduction there, minimize contamination, you design to limit leakage, and control spread of contamination, provide for early detection of leaks, prepare follow-up corrective measures.

Then you see a whole bunch of words here, and at the tail end of those bunch of words you see 1.a. The one means it's in Section 1, and A is the first of the things. I tried to paraphrase them but it's awfully difficult, so these are kind of somewhat shortened statements of what's in through there. And in the upper right you see the word "prevention design", so these are some of the design things you can do to prevent. And we just kind of, I don't know, maybe - let's take a look at the bottom one there, the fourth one. We already had seen that I think in the AP 1000 slides, radioactive SSC, systems, structures, and components should be designed for the lifetime of the facility to avoid leakage and spread of contamination.

I just want to mention, I think there are 61 of these little bullets, so I don't -- there's no need to go through all 61. Plus, it's remarkable how many of these were found in the AP 1000 and the ESBWR presentations. They're already in there, and I think part of the reason why that there's a similarity is either we're all working similar good ideas, or we had three public meetings with the industry. And in the last of the three public meetings, Ralph presented us the groundwork Guidance. There were 33 items in that. I went through that, and I could only pull out about 10 of them we hadn't already covered. So, in other words, we're already using similar thoughts, similar ideas.

The bottom one, radioactive SSC should be designed for the lifetime of the facility. Well, gee whiz, if you keep changing things, there's more chance for contamination, leakage, et cetera, et cetera, et cetera.

The next page, let's see. The second item, potential spill areas, floors should be sloped to drains that lead to the rad waste system. We already heard that earlier in the day. The bottom of the page there, seal surfaces to facilitate cleaning and decontamination to reduce the generation of radioactive waste. Heard that already, there's one. Going to jump to the next page, for SSC that have a high potential for leakage, floor liners and catch basins should be used. Oh, another one, the drains from locker rooms - we didn't hear that. I think that's a different one. Steve Garry provided us that one, and it's -- they should be routed to rad waste processing facilities to prevent reconcentration of radioactive materials in sewerage plants. Ventilation systems should confine airborne radioactive materials within processing areas.

The bottom one there, talk about sampling stations should be designed to minimize the possibility of sample fluid leaking to the ground, or to the underlying pad surface. I don't think I'd heard that today.

This one, if you look at the heading at the top of the page, these are inspection and maintenance things you could do to minimize contamination. The second one there, I see monitoring sensors should be designed to allow instrument replacement. The expected life cycle of the facility design should include provisions to facilitate the maintenance, inspection, removal of radioactive components, so these are some of the inspection maintenance things you could do.

The one there at the top of the page says seals should be maintained over the life of the facility, and their integrity should be routinely inspected. Ventilation system should be periodically checked. We'll jump on. Detection, a leak identification program, et cetera, et cetera, et cetera. A second one, provision should be made to allow timely identification of leak locations, where are the leaks?

The bottom one is a very important one because the FSME staff are very much concerned with residual radioactivity, particularly from the real slow leaks that may go on for long periods of time. And, if possible, leak detection systems should be provided with the capability to detecting and quantifying small leakage rates, if feasible. Correction - radioactive lines and temporary mobile systems should have a means of promptly isolating leaks. So these are some of the things - so, basically, to minimize contamination, you promptly correct things, that's part of the guiding principles.

Jumping on to the next section, minimization of environment contamination, we see a nice scenic picture of a nuclear facility somewhere in a coastal area. We see mountains and everything else, and we have to thank Tom Nicholson for this, about getting across the idea of a conceptual site model. We're talking about submittal of application, before you do it, you should take a look at the overall site. You're going to have nature, and you're going to have a facility. The two are going to act together. You should have an idea what the site is going to behave like beforehand.

In this particular picture, looking at it you can tell certainly the ground water is not going to go this way, it's going to go this way. It will give you an idea where to sample, where to look for things. It should also, in this particular view, you should have a rough idea from the picture where contamination might happen, and where it's most likely to happen. And this is the idea behind the conceptual site model.

Also, to minimize environmental contamination, all those good things that you did to minimize contamination inside the plant - well, this applies outside to the environment. Keep the plant clean, and good, and operate well, it's going to protect the environment.

So the conceptual site model is based on the site characteristics and the facility design, will assist you to understand the site, and also, very importantly, the plan of corrective actions needed, things they should do, establish a background for the CSM, identify potential release mechanisms, et cetera, et cetera.

And, finally, the bottom one right through there, Jake Philip, our geotechnical engineer, pointed out, that it's very important to assess the site changes due to construction. Certainly, you can predict some of them before construction. You can have a crude idea, roughly, what might happen, and think about that.

Some of the things, this section for environment, I think we have about 25 different of these sub-items through there in there, some things you can do in terms of design. The top one there, systems containing radioactive material should have at least two impermeable boundaries to the environment, capability of periodic testing and inspection. That's an important one, because the situations with the power plants, the leakage, the unintended leaks at places like possibly Indian Point, Braidwood, and everything else. As far as I can know, those were single barrier failures. If there were a second barrier then, conceivably, some of these things might be avoided, so these are things to be considered.

The second one, tank catch basins should be of solid construction. As I looked through this last night, it sure sounded familiar, and I might have gotten that one from Ralph Andersen from his groundwater protection, the items that he had come up with.

The third one down, exterior tank should be located above bermed concrete pads. We heard that earlier in the talk about the AP 1000. Systems containing, transporting, and processing radioactive liquids should not use buried piping or drains, but if you do do it, think about ways to kind of do things a little bit better. There are ways that might be possible.

The next one on the top of the next page says that if you do have underground piping, they should be enclosed within structured pipe chases, provisions for periodic inspection or surveillance. When pipe chases are not feasible, the use of double-walled pipes, leak detection capability should be considered, so there's possible things that a person might consider to do if you have to go the route of buried piping.

The next one, radioactive material, handling, staging, storage, decontamination, should be located inside buildings. We heard that earlier in the AP 1000. The third one, we heard that, again, in the AP 1000. This is about the penetrations. The bottom one, this is just good engineering practice, avoid bypasses or drains that would allow rad waste to be inadvertently circumvent a rad waste treatment system, where it would be released directly to the environment.

The top one, this is, again, a good engineering practice - drain systems for storm water and sanitary sewerage should be separated from contaminated waste drain systems. The next one down, use of sills. We heard that one mentioned in the AP 1000, some kind of a sill at the entrance of compartments that radioactive materials are in in case there's leakage to contain it in the compartment.

Third one down, that was the penetration of the outer walls. Just jump on. Let's see. Oh, top here. The design of excavation and selection of backfill. This is one that our geotechnical engineer, Jake Philip, pointed out to us, and this is one that is overlooked. Like an engineered structure, if you engineer your backfill, you can do all sorts - you can direct the water where you want it to go. Give you an example, if you were to use a silt or fine sandy loam, you could actually wick away moisture, small leaks could be wicked away, and you could direct it to a drain in some direction where you want it to go. And you could monitor it. The reason why I speak somewhat knowledgeably about this is I did a lot of work on research on covers, and we had something called a conductive layer barrier, and it would wick water to where you want it to go. This would be an application of that principle, wicking it to some direction.

The second one, backfill should not contain soil that contains concentrations of radioactive material above the naturally occurring levels. Again, that came from Jake, and he pointed out that many -- if we're talking about new reactors, they may be at existing sites, so be careful what kind of material you do use for backfill, just in case there's on-site contamination.

Potential leakage from any existing adjoining nuclear facility should be prevented from migrating into the excavation and backfill of a new nuclear facility.

Okay. This one here, we're still talking about prevention, inspection and maintenance. Well, the integrity of seals should be periodically verified. Monitor backfill or structural fill for evidence of clogging, migration of fines into it, and blocking it. The design groundwater level should be maintained below the foundation of the SSC. This is a common thing at construction sites. We have a reasonably high water table. We artificially maintain the water table low by continual pumping. You can keep it below the facility.

Let's see, the bottom one, the extraction of groundwater or leaked liquid radioactive effluent must consider potential impacts on the foundation. So think about that, if you have to extract.

Detection - top one, if the systems containing radioactive material do not have two impermeable boundaries to the environment, applicant should propose specific environmental monitoring. Perhaps, for example, sampling groundwater in close proximity to potential sources, periodically verify integrity of the system. And on and on it goes, let's see. Going to just jump the next page.

If foundation drains are used as part of the building design, capability of sampling and processing, the effluent of those drains should also be included. I'm going fast because I think that probably nobody in the room really wants to do all too much on these, just kind of get the big picture of what it is, some details that you could use for detection. Correction - if you do have sumps or retention ponds, you should have a liner, capability for isolation or routing to monitored release paths.

The bottom one - design and operation of groundwater capture zone surrounding SSC may provide effective means to isolate and collect liquid radioactive contaminants escaping to the subsurface, and prevent abnormal release to groundwater.

Jumping to the next section, facilitate decommissioning. This is one that's -- this is the introductory little paragraph, Section 3, the introduction. This would begin at the design stage. You consider the design with the thought hey, I'm going to have to decommission this thing some time in the future. The MagNOX facility, give you an example, they were clearly not designed for decommissioning. It's a real difficult thing, because of the massive structures of the MagNOX facilities.

The second bullet there says ensure through the life of the facility that design and operating procedures minimize the amount of residual radioactivity, require remediation at the time of decommissioning. And I heard from Ralph Andersen talking before about the nuclear power plants are pretty good about minimizing contamination, and minimizing generation of waste. The latter one, of course, is driven to a great degree by economics. And properly designed and operated facilities will support efficient decommissioning, as well as reducing the generation of radioactive waste. So this would be kind of the introductory lead-in to kind of the performance objectives part of that section, and then there would be a series of specific little items. Here they are.

This first page, all four of those items, turns out that they were information gathering. You just look at the letters behind them, A, B, C, so that our little laundry list was information. Then at the second page here, we start getting down to minimize the use of embedded pipes and facility walls consistent with ALARA. Temporary piping, second bullet there, should be removed to avoid undocumented random pipe in the field, which when covered will raise questions about the extent of contamination during decommissioning.

Number three, if you leave construction debris all around the site, it's going to confuse your ultimate decommissioning, so it's better to remove it, if you can, as much as reasonable. SSC design should facilitate removal of equipment. Well, we've heard that one with regard to the AP 1000 and ESBWR.

Now this one is decommissioning of a nuclear power plant somewhere in the Northeastern United States, and, of course, you want to minimize waste generation. You can do that through your prevention, you could do it through design and operations.

Here's the introductory paragraph. Minimizing waste generation is both a design and operational consideration. And this was where the life cycle approach should be taken. Identify all the components used in the facility and all waste that will result from the systems, processing, and if possible, try to think it through to final disposal. Although, I recognize this may be very difficult if we're talking about some of the things that are being disposed 30 years into the future.

The bottom one, let's see, systems design should enable operators to perform decontamination efficiently, while minimizing doses and production of waste. Prevention through design - the first one talks about volume reduction using ANSI standards. The second one is about try not to mix waste streams to get volume, mix the waste streams. And the bottom one is - oh, yes - let's see - on-site decontamination facilities, waste segregation facility should be provided for the orderly management and segregation of large quantities of radioactive material.

This one talks about the continuous concrete pores. The bottom part of it really mentioned that maybe modular design may allow you to remove just separate layers of contaminated material, thereby minimizing the volume of contaminated waste. So this is prevent through design.

Prevention through operations, waste should be shipped off-site when generated, legacy waste should be avoided. And finally, the last one there, this is a very important one to our FSME colleagues, and this is about try to avoid the on-site disposal of radioactive material. However, if you do go the route of using the 20.2002, on-site disposal should not be located near a susceptible or surface water groundwater intrusion, and must have proper monitoring to detect potential radioactive radionuclide migration. So that was very important to our FSME colleagues. They're very much concerned about legacy sites and residual radioactivity.

This is the last slide, and what we hope to do is release the Regulatory Guide for public comment in July of this year. We would like at least a 90-day period because this is a new endeavor, it's new, it's different, and we expect extensive comments. And if all were to go well, we would expect the final Guide possibly in January of 2008.

And with that, Bill.

MEMBER CLARKE: Ed, thank you very much. Let me just ask you a quick question, and then we'll --

MR. O'DONNELL: Sure, Jim.

MEMBER CLARKE: -- do a round. We heard a discussion about maybe putting more emphasis on performance, and less on the checklist. And I don't mean to imply that this is a checklist, because I'm not sure about the intent of that, and that's the basis for my question. I thought it was encouraging, as you did, that all of the discussion has identified things that are coming from all different directions. What's coming from the reactor side are things that have been identified, what you have identified, and what the industry has identified, I mean, it's all good stuff. And I'm wondering, is the intent to frame it as these things should be done, or is the intent to frame it as this is what the NRC thinks is good engineering practice? There are going to be site-specific and design-specific differences, and take it from there. I just kind of throw that out. I'm interested in your reaction.

MR. O'DONNELL: I'd like to throw that to Bill, only because my mouth is dry.

MR. OTT: Good excuse, Ed.

MR. O'DONNELL: Yes.

MR. OTT: I think the observation that - and the way we organize this, the focus on prevention, detection, and correction, all these things are things that could be considered for a particular individual system, but a lot of them might not apply for a given individual system. Essentially, what we're suggesting, and I think the word was used earlier, either by Westinghouse or GE, that when they go through the design, they should systematically look at their system, figure out whether prevention is relevant, whether early detection is relevant, if they've got a containment failure, prevention doesn't work, and then do we have to make some provision in our plans for how we could clean it up quickly? And I think timing is something that's underplayed in the Guide.

We use the words "prompt detection, or early detection and prompt clean-up", so the concepts are there, but if you want to minimize contamination, and minimize the spread of contamination, that time factor is critically important. So where you put detection instruments, and how you try and contain any kind of a spill close to the facility, or close to the location of the spill are critical items, but it's really this approach of trying to use this philosophy of prevention, detection, and correction, and using it systematically whenever you've got one of these boundaries that might cause you a problem with contamination of the environment of the facility. I think that's the key to the Guide.

MEMBER CLARKE: Thank you. I want to continue starting out with our panel, so I'm going to go to Eric Darois.

MR. DAROIS: Perfect, because I wanted to follow-up on your comment. I have just a little heartburn with all the shoulds in here. I've heard it said many a time that give me a good reason why you didn't do it, and then we'll let you off the hook from implementing the should. But you've got a couple of things, and I'm not going to go through the whole thing, but I'll give you a couple of examples, and there are more that I struggle with. One is what you had just mentioned, Ed, on the avoiding the 20.2002 on-site disposals. Well, there's been a number of cases when the utility did that and made the right decision. There's been a few cases when it's been -- very few cases I think where it's perhaps been the wrong decision, but you know, consider very low-level sludge from a discharge canal, and you go through the process, and then you've got 100,000 cubic yards of soil that you place on the property that would ultimately meet the decommissioning criteria, as it is today; that it's going to cost and arm and a leg to get rid of otherwise. How do you get around that when it says you shouldn't do that? It's a cost-benefit analysis, so that's one example.

And the one that I read in the Reg Guide, and I don't know how to interpret it, you didn't go over it, but it's any backfill you use should contain soils that are not above natural radioactivity levels, or something like that. Background, or backfill that you use in construction. I don't know how to implement that either, because I don't -- that means if I have a bucket of soil, it's all got to be below whatever I consider background, and that's a tough one to get your arms around. That's just a couple of examples of things that I don't know how I would implement, and how do you get around the should?

MR. O'DONNELL: Well, going back to - I just pulled up on the screen the 2002 one, so there's an if - if you do it, you should try to avoid areas susceptible, surface water, groundwater intrusion, those are reasonable requirements, those two are reasonable. And the next part, must have proper monitoring - the question on that one is how long does the monitoring continue? Does it continue as long as you have a license? And if nothing is happening, presumably then you can go through --

MR. DAROIS: But it's not tied to the quantity or the concentration. If I'm putting something in the ground that's .02 picocuries per gram, I shouldn't have to do anything.

CHAIRMAN RYAN: The hard part of this, Eric - I agree with Eric. I think this one is a deep hole with a blanket over the top. The reason I think that is that I don't know how to demonstrate any of that. Should not be located in areas susceptible to surface water or groundwater intrusion. Well, that's the Eastern United States. How far away is an area? Is an area an acre, or 50 miles or what? You know, I struggle with that. Groundwater intrusion, intrusion into what? Intersecting the surface, 20 feet, 100 feet? It's very, very difficult to get that. And, again, what you end up getting to is some kind of a decommissioning dose criteria-driven analysis with a prescribed method, and I think you either say 20.2002 can be done, or you say it can't be done. This says well, maybe yes, maybe no. And we're not getting any criteria --

MR. DAROIS: And we've already had discussions in prior meetings where maybe an entry in your 50.75(g) file would suffice for an on-site storage, deal with it later at decommissioning. It just gets into space that I don't think has been yet well defined.

CHAIRMAN RYAN: The other dimension is there is an effort underway for considering long-term on-site storage. Now I know that's aimed at packaged waste and other elements, but why couldn't this be a long-term on-site storage of 100,000 yards of soil? Now I don't know how you deal with that, so I think there's a caution on that one. And I agree with Eric, I would think hard about maybe even having it in there. The rules exist to take care of it, anyway. You're adding something that could actually end up being confusing, rather than helpful.

MR. O'DONNELL: That's a good point if the rules -- yes, the rules do -- yes, good point on that one.

CHAIRMAN RYAN: You know, waste should be shipped off-site when generated, legacy waste should be avoided. Yet, we're getting a rule for long-term on-site storage. And, again, I would just comb through it again. And I don't disagree with the idea that it's best to send it to the disposal site earlier rather than later, because there are things you do avoid, but what's the return on that? I just wanted to jump in here. It's going to be a cost management, you ship a half a load, or a whole load, you pay the same price, so you wait a while until you get a full load, or something like that. So there's lots of practical reasons to dive in there.

MEMBER CLARKE: Thank you both. Eric Abelquist.

MR. ABELQUIST: Couple of comments. It seems to me that the regulatory areas that we already have in place are dose limits, environment release limits, ALARA, and all of these ideas that you just presented, Ed, are terrific ideas. And if there were no barriers to implementing all of them, the idea should be go ahead and do all these things, and it's going to keep dose limits down, it's going to minimize releases to the environment, and we're going to be following practicing ALARA in this process. So since you already have those regulatory purchases already, it seems very difficult to me to regulate on the specific good practices. And I'll share with you an analogy that came to mind as you were presenting.

About a decade ago, the issue of characterization came up, and I remember the question was, what should be the minimum that the licensees should be doing, because they need to do more. Too often, we would get into clean-up and final status surveys, and a route cause for a really poor final status survey was they didn't know what the extent of contamination was. And so, I remember going round and round, how do you regulate characterization? You really need to regulate 25 millirem and the final status survey needs to demonstrate that the clean-up was successful, and it was 25 millirem and ALARA, and you need to do a good characterization and consider all this, but the focus wasn't on let's regulate characterization. It was, the end-point is clearly license termination criterion, 25 millirem. And that just seems to me that this is where we're at on this particular subject, is that we already have the regulatory purchases, and these are all good ideas. I just don't know how you burden them with more. We're going to check to see if you did every single one of them, or however it ultimately is done.

MEMBER CLARKE: Okay. Thanks, Eric. Ruth.

MEMBER WEINER: I share some of Eric Darois' concern about the number of shoulds, and just to give you an example, groundwater pathways and surface water pathways can be altered by nearby construction that has nothing to do with the facility that you're talking to. And 30 years after the facility is shutdown, and you get a condo development, or whatever, an industrial park, you can change all those paths, and there's no way that you can foresee that, or forestall it, as far as I can see. That's just an example of something that happened.

To what extent are the -- and this is kind of a general question, may have some examples. There have been large decontamination and decommissioning projects, Main Yankee, Big Rock Point, and, of course, Rocky Flats, some of the Hanford reservation, and a number of them. To what extent has this Reg Guide incorporated the things that you've learned from those decommissioning projects?

MR. O'DONNELL: Yes, I would say to a great degree. And I think Ralph had made the point that we're just not at the beginning. We've had a tremendous amount of experience through the years, and certainly with the DOE sites, and the U.S. commercial sites. We've had a lot of experience with it, so a lot of that was kind of factored into this.

MEMBER WEINER: When you did that, did you factor in the cost of doing that, or the cost-benefit ratio of doing that?

MR. O'DONNELL: No, I did not. I did not.

MEMBER WEINER: And the reason I make that point is, some of these projects, particularly the DOE ones were hugely expensive. And the question is, again, getting back to the fact that you have a standard, what did this huge amount of investment actually buy you in terms of useable or preservable environment? And I cannot help but think that that needs to be a consideration.

MR. O'DONNELL: Yes. It has caught our thinking through the years, and it's been such a long period. We've learned -- in the 1960s, we used to dump rad waste off of the hillside. That was the case of the sites up there in Pennsylvania, you know, Shield Alloy dumped it right off the hillside. We wouldn't even think of doing that today. We've learned a lesson on that particular one, so I think without giving any specifics, we've really learned to -- let's go back -- piping is another example. The single piping leaks, we've learned from that - well, gee, if you have a single - no second barrier, you're going to have some residual radioactivity, and you're going to have to figure out how far it went, et cetera, et cetera, et cetera. This leads us to a thought that gee, maybe I should figure out some way around that, and maybe the double-walled piping might be a way, or a piping gallery might be a way around that, or if I put the thing in the ground, have some sort of a fine sandy loam, which I can monitor, something of that sort. So these are things which are driving us, and when I say "us", I mean people here collectively in the room who are kind of doing this sort of stuff. So going back to the DOE sites, they were very expensive, and, of course, they reflect technology of the 50s and 60s.

MEMBER WEINER: That's true, but I just wondered to what extent -- you've given some very good examples of cleaning up and decommissioning, and preventing contamination. Do you have any examples of when more was done -- more needed to be done than you really needed to do to protect the environment or people? Are there any examples like that?

MR. O'DONNELL: I was hoping that somebody -- Tim, will you come up to the microphone?

MEMBER WEINER: Sure.

MR. O'DONNELL: Tim Frey is coming up to the microphone.

MEMBER WEINER: Okay. All right. Just one or two. Do you have an example of where more was done than you needed to do?

MR. O'DONNELL: Tim was standing up, and I thought he was standing up to come to the microphone.

MEMBER WEINER: Oh, okay. I'll hold the question. Finally --

MR. O'DONNELL: Let me put it this way, Ruth; the public would say not enough was ever --

MEMBER WEINER: Well, we know that, but

the point is to get back to what Eric Abelquist said. We have standards, and if you -- and we're looking at the question, what do you need to do? How do you balance the costs and benefits? That's the basic question. You've talked about the benefits in terms of decontamination and decommissioning. I'd like to sort of look at the cost, because we're going to do a lot more decommissioning than has been done to-date. And this Reg Guide is going to guide it.

MR. O'DONNELL: Yes.

MR. OTT: Can I offer an observation here?

MEMBER CLARKE: Let's get through the round, and then we'll get into --

MR. O'DONNELL: Bill Ott will --

MR. OTT: I just want to offer one observation. The focus in 20.1406 is addressing things at the design stage. If we were to ask Westinghouse today how much it's going to cost them to build AP 1000 as they're changing it to accommodate 1406 and compare that to what it would have been before, we might have an estimate. If they started from today and designed for 1406, I don't know how we come up with a dollar value.

MEMBER WEINER: That's a good point. Thank you.

MR. OTT: Okay.

CHAIRMAN RYAN: In reading through the document, Ed, I think about reactors all the way through. I'm really worried about the licensees, I heard 1406, of course, applies to everybody. What do they do? Everybody being everybody from small facilities to maybe even larger alternate fuel cycle facilities like reprocessing at some point down the line. I think that's something you don't have enough language on in this Guide, because for a small facility that may be, I don't know, producing radio isotopes for medicine or something, that's a big deal. There's a lot of onerous stuff that they're not used to in this.

MR. O'DONNELL: Yes.

CHAIRMAN RYAN: But I don't think your intent would be to apply every element that you've laid out here, God forbid have a checklist that you've gone through, 3A through F. If this is going to apply to all facilities, of all types, I think you need to do something either in the preamble or the introduction to stratify that in some way so it doesn't -- it's clear that you're not intending the full suite of things to be critical for every type of licensee.

MR. O'DONNELL: I recognize the merit of that comment, and that was the reason why at the very beginning I even tried to make the point of used all pictures of reactors, and really applies to all, and I was aware that we're really skewed towards reactors.

CHAIRMAN RYAN: Well, without benefit of hearing this conversation, it would be tough, it's tough to see that in a document, so that's one question. So I think the fact that it applies to everybody needs a little bit more work to say what exactly applies to me, because that's - when I'm a licensee, I'm going to come in and say fabulous document, what applies to me? I'll look at that more carefully than what doesn't apply to me, so that's one.

The second is, what's the benefit? What does he mean by that? You know, in a lot of areas, if a licensee performs well, there's a reward of some kind, there's reduced inspection, there's lower decommissioning trust fund costs, there's something, and I don't see any treatment of that. I know I raised that point before in these discussions on decommissioning.

MEMBER CLARKE: That's a good point, Mike. When we get everybody up, and get all their ideas, we'll have -- but that's certainly one I'd like to raise again.

CHAIRMAN RYAN: Yes. I think that's something to think about. I'm going to have to spend a lot of money, no matter who I am, either in design, or in facility management, or operation, or all the above, of monitoring, and I'm wondering what the benefit is.

MR. O'DONNELL: Yes. And, obviously, if you do many of the things that are in here, you'll be able to demonstrate to your regulator, gee, I did these big items which are at the beginning paragraphs of each of the sections.

CHAIRMAN RYAN: Right.

MR. O'DONNELL: You know, I prevented, I corrected, or at least I have an early detection program. I've worked very vigorously and tried to use whatever the best techniques today. And, hopefully, this will satisfy your regulator a little bit better. That's kind of the most obvious reward, would still save you a tremendous amount of money in legal fees, and he's not going to tell you go out and do --

CHAIRMAN RYAN: Yes, I'm not spending a lot of my management time on regulatory issues, but then there's the other aspect. If I do make disposals today, and I don't store material on-site, my burden on potential problems is lower, so maybe my decommissioning requirement shouldn't be so high. I just -- I really think at some point that this is an ongoing, even said in the documents, life cycle requirement. I'm looking for some ongoing life cycle benefit. I don't think that's an unreasonable concept to explore.

MR. OTT: I would like to make one brief response to that, I guess. We licensed 103 or 107 nuclear power plants. We didn't design any of them to leak, or give us problems with decommissioning. We designed them to be the best that the industry and science could design at the time. But yet, today, we continually see problems. The greatest benefit that I could see coming out of this, is learning from all those problems, and having a generation of plants that doesn't experience them.

CHAIRMAN RYAN: Don't disagree one iota. I'm not talking about the power plants, I'm talking about the thousands of agreement state licensees, NRC licensees that are going to have to deal with this, tens of thousands, not the hundred power plants.

MR. OTT: And I agree with you, both about the fact that we haven't culled out the materials licensees enough.

CHAIRMAN RYAN: Right.

MR. OTT: As I admitted at the very beginning, we had focused on reactors because that's the thing we have to deal with this fall.

CHAIRMAN RYAN: And maybe this one should be titled so that's clear, that another one will come later.

MR. OTT: The problem is that, to the extent that these other licensees have the same kinds of facilities, the same kinds of concerns arise, so if they've got a liquid rad waste treatment system, and they've got liquids, and they want to use double-walled pipes, and --

CHAIRMAN RYAN: My guess is that's a handful, Bill.

MR. OTT: It could be. I don't know.

CHAIRMAN RYAN: It's a handful. Trust me.

MR. OTT: Okay.

CHAIRMAN RYAN: There's not a huge number of folks that have these complex systems in their facilities, because we don't do any reprocessing. Even nuclear medicine is relatively modest, in terms of --

MR. OTT: But if, as a result of being if we do have reprocessing facilities, then a tremendous amount of this is going to apply to those reprocessing facilities.

CHAIRMAN RYAN: When and if.

MR. OTT: When and -- agreed.

CHAIRMAN RYAN: Not going to let you off the hook. The other thing --

MR. OTT: It's a matter of degree. I mean, if you've got a small mom and pop operation with a very small set of sources, they're going to close it and not pay any attention to it.

CHAIRMAN RYAN: I'd like a small rebuttal on the issue of 100 reactors designed to the best of the day. Remember at that day and time, using thousands of curies of Tritium to do TRACER studies in groundwater was perfectly acceptable, so the whole mindset was different, on what a proper design was.

MR. OTT: Yes. I mean, everything is -- we've advanced 40 years in our design knowledge, our materials knowledge, everything else.

CHAIRMAN RYAN: And what's appropriate in the environment and what's not, so I think that's, certainly, something for additional conversation. But, again, the two main points is, I think you need to think about, not just the reactor audiences. And there's a third audience, which are all the agreement state program folks that are going to have to implement this. So they're going to need some guidance on what proper implementation is, so you're going to evaluate them through the impact program on it. So that's one. I think we said enough about the other ones. I'll leave it there. Thank you.

MR. OTT: Okay.

MEMBER CLARKE: Okay. Allen, this time I mean it.

VICE CHAIRMAN CROFF: Easy for you to say. I'm just going to endorse a lot of things Mike has said in the past.

CHAIRMAN RYAN: Thank you.

MEMBER CLARKE: Is that it? Okay.

Bill.

MR. O'DONNELL: They're trying to pass so they can get to the roundtable, Bill.

MEMBER HINZE: I think so. Well, I'm not going to let them. Let me ask you a question here regarding this paragraph that you inserted regarding the demonstration of compliance, and you've praiseed that in slide 4. I wonder if you ever gave any thought to defense-in-depth as part of the consideration?

We understand that there are failures in our engineering. We have limitations in our science. There are failures, and one of the things that we do in building nuclear plants is we have the defense-in-depth. Why don't we have a defense-in-depth here in terms of demonstration of compliance?

MR. O'DONNELL: Yes, we've got -- yes, that's a good thought, because we have it buried several other places, particularly when we talk about anything leaked, should have double-barriers. But yes, conceivably, it could be mentioned up through here.

MEMBER HINZE: Yes. We seem to have forgotten that whole concept in nuclear waste. We have it at Yucca Mountain. We keep -- at least it's in the back of our mind. We have engineer barriers, we have geological barriers, and we don't rely on either one entirely, or at least we feel we shouldn't.

Let me ask another question. There seems to be a focus here, or at least some of your initial comments focused on detection of leaks, both liquid and gaseous. What's the state-of-the-art in terms of the detection, the early detection, if you will? And what is being done by the NRC to make certain that we can do this, your prevention, early detection? Can we really do a good job at early detection?

MR. O'DONNELL: Well, it's a -- I realize you're coming at it as a geophysicist, from a geophysical thing, but it depends what you're talking about. We've heard the discussion from AP 1000 about the fuel pool. Gee, if the things is suspended up in the ceiling, and you can get underneath it and look at it, and visually you don't need any fancy geophysical technique. Beyond that, I really can't provide you too much more than what you already know, in terms of detection techniques.

MEMBER HINZE: Well, if it's no more than I know, then we have got a long way to go.

MR. O'DONNELL: Yes. Some of those simple, easy things are very, very good. The very simple, easy things. For example, you had a pipe, and you put it in a fine, sandy loam, easy to pick up, change the resistance. It's easy to do that. That could be done.

MEMBER HINZE: Right.

MR. O'DONNELL: Sensor, these kinds of things can be done.

MEMBER HINZE: This becomes difficult when you get the very small quantities. And you can -- I can dream up all kinds of scenarios in which your detection system would flunk the course, believe me. What about soil gas? Is this a concern in terms of contamination?

MR. O'DONNELL: Gee, I don't know. And, again, I'm many years behind the times on soil gas detection, because I worked for a company, we used to do expiration using that technique. The technique is there, you know.

MEMBER HINZE: Okay. Since I only want my three, I recall when I was in the service, the mantra was preventative maintenance. In other words, you change the carburetor before it went, because when you want to use the vehicle, you had to use it. Is there any protocols for understanding when you will have failures of mechanical systems, or electrical systems, et cetera, so that you can replace or maintain before it fails?

MR. O'DONNELL: Gee, obviously, it's going to get very specific to whatever valve, pipe you're talking about, plant.

MEMBER HINZE: Yes, but I think there should be some general protocols on this. I don't think one needs to be --

MR. O'DONNELL: On this one, I'd have to defer to some of the power plant fellows in the room, and I don't see anybody putting his hand up, or rushing up to the table. Maybe at the discussion, they will run up and talk about it.

MR. DAROIS: I can share with you, and I'm not an expert on this at all, but I just know the key words and tricky phrases. But I know EPRI's NDE group is working on - Non-Destructive Evaluation Group - is working on trying to develop a guided way of inspection methodology for something like buried pipes, that will detect wall thinning and that sort of stuff before it fails. I mean, that's a microcosm of what you're asking, but that's one example I'm aware of.

MEMBER HINZE: Sixty years ago I tried to use that to destroyed airfields with an atomic weapon, and it doesn't work. I mean, guided way is tough going.

MR. DAROIS: Yes. They've perfected it in the oil industry, apparently.

MEMBER CLARKE: Okay. Ed, thank you very much.

MR. O'DONNELL: Okay. Thank you.

MEMBER CLARKE: What I'd like to do now is stay where you are, and if we could ask the other presenters to come to the front.

(Off the record comments.)

MEMBER CLARKE: Other presenters who are still here, hopefully, can you come to the front?

MR. O'DONNELL: Ralph is still here, Jim is back there, and Bill Ott, why don't you come on up here, too.

(Off the record comments.)

MEMBER CLARKE: Welcome back, everyone, and we're officially into the roundtable, and there are a number of ways we can do this. I suspect we'll do them all. But Mike gave us some things to think about, we could start there. And I thought those were awfully good questions, and it would be good maybe just to go down the line of the folks in front, and see what your thoughts are. And as I recall the questions, Mike, you asked for the top five that could have the most impact.

CHAIRMAN RYAN: Yes.

MEMBER CLARKE: And what do you think about decommissioning metrics. What are your thoughts about that? How do you know when you're on the right track, when you're done, when you're doing what you should do, given all these other things that we've been talking about? Is that a fair --

CHAIRMAN RYAN: Yes, I think the first one is pretty straightforward. From your experience, whether it's design, operation, or both, what do you get the biggest reduction in risk, I mean, from any point of view you like, in the things that you've done and designed, or you're going to do in operations and so forth? I mentioned in talking to Ralph that I think the MPO measurables, for example, go a long way at looking at reducing worker dose, and water quality has been a key issue, and that's resulted in a lot of benefits in decommissioning, and clean-ups, and outages, and lots of things have fallen out of that. That's one.

And then the second one is not so much what do you think of metrics, but more, if I'm going to implement the guidance, and the regulation, it's my favorite question to ask a regulator - how do I know I'm done? When am I done? Tell me what you want, I'll do it, but tell me when I'm done. That's it.

MEMBER CLARKE: Well, I guess in this case you're done when you meet the standard.

CHAIRMAN RYAN: What is the standard?

MEMBER CLARKE: Yes.

CHAIRMAN RYAN: That's my point.

MEMBER CLARKE: If you want unrestricted release, we know how -- but the question may be more, how do I position myself so that when I get to decommissioning, I will be able to do that.

CHAIRMAN RYAN: Well, it's a little bit more complicated than that, Jim, I think. And, again, let me try and refine the question. For reactors, I understood a lot of what was in the Reg Guide, and it made a lot of sense to me how piping is designed, and systems, and simplify them, and lots of those kinds of things. But, again, I'm thinking from a broader perspective of thousands and thousands of licensees in agreement states, and non-agreement states that are going to have to deal with this in some form or fashion. Their goal is going to have to be, when am I done? How much of this do I need to do? And what's my finish line? When do I know I've accomplished my goal under this regulation? Whether it's a reactor, or whether it's a licensee that has 300 curies of XYZ, that he uses in a chemical process to produce some radionuclide for an application, or whether it's sealed sources in a radiation facility. What do I need to do to meet this requirement? I'm ready for decommissioning. So it's a big question, but I think it's an important one for the Guidance to somehow address. And the top five list is what's really worked. Not having underground pipes that you ignore for 20 or 30 years is probably a good example.

MR. DAROIS: I think we know better what didn't work.

CHAIRMAN RYAN: Yes. And, therefore, you can say what you would do to avoid it. I'll be quiet and listen for a while.

MEMBER CLARKE: Eric and Ed, if you want to jump in and give us your responses to this. Obviously, keeping stuff out of the groundwater is a big plus when you get to the end.

MR. DAROIS: Well, I was going to add to the discussion some of the points you brought up, Ruth. And that was, how much money do we spend in these measures? I'll reiterate something that Jervan Nordnan, who is the licensing manager Connecticut Yankee presented at the last NEI groundwater meeting. He, basically, said, and I think I've got the number about right, that the groundwater and soil contamination at that project cost $75 million. So I don't know if that's a lot or a little in terms of design considerations. How much does it cost to line a PAV with a half-inch stainless steel? I don't know, is it 10 million, is it 30 million, 200 million? I have no clue, but that's --

MEMBER CLARKE: It's not 75.

MR. DAROIS: It's probably not 75. That's not the only problem that would cause that amount of money to be spent. And all that is is one data point, too, so --

CHAIRMAN RYAN: But it's a principle. I mean, to me, Eric, the principle is avoiding large volume soil contaminations with material that doesn't meet decommissioning requirements is number one in the hit parade kind of issue for me. That's where a huge amount of extra money gets spent on decommissioning any facility, that's one.

MEMBER WEINER: And that's a good example.

MR. DAROIS: It is.

CHAIRMAN RYAN: You know --

MR. DAROIS: Be better off saying let's not put these design considerations, and put the money in the bank, and 60 years from now we'll have $700 million to draw from, you know, because it's grown in interest that much, and we're better off doing it. It's the inverse of what we're talking about here, I understand. There's still that cost-benefit.

CHAIRMAN RYAN: And I'm just looking to see what some of the others were.

MR. ANDERSEN: Well, it seems to me that a starting point, and this actually came out from the operating plants under the groundwater initiative, is to understand where your risk is. And as a consequence, one element of that initiative was for people to review the systems in their plant in terms of, not highly quantitative, but in a qualitative sense of relative likelihood of failure that would result in leakage into soil or groundwater, and then what the consequence would be. What are the activity levels that are in those systems? And we do that for accidental analysis, so it would strike me that that would be one of those top five, is to be able to lay out such an evaluation, and then explain what actions were taken in terms of design or proposed operational programs to mitigate that. Because, again, that's fundamental to what we do in the accident space.

CHAIRMAN RYAN: So if I may just kind of restate it, I think you're -- and I hear you saying, and I agree with you, that if I develop a plan that recognizes that my facility sits on resources, which are the soil and groundwater, and surface water system that I'm on, and that's around me, and I have to understand my plant's potential - I mean, plant facility, licensee's activity, whatever, at whatever level, I need to understand my potential impacts on that system from my proposed operations. That's as important as, am I going to be safe in the laboratory, or the reactor space, or wherever.

MR. ANDERSEN: Again, if you translate it into ALARA space, you lower the doses. You don't run off and spend 1,000 person-hours planning a job that's going to have one person millirem of dose, so in the initiative, whatever everyone did is, they went out and they ranked their systems, and their configurations, and said - simple things, like where do I have a direct interface with soil, or the outside world? And where I do have such a direct interface, how much activity do I have in that system? As you mentioned, the concentration level is already below what you would have to mitigate, that wouldn't be a very high priority, even if there was a high likelihood of failure. But this goes back to systematic approach. To me, that would be step one in any design evaluation, preceding figuring out where I would end on all these measures. And I really think the designers either overtly, or implicitly probably did that. Gee, spent fuel pools, it's not very difficult to start with that, and say what's my configuration for that, and fuel transfer canal, that's where the radiation is, and sort of work from there, primary system, secondary systems.

MEMBER CLARKE: There's another piece to this. Again, I wouldn't necessarily conclude is something everybody should do in every instance, but the chemical processing, and others have developed ways of doing what's called a groundwater vulnerability analysis, and now you're bringing in the site-specific characterization, that you need to determine if you do have a release, then where is it going to go? How much time do I have to do something about it? Where do I need to put detection systems? How am I going to deal with it, if it happens? And that's -- Ralph, I think that's another systematic way of looking at some facilities in some locations. Again, I don't think it's a general thing. It's something for everybody, is your point. Right? If you get beyond reactors and material sites, and you have the other cases, but it strikes me from years and years of working on superfund sites that boy, if you get stuff in the deep soil, in the groundwater, you are into it. You're just flat out into it. And that ought to be right up there as something that needs to be prevented. Surface soil, one thing.

MR. ANDERSEN: Is that the term of art of groundwater vulnerability analysis?

MEMBER CLARKE: Probably.

MR. ANDERSEN: Ask somebody about that, what they recognize?

MEMBER CLARKE: I think so. Groundwater vulnerability analysis.

MR. ANDERSEN: Part of an adjunct to that, Mike, I would suggest going to the questions you asked. Maybe something that needs to be in the Reg Guide are really some front-end screening criteria, figure out where you stand. You made that comment about the other thousands of licensees. If you recall, in the decommissioning area, after the rule was finalized, that was really a first step, was to try to come up with screening criteria where people could simply be done, without having to go highly elaborate analysis to show that they're okay. So maybe conceptually putting something like that in the Reg Guide, where somebody can get to a point where they say I don't need to read the rest of this Reg Guide.

CHAIRMAN RYAN: Well, I think that's a real good way to get at it, Ralph. I mean, I can envision licensees that I know, that would say I have fairly substantial, but not fabulously big sealed sources, and I have a certain activity, and I'm done. Here's all my material right here, and I do surveys, and leak checks, and I'm done. That's it, the whole package is right here in front of your very eyes right now in the inspection, so I think -- and that may even be an exempt category, or just failure to control means failure to meet the new regulation, all the way on up to reactors. And having a graded approach might be a way to think it through.

Let's just talk about it two seconds more. If I've got all sealed sources, I'm probably less risky than if I've got sealed sources and solids. I'm probably less risky than if I've got sealed sources, solids, and liquids. And then if I have liquids and processes, I mean, you can kind of think your way through simple to complex, and come up with a half a dozen tiers of potential for problems, or the kinds of groundwater, or surface water issues come up, go up the scale. But I really think it shouldn't be one shoe fits everybody's foot here.

MEMBER CLARKE: Okay. Thanks. Other thoughts?

MR. DEHMEL: Yes. Let me add something with respect to - it seemed that the gist of the discussion focused heavily on decommissioning, and what happens at that time. Now what kind of design features do you have into the facility to facilitate decommissioning, as well as, well, if you have some contamination, depending what the levels are, it can be handled later on at the time of decommissioning. But as a technical reviewer looking at DCDs, design certification, as well as COL application packages in the near term, we're concerned about the immediate consideration of protecting the environment, minimizing releases of contamination of radioactivity in the environment, and complying with Appendix I and Part 20 requirements. So if I were to look at a DCD, or at a COL application, and if this Reg Guide were available to me as a tool, I would focus my review, and use that as a point of reference to determine whether or not the applicant has applied some minimum consideration in making sure that some design features incorporate some common sense engineering, and that some operational considerations have been taken into account, such that when the plant is operating, the focus would be on minimizing spills and leaks, and releases of radioactivity into the environment, both through -- define a release pathway, and unmonitored, uncontrolled release pathways.

Now somebody said well, is this too much of a checklist? Well, the technical reviewer uses a checklist, and march down literally Reg Guide, and say yes, you made this one, yes, you made this one, and you're done. But I think that -- I don't think I would use that as a checklist in that context. What I would do is the following. I think what I will do is the following, is focus on plant systems and approaches in the design, either DCD or the COL stage, where I know inherently those kind of systems and operational features would lead to potential leaks, much more than a sealed system, permanently installed system. And my focus is really right now on mobile and temporary system, because all the designs that are coming forward are focusing heavily on mobile skid-mounted portable system for treating waste, liquid waste, as well as solid waste. So I would look at a Reg Guide and say now, what are some of the design features that are proposed, sound engineering practices of these features that are proposed in the Reg Guide, and how did the applicant consider them?

Now, obviously, you cannot take the Reg Guide and start doing a sub-system by sub-system analysis. First, there's not that kind of detail. And, secondly, the Reg Guide is not enough of a checklist, if you were to do this. So what you would expect to do, what I would expect to see, the applicant look at the Reg Guide, and, for example, in the introduction of Chapter 11.2, where the focus will be, perhaps, on mobile liquid waste processing system, I would expect to see discussion to see, because we're going to be using liquid rad waste process system, we have evaluated this Reg Guide, and based on that, we have adopted the following engineering concepts, or design features for the purpose of essentially making sure that these portable systems once operating, once connected, will minimize the leaks and spills, and unmonitored, uncontrolled releases to the environment.

And these are the kinds of things I would look, and essentially see how they've met that requirement, by essentially saying these are the design features that we're proposing. So it's not really a checklist in the context of checking item by item, but it's more kind of design philosophy outlining example of engineer design features that if you were to look at at a mobile liquid waste system, and you could say well, how is this going to be put into the plant? How is that going to be connected? So the first thing you think about, for example, are truck bays. That, essentially, by definition a truck bay offers a ready-path to the environment, because you have to be able to bring the thing in and out.

If it's mobile, that means it's going to be connected to permanently installed plant system, that means you have to have some sort of connections. What kind of connections are those going to be? Will they be, for example, hard piping, self-sealing, quick disconnect features? So these are the kinds of things that would look as to the operational and the design philosophy, that an applicant would propose, and say they've considered the fact that there are going to be a lot of connections made and broken to install the system and change it, that in that consideration, the following type of features were folded into the design. And look at the Reg Guide in that context, as opposed to using it as a true checklist, because then the Reg Guide does not have that kind of detail to be able to use it really as a checklist.

MR. KIRSTEIN: But doesn't the problem still remain then, when are you done? I mean, it's still open to interpretation of what design features exist to minimize the possibility of contamination? Being a vendor, we like checklists, because then we know when --

MR. DEHMEL: Right.

MR. KIRSTEIN: And that's kind of where I'm kind of struggling with that.

MR. DEHMEL: Well, look at the dilemma the staff has. For example, right now at the DCD stage, a commitment is made to install or to ultimately propose the use of a liquid rad waste processing system. It's portable, it's mobile, but the DCD does not provide any specific details, so if we were to use a Reg Guide, we would look at this and say well, you can't really apply the Reg Guide in the level of a checklist, because the way the DCD describes the system, it's very nebulous. So how would you then be able to use a checklist even more detailed than a Reg Guide, against a system that's being presented as a black box? Here's a bay where this system will be brought in place. We don't have the design detail now. It's going to be the responsibility of the COL applicant to provide the detail, so how does a reviewer deal with that kind of situation at the DCD stage?

The only thing we have, if we were to use the Reg Guide, and look at these conceptual design features and say well, yes, they described the fact that if you're going to have these quick disconnect system, these pipes and so on, they're going to be self-sealing. Well, to me, that's a step in the right direction.

CHAIRMAN RYAN: I think, Jean-Claude, I

don't disagree with you. I mean, to me, I mean, you're picking on an example I noticed a little bit about, liquid rad waste systems. They're reviewed under 50.59 reviews. Right? Like 50.59 review, how do you do those? Well, you know, the potential is there to spill X gallons with these activities, and this is the clean-up thing, and this is what the consequences would be, and we block the drain, and we do all those -- I mean, and you're going to make a judgment based on that. At the end of the day, we've got to deal with the judgment somehow, but making an analytical judgment is a little bit more helpful than just saying I feel good about it. And it sounds like you're heading in that direction.

MR. DEHMEL: Right. At the DCD stage, the only thing we can say - all I can say as a reviewer, is that since there's not enough technical detail about how these interfaces will be made, then the only thing I can hope to look for in the DCD application is that these are the general design considerations we will provide for the interface of these systems, and there will be a few itemizing what those are. And that's the only thing I can look for, and that's the only thing I can hope for.

CHAIRMAN RYAN: But it's also fair to say that you're comfortable with, I think from what you've said, the notion of liquid rad waste systems that are mobile at this stage. That's not something that's, oh, my God, why would you even think that.

MR. DEHMEL: No, absolutely not.

CHAIRMAN RYAN: So, I mean, there is -- you're over one hurdle here, the liquid rad waste systems that are mobile, or temporary, will change out over time is not a bad thing. That's okay, in concept, and then the details will determine whether at the licensing stage it's okay, based on the specifics.

MR. DEHMEL: Then at COL stage, you would expect to see a lot more technical detail, because now at that point, the design is further down the line. There may be more information about the type of mobile rad waste system, maybe, maybe not. And so we would expect a little bit more engineering detail, and description. But the only thing I can tell you is, the Reg Guide is not detailed enough to do this kind of engineering checklist, the way it was envisioned and discussed earlier. It's just not that kind of technical detail to be able to say you're done, you're done, because it's obvious that the Reg Guide is not all comprehensive, to start with. Right? And then the question is, if we, the staff, were to review against the Reg Guide and say this is the master checklist, well, how can that be? So we could always be countered by the applicant to say no, no, no. We have a better idea, or your Reg Guide is wrong for th is particular instance, or that particular feature does not apply.

CHAIRMAN RYAN: And I appreciate the value of checklists in the design setting, but in the agreement state, or the non-reactor licensee setting there will be thousands of NA, NA, not applicable. So I'm not a big fan of the checklist approach, for that reason, it applies to everybody. If it just applied to reactors, so be it.

MEMBER CLARKE: I think what Jean-Claude is saying, though, is that he does not want the licensee to come away with that interpretation, that it is, in fact, a checklist.

MR. DEHMEL: I could not use it as a checklist.

MEMBER CLARKE: Yes.

MR. DEHMEL: I could not.

MEMBER CLARKE: Might not be all-inclusive.

MR. DEHMEL: Yes. And I realize --

MEMBER CLARKE: I don't know if the language is in the Reg Guide or not, but I guess I would suggest strongly that it become very clear to the potential licensee that you do not want them to interpret that as a checklist. You want them, perhaps, and I don't mean to put words in your mouth, but maybe these are things to think about, as you go through your system, and you decide how you're going to, in fact, minimize contamination. Is that fair?

MR. DEHMEL: Yes. Essentially, it's more because -- it's more of a design philosophy, design approach. Looking at the Reg Guide, identifying some section of the Reg Guide that would apply, for example, for liquid rad waste portable systems, that would look at, for example, how do you design concrete joints to make sure that there is no leakage between floor joints, and so on; as opposed to using it as an engineer - a detailed engineering checklist, because it's not that. It cannot be that, versus not -- it can't be all comprehensive. It's not.

MEMBER CLARKE: But do you think there's a danger that it will be interpreted as a checklist? Maybe I should ask the licensees.

MR. KIRSTEIN: No, I think I retract that statement, and I think you're correct. The level of detail in the DCD would not be able to give the reviewer an adequate feel for meeting certain checklist requirements. I think there has to be a happy medium in there somewhere. I agree.

MR. MENEELY: Well, but the level of detail of what Ed presented has a lot of checklist-type items in it, that someone could come back, whether it's at COL stage, or DCD stage, or at an audit later during operations, to say do your locker room drains go to your rad waste system? That's a pretty yes or no kind of question. That's a checklist, so it may not be directly about the liquid rad waste system, but it's about the plant. I guess I don't know why you would include this kind of detail in the Reg Guide, unless you were going to come back and regulate against it some day, or at least ask questions against it some day. As I say, maybe you can ask them at the DCD stage, but at some point you're going to ask them.

MR. ANDERSEN: Well, it would seem to me that unless the purpose of Reg Guides has changed substantially, that certainly, one primary purpose is to provide an acceptable means for demonstrating compliance with the regulation. And throughout FSARs that have existed for a long time, and even the new ones, the commitment to a Reg Guide is usually considered to be adequate, because you have committed to a method that is acceptable to the staff to demonstrate compliance. So what I would say is that, either as the licensee, or as a reviewer, if you believe the Reg Guide is missing information that satisfies that need, however it's constructed, then it's an inadequate Reg Guide. I want a Reg Guide that tells me how to comply with 20.1406. We're not going to get that, stop the train. I don't want a Reg Guide that is interesting information, but does not provide a method that is acceptable to the staff. So if I were providing an application, which, of course, NEI isn't going to build a reactor, I would expect that, one, I would make a definitive commitment to the Reg Guide, or take exceptions to it. And then, two, I would provide you sufficient illustrative information on all the things that you've talked about, that you could determine from that, that, in fact, I've complied with 20.1406. Because that's the conclusion we need to reach, is that I complied with that requirement.

MR. DEHMEL: But the industry does that already. If you look at the DCDs, the first section of all the system design-basis, it looks at the Reg

Guide, it looks at a regulation, and it provides essentially a discussion as to well, this design - this system is designed as follows. It's in compliance with the following design-basis to Reg Guide, and so on, and it goes on and provides the text to support those statements. So what is so different now about Reg Guide, this Reg Guide 20.1406? Why are we stumbling on that? I don't think we should. It's no different than any other Reg Guide.

MR. ANDERSEN: Except that it doesn't exist. But said differently, and I would think - let's just pretend I'm not a reactor licensee, just to satisfy the broader need. If I made an application, and you challenged me that it was incomplete under 20.1406, and if there is a Reg Guide that provides a method acceptable to the staff for complying with 20.1406, then if I felt that I had developed the application consistent with that Reg Guide, my challenge to you would be well, show me how I didn't meet the Reg Guide. Where did I not meet the method that was acceptable to the staff? So the Reg Guide should be sufficient for that, because all the other Reg Guides are.

Charlie weighs against 8.8. He doesn't just make things up that aren't in 8.8, and say well, you should also have this.

CHAIRMAN RYAN: Let's take a second and read the regulation. I think that -- I just did that, and it was real interesting to do that after these couple of hours. "Applicants for licensees and renewals after August 20th, 1997 shall describe in the application how the facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, and facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste." That's a mouthful.

MR. ANDERSEN: For instance, the standard is not prevent unmonitored, and uncontrolled releases.

CHAIRMAN RYAN: Right.

MR. ANDERSEN: It is not that.

CHAIRMAN RYAN: Right.

MR. ANDERSEN: There is no such requirement.

CHAIRMAN RYAN: So, again, I kind of cycle back to, there's a whole range of facilities. It might be helpful to have a little bit more in the preamble information on what are the range of facilities, and how does all this apply to me? If I've got 20 sealed sources and three vials of standards, it's pretty easy. And I think if this is going to apply to everybody, we really need to think, not just in terms of the harder ones, and the more complicated ones, but really get across the whole spectrum of licensees with some graded approach, shall I use that whole term.

(Off the record comments.)

MR. OTT: I want to offer one additional observation about that, and I'm glad you actually read the regulation out, because it focuses on new facilities, other than renewals?

CHAIRMAN RYAN: Right.

MR. OTT: I think that's going to relieve a lot of the burden on materials licensees. It's only new facilities that have to comply with this regulation at this time. On the other hand, I do agree that we need to put some introductory material in the Guide to point out that even those new facilities need to look at this with a special eye towards what applies to them, what's relevant to them.

CHAIRMAN RYAN: You need to tell them what that special eye is. They don't need to figure it out on their own. That's my point.

MR. OTT: Right.

CHAIRMAN RYAN: I mean, if I was an

applicant and I said all these things apply, and I'm looking for relatively small activity, it's going to drive me crazy to go through that.

MR. OTT: Well, we might be able to do it by, as you said before, sealed sources, sealed sources and solids.

CHAIRMAN RYAN: Yes, I guess in petitioning -- yes, that would be helpful, too.

MR. OTT: If we did that by cases of licensees, then we might be able to do something.

CHAIRMAN RYAN: Classes or something. I think that's -- and maybe there's even over X thousand curies, or under this, or some kind of --

MR. OTT: But in terms of the total burden, it shouldn't be as much of a shock as we were thinking earlier, because I had totally lost track of the fact that we are dealing only with new facilities here.

CHAIRMAN RYAN: Well, we're dealing with a decade of new facilities, at least, plus whatever comes now. I mean, that's ten years old.

MR. OTT: Right. Well, yes.

CHAIRMAN RYAN: That's not exactly yesterday.

MR. OTT: Good point.

MEMBER CLARKE: We're coming down the home stretch. We've got 15 minutes left. Let me ask the panel and the Committee if they have any questions that they've been holding. I think discussion has been very helpful. Any more responses to what we've been talking about from you folks? I do want to give our panel and our Committee another shot.

MR. ANDERSEN: Something we haven't talked about, and I'm not sure that even in 15 minutes we could get started, but it's an idea that we're going to take back, and that's this idea of a metric. I think that's essential. The measure of when you've done enough shouldn't be the number of things you've done, or the amount of words you put in an application, or the level of detail. It should be that you've met a standard that can be objectively weighed. And even though you may not be able to get to that quantitatively, we ought to, at least, be able to ultimately have a qualitative metric that we're aiming at. Because I think the question we had earlier about what's the end-point, what are you really trying to accomplish here? I mean, we all know we're trying to make the world a better place. I understand that element of the regulation. I just don't know beyond that, what it is we're actually trying to accomplish, until there's been some discussion of that, and that shows up in a Reg Guide to help understand it. But I just offer that thought. I think that's a very fruitful area for further thought.

MEMBER CLARKE: Eric, and Eric, and Eric. Three Erics.

MR. DAROIS: Well, I had a few things from earlier. I guess we're going to change topics a little bit. And this is kind of a little bit all over the map, so I've just got a few items. One is, on the 1406 Reg Guide, there's a small paragraph in there that deals with 10 CFR 50.75(g), and I would assume 30(g), as well. But just a commentary on 75(g), that the interpretation of what you need to put in your 75(g) file is still not particularly clear across the industry, and I'll give you two examples. One is, where one utility records everything, every contamination area that's set up in the radiological control area of the plant, which I don't think that's the intent of 50.75(g), especially if it doesn't impact decommissioning costs. And then there's examples on the other end of the spectrum. I don't know if we need to consider expanding that a little bit, and providing some additional guidance somewhere on what 50.75(g) events get recorded. I know my answer, but I'll leave it at that.

With regards to one thing that was said a couple of times today, that certain systems should have double containments, which, again, sounds like a great idea all over the place, but think about spent fuel pools when that statement is made, and I don't know if that's double containment or not, because there's fuel cladding in place, and then there's a liner. But if that's the interpretation, then also realize that we've had spent fuel pool leaks with that configuration for a variety of reasons.

That's probably my most significant stuff, so I'll give other folks a chance to talk.

MR. ABELQUIST: Well, my big issue has been addressed several times. That's having performance-based objectives or criteria for implementing 20.1406. The only other point I'd throw out that I thought about when I initially went through this, when I think about decommissioning, I first think about the real work, actually digging soil, knocking down buildings, pulling out rubble, debris. But another important, sometimes very costly part of decommissioning is the final status survey. I know when we did it for Fort St. Vrain, that turned out to be a humongous aspect of the overall cost, and so in that context, if we think about what drives up the final status survey costs, one of the big issues is, for any type of facility, if there are alpha contaminants that have very low DCGLs, which they do based on the screening model we typically end up using, that adds up to be just a terrifically expensive part of the overall final status survey, which is the final part of decommissioning. And so, anything that we could add to help out in the overall D&D facilitation that addresses the final status survey aspect would be probably helpful.

MEMBER CLARKE: Anyone else on the Committee? Anyone else?

CHAIRMAN RYAN: We had a couple of comments here. You need to come up to the microphone and tell us who you are.

MR. BLAND: I'm Stewart Bland with Chesapeake Nuclear Services. Mike, I wanted to point out, is that in the non-reactor licensee, in the NMSS consolidated guidance, quite a few of those, there are specific words in there that do address 1406, basically saying is that if you do your design and evaluation programs as laid out in the consolidated guidance, that is sufficient for addressing 1406. So

I think in terms of the Regulatory Guide going forward, looking back at that NMSS consolidated guidance, and linking to that in some fashion, I think it's going to answer a lot of the questions you have.

CHAIRMAN RYAN: Maybe that's the hook, is if it can be linked back to that. I didn't realize that was in there. I haven't looked at that guidance. Thanks. That's great.

MEMBER CLARKE: Thank you. Bobby?

MR. EID: This is Bobby Eid from Division of Waste Management. I think you asked lots of good questions, and the solutions to most of those questions actually in NUREG-1757, categories of the sites, classifications for the sites. I believe it would be good to use this kind of classification in the current guidance, so it can be some kind of guidance when to do all of this list, or checklist, so to speak, and when not, because for sealed sources, you do not need to do all of this kind of checklist that we're talking about, because it will be confusing for the audience, will be confusing for the agreement states if they think that everything is to be applicable, so I agree with your comments.

CHAIRMAN RYAN: That's great. Thank you.

MEMBER CLARKE: Anyone else? Any other

comments, questions? Anything you folks would like to say in the few minutes we have left? If not, let me thank you all very much.

CHAIRMAN RYAN: Come on up, Bobby.

MR. EID: One issue was raised that Eric Abelquist mentioned about using the decommissioning criteria, which is 25 millirem. It is good idea; however, you will know exactly what is the status of decommissioning and the scenario to be used. So the 25 millirems when it comes translate to actual concentration could be different depending on the scenario. So if you assume green field and residential apartment, of course, concentration would be different; whereas, if you assume some kind of restrictions for the site, or other kind of scenario, like industrial scenario, so the concentration could be different completely.

In addition, also, the groundwater protection required by EPA needs to be taken into consideration, because some licensees in the states, they try to comply with EPA groundwater protection. That's another issue, too, to be taken into consideration. Therefore, when you consider about the decommissioning criteria to comply with, you need to think about the flexibility for what is the site at the end is going to be used for. Otherwise, you try to clean up to the atom, so you don't want to spend the cost in advance specifically when you assess decommissioning cost early in the process. Thank you.

MEMBER CLARKE: Those are good points, Bobby. Thank you.

Okay. Well, let me thank you all very much. This has been very helpful, very interesting to us. Let me thank Derek Widmayer for pulling all this together, Eric Darois, Eric Abelquist.

Mr. Chairman, back to you.

CHAIRMAN RYAN: Let me add my thanks to all the panel members, and staff, and guests. We really appreciate it. This has been a very fruitful afternoon discussion, and I'm going to guess just for everybody's benefit, we'll probably put together a letter on this, specifically, and communicate that forward, as we normally do. So I appreciate everybody's input, and with that, we will adjourn today's meeting, and adjourn the session. Thank you all very much.

(Whereupon, the proceedings went off the record at 4:54 p.m.)

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 180th 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.

Charles Morrison
Official Reporter
Neal R. Gross & Co., Inc.

Implementation of 10 CFR 20.1406

Ralph L. Andersen, CHP
Director, Health Physics & Low-Level waste

NEI
NUCLEAR ENERGY INSTITUTE

Prologue

- Industry has many public meetings with NRC on 20.1406 and related regulatory guidance
- Industry has shared lessons learned from:
  - New plant design reviews
  - Decommissioning experience
  - Groundwater protection initiative
- Industry and NRC continue to inetract through the New Plant TF on RP & Radwaste

NEI 2

Examples of Groundwater Protection Considerations for New Plants

- Structures and Outside Areas
  - Grid system to create zones of influence
- SFP & Transfer Canal
  - Single continuous pour
  - *Leak detection system*
- Piping
  - All ties between RW and discharge lines should be located inside buildings
    - Control leakage
    - Facilitate inspection and repair without excavation
- Tanks
  - Prohibit underground tanks in all cases
  - No field fabricated flat bottom designs
    - Significant industry experience (Oyster Creek, Connecticut Yankee, others)
- Inspection and Integrity testing
  - Design should address frequency of inspection needs
    - platform versus ladder, removal decking, hinged manways, etc.
  - Design should accommodate internal inspection equipment access
    - Traveling probes, cameras, robotics, etc.

NEI 3

Examples of Decommissioning Lessons-Learned

- Embedded Piping
- Concrete Contamination
- Fuel Pool Cooling (during decommissioning)
- Decommissioning "Cold & Dark" Approach

NEI 4

Requirement

§ 20.1406 Minimization of contamination.

"Applicants for licenses, other than renewals, after August 20, 1997, shall describe in the application how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste."

NEI

Intent

"The intent of this provision is to emphasize to a license applicant the importance, in an early stage of planning, for facilities to be designed and operated in a way that would minimize the amount of radioactive contamination generated at the site during its operating lifetime and would minimize the generation of radioactive waste during decontamination." (62 FR 39082)

NEI

Intent (continued)

"Specific minimization requirments contained in the proposed rule are directed towards thos making application for a new license because it is more likely that consideration of design and operational aspects that would reduce dose and minimize waste can be cost effective at that time compared to such considerations during the license renewal stage where the existing design and previous operations may be major constraints." (62 FR 39082)

NEI

7

Key Concepts

- emphasize the importance, in an early stage of planning
- minimize, to the extent practicable
- facilitate eventual decommissioning
- consideration of design and operational aspects
- cost effective

NEI

ALARA Analogue

§ 20.1101 Radiation protection programs.

(b) The licensee shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA).

NEI 9

Regulatory Guide 8.8 (ALARA at Nuclear Power Plants)

"Attaining the following objectives to the extent practicable throughout the planning, designing, constructing, operating, maintenance, and decommissioning of an LWR station will be considered to provide reasonable assurance that exposures of station personnel to radiation will be ALARA."

NEI 10

RG 8.8 (continued)

"The methods are deliberately stated such that considerable flexibility can be used in a manner by which the objectives can be achieved. Differences among stations might necessitate further innovation in methods used to achieve the objectives."

NEI 11

Additional Key Concepts

- Emphasize a systematic approach, rather than prescriptive "to-do list."
- Provide considerable flexibility
- Recognize differences between plant designs and station operations
- Enable and expect innovation (consider an appendix or separate document for the catalog of ideas)

NEI 12

Implementation Considerations

- First-time implementation in certification and licensing processes
- Regulatory guidance (RG) will follow certified designs, certifications in progress, and COLs in various stages of preparation and submittal
- Very broad scope –all phases and most disciplines
- Many lessons (in process and in substance) will be available to be learned

NEI 13

Implementation Suggestions

- Allow ample time for comment on the draft (at least 90 days)
- Issue as a draft "for interim use' and continue to receive feedback
- Plan a workshop after a period of implementation to review experience and lessons-learned

NEI 14

Structural Suggestions

- Emphasize objectives and systematic process in the regulatory guide, including key elements to be addressed
- Capture specific examples in a separate technical document (NUREG?)
- Periodically update the technical document with experience and lessons-learned

NEI 15

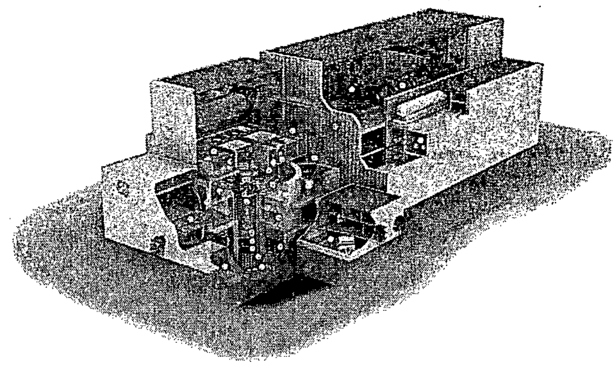
Summary

- Compliance with the requirement should be viewed as implementing an effective process, not completing a check list
- Regulatory guidance should encourage flexibility, innovation, and cost-effectiveness
- Remember –we are enhancing an existing framework and experience base –not starting from zero.

NEI 16

Working Group Meeting on Implementation of 10 CFR 20.1406

June 19, 2007



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DCD Revision 3 – Section 12.6.1

Examples of ESBWR design procedures for operation that minimize contamination and facilitate decommissioning include the following:

- Design of equipment to minimize the buildup of radioactive material and to facilitate flushing of crud traps;
- Provision to design features such as the Reactor Water Cleanup/Shutdown Cooling System and the condensate demineralizer to minimize crud buildup;
- Provisions for draining, flushing, and decontaminating equipment and piping;
- Penetrations through outer walls of a building containing radiation sources are sealed to prevent miscellaneous leaks to the environment;
- Equipment drain sump vents are piped directly to the radwaste HVAC system to remove airborne contaminants evolved from discharges to the sump;
- Appropriately sloped floor drains are provided in areas where the potential for a spill exists to limit the extent of contamination;

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DCD Revision 3 – Section 12.6.1 (cont.)

- Provisions for epoxy-type wall and floor coverings which provide smooth surfaces to ease decontamination;
- Equipment and floor drain sumps are stainless steel lined to reduce crud buildup and to provide surfaces easily decontaminated;
- For all areas potentially having airborne radioactivity, the ventilation systems are designed such that during normal and maintenance operations, airflow between areas is always from an area of low potential contamination to an area of higher potential contamination;
- The reactor building HVAC system is divided into two major components: the contaminated and clean areas. The clean area system conditions and circulates air through all the clean areas of the reactor building; the contaminated area system conditions and circulates air through the contaminated areas of the building;

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DCD Revision 3 – Section 12.6.1 (cont.)

- The Fuel and Auxiliary Pools Cooling System (FAPCS), equipped with two independent filter demineralizer units, is designed to reduce pool water radioactive contamination in the major pools in the ESBWR; and
- The ESBWR is designed to limit the use of cobalt bearing materials on moving components that have historically been identified as major sources of in-water contamination.

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DCD Revision 3 – Section 12.6.2

Examples of ESBWR design procedures for operation that minimize the generation of radioactive waste include the following:

- The Liquid Waste Management System (LWMS) is divided into several subsystems, so that the liquid wastes from various sources can be segregated and processed separately, based on the most efficient process for each specific type of impurity and chemical content. This segregation allows for efficient processing and minimization of overall liquid waste.
- During liquid processing by the LWMS, radioactive contaminants are removed and the bulk of the liquid is purified and either returned to the condensate storage tank or discharged to the environment, minimizing overall liquid waste. The radioactivity removed from the liquid waste is concentrated in filter media ion exchange resins and concentrated waste. The filter sludge, ion exchange resins and concentrated waste are sent to the Solid Waste Management System (SWMS) for further processing.

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DCD Revision 3 – Section 12.6.2 (cont.)

- The SWMS is designed to segregate and package the wet and dry types of radioactive solid waste for off-site shipment and burial. This segregation allows for efficient processing and minimization of overall solid waste.
- For management of gaseous radioactive waste, the Offgas System (OGS) minimizes and controls the release of radioactive material into the atmosphere by delaying release of the offgas process stream initially containing radioactive isotopes of krypton, xenon, iodine, nitrogen, and oxygen.

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DCD Revision 3 – Section 12.6.2 (cont.)

Examples of ESBWR design features that minimize the generation of radioactive waste during decommissioning operations include the following:

- Reduction of cobalt content in structural and bearing materials;
- Minimization of crud buildup in drains by use of stainless steel linings, improving drainage, and facilitating flushing; and
- Easing surface decontamination by providing epoxy-type wall and floor coverings.

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DCD RAI 12.7-1

Section 5.2 of NUREG/CR-3587 lists several decommissioning facilitation techniques that are applicable during the design and construction phase of a commercial nuclear power light water reactor. Describe to what extent each of these features were incorporated in the ESBWR design, or describe why the recommendation is not practical. Provide illustrative examples.

Response:

The basis for the response and DCD markups is the guidance from the October 10, 2006 NRC memorandum from Larry Camper to David Matthews (ADAMS #ML062620355), which consolidates many of the decommissioning facilitation techniques described in NUREG/CR-3587 "Identification and Evaluation of Facilitation Techniques for Decommissioning Light Water Power Reactors"

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DCD RAI 12.7-1 (cont.)

DCD 12.6.1 proposed additions (in red):

- Appropriately sloped floor drains are provided in areas where the potential for a spill exists to limit the extent of contamination. The floor drains are designed to be of monolithic construction and to minimize possibility of liquid penetrating at embedment boundaries. No grout is used in the installation of the floor drains. Periodic visual inspections of the installation around the floor drains will be performed to ensure that no bypass exists in these floor drain areas;
- To facilitate decommissioning, the Reactor, Fuel, Turbine, and Radwaste Buildings are all designed for large equipment removal, consisting of entry doors from the outside and numerous equipment hatches within the buildings;

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DCD RAI 12.7-1 (cont.)

- The mobile liquid radwaste systems are skid-mounted and are located in the Liquid Waste Treatment System bay to allow truck access and mobile system skid loading and unloading, to ease the decommissioning process;
- For some piping, feed-throughs with short sections, the piping may be embedded in concrete as discussed in subsection 12.3.1.2.4. Minimization of short sections with embedded piping to the extent practicable facilitates the dismantlement of the systems and the decommissioning of the facility;

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DCD RAI 12.7-1 (cont.)

- In consideration of minor leaks over long periods of time, the liquid radwaste system (tanks, piping, etc.), Radwaste Building, and the radwaste tunnels are designed to conform to Regulatory Guide 1.143. The spent fuel pool has a leak detection system to monitor any leakage during plant operation, as discussed in Revision 3 of DCD Tier 2, subsection 3.8.4.2.5. The underground tunnels to and from the Radwaste Building contain radwaste piping. The concrete in these tunnels is sealed for ease of decontamination during operation. The tunnels have floor drains to remove any fluid that potentially could leak from the piping. Plant procedures require periodic visual inspection of the radwaste piping in the tunnels; and

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DCD RAI 12.7-1 (cont.)

- There is no concrete block wall construction in ESBWR. Holes provided for removal of components are filled with interlocking metallic blocks filled with concrete for shielding purposes, as discussed in the last two paragraphs of DCD Tier 2, subsection 3.8.4. Therefore, there is no exposed porous concrete that could be contaminated, which provides for easier decommissioning.

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DCD RAI 12.7-3 S01

Response indicates that the Radwaste Tunnel is designed to the same standard as the Radwaste building, and that the Radwaste Building is designed to mitigate spills. What design features of these structures prevents leakage from piping and components housed in them from reaching the ground water or environment for the life of the plant? Are these continuous pour, reinforced concrete structures, with no seems or joints? Are there expansion joints at the interfaces between the tunnels and the buildings. If so, how is leakage prevented through them for the life of the plant? Are expansion joints accessible for inspection and maintenance? Do the radwaste tunnels have design features to detect leakage (large acute, or small long term) from the systems into these tunnels? Is there any contaminated piping in the ESBWR design that will be buried in the ground, not routed through one of the radwaste tunnels? Does the Spent Fuel Pool (SFP) have a double liner with a tell-tail leak detection system? The <u>additional information provided does need to be included in the DCD.</u>

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DCD RAI 12.7-3 S01 (cont.)

<u>Response:</u>

The leak detection and leak prevention design features addressed in this RAI were previously provided in the response to RAI 12.7-1 (MFN letter 07-222 dated May 4, 2007). Changes to DCD Tier 2, Section 12.6 were included with the response to RAI 12.7-1, and will be provided in DCD Revision 4. <u>The ESBWR SFP has a single liner with an associated leakage detection system as described in the response to RAI 12.7-1.</u>

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AP1000
Compliance with 10CFR20.1406
Westinghouse Technical Report 98

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AP1000 Fundamental Design Objectives

- **Compliance with ALWR Utility Requirements Document**
  - AP600 & URD were developed cooperatively
- **Increased Operation and Safety Margins**
  - Design Basis Accidents, PRA (core melt prevention & mitigation)
- **Licensing Certainty**
  - NRC Final Design Approval / Certification
- **Greatly Simplified Plant**
  - Simplified Design Simplifies Construction, Maintenance, Operation
  - Competitive Cost of Power
  - Extensive Use of Modular Construction
  - Short Construction Schedule
  - Improved Availability, Maintenance, Inspection, ORE
- **Integrated Power Plant Design**
  - Pre-Engineered / Pre-Licensed Standard Design
  - Standard nuclear island, turbine island, annex & radwaste buildings
  - Greatly limits (but does not eliminate) site-specific variations

Current AP1000 Design & Licensing Status

- **AP1000 Design Control Document Revision 15**
  - November 2005
- **Certified by USNRC**
  - Final Design Approval September 2004
  - Design Certification issued December 2005
- **AP1000 DCD Supplemented by Technical Reports**
  - Used to close open items, document design progress on standard basis
  - Reviewed by NRC (or scheduled for review)
  - May be referenced by Combined-License Applicants
- **AP1000 DCD Revision 16 Submitted in May 2007**
  - Request for revision of Design Certification
  - Incorporates TR's, provides overall update

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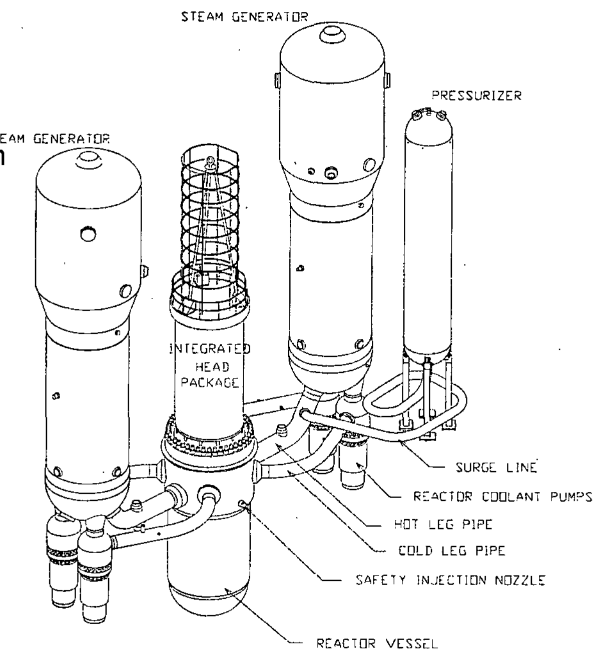
AP1000 Simplification – Primary Loop

- **Fuel, Internals, Reactor Vessel**
  - Integrated head package
  - No bottom-mounted instrumentation
  - Improved materials - 60 year life
- **Steam Generators**
  - Similar to large Westinghouse (CE) in operation - ANO RSG
- **Reactor Coolant Pumps**
  - No shaft seals
- **Simplified Main Loop**
  - Reduces welds 67%, supports 90%



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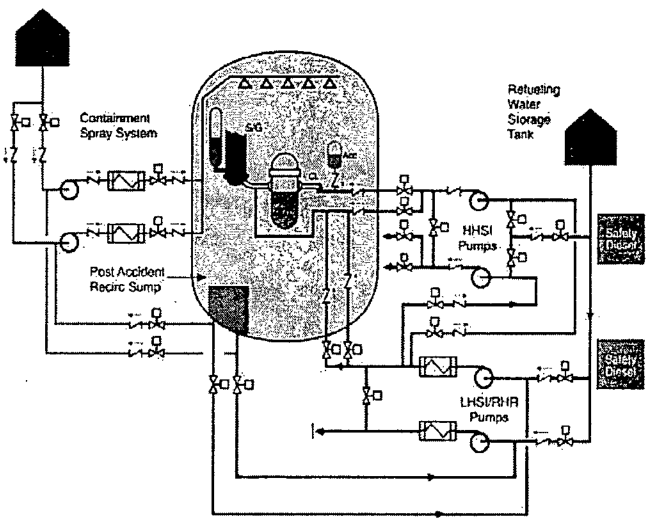
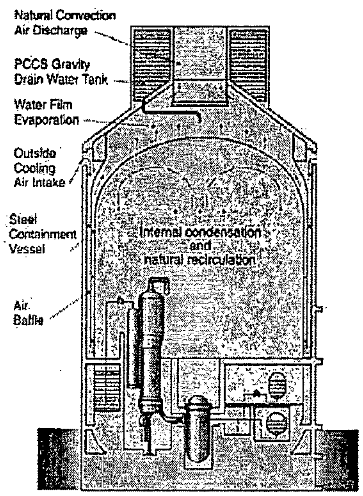
AP1000 Simplification – Passive Safety Systems

Standard PWR



AP1000



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AP1000 Simplification – Key RCS / Plant Features

- **No Boron Changes for Load Follow**
  - Gray control rods
- **Tight Systems – Minimal Primary Leakage**
  - Canned Motor Reactor Coolant Pumps
    - No seal leakage
    - No seal support systems required
  - Valve & Component Leakoff Minimized
    - Minimized Component Count
    - Packless & Enhanced Packing Valves Used Throughout

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AP1000 Plant Arrangement

AP1000 & 10CFR20.1406 History

- **1406 Was Not Specifically Considered in Initial AP1000 Design Basis**
  - AP1000 substantially based on AP600, which was pre-1997
  - 1406 was not discussed in AP1000 DCD through Revision 15
- **However, We Believe AP1000 Demonstrates Significant Compliance with 1406**
  - Good modern design practices are congruent with 1406
  - AP1000 emphasis on
    - URD Compliance,
    - ALARA,
    - Simplification
    - Utility review and operating feedback

AP1000 & 10CFR20.1406 Compliance Approach

- **AP1000 is a Single, Standard Design**
  - Maintaining standardization is critical for design, regulation, construction, operation
  - Standard design has limits - site-specific decisions do occur
- **Effort to Maximize 1406 Compliance Demonstration at DCD Level**
  - Many Important Plant Features Can Be Demonstrated in DCD
    - DCD Tier 2 Level Design Description
  - Some Aspects of 1406 Compliance are Site-Specific
    - Committed via DCD Combined-License Open Items
    - Addressed in COL SAR
  - Some Aspects of 1406 Compliance Require Policies or Operating Procedures from Licensee
    - Also committed via DCD Combined-License Open Items
    - Addressed in COL SAR or commitment made therein

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AP1000 & 10CFR20.1406 Compliance Demonstration

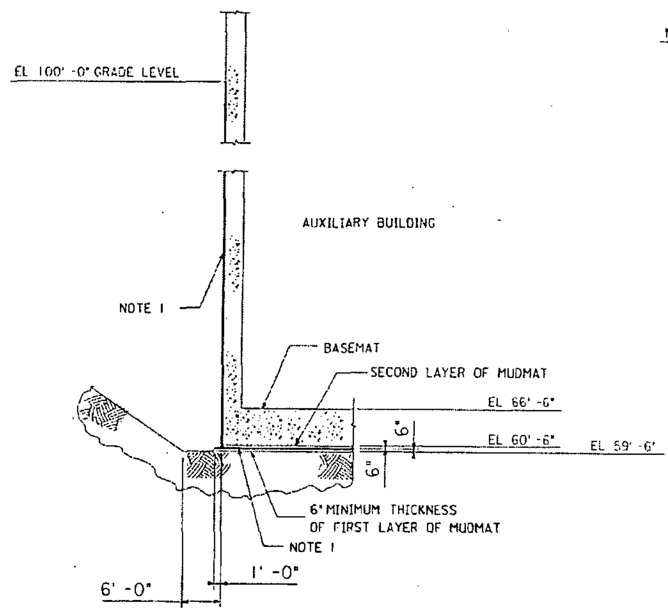
- **Need to Demonstrate Standard Plant Compliance in Timely Fashion**
    - USA COL Applications begin Fall 2007
    - China schedule is more aggressive
  - NRC Review Desired as Early as Possible to Avoid Divergence
  - 1406 TR Prepared January/February 2007, Submitted to NRC April 2007
    - Includes 1406 discussion, DCD markups
  - DCD Revision 16 Submitted May 2007 – Includes 1406 Discussion, Compliance
- **Resources Available for Reviewing With Respect to 1406**
  - DG1145
  - Industry Forums, Workshops
    - NEI / EPRI Groundwater Initiatives
    - EPRI Radwaste, ALARA, Groundwater Review Teams
    - AP1000 Buyer's Group Radwaste, ALARA, Radiation Protection, Layout Review Teams
  - NRC "Lessons Learned"
    - ML062620355 (October 2006) was a key resource
- **Ultimately, Westinghouse had lead for compiling the AP1000 position**

Westinghouse

AP1000 & 10CFR20.1406 Examples of Compliance

Feature	Reason for Inclusion in Design	Implications of Review for 1406
Source Term Minimization (TR98 Item #1)	Good design practice, ALARA, URD	No changes to design; DCD description updated to describe chemistry control capabilities as an ALARA / minimization of contamination benefit
Simplification (TR98 Item #2)	Fundamental to AP1000	No changes to design or DCD for 1406
Leak-tightness of Auxiliary Building (monolithic basemat, walls) (TR98 Item #5)	Good design practice, URD	No changes to design or DCD for 1406

Nuclear Island Waterproofing



NOTES:

1. HDPE DOUBLE-SIDED TEXTURED WATERPROOF MEMBRANE ON TOP OF FIRST LAYER OF MUDMAT AND ON OUTSIDE VERTICAL FACE OF AUXILIARY BUILDING WALL UP TO EL 100'-0" GRADE LEVEL (WITH PROTECTIVE SHIELD ON VERTICAL FACE)

AP1000 & 10CFR20.1406 Examples of Compliance

Feature	Reason for Inclusion in Design	Implications of Review for 1406
Prevention of leakage through doorways (TR98 Item #6)	Good design practice, AP1000 safety / security policies, URD, ML062620355	New design criteria, DCD description updated
Restrictions on application of concrete block walls (TR98 Item #7)	URD, ML062620355	Changes to design criteria, DCD description updated
Steel walls (large module construction), impervious coatings (TR98 Item #9)	AP1000 Modular Construction Approach	No changes to design or DCD for 1406

AP1000 Auxiliary Building Layout Elevation 66'-6"

AP1000 Building Modules

AP1000 & 10CFR20.1406 Examples of Compliance

Feature	Reason for Inclusion in Design	Implications of Review for 1406
Design for large component removal (TR98 Item #10)	Good design practice, Utility Input, URD	No changes to design or DCD for 1406
Minimization of embedded pipes (TR98 Item #11)	URD, ML062620355	Changes to design details and design criteria, DCD description added
Spent fuel pool designed to eliminate leakage to groundwater (TR98 Item #15)	Good design practice, URD, AP1000 Modular Construction Approach, ML062620355	No gross changes to design, changes to design details and design criteria, DCD description added

AP1000

AP1000 Auxiliary Building Layout Grade Level (Elevation 100'-0")

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AP1000

AP1000 Auxiliary Building Section Fuel Pools & Waste Holdup Tanks

Westinghouse

AP1000 & 10CFR20.1406 Examples of Compliance

Feature	Reason for Inclusion in Design	Implications of Review for 1406
Ability to update radwaste processing equipment (mobile equipment facility) (TR98 Item #16)	URD, Operating Experience, Utility Review & AP1000 Buyer's Group requirements	No changes to design or DCD for 1406
Liquid radwaste discharge piping design (outside buildings) (TR98 Item #27)	URD, Operating Experience, ML062620355	Better definition of design criteria, DCD description added
All radioactive tanks inside buildings(1) with alarms, overflow connections, drains; designed for life of plant (TR98 Item #22)	Good design practice, URD	No changes to design or DCD for 1406

(1)The condensate storage tank will not normally be radioactive and is treated as a special case (it is outside, but includes provisions to avoid environmental leakage)

AP1000 Auxiliary Building Section Effluent Holdup Tanks

AP1000 & 10CFR20.1406 Commitments Extending Beyond DCD

COL Item	Reason for Inclusion	Implications of Review for 1406
Applicant will characterize site subsurface hydrology (TR98 Item #30)	Good design practice, Operating Experience, Prior NRC Feedback	COL Item previously included; no changes to design or DCD for 1406
Applicant will establish groundwater monitoring program in key areas of site (TR98 Item #31)	ML062620355	DCD revised to incorporate COL requirement. Note that areas of monitoring are specified at DCD level.
Applicant will establish program to document events of interest for decommissioning, and to remediate leaks with potential for groundwater contamination (TR98 Item #32)	ML062620355	DCD revised to incorporate COL requirement.

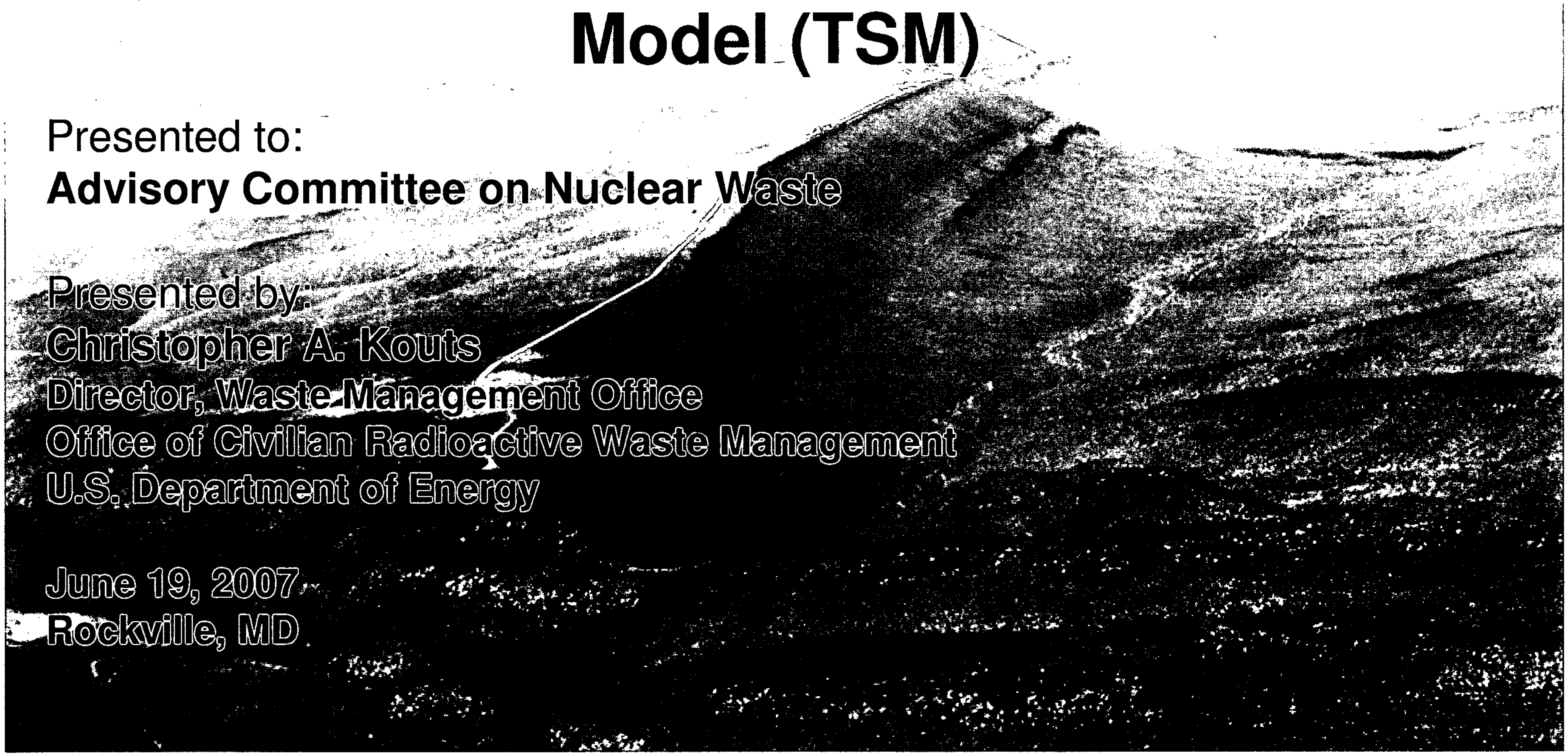
AP1000 & 10CFR20.1406 Summary

- **AP600 / AP1000 Did Not Specifically Reference 10CFR20.1406**
- **However, AP600 / AP1000 design did draw heavily upon:**
  - ALWR Utilities Requirements Document
  - Utility Experience
  - Lessons Learned
  - Good Operating Practice
  - Desire for Reliability and Simplification
- **We Believe AP1000 Provides a Very High Degree of Conformance with 10CFR20.1406**
- **Review Against Best Available Resources (ML062620355) Generally Confirms That Conclusion**
  - Some adjustments to AP1000 design / design criteria / commitments
- **Need to Maintain Standardization**

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

CRWM Program

Transportation, Aging and Disposal (TAD) Canister System Status and Total System Model (TSM)



Presented to:
Advisory Committee on Nuclear Waste

Presented by:
Christopher A. Kouts
Director, Waste Management Office
Office of Civilian Radioactive Waste Management
U.S. Department of Energy

June 19, 2007
Rockville, MD

Transportation, Aging, and Disposal Canister Development

- TAD Background
- TAD Program Implementation
- TAD Implementation Process
- Final TAD Performance Specification
- TAD Operations

TAD Background

- DOE announced incorporation of a Transportation, Aging and Disposal (TAD) canister system approach in October, 2005
- TAD system benefits include:
  - Supporting the standardization of commercial spent nuclear fuel (CSNF) storage, transport, aging and disposal packaging, allowing integration of CSNF handling operations
  - Utilizing utility fuel handling experience in loading CSNF
  - Simplifying DOE operations and minimizing redundant handling of bare CSNF assemblies at the repository
  - Reducing low-level waste production and worker radiation exposure at DOE facilities
  - Reducing complexity and cost of DOE facilities

TAD Background

- TAD canisters will be the key interface component that facilitates system functions for temporary storage of spent nuclear fuel at utility sites, transport to the repository, aging at the repository and ultimate disposal
- TAD canister system will comply with regulatory requirements of 10 CFR 71 – Transport, 10 CFR 72 – Storage, and 10 CFR 63 – Disposal

TAD Background

- Development philosophy of the TAD approach is to use proven industry practices, guidance and experience
- The Nuclear Waste Policy Act directs the DOE to use private industry to the fullest extent possible for transportation related activities
- Based on prior experience with a canister-based approach, DOE decided to utilize industry expertise for TAD component design through the use of a performance specification
- Development of the TAD specification received substantial input from the industry and from the transportation and repository components of the program

TAD Program Implementation

- DOE issued the preliminary TAD system performance specification on November 29, 2006 and initiated a proof-of-concept design phase
- Qualified vendors have completed TAD proof-of-concept designs:
  - Energy Solutions
  - Holtec International
  - NAC International
  - Transnuclear (TN)
- DOE review of the submitted TAD proof-of-concept designs was completed on March 2007

TAD Program Implementation

- With the proof-of-concept design phase completed, DOE will initiate the procurement for the development of complete TAD system designs and safety analysis reports (SARs) for NRC certification under 10 CFR 71 and 10 CFR 72
- Cask vendors will submit DOE-reviewed TAD system SARs to NRC for review and approval
- Cask vendors will notify DOE of any proposed modifications of TAD designs resulting from the NRC review for 10 CFR Parts 71 and 72
  - In such an event, DOE will evaluate any proposed changes to ensure continued compliance with DOE performance specification

TAD Implementation Process - DOE Oversight of TAD Development

- DOE will review NRC-certified (Part 71 and 72) TAD systems to affirm compliance with DOE performance specification
- NRC-certified TAD systems that DOE determines meet the DOE performance requirements will be placed on a DOE-maintained list of approved TAD system cask models
  - The list will be updated regularly to include the latest DOE-approved TAD designs that are consistent with repository licensing requirements

TAD Implementation Process – DOE Oversight of TAD Fabrication

- After NRC certification, cask vendors will fabricate and utilities will deploy TAD systems for utility at-reactor storage
- DOE will require that utilities using TAD-based systems for at-reactor storage certify that TAD systems and components are fabricated in accordance with approved design drawings, specifications, and NRC-approved quality assurance (QA) requirements
- Modifications to TAD systems or components that arise during the fabrication process will require DOE review to ensure continued compliance with DOE performance specifications

TAD Implementation Process – Loading by Utilities

- Utilities that use TAD systems for at-reactor storage or for direct transfer to DOE will be required to certify to DOE that the canister has been loaded and prepared in accordance with all requirements under the provisions of an NRC-approved QA program and DOE specifications
- DOE will require utility certification prior to acceptance of each TAD canister
- DOE asserts <u>NO</u> regulatory authority over utility operations

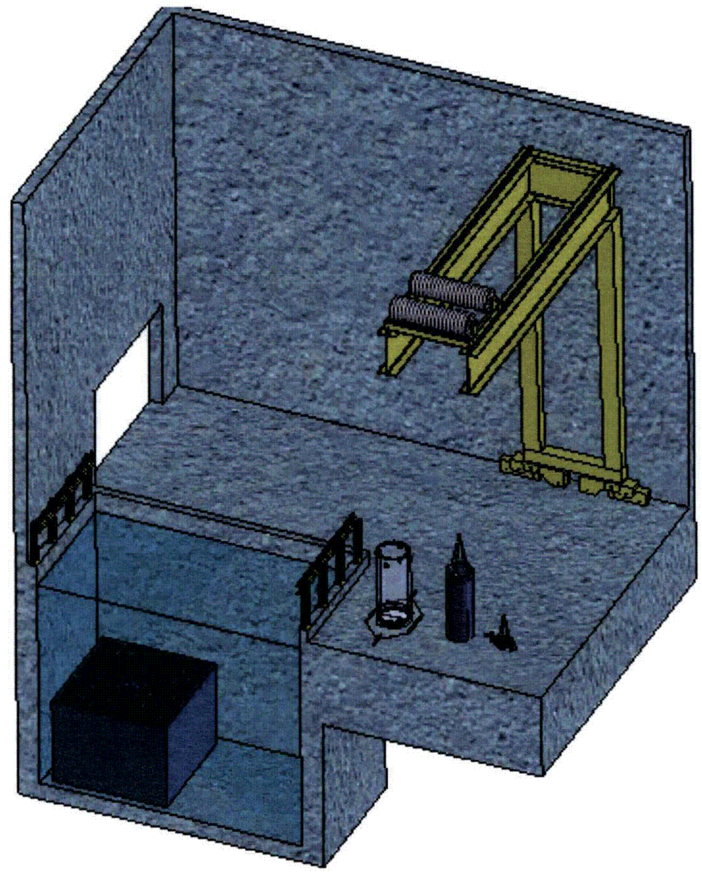
Final TAD Performance Specification

- The final TAD specification delineates the requirements that DOE will rely upon in the repository License Application to demonstrate compliance of the TAD system with 10 CFR 63
- The specification includes other requirements that are expected to improve the efficiency of TAD system operations at the repository
  - Dimensional, weight, radiological and handling requirements

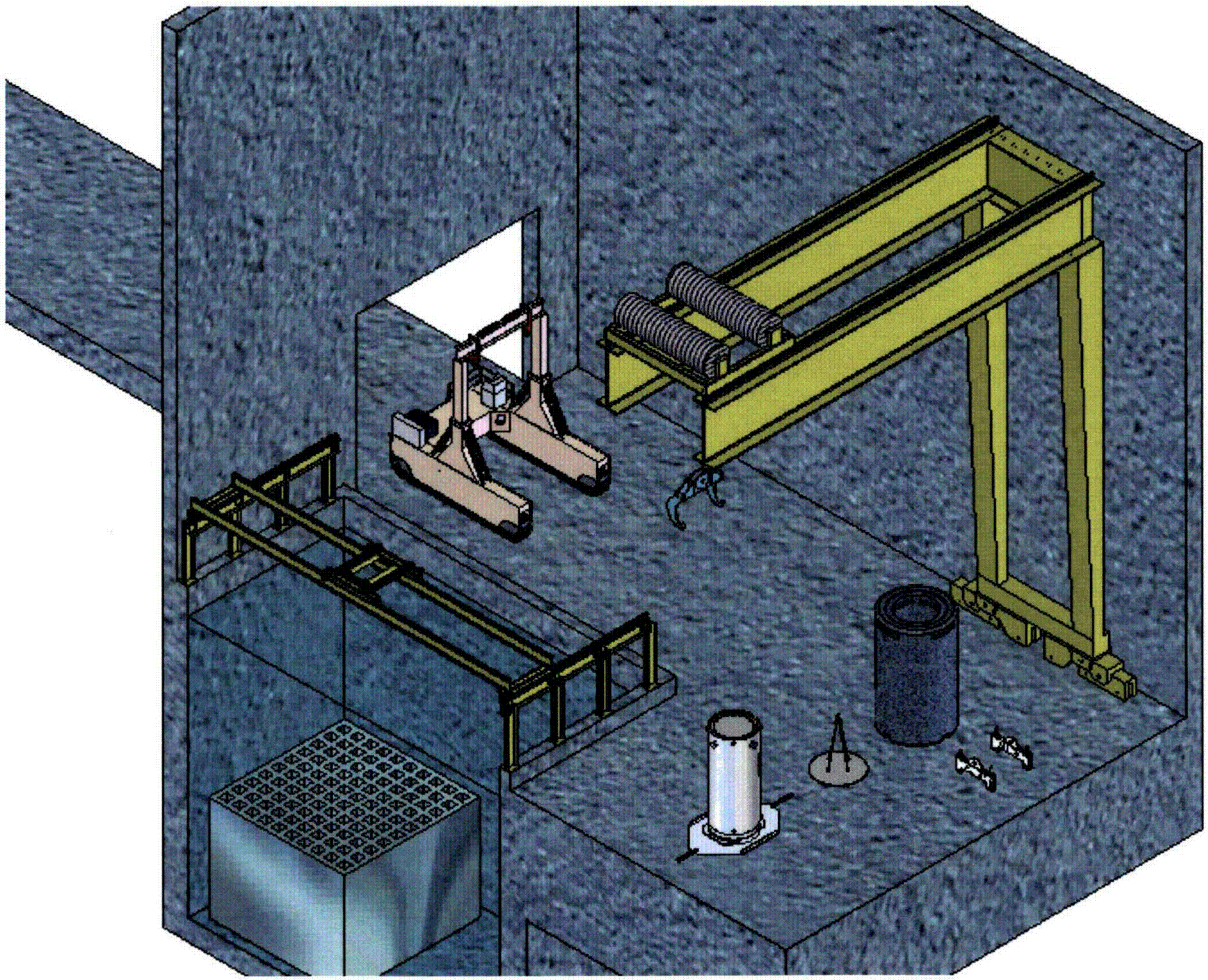
Final TAD Performance Specification – Highlights

- Capacity – 21 PWR's or 44 BWR's
- Canister Length (including lifting feature) – no less than 186.0 and no greater than 212.0 inches
- Diameter – 66.5 inches
- Maximum Weight – 54.25 tons
- Maximum average dose rate from top – 800 mr/hr
- Borated Stainless Steel is the required neutron absorber for disposal
- TAD canisters to be seal welded
- TAD canisters, transportation overpack lid and aging overpack lid will have a common lifting fixture
- Handling and aging at repository in vertical orientation
- Organic, pyrophoric, and RCRA materials prohibited

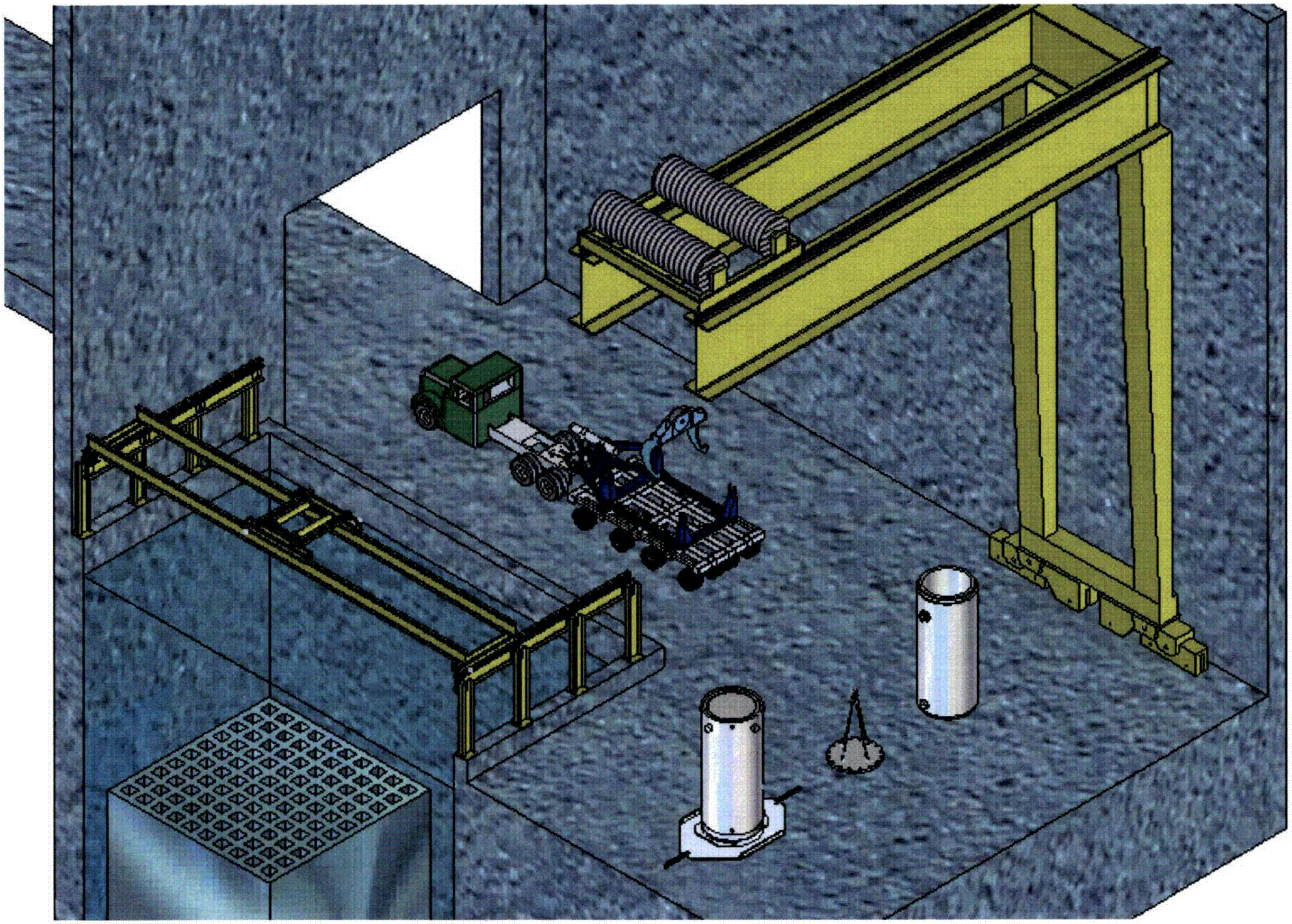
TAD Operations – Loading Fuel in a Pool



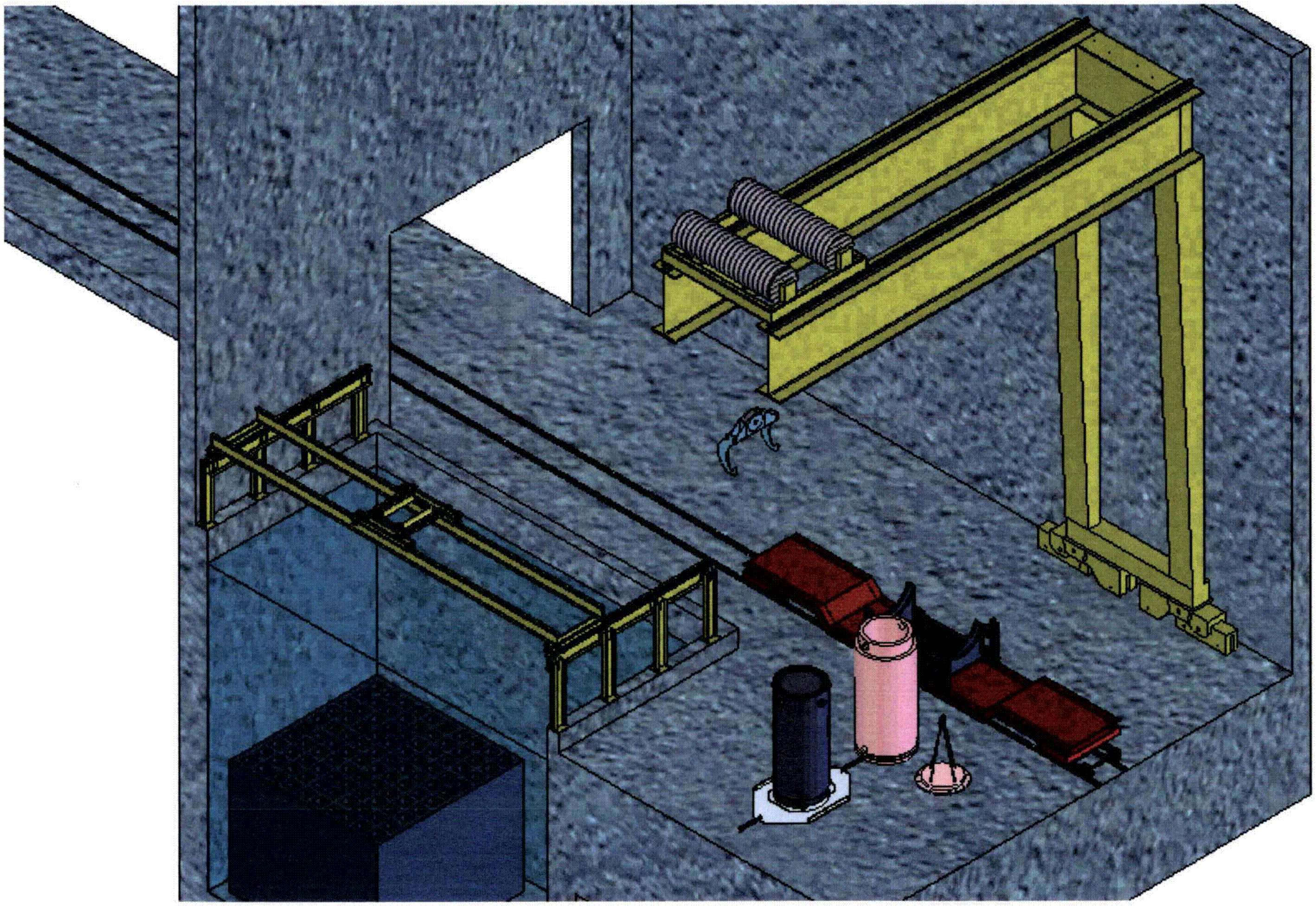
TAD Operations – Transfer to Dry Storage in a Vertical Configuration



TAD Operations – Transfer to Dry Storage in a Horizontal Configuration



TAD Operations – Transfer into a Transportation Cask



TAD Summary

- The finalized TAD Specification can be found on the OCRWM website: http://www.ocrwm.doe.gov/
- Procurement initiation
  - Development of TAD system final designs
  - Development of the safety analysis reports for NRC certification under 10 CFR 71 and 10 CFR 72

Total System Model

- Overview
- Phase 1 TAD System Study
- Critical Decision-1 (CD-1) TAD System Study
- Thermal Analysis
- Current and Future Expectations

Total System Model – Overview – History

- The Total System Model was developed in 2003 to be an integrated analysis tool
- First complete Version 3 (V3) with associated "Base Case" issued in November 2004
  - "Base Case" = simulation of "current" baseline Civilian Radioactive Waste Management System (CRWMS) operation (bare CSNF – based system)
- Version 4 (V4) completed in July 2006
  - Adaptation of V3 model to support initial evaluations of TAD feasibility ("TAD Study")
- Version 5 completed in April 2007
  - Further adaptation of V3/V4 model to support CD-1 Study

Total System Model – Overview – Integrated Solution to Waste Disposal

- The Program continues to develop an integrated solution to accept, transport and dispose of spent nuclear fuel
- As with any large undertaking, this Program has resource, institutional interface, and existing technological constraints
- The TSM is one tool to analyze the linkages, interactions, synergies between Program functions: waste acceptance, transportation, and the repository
  - Baseline performance
  - Alternative analysis
  - System solutions
  - Program and policy impacts

Total System Model – Overview

Waste Acceptance → Transportation → Repository

Waste Acceptance	Transportation	Repository
Requirements/Inputs	**Requirements/Inputs**	**Requirements/Inputs**
SNF Characteristic Data	Transport routes	Waste Acceptance Criteria
DOE HLW, SNF Data	Cask Capabilities	Thermal management
DPC/TAD/TSC	Cask Availabilities	Lag Storage needs
Dry Storage Parameters	Transit times	Facility Design Baseline
Utility Capabilities	Unit costs	Repository Unit Costs
Storage Status	Fleet Management	Waste Handling Needs
Closure Times	Truck/rail options	Aging Pad Size
Proposed shipments	Barge/HH	
Utility trading		
Origin Unit Costs		
Agreements/Commitments		

↓

Integrated Waste Acceptance, Transportation, and Repository Systems Analysis

Total System Model – Overview

Integrated Waste Acceptance, Transportation, and Repository Systems Analysis

SYSTEM ANALYSIS RESULTS

Truck/rail selection

Shipping Schedule

Cask Parameters (type, number, when)

Transportation Origin, Route, Time

Transportation Resources

Dose

Life Cycle Cost

Total Project Cost

Funding Requirements

Aging Requirements/Schedule

Emplacement Schedule

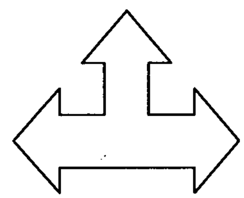
Meet Design Basis Assumptions?

Uncertainties and Sensitivities

The TSM will analyze the interactions and optimization of all project elements and provide an integrated decision tool.

Transportation

Waste Acceptance



Repository

Programmatic Decision Bases

Total System Model – Overview

WA Module:

•Initial State (IS) calculation

Transportation Module:

- cask allocation functions, the
- routing maps,
- rolling stock functions, the
- cask maintenance functions,
- and repository interface

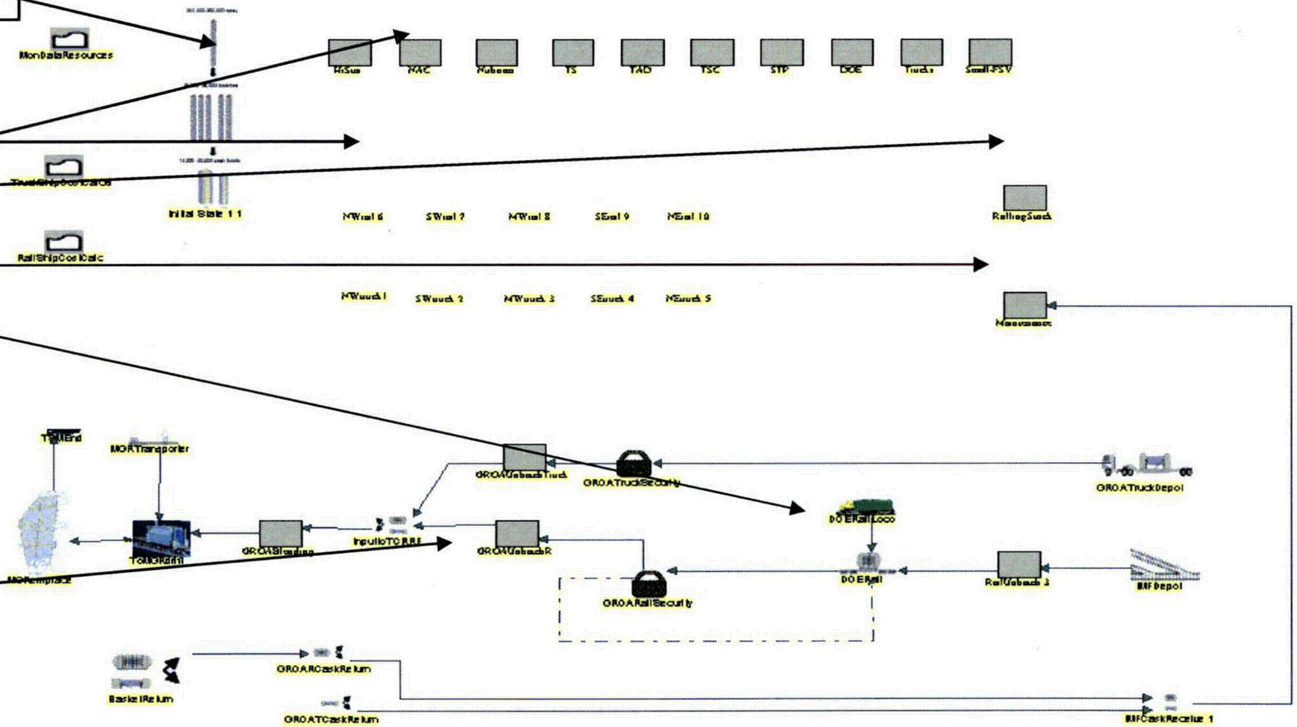
Repository Module:

•GROA facility functions

•Transportation link into the GROA

•WP fuel loading/emplacement

•Fuel Aging and return



Total System Model – Phase 1 TAD System Study

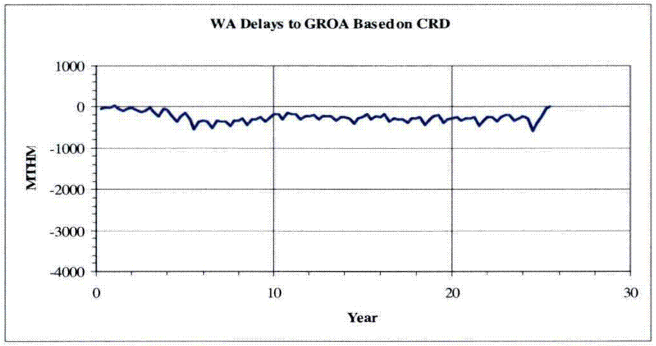
- In FY 2005, the TSM was used to conduct a system study to evaluate the feasibility of an using a canister-based system for receiving, transporting, aging and disposal of CSNF
  - A list of 70 combinations of parameters developed covering key system elements
  - 40 alternative scenarios selected to analyze impacts of transportation, aging, and disposal systems
- Key insights: Demonstrated that a primarily TAD canister-based system is a viable alternative:
  - Required acceptance rates can be achieved
  - Repository aging pad capacity limit not exceeded
  - Emplacement operations can be completed within 50 years
  - TAD/WP processing can meet 1.45 kW/m subsurface thermal line load

Total System Model – CD-1 TAD System Study

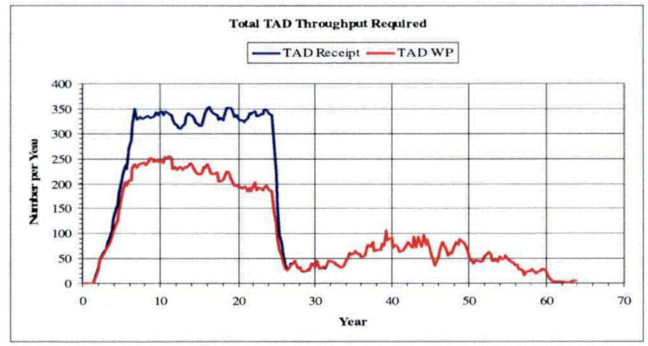
- In FY 2006, continued analyses to support TAD based approach:
  - Evaluated alternative configurations within the repository
    - Processing facilities (wet and canister)
    - Number of waste package closure cells
    - Fraction of waste stream CSNF in TADs (vs. bare fuel)
  - Provided input to CD-1 cost and schedule estimates for configurations evaluated
- Key insights:
  - Mostly TAD based system (90% TADs) can meet repository processing rates in CRWMS Requirements Document
  - For 90% TADs waste stream, a single "wet" processing facility is able to keep up with bare fuel receipt rates.
    - If the bare fuel fraction significantly exceeds 10%, additional "wet" processing facilities may be needed
  - 6 weld cells should be sufficient to produce the required number of waste packages per year

Total System Model – CD-1 TAD System Study

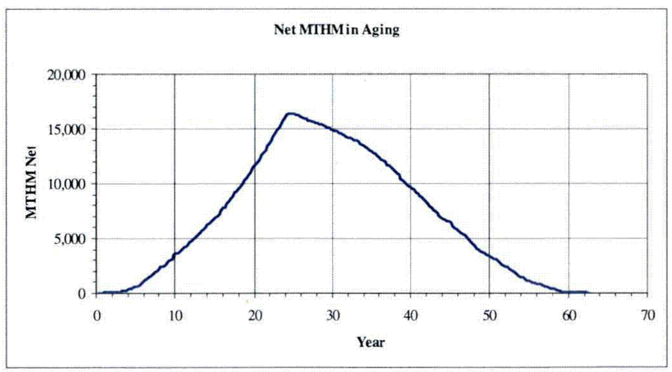
Key Elements: 70,000 MTHM, Large (21PWR/44BWR) TADs plus some DPCs, trucks (88% TADs by weight), 1 Wet Handling Facility, 6 Welders (3 CRCFs)



Valley Curve



TAD Throughput Required



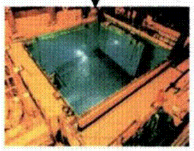
Net CSNF in Aging

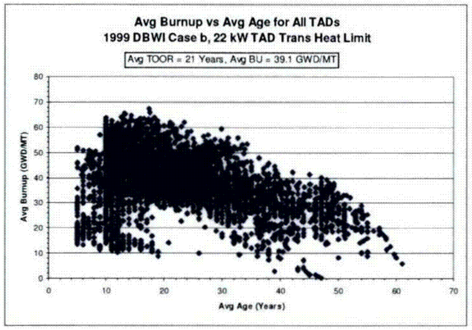
Total System Model – Thermal Analysis

- In FY 2007 – TSM is being utilized to:
  - Assess if repository subsurface can accept a variety of TAD loadings characterized by these waste stream parameters:
    - Assembly burnup
    - Time out of reactor
    - Thermal limits on TAD transportation casks
  - Assess further if those loadings are bounded by existing thermal constraints
    - Preclosure limits
    - 96°C - Mid-pillar temperature
    - 200°C - Drift wall temperature
    - 350°C - Cladding temperature
  - Preliminary insights suggest:
    - Thermal constraints are manageable given the ability to use the aging pads as a "blending volume" for emplacement
    - Various loading, aging, and operational scenarios could exist to support subsurface emplacement strategies that meet thermal goals

Total System Model – Thermal Analysis

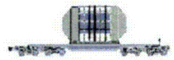
Acceptance
at Waste
Sites

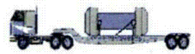


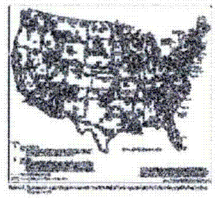


A broad range of realistic age and burnup properties considering each CSNF assembly

Transportation
to Repository

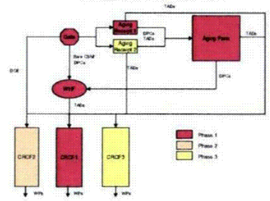




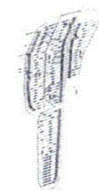


Repository Operations

Transfer to WP



Emplacement



Pre-closure and post-closure temperature constraints (e.g., 96° C mid-pillar temperature, 200° C drift wall temperature, 350° C clad temperature, etc.)

Total System Model – Current and Future Expectations

- TSM Version 6 in progress
  - Scheduled for completion by end of FY 2007
  - Will revise repository model to emulate final CD-1 configuration
- Ongoing use in FY 2007 for thermal management scoping analyses
- Will continue to be used as a key tool for integrated systems analysis of CRWMS operations
  - Waste acceptance options
  - Transportation planning
  - Repository operation options

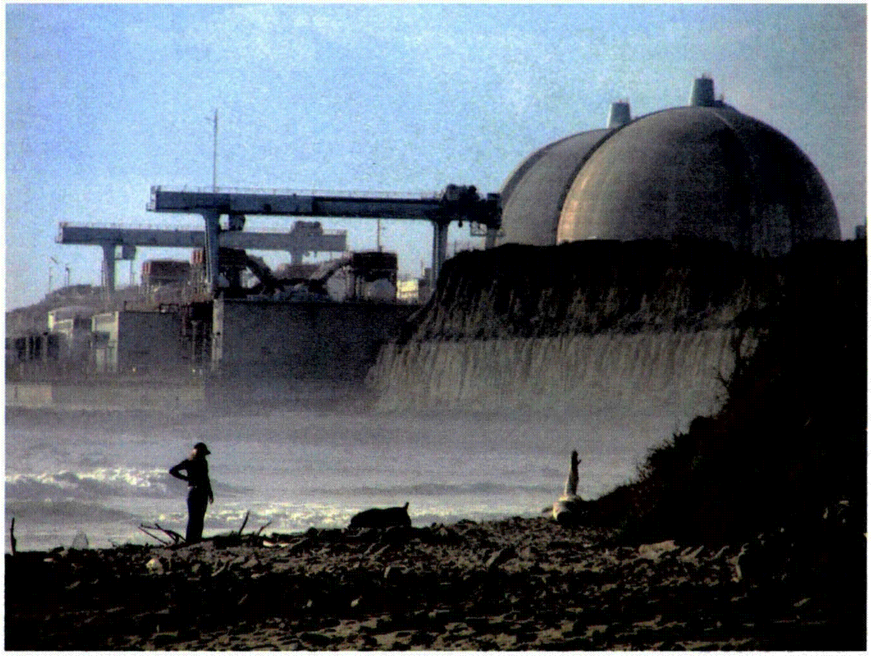
Total System Model – Summary

- The TSM has been integrated into the project and successfully used to:
  - Evaluate alternative system configurations and processing capabilities
  - Develop cases for analysis that reflect current system realities and the design of the planned surface facilities
  - Identify potential disconnects between various components of the waste management system
  - Identify credible scenarios for judging the viability of the waste management system
  - Assess ways to minimize size of the aging pads
- FY 2007, TSM work continues to support repository post-closure thermal response
- The TSM will continue to be a key tool for integrated systems analysis of CRWMS operations

Final Summary

- TAD canister design development is underway
- TAD proof-of-concept vendor design was completed in March 2007
- TAD canister concept is being incorporated into the License Application
- TSM continues to be a key program tool for system analysis for the integration of waste acceptance, transportation and repository activities

Implementation of 10 CFR 20.1406 – Life Cycle Planning



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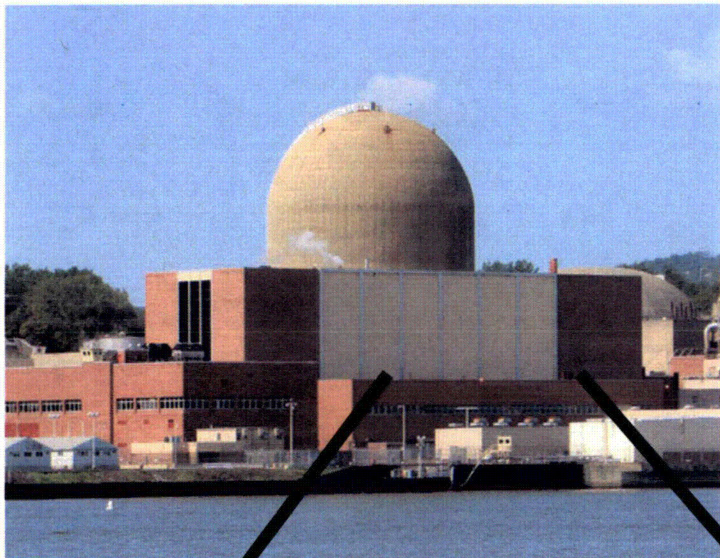
June 19, 2007

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

10 CFR 20.1406 requirements



For license applications after August 20,1997 the application must describe how facility design and operation will:

Facilitate decommissioning

Minimize

- Contamination of the facility
- Contamination of the environment
- Generation of waste

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Principles embodied in guidance

- **Prevent** -- unintended release,
- **Detect** -- early detection if there is unintended release of radioactive contamination, and
- **Correct** -- unintended release of radioactive contamination by prompt and aggressive action.

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Demonstration of compliance

- Good engineering and science

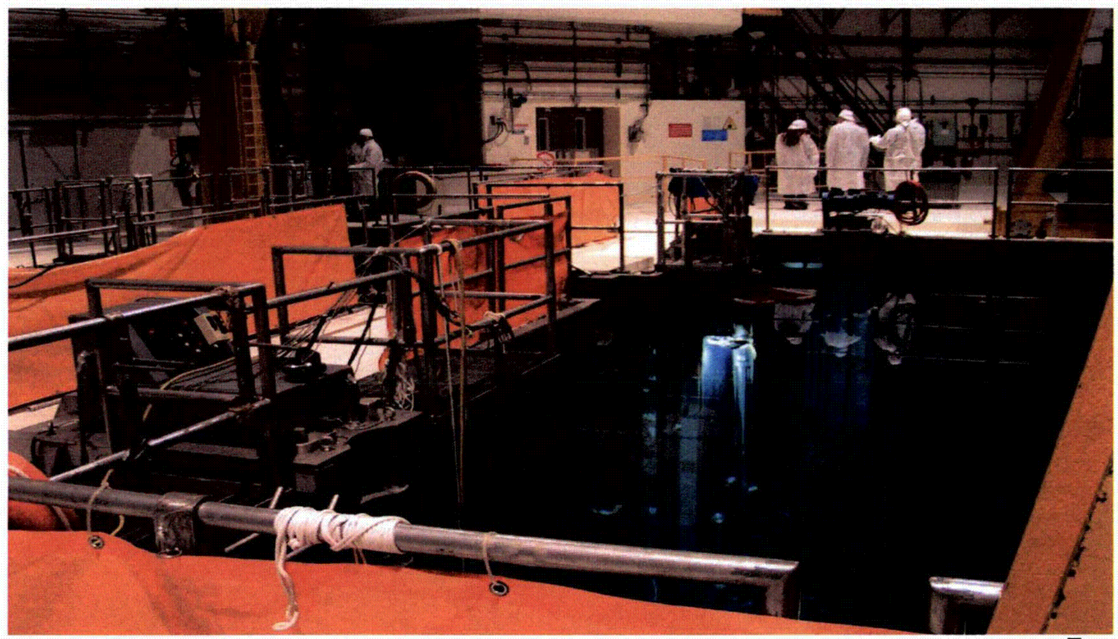
- Application of guiding principles
  - prevention
  - early detection
  - prompt correction

Minimization of facility contamination

- Prevention
  - Design
  - Inspection / maintenance

- Detection

- Correction



Minimization of Contamination (Section 1, Introduction)

- Design to limit leakage and to control spread of contamination
- Provide for early detection of leaks
- Prepare follow-up corrective measures

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Prevention - design

- Interfaces between the radioactive SSC important to radiological safety and the non radioactive SSC should be minimized. Interfaces should have a minimum of two barriers, including one that can be a pressure differential. (1.a)

- To prevent cross-contamination, radioactive material processing areas should be isolated from other areas within the facility through the use of compartmentalization and access controls. (1.b)

- To control leaks, radioactive SSC such as a spent fuel pool and associated piping, should be designed to permit the isolation of clearly-defined zones within that system. (1.f)

- Radioactive SSC should be designed for the lifetime of the facility to avoid leakage and spread of contamination. (1.i)

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Prevention - design cont'd

- Highly contaminated areas (e.g., refueling canals, valve alleys) should include provision for decontamination methods specifically designed for those areas. (1.k)
- In potential spill areas, floors should be sloped to drains that lead to the radwaste system. (1.l)
- Avoid traps, stagnant legs, dead spaces in components and provide drains. (1.m)
- Material selection for SSC should consider the operating environment and intended means of disposal. (1.p)
- Seal surfaces to facilitate cleaning and decontamination and to reduce generation of radioactive waste. (1.p)

Prevention - design cont'd

- For SSC that have a high potential for leakage, floor liners and catch basins should be used. (1.t)

- Drains from locker rooms and clean-up showers should be routed to radwaste processing facilities to prevent the reconcentration of radioactive materials in sewage plants. (1.v)

- Ventilation systems should confine airborne radioactive materials within processing areas. (1.w)

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Prevention - design cont'd

- Condensation from coolers handling contaminated air should be collected and routed to a monitored liquid effluent discharge. (1.x)

- Tank sampling stations should be designed to minimize the possibility of sample fluid leaking to the ground or to the underlying pad surface. (1.z)

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Prevention - inspection and maintenance

- A maintenance and inspection program should be applied to radioactive SSC that have a potential for leakage of radioactive material to the site environs, that is, on-site and off-site locations outside of the facility SSCs. (1.c)
- Monitoring sensors should be designed to allow instrument replacement. (1.q)
- Considering the expected life cycle of the facility, the design should include provisions to facilitate the maintenance, inspection, and removal of radioactive components. (1.j)
- Piping should be designed to facilitate access for decontamination. (1.n)

Prevention - inspection and maintenance cont'd

- Seals should be maintained over the life of the facility, and their integrity should be routinely inspected. (1.r)
- Ventilation systems should be periodically checked to insure that the system continues to be adequate for controlling contamination. (1.w)

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Detection

- A leak identification program should be developed for components containing radioactive materials to prevent unnecessary contamination of equipment and surrounding areas and to minimize radioactive waste. (1.d)
- Provision should be made to allow timely identification of leak locations. (1.f)
- Leak detection systems should be provided with the capability of detecting and quantifying small leakage rates (e.g., several gallons per week) from each zone. (1.f)

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Correction

- Radioactive lines in temporary and/or mobile systems should have a means to promptly isolate leaks. (1.o)
- Leak or spill collection systems should be provided to protect against leakage and/or isolate the release of liquid contamination through redundancy concepts such as multiple piping enclosures with pans/trays or drainage to channel contamination for collection and processing. (1.e)
- The initial facility design should include system decontamination facilities/provisions, that provide the means for timely reduction of the buildup of radioactive source terms which could lead potentially to facility contamination. (1.h)

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Minimization of Environmental Contamination

- Conceptual Site Model
- Prevention
  - Design
  - Inspection / maintenance
- Detection
- Correction

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Conceptual Site Model (Section 2, Introduction)

- A conceptual site model (CSM) based on site characteristics and facility design will assist in: (1) understanding site performance, and (2) planning for corrective measures

- Applicants should:
  - Establish background for the CSM
  - Identify potential release mechanisms and possible locations of contaminant releases
  - Develop CSM of ground-water system and identify potential contamination pathways
  - Assess site changes due to construction

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Prevention - design

- Systems containing radioactive material should have at least two impermeable boundaries to the environment with the capability for periodic testing and inspection. (2.b)
- Tank catch basins should be of solid construction, sealed, and leak proof, and should have a capacity sufficiently larger than the maximum tank volume to accommodate the contents of the tank in the event of a system failure. (2.c)
- Exterior tanks should be located on or above bermed concrete pads. Each concrete pad should be lined or sealed with an impermeable membrane. Each bermed area should have provisions for sampling and release of rainwater. (2.d)
- Systems containing, transporting, or processing radioactive liquids, should not use buried piping and drains. (2.f).

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Prevention - design cont'd

- Underground piping containing radioactive liquids should be enclosed within structured pipe chases with provisions for periodic inspection (visual) or surveillance (leak detection system) to verify piping integrity. When pipe chases are not feasible, the use of double-walled lines with built-in leak detection capability should be considered. (2.f)

- Radioactive material handling, staging, storage, and decontamination areas should be located inside buildings or in contained areas. (2.h)

- Avoid the use of below-grade conduit and piping penetrations through walls that form exterior boundaries. This is particularly applicable to penetrations at or through the floor level. (2.i)

- Avoid bypasses or drains that would allow radwaste to inadvertently circumvent a radwaste treatment system or to be released directly to the environment. (2.j)

Prevention - design cont'd

- Drain systems for storm water and sanitary sewage should be separate from contaminated waste drain systems. (2.k)
- Use sills at ingress/egress points of rooms or buildings. containing radioactive systems to prevent leakage/seepage to the outside. (2.m)
- Penetrations through outer walls of a building containing radioactive systems should be sealed to prevent leaks to the environment. (2.n)
- The design for major radioactive system barriers such as spent fuel pools and transfer canals should consider measures to minimize the need for seals (e.g. continuous concrete pours). Alternatively, clear separation between major structures should be considered, with both visual and integrated leak detection. (2.o)

Prevention - design cont'd

- The design of excavations and the selection of backfill for SSC containing radioactive materials should prevent contaminants from the facility reaching natural permeable layers or fractured rock. (2.p)

- Backfill should not contain soil that contains concentrations of radioactive material above the naturally occurring levels. (2.q)

- Potential leakage from any existing adjoining nuclear facility should be prevented from migrating into the excavation and backfill of a new nuclear facility. (2.s)

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Prevention - inspection / maintenance

- The integrity of seals should be periodically verified. (2.n)

- Monitor backfill or structural fill designed to transport leakage from radioactive systems for evidence of clogging (e.g., blockage by migrating fines from surrounding soil). (2.r)

- The design ground-water level should be maintained below the foundation of SSC

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Detection

- If systems containing radioactive material do not have two impermeable boundaries to the environment, the applicant should propose specific environmental monitoring (e.g., sampling of ground water in close proximity to potential sources) to periodically verify integrity of the system). (2.b)

- Tanks, sumps, and ponds containing radioactive materials should have at least two impermeable boundaries to the environment with an integrated leak detection system capability that triggers an alarm at an operator station. (2.c)

- Exterior tanks should be located on or above bermed concrete pads. The bermed areas should have provisions for sampling and release of rainwater. (2.d)

- Monitoring systems and programs to detect the source and extent of leakage of radioactivity from SSC, should be deployed as close as possible to the SSC and designed to expedite early detection so that remedial action can be taken if necessary. (2.e)

Detection (cont'd)

- If foundation drains are used as part of a building design, the capability for sampling and processing the effluent of those drains also should be included. (2.g)

- Proposed monitoring programs should allow for re-evaluation of the location of monitoring sensors and sampling frequency if contaminants are detected. This analysis should provide the technical basis for determining the need for further action. (2.v)

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Correction

- Sumps or retention ponds which have the potential to become contaminated should include a liner and the capability for isolation or routing to a monitored release path. (2.l)
- In the event of leakage from the facility to the environment the design of excavations and selection of backfill should facilitate the migration of contaminants to designated systems of the facility (e.g., radioactive external waste drains or sumps) for eventual extraction and treatment. (2.p)
- If contamination is detected, the conceptual site model and monitoring information should be used to develop event specific models of contaminant migration before the selection of a remediation strategy. (2.w)
- Design and operation of ground-water capture zones surrounding SSC may provide effective means to isolate and collect liquid radioactive contaminants escaping to the subsurface and to prevent abnormal release to ground water. (2.x)

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Facilitate Decommissioning

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Facilitate Decommissioning (Section 3, Introduction)

- Begin at design stage.
- Ensure throughout life of the facility that design and operating procedures minimize the amount of residual radioactivity that will require remediation at time of decommissioning.
- Properly designed and operated facilities will support efficient decommissioning as well a reducing generation of radioactive waste.

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Facilitate decommissioning

- All information relating to the facility design, facility construction, site conditions before and after construction, onsite waste disposal, onsite contamination, and results of monitoring should be centrally located and readily recoverable. (3.a)

- Document environmental contamination and operational events, over the lifetime of the facility particularly those which may result in residual contamination. (3.b)

- Plans and procedures to facilitate decommissioning should include: (1) comprehensive video records of the equipment layout in areas where radiation fields are expected to be high following operations; and (2) as-built drawings of the facility. (3.c)

- Records should include global positioning system readings that pinpoint all buried component locations, particularly components in the site environs. (3.c)

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Facilitate decommissioning (Cont'd)

- Minimize the use of embedded pipes in facility walls, floors, etc. consistent with ALARA. (3.d)

- Temporary piping installed during construction should be removed to avoid undocumented random piping in the field that, when uncovered, will raise questions about the extent of site contamination during decommissioning. (3.e)

- Construction debris should not be disposed of within the controlled area. (3.e)

- SSC design should facilitate the removal of equipment and/or components that may require removal and/or replacement during operation or decommissioning. (3.f)

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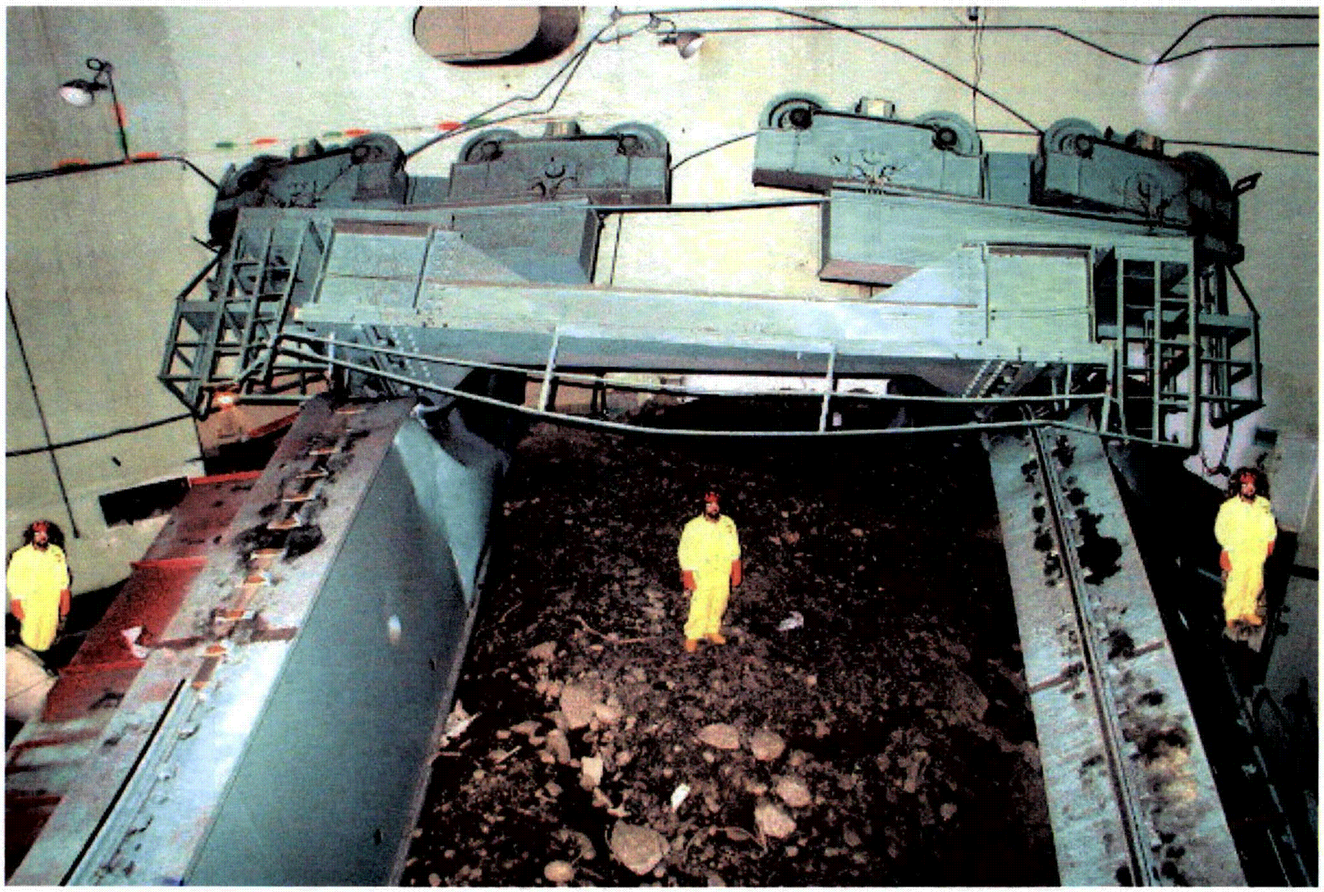
Minimize waste generation



- Prevention
  - design
  - operations

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Minimize Waste Generation (Section 4, Introduction)

- Minimizing waste generation is both a design and operational consideration.
- Life-cycle approach should be taken in identifying all components used in the facility and all waste that will result from system operations and processing.
- Life-cycle waste management planning should be carried out for any new waste stream to define the strategy for its conditioning, storage, or disposal.
- System designs should enable operators to perform decontamination efficiently while minimizing doses and production of radioactive waste.

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Prevention - design

- Volume reduction should be considered for minimizing the volume of generated waste, consistent with ANS-40.35-1991, "Volume Reduction of Low Level Radioactive Waste or Mixed Waste." (4.a)

- Waste streams with significantly different levels of contamination should not be mixed in order to minimize the volume of the higher-activity wastes. (4.b)

- Onsite decontamination facilities and/or waste segregation facilities should be provided for the orderly management and segregation of large quantities of radioactive material/waste. (4.d)

Prevention - design (cont'd)

- Continuous concrete pours eliminate potential leakage paths through seams used in non-continuous pours. However, continuous concrete pours are difficult to dismantle and can create significant quantities of contaminated waste at decommissioning. Consideration should be given to modular construction for those structures in which liquid leakage is not a concern. Modular design permits the removal of separate layers of contaminated material, thereby minimizing the volume of contaminated waste. (4.e)

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Prevention - operations

- Waste should be shipped offsite when generated, and legacy wastes should be avoided. (4.b)
- Avoid onsite disposal of radioactive material. If done under 10 CFR 20.2002, onsite disposal should not be located in areas susceptible to surface-water or ground-water intrusion and must have proper monitoring to detect potential radionuclide migration. (4.c)

Look Forward

- Release of the draft Regulatory Guide for public comment is expected in July, 2007
- Public comment period – 90 days
- Final guide expected in January, 2008