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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

502nd MEETING

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FRIDAY

MAY 9, 2003

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ROCKVILLE, MARYLAND

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The meeting was held in Room T2B4, Two White Fling North, Rockville, Maryland, at 8:30 a.m., Mario V. Bonaca, Chairman, presiding.

PRESENT:

MARIO V. BONACA, ACRS Chairman
GRAHAM B. WALLIS, ACRS Vice Chairman
GEORGE E. APOSTOLAKIS, ACRS Member
F. PETER FORD, ACRS Member
GRAHAM M. LEITCH, ACRS Member
DANA A. POWERS, ACRS Member
VICTOR H. RANSOM, ACRS Member-at-Large
THOMAS S. KRESS, ACRS
WILLIAM J. SHACK, ACRS
JOHN S. SIEBER, ACRS

STAFF PRESENT:

JOHN LARKINS, Executive Director

SAM DURAISWAMI, ACRS/ACNW

SHER BAHADUR, ACRS/ACNW

HOWARD J. LARSON, Special Assistant, ACRS/ACNW

C O N T E N T S

P R O C E E D I N G S

(8:33 a.m.)

CHAIRMAN BONACA: Good morning. The meeting will now come to order.

This is the second day of the 502nd meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the committee will consider the following:

Subcommittee report on the revised application for the mixed oxide fuel fabrication facility;

Subcommittee report on the integrated industry initiating event of former syndicator;

Future ACRS activities;

Report of the Planning and Procedures Subcommittee;

Reconciliation of ACRS comments and recommendations;

And proposed ACRS reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mr. Sam Duraiswami is the designated federal official for the initial portion of the meeting.

We have received no written comments or

requests for time to make oral statements from members of the public regarding today's sessions.

A transcript of portions of the meeting is being kept, and it is requested that speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard.

Before we proceed, I would like to announce that Barbara Whitaker, who has been with us for the past three years, is leaving the ACRS to join RES on June 1st, 2003.

Where is Barbara?

PARTICIPANTS: She's not here.

CHAIRMAN BONACA: She's not here.

Well, we would like certainly to thank her for her outstanding administrative support to the ACRS and wish her good luck, and we hope you have an opportunity to go by her desk and let her know because she's not here right now.

MEMBER POWERS: Slaving away for us right now.

CHAIRMAN BONACA: Slaving away for us.

With that I'll move to Dana who is going to give us a summary report on the revised application for the mixed oxide fuel fabrication facility.

MEMBER POWERS: I didn't know we were going to be on the record for this. We're not quite prepared for that, but we can do that because we've got all kinds of support crew here to see how well I learned the lessons from all of these subcommittee meetings we've had.

What I wanted to try to accomplish today was to brief the committee a little bit on where we stand on this particular review of the MOX facility, MOX fuel fabrication facility, and remind you that this is one of those activities the Commission has specifically asked us to take a look at and address for them, and it's a little bit different world than what we're used to working in. This is definitely not a power reactor.

A different set of regulations apply to it. There's a different set of terminologies that apply to it, altogether a different world, and what I'll try to do is give you a brief synopsis of this world, try to direct you to the right parts of the Code of Federal Regulations for looking at things, and give you a status on how we're going to proceed with this.

You'll recall we're on a pretty good pace to get everything done about a year, two years ago almost, and then there was some change in the mission that, quite frankly, was probably horribly time consuming for the folks at DCS to make the changes, but it wasn't a very big perturbation in the facility from a safety perspective. So a lot of our past work stands in good stead for that.

So right now I see us moving on at a pretty expeditious clip on the whole thing.

Well, this says the mixed oxide fuel fabrication facility. I think everybody understands this is a facility for manufacturing mixed oxide fuel for use in commercial nuclear reactors using weapons grade plutonium. There is a health amount of information in the world's literature on the use of mixed oxide fuels in commercial nuclear power plants.

That experience, however, is largely with what you would call reactor grade plutonium, and this is going to use weapons grade plutonium. How big the perturbation is is a lot in the eyes of the beholder, but it's clear that it's a perturbation.

That part of this activity, using the fuel in the reactor, is not part of this review. We're only looking at the fabrication of the fuel itself.

MEMBER KRESS: Where does Mileadadum trifuoride enter the picture?

MEMBER POWERS: Well, I have no idea why you ask the question, Dr. Kress, because there is no Mileadadum indicated up there. The Mileadadum symbol is MO. M is well known to stand for mixed oxide.

MEMBER KRESS: Oh. My mistake.

(Laughter.)

MEMBER POWERS: The facility that they're setting up has additional peculiarity that they're not going to be terribly used to, is that it is located on the Savannah River site, which is a DOE facility, and it is a huge reservation.

There it is. Here's the site boundaries out here. And I forget. It must be about five miles, six miles between the facility and the site boundary, and even when you get to the site boundary, you've got a long ways to go before you hit civilization. Some people say several states.

(Laughter.)

MEMBER RANSOM: Dana, where are the old production reactors?

MEMBER POWERS: The Savannah River site.

(Laughter.)

MEMBER RANSOM: But you don't know where?

MEMBER SIEBER: From north to south it's 40 miles.

MEMBER POWERS: It's a fair sized facility. There's a lot of agonizing over the fact that there's a public road that goes through there. That's something that Savannah River has put up with for years. They've got decent ways to deal with that particular problem.

Locating things on the Savannah River site really gives you some interesting benefits. You've got a well developed structure for security certainly, a well developed structure for things like external fire department responding to an event at the facility.

We'll discuss the problem of the collocated workers, which figures a lot in the debates on this subject. I think it's a tempest in the teapot because what you've got is a bunch of people on this site unassociated with the facility, but they're reasonably disciplined folks that are under reasonable control. I mean, they're a lot easier to control than a generalized public.

The facility also has this peculiarity that it's receiving a product from a DOE operation, regulated, patrolled, safety assessed by DOE. It goes into the mixed oxide fuel fabrication facility. The effluents from that facility go back into the DOE system and outside of NRC control. The product goes off to commercial reactors, presumably Catawba and McGuire, and, no, Dr. Kress, I do not know why ice condensers are peculiarly appropriate for mixed oxide fuel, but that's not part of this review.

MEMBER KRESS: Okay.

MEMBER POWERS: And presumably the irradiated product then comes back into the DOE system. So this is going to be an island of NRC regulation within the DOE site. It will be interesting to interview the people developing this facility after a few years of operation to see whether they prefer DOE oversight or NRC oversight.

I will definitely place my bets on how that outcome is.

We have developed in this country a lot of facilities for handling plutonium based fuels in this country. We haven't done any in the last 25 years, but the technology is reasonably established, and what they are doing at this facility is that they are borrowing, adapting, learning from more modern facilities that have been set up in France.

It's not a copy of a facility in France, but you know, it has benefitted from their more recent experience, but it's using relatively established technologies.

These are leaning forward in the trenches in modernization of this, and the major elements, you dissolve plutonium dioxide. You run a PUREX process. Then you cinder up some powders, disburse that and it's into UO_2 powders, make some fuel pellets, and put it in fuel rods.

There is nothing in this that would not be familiar to people that have been handling plutonium in the past.

VICE CHAIRMAN WALLIS: This is like the facility that we visited in France.

MEMBER POWERS: Very much like this, very, very much like that.

For those of you who are not familiar with the PUREX process, this is a solvent extraction type of process where you're moving plutonium and uranium from an aqueous phase into an organic phase, variously known by names like -- what is it? -- normal paraffinic hydrocarbon, but to anybody else is known as kerosene.

A little more detail on the process here. It just shows you that they like to divide it down into what they call the AP and MP processes. AP stands for aqueous polishing. MP, I can never remember what it stands for, but that results in your making fuel rods.

I think there's nothing terribly surprising about what the facility looks like. What? I think it's a three story building laid out with the various areas defined. It operates with a relatively conventional, multiple nested zone kind of heating/ventilation system so that the leakage is all inwards, fairly familiar technology.

Because it's located in a site, you need to stay aware of what boundaries are, and you have a site boundary that's way the heck out, and these are the definitions for the boundaries that come out of Part 20.

That boundary is really controlled by the Savannah River site itself. Then you have controlled areas and restricted areas. What these help you do is define facility workers, what I like to call collocated workers. I think they use a different term for it, but it means the same thing, and the public. The public is outside the site boundary.

The facility workers are the guys obviously within the restricted area. In between you have lots of people who are working on the Savannah River site, and even people associated with the facility that don't ordinarily constitute radiation workers.

Okay. That ha in the past always been a subject of a large amount of debate. Why don't you treat people on the site, but not associated with the facility as the public? It's extraordinarily different to understand why the secretary working in the SRS building is any different than the secretary working in a bank outside the site as far as her volunteering for radiation exposure.

Well, that debate has gone on, gee, as long as I can remember, and I think they've come up with a reasonable compromise on this sort of thing. They say, "Well, we'll just educate these people, and they'll know what to do in the event of an emergency. They'll be aware of what the facility context, and they'll know what to do in case there's an accident. And so we will treat them a little bit differently than the public and clearly not call them facility workers."

Okay. Well, things are different when you work with facilities. You're working with a different set of regulations. I'm going to focus just on the criteria that come out of 70.61. Here are the dose limits that you have. For workers we're trying to keep doses below 25 REM. The public, you want to keep them below five REM.

MEMBER KRESS: I don't see a third criteria for that group you just talked about.

MEMBER POWERS: Well, they become --

MEMBER KRESS: Workers?

MEMBER POWERS: -- workers because they're educated, right.

MEMBER KRESS: Okay They're included.

MEMBER POWERS: Well, they're different things, and I don't want to go into all of the subtleties on that.

I think the more limiting issue here is really this criterion of 24 averaged releases off the site of 5,000 times Table 2. Those of you that get to work with Table 2, I don't need to explain to you what it is.

Those of you that have never had the pleasure of dealing with Table 2 and Appendix B of Part 20 really ought to do it.

MEMBER APOSTOLAKIS: I thought we were fortunate.

MEMBER POWERS: It's an experience that will enlighten and educate you.

MEMBER APOSTOLAKIS: Okay.

MEMBER POWERS: At this stage in the process for the MOX facility, we're dealing with the design basis. They're seeking a permit to go construct this facility, and the regulations specify what you're supposed to do, and you're supposed to address all of these topics that I have listed down here.

I'm anxious for the committee to delve deeply into the first one and explore all of its nuances and ramifications in great depth. The subcommittee itself doesn't intend to.

More interesting than that list of --

MEMBER APOSTOLAKIS: Dana, wasn't ThE PRA there on the list? I didn't -- or an ISA. Is that what they're doing?

(Laughter.)

MEMBER POWERS: GRA, George.

MEMBER APOSTOLAKIS: ISA.

MEMBER POWERS: No. You will learn to say ISA with a smile on your face.

MEMBER APOSTOLAKIS: There will be a letter form this committee that we use the word "ISA," the acronym?

MEMBER POWERS: Not for this stage.

MEMBER APOSTOLAKIS: Okay.

MEMBER POWERS: ISA --

MEMBER APOSTOLAKIS: So we have time to educate themselves.

MEMBER POWERS: ISA is going to be used to identify the items relied on for safety, IROFs.

MEMBER APOSTOLAKIS: Isn't that some that that Mary Drewin (phonetic) and her project on coherence should pick? It is just trying to harmonize the regulations. Why are we using ISA here and PRA there?

MEMBER SIEBER: Yeah, we should drop PRA.

MEMBER APOSTOLAKIS: I'll talk to Mary.

MEMBER POWERS: Why don't you be nice and let Mary at least sort out her problems with reactors? Once she's proven herself on that, we will let her move into facilities.

MEMBER APOSTOLAKIS: It may be late.

MEMBER POWERS: The number of mixed oxide --

MEMBER APOSTOLAKIS: You're using defense in depth, too?

MEMBER POWERS: Once mixed -- remember mixed oxide fuel fabrication facilities we intend to review in this country is fairly limited right now, George.

MEMBER APOSTOLAKIS: Yeah.

MEMBER POWERS: So I would not expend an enormous amount of effort plaguing poor Mary and her activities.

MEMBER APOSTOLAKIS: It's initial national importance.

MEMBER POWERS: More interesting to me than the debate over ISAs or PRAs or some of the other standards that they're using, and they use defense in depth, but they have a peculiar definition of defense in depth, and I list it up here in hopes that no members slit their veins over this definition of defense in depth because this is actually in the regulations, and we can't change it. This easily is one of the worst definitions of defense in depth I've --

MEMBER KRESS: That was in the white paper.

MEMBER POWERS: What did you say?

MEMBER KRESS: That was in the white paper.

MEMBER APOSTOLAKIS: Not this. Was this?

MEMBER KRESS: Yeah.

CHAIRMAN BONACA: The second paragraph, yeah.

MEMBER POWERS: This one just doesn't cut it if you ask me in the definition of defense in depth, but it will do for this facility.

The other requirements are that the design must incorporate to the extent practical preferences for engineered controls and enhance safety.

The strategy the application is adopting is consistent with this approach. He has a mitigation of prevention and mitigation in his facility. He is looking at a large amount of redundancy in things like the power coming into the site. They have this conventional nested ventilation system for preventing leaks to the outside, and they use a HEPA filtration system.

That cause pause to us because in the traditions of the Savannah River site where it has always been to use sand filters for these, there has been a bad history within the DOE complex in using HEPA filtration systems, and we pursued this in great depth, and I can definitely attest that the people working for the applicant on HEPA filters know more about HEPA filters than I will know if I stay up nights studying, and they have definitely optimized that technology and are using it in a redundancy that's pretty interesting.

It's redundancy, but not so much diversity that makes for interesting discussions on defense in depth, but looks to be effective.

Well, the application of the SER cover a huge number of topics, a variety of safety considerations. Where have we been focusing our attention?

We've focused really in the areas of fire and criticality. When you think about this facility and getting radiation off the site boundary, radioactive material off the site boundary affecting the public, the only ways you think you can do it is fire. There is just not another mechanism for doing it.

If you think about how you contaminate the site with things other than plutonium, the only way you can do it is a criticality event. And so these are the things that have occupied our attention.

The area of criticality is fairly well established technology for preventing a criticality. There's a double contingency standard. This is an area of some ongoing discussion between the staff and the applicant on the implementation and devotion that you will give to the double contingency principles. But, quite frankly, those principles have served us well in these areas.

We have a couple of questions as we go into this on other areas of potential criticality. Much of our attention has been devoted to fire, and fire is an issue for this facility. One of the working fluids you have is kerosene, and there's a lot of it on this site.

A lot of it is contained in welded steel piping systems, and it's a little hard to understand how you would ignite it, but quite frankly, you're working with kerosene, and so there's a potential for fire.

The other areas of fire is this peculiar thing called red oil, and if you have not worked in solvent extraction systems for plutonium, you turn around and start making funny jokes about communist petroleum products creeping into our system.

Red oil is one of those little mysteries of process chemistry that abound in all big process chemistry operations. This one involves a decomposition product or the extractive agent, which is tertiary butyl phosphate that decomposes and combines in some way with metal ions in nitrate to form something that can burn and burn fairly energetically.

It has been encountered in the PUREX and its predecessor processes now for, gee, I guess the first one was back in the --

MEMBER SIEBER: Forty years.

MEMBER POWERS: -- 1940s was the first time it was encountered.

MEMBER SIEBER: Forty or 50 years.

MEMBER POWERS: Fifty years or something like that, and there have been some spectacular events.

Every time there's one of these events, people launch a big effort to understand what red oil is. It's complicated. It's difficult to reproduce in the laboratory.

They usually despair and apply some administrative controls to avoid the problem, and we go for another several years until some new feature of the red oil fabrication bites us.

MEMBER SIEBER: I guess it's hydroxyl amine nitrate, which is temperature sensitive.

MEMBER POWERS: That's another one we'll get to.

MEMBER SIEBER: Okay.

MEMBER POWERS: This red oil is weird.

What happened within the community working with the PUREX process is they have found empirically that if they keep the temperatures low and do not allow the accumulation of degradation products for long times in the system, that they avoid the red oil process.

And that works. We don't have red oil problems when you do that sort of thing.

The applicant himself is exploring the chemistry in more detail. It's very interesting, but quite frankly, he's adopting the empirical guidelines that have been developed over the years. They just keep the temperature low and don't allow the accumulation of degradation products as you recycle this solvent and the extraction agent through the system. In other words, we replace it every once in a while.

There's another ammonium nitrate problem in the system similar to the kinds of empirical things to handle those problems. We have asked them about ammonium nitrate accumulation in ducts and things like that. I presume they'll get back to us.

My experience is that we have on occasion seen ammonium nitrate accumulation in duct work, but never any amount that would amount to anything. I mean, it's dust here and there.

There are also interesting fire hazards associated just with working with the zirconium cladding on fuel. Zirconium metal has a history of spontaneous combustion when it's mistreated or inappropriately stored.

More interesting, I think, is an issue raised by the brethren on the ACMW when they attended the meeting, was to focus some attention on the hazards associated with the waste streams and their waste handling areas and whether there were fire hazards associated with that.

Well, this is some of the issues that have arisen in the course of the subcommittee meeting. There is a catechism that has been developed primarily in the Department of Energy for evaluating the hazards posed by accidents at their plutonium facilities. The last time I spoke to you, I think I went into some of the details of what's called the five factor formula, which involves taking the product of the material that's at risk, the damage ratio, and the damage that occurs to the facility. What's the airborne release fraction from that? How much of that is respirable? What fraction of that leaks?

The catechism that's developed is that you go through this process, and you get to this airborne release fraction. You go to a database. A lot of us call the Mishima database because Joe Fu Mishima put it together from year and years of experimentation he had done on what kinds f fractional releases you get when you abuse and torment lutonium in various forms.

He put them all together in a book. If you look up and you find an experiment that you think is appropriate, you take the airborne release fraction out of that. You assign some respirable fraction to it, and you proceed with the multiplication.

There are at least two difficulties that you encounter in applying the Mishima database. First of all, which of all these things do you pick?

There are a lot of experiments that you can pick, and it is never obvious to me at least which one is the appropriate one to use.

The next issue you have is Joe Fu did his experiments like he put a piece of paper in a Bunsen burner and looked at what fraction of the plutonium on that filter paper went up the stack.

Joe Fu did not do experiments in which he took mixed oxide fuel fabrication facilities and initiated accidents and measured the release fraction. How do you take the release fractions that Joe Fu got in his experiments and say what's the release fraction that you get from an accident at the facility?

The contention is made that these release fractions are bounding, from the database are bounding on the release fractions that you would get from the events at the facility.

I have no doubt that that's true. It is certainly true that in most cases the respirable fraction is taken as one, and I will concede that adopting the respirable fraction as bounding, I have no problems with that.

The release fractions being bounded, I'm quite sure they're true. However, my experience has been that in the fuels area that we usually take experiments and apply an elaborate amount of physics to go from the experiment that we do on a small piece of fuel to predicting what happens in reactor accidents.

That phenomenological scaling, if you will, is at least not transparent to me from the database, what's done in the safety analysis, and consequently, I don't understand why one can have a confidence that the assessments they've done are bounding.

What I do have a confidence in is that this facility does not pose an enormous amount of hazard and that you can probably adjust those release fractions by orders of magnitude and still not pose a hazard, and it's a little bit much to make a big deal about this, but I would say that this is one of the areas that the subcommittee is still pursuing.

More important to me is the issue of fire protection at the facility, though, in fact, I think they have a pretty good fire protection program planned for the MOX facility.

What I don't see is a very clear, precise design basis for the fire protection system. I would like to see something akin to what we do for the reactors that say we will have a channel, a pathway for shutting this facility down, and understand shutting down the facility is a peculiar comment. You don't really want to shut it down. You want the ventilation system to keep working.

PARTICIPANT: To keep going.

MEMBER POWERS: So keeping this facility working in the event of a fire, and I think they can do that. It's just not a clearly set.

There are some problems, some issues that have risen with respect to the strategies for suppressing fires. In one area they are using what they call a clean agent for suppressing fires, and what a clean agent is is some mixture of basically carbon dioxide that blankets the burning material and denies it oxygen. So the flames disappear.

But it does not quench the hot material. In fact, it helps insulate the hot material, which is already insulated by a char. Consequently, when the clean agent is disbursed and oxygen again has access to the material, the flames burst up again.

Those of you that recall our discussion of the fire in the cabinets, in the instrumentation cabinets at San Onofre, saw that that happened several times, that they would suppress the fire with the CUS-2 extinguisher. They'd open up the cabinet, take a look at what kind of damage that had been done, and it would promptly burst into flames.

It can be even worse than that. While this stuff is hot, but not burning, it bakes out all of the nice, volatile organics, which accumulate because they're heavier than air. The oxygen comes in, and you get a vapor combustion event that can be modestly surprising.

Again, with the criticality in the waste handling zone, it's something we're continuing to look at, and you'll never guess that at least one member of the committee raised the issue of material selection and corrosion. I'll leave it to you to guess who might have raised that question.

It is a non-trivial question. Some of the feeds they will be using do have chloride contamination, a stainless steel system. It would be an unfortunate thing to have a piping mistake in that.

Yes, sir?

MEMBER RANSOM: I wonder if they considered the danger of the CO_2 extinguishing system. You know, out at ATR they killed a couple of people because of accidental discharge of the --

MEMBER POWERS: Yeah, we had Link Technologies, Ali and his team looked exactly into that event. That's not really a hazard here. They're using these things and nozzles and the glove boxes, whatnot. We don't really have that problem here.

Well, the status. We have the best part of a draft SER. Quite frankly, it is one of the better SERs I've read recently. The staff in producing this SER has in many cases, not all cases, but in many cases, tried to communicate what the basis they used in evaluating what the applicant has said and why they think that that's a reasonable thing for them.

The SER is quite comprehensive, as is the application report. They are basically pretty well done documents.

There are a few outstanding issues. I've listed down here 19. I'm sure that's a time dependent quantity. Some of them are just adjusting language to get that so that it's more aligned with what's in the regulations. Some of them are a little more substantive than that.

My feeling is that we're progressing forward on this facility sufficiently that we can come directly to the ACRS with this facility without having another subcommittee meeting, barring some contra temps in the resolution of the outstanding issues.

The burden in doing that, of course, is that the members do need to reacquaint themselves with the facility. You don't use it very often, and you just need to familiarize yourself with what they're trying to accomplish here in the safety analysis for this phase.

There is a second phase in the licensing process, which is the possession and operation permit. Right now we're just setting down the design bases for the construction permit, but it looks to me like we can come directly to the committee. I think everybody has got their stories pretty well organized.

I look at the schedule, and it looks to me like there's an August deadline for the staff to produce the report. That would mean they have to come to us in July. Okay?

They haven't told me that's what they're going to do. That's my guess of what they'll do. If Drew objects, do object now. Otherwise I think we're on a pathway to look at this facility in July.

You can look at the documentation on the Web, and it's pretty easy to get to. It comes down pretty quickly, and it's more convenient to look at it on the Web than to get what amounts to a set of documents about this big.

Some of the background materials that you might want to look at, standard review plans and things like that, you'd probably need to have supplied to you. They're not so convenient to get to.

That's all I had to say about the facility. We are benefitted by having representatives both from the staff and the applicant here, who I invite to give me a grade on my summary of the facility and correct any errors that I might have allowed to creep into my discussion of this facility.

MEMBER LEITCH: Dana, one question I had when we talked about this 18 months or so ago related to operator selection staffing levels, training levels. I assume that's still yet future.

MEMBER POWERS: That would be in the next stage.

MEMBER LEITCH: Yeah.

MEMBER POWERS: That would be in the next stage.

Now, they address it, but I consider that to be more for information than it is in the specific requirements in the regulations for this stage. They do address training and a lot of activities like inspections, that sort of thing. They actually go into either a nice amount of detail or a mind numbing detail, depending on your interest in the particular subject, particularly in the application.

So, Peter, give me a grade. Tell me if there's anything we need to add to this.

MEMBER RANSOM: Dana, I've got a question. This is a commercial facility located on a DOE site, I assume, right?

MEMBER POWERS: Well, roughly.

MEMBER RANSOM: What's to prevent a nuclear power facility being located on a DOE site and then you avoid all of the NRC troubles?

MEMBER POWERS: Did you have some

perception that I was a lawyer?

(Laughter.)

MEMBER POWERS: Have I misled you in my discussion?

MEMBER RANSOM: Well, it's the first time I've ever heard of a commercial facility being located on a DOE site.

MEMBER POWERS: well, in your old homestead up in Idaho, they are planning to locate the 2010 reactor up there.

MEMBER RANSOM: NHTGR?

MEMBER POWERS: And so I guess there is no prohibition against that.

MEMBER SIEBER: What about Hanford?

MEMBER POWERS: Well, Hanford, now, Hanford supplied steam to a commercial facility off site. I don't know exactly what an assigned boundary is, but I think they're off the site.

MEMBER SIEBER: Well, N reactor was on site.

MEMBER POWERS: N reactor was on site, but they pumped their steam across the river to the facility that generated the power.

MEMBER SIEBER: Across the river

MEMBER POWERS: Yeah.

MEMBER KRESS: On a scale of one to ten, I give you a grade of 11 and a half.

MEMBER POWERS: No, no. Thank you, Dr. Kress, and I will pay you afterwards. I want to hear from people that know something about this facility.

CHAIRMAN BONACA: All right. Well, thank you for the informed presentation.

MEMBER POWERS: If Peter or Drew have anything to correct.

MR. HASTINGS: Yeah, this is Peter Hastings with DCS, and of course, I would concur with Dr. Kress.

(Laughter.)

MEMBER POWERS: It's not going to help you, Drew.

MR. HASTINGS: With the sole exception of your distance to civilization remark, I think the --

(Laughter.)

MR. HASTINGS: -- highly accurate.

MEMBER KRESS: Yeah, I told him one state away.

VICE CHAIRMAN WALLIS: Well, some people might think the distance to civilization would be several oceans.

MR. PERSINKO: This is Drew Persinko, the

South Manager for the MOX facility.

I think you were accurate in your presentation. I'd just like to point out to the full committee a slight clarification, that when you showed Part 70.61, you showed the consequences aspects of it, but it's really what we call the performance requirements which is a combination of consequences with likelihood. So there's that aspect of 70.61 as well.

MEMBER POWERS: Yeah, I started to go into credible and incredible accidents and frequencies, and I decided that even I didn't believe that.

VICE CHAIRMAN WALLIS: Okay. Thank you.

We now have another presentation from a subcommittee chairman. That's George Apostolakis on the integrated industry initiating event performance indicator.

MEMBER APOSTOLAKIS: I have a conflict of interest, Mr. Chairman.

VICE CHAIRMAN WALLIS: Yes, it's going to be done by Bill Shack, Mario.

CHAIRMAN BONACA: Should I plug my ears some?

PARTICIPANTS: No.

CHAIRMAN BONACA: Just keep silent.

MEMBER POWERS: There will be no snickering, sir.

CHAIRMAN BONACA: Do not speak unless spoken to.

MEMBER APOSTOLAKIS: It's easy to say nasty things about PRA because he can't say anything.

MEMBER SHACK: We had a subcommittee meeting to review staff work on what they call the industry initiating event performance indicator. The development of this indicator is part of what is called the industry trends program, and the industry trends program is intended to complement the plant level oversight provided by the ROP.

The ROP looks, of course, at a plant specific kind of performance. The industry wide view is sort of we had some discussion of what you would learn from an industry-wide view since, again, a plan has a problem; the industry has a problem.

But the thought was that the industry-wide view could reveal trends that wouldn't be clear on a plant specific basis, especially as we looked at things like initiating events, which at least some of them are fairly rare events, and if you looked at an individual plant, you might wait some time before you see them. If you pool the data on an industry-wide basis, you might see trends that wouldn't be revealed on a plant specific basis.

The industry trends are also useful in providing what is for the NRC a congressionally mandated assessment of safety in the nuclear industry in the country, and it was also argued they might provide a context for considering the plant specific results just like, again, looking at the plant specific results in the context of industry performance.

Now, the industry trends program is presumably a larger set of indicators that will be developed. This is, again, an ongoing program. So we had a kind of a brief overview of the notion of an industry trends program, this notion that we would be looking at data and combining it to look at the industry.

Then we looked at this one particular indicator that they have been working on to develop this so-called industry initiating event performance indicator, and the initiating event indicator looks at a fairly broad range of risk significant initiating events, and again, we asked them just how they selected the initiating events that they did, and it doesn't appear that they had, you know, sort of a 95th percentile of all the risk due to initiating events, but they were concluded to be the most important initiating events.

They had nine events for BWRs, ten events for PWRs because the PWR initiating event includes a steam generator tube rupture, of course, which has no analogy in a BWR.

MEMBER POWERS: But there are bypass accident analogies in BWR.

MEMBER SHACK: Yeah, but this is really a CDF driven thing. So this is an initiating event for CDF.

MEMBER POWERS: Well, you know, somehow it strikes me as a perversion of the idea of risk informed regulation if you're going to ignore those things that don't fit in the CDF as surrogate for risk, and that's what happens. Bypass accidents don't fit using CDF as a surrogate for risk because even though their initiating frequencies can be low, their risk is very high

MEMBER SHACK: At the moment they're focusing on, again, some of the other initiating events. They're looking at small break LOCA, loss of instrument air, loss of feedwater, loss of heat sink, stuck open SRVs, loss of off-site power, general transience.

Again, some of these events occur often enough that you can get plant specific data. Others are rare events, and you can get meaningful data only on an industry-wide basis. And what they decided to do for their performance indicator base was to use industry average frequencies of these initiating events.

So they would look at essentially all instances of steam generator tube rupture in PWRs, all instances of loss of off-site power for the families of reactors.

They would then trend these frequencies. So that would be one level of indicators, would be the industry trends in these initiating event frequencies.

Now, again, that tells you something about the trending of the initiating event, but the real trick is to estimate the risk significance of these trends, and they chose to do this by computing an average CDF associated with these initiating events.

So you have one set of indicators, which is really the trending of the frequencies. The other is this average CDF. They compute the average CDF by averaging over all plants as though the plant had the industry average frequency of initiating event.

So you take your industry average initiating event frequency, and then you look and see what the associated CDF per plant is with those initiating events, and then average that CDF.

For a plant, you can compute the CDF corresponding to the initiating events from the burn bound importance measure for each initiator. These important measures are computed from the staff SPAR models.

You then, again sum those up for each plant, and then you average them over all the plants. You can interpret the resulting CDF as that due to a plant with an average burn bomb importance and an average frequency of initiating events.

Now, it turns out that the trending the frequencies itself is not a trivial exercise. We have a statistical variation in the number of events from year to year that's just fluctuating.

In some cases over a ten to 15 year period, there's a clear decreasing trend in the number of events, but now we may have reached the plateau, and they were trying to get a baseline.

Again, if we're looking for a trend, we have to have a baseline to measure the trend against. Their properties for a base was to use a long enough period to get a good estimate of the frequency and short enough that the frequency over that period was approximately constant.

They came up with some statistical rules that allowed them to estimate these baselines for each of the initiating events, and if you took those baseline estimates of the frequencies of the initiating events, then your average CDF for those initiating events for BWRs was about one times ten to the minus five for a reactor year, and it was dominated by loss of off-site power, loss of heat sink and feedwater.

Your baseline CDF for PWRs is 3.65 times ten to the minus five per reactor year, and again, that's dominated by small break LOCAs, loss of vital DC bus and loss of off-site power.

They have, again, statistical rules to compute their baselines. They compute the current frequencies as three-year Bayesean running averages, and so they can now have essentially a baseline for the frequency. They have averages, current averages that they can compute, and they can then begin to establish as trends.

So what you get out of this analysis is a current average value of the CDF, which in some sense is a measure of safety, and then you can begin to get trends both in the average CDF and the initiating frequencies which, again, tells you something about performance in a sense.

Once you've established that you can compute these trends in this average CDF, you'll also have this question of, well, what does it mean. What is a threshold? What does the trend mean, and how do you set thresholds or measures of significance of the trend?

That's a problem they haven't solved yet. That's essentially, you know, work in development. They plan to hold a public workshop in July to do this. We will presumably get a chance to review that work and to have some input into it before the final, but again, this is a work in progress, and that's basically the status that they've come up with, their methods for computing the baseline values and the trends, and now the question is to come up with criteria for significance in the trends and the baseline guidance.

Any of the others?

MEMBER SIEBER: Yeah, I think it's worth adding why they're doing this in the first places. One of the reasons that they're doing it is the one that Bill stated, which is there is a federal law that requires the NRC to report to Congress abnormal events and the safety status of the industry, and this is one of the tools that they will use to do that, and it's a little bit different than what they are currently doing, which is basically reporting serious events that occur without any analysis of trends.

The other thing is that they plan to use it in a way that's quite similar to the matrix in the ROP.

In other words, if the trend is basically negative or steady, they will not take any regulatory action, but as trends are identified which are adverse, then they will go through a graded approach to regulatory action, which would be first to engage the industry to solve the problem; second, generic communications to licensee; third would be generic safety inspections to determine the root causes and so forth for adverse trends; and then lastly, declaring whatever issue caused the negative trend a generic safety issue.

So this is the other half of why they're doing this because, you know, just developing performance indicators to put on the wall or in a filing cabinet someplace is a lot of effort unless you do something with it, and that's what they plan to do.

MEMBER RANSOM: Well, just one comment. It looks like this performance indicator is based on a linear type model, in other words, the response surface type approach that's used somewhat in evaluating uncertainty in, you know, the existing models.

And I would think this non-parametric probability theory might be used here, you know, to invoke some of the non-linearities of these initiating events.

For example, like in some of the modern systems where presumably the cord is not uncovered, although there's, you know, some probability in the frequency distribution of initiating events that the core would uncover, but the derivative would be zero for the most part, and then only in the extreme case of some of these small, less probable aspects of the event would it be, say, non-zero.

And I'm wondering how this would incorporate that kind of an effect or does it only do it in some average sense?

MEMBER SHACK: Certainly the argument is that the CDF is linearly related to the initiating event frequency through the burn bound measure.

MEMBER SIEBER: Yeah.

MEMBER SHACK: It's not clear to me that there's a non-linear relationship there.

MEMBER SIEBER: I would think it's linear.

MEMBER SHACK: You know, this may be a case where the response surface actually is linear.

MEMBER RANSOM: Well, I wouldn't think -- just take some of the modern systems where core uncovery (phonetic) is highly improbable, but if you include the uncertainties involved in the estimation, there is some at least small probability that the core would be uncovered and core damage would occur.

VICE CHAIRMAN WALLIS: This isn't the Burnbaum coefficient that's sort of integral of all of that?

MEMBER SHACK: Yeah, right. I think the Burnbaum coefficient would measure that.

MEMBER APOSTOLAKIS: But they're working with BRA. BRA is linear in this work.

MEMBER SIEBER: Yeah, right.

MEMBER APOSTOLAKIS: You're referring, I think, to physical phenomena where you have --

MEMBER RANSOM: Well, this is a partial derivative of the possibility of core damage frequency with respect to frequency of the --

MEMBER APOSTOLAKIS: Oh, you mean Burnbaum?

MEMBER RANSOM: Yeah, it's right here. You know, the definition basically --

MEMBER APOSTOLAKIS: Yeah, but it's the partial derivative of a linear function.

MEMBER RANSOM: Yeah.

MEMBER APOSTOLAKIS: The PRA is a linear function of the --

VICE CHAIRMAN WALLIS: Yeah, you have twice as many initiating events.

MEMBER APOSTOLAKIS: What?

VICE CHAIRMAN WALLIS: You have got twice as many initiating events. You have twice as much core damages.

MEMBER APOSTOLAKIS: That's right. Also unavailabilities. It's linear in everything.

VICE CHAIRMAN WALLIS: It integrates out all of these other things in PRA.

MEMBER APOSTOLAKIS: In fact, they take the difference, don't they?

MEMBER SHACK: Well, they look at it both ways, the difference or the absolute value.

MEMBER APOSTOLAKIS: No, I mean they don't show a derivative.

MEMBER SHACK: No, they don't show the derivative. You're right.

VICE CHAIRMAN WALLIS: But they mention the word "derivative."

MEMBER SHACK: You're right.

MEMBER APOSTOLAKIS: They do mention derivative?

MEMBER SHACK: Yes, yes. I think the problem is, of course, you don't walk into the SPAR model and ask for a derivative.

MEMBER APOSTOLAKIS: Right, but why? I don't understand it. Are they unhappy with other measures? This is now an academic discussion.

VICE CHAIRMAN WALLIS: Therefore important.

MEMBER SHACK: Well, I thought the Burnbaum was a better measure. You're the PRA expert.

MEMBER APOSTOLAKIS: Better than what?

MEMBER SHACK: It was a more meaningful measure because it didn't look at, you know, I take one thing and I set it to zero and I take --

MEMBER APOSTOLAKIS: Oh, okay.

MEMBER SHACK: You know, and so, in fact --

MEMBER APOSTOLAKIS: So the next step in

three years will be the differential measure which now takes this and divides.

MEMBER POWERS: Gosh, that sounds like a major breakthrough, doesn't it, George? It's only been in the literature now how long?

CHAIRMAN BONACA: All right.

MEMBER APOSTOLAKIS: Very good. Well, I take that back. I didn't say "very good."

MEMBER POWERS: So marginally adequate, huh?

CHAIRMAN BONACA: You cannot say anything. You're completely --

MEMBER APOSTOLAKIS: I can ask a question for my own intellectual satisfaction.

CHAIRMAN BONACA: Yes, yes, sure. But you cannot provide an answer.

(Laughter.)

MEMBER POWERS: Was that a statement of permissiveness or ability?

CHAIRMAN BONACA: Both. No, no.

All right. With that we move to the next item on the agenda. That's John is going to walk us through future ACRS activities, a report of the Planning and Procedures Subcommittee.

MR. LARKINS: Has everybody got a copy of the packet? I assume everybody has had a chance to peruse through it.

PARTICIPANT: No. No, we didn't.

MR. LARKINS: And if there's no comments we'll move on.

Okay. Let's go to the anticipated work load for June. Well, let's look at May real quick. We're finishing up the PRA letter this morning, and I guess the vessel head penetration cracking and head degradation letter and the Reg. Guide 1.178.

MEMBER SIEBER: Do we need a reporter for this portion?

MR. LARKINS: No, no. We don't need you.

(Whereupon, at 9:32 a.m., the meeting in the above-entitled matter was concluded.)