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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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PUBLIC MEETING

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WORKSHOP ON DEVELOPMENT OF REGULATIONS FOR SPENT NUCLEAR FUEL REPROCESSING FACILITIES

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TUESDAY

SEPTEMBER 7, 2010

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The meeting convened at the Hilton Washington D.C./Rockville Executive Meeting Center, 1750 Rockville Pike, Rockville, MD, at 12:30 p.m., Francis Cameron, presiding.

PRESENT:

FRANCIS CAMERON, Facilitator

SVEN BADER, AREVA

MARISSA BAILEY, NRC

JIM BRESEE, DOE

JOSE CUADRADO, NRC

YAWAR FARAZ, NRC

JOHN FLACK, ACRS

CATHY HANEY, NRC

THOMAS HILTZ, NRC

PRESENT: (CONT.)

MIRIAM JUCKETT, CNWRA

ED LYMAN, Union of Concerned Scientists

ARJUN MAKHIJANI, IEER

ROD McCULLUM, NEI

ALEX MURRAY, NRC

PHIL REED, NRC

STEVE SCHILTHELM, Babcock & Wilcox

DANIEL PAUL STOUT, TVA

I-N-D-E-X

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

12:46 p.m.

MR. CAMERON: Good morning everyone, or I should say good afternoon everyone. Welcome to the NRC's workshop on the NRC reprocessing rulemaking and I would just thank you all for being here and Ed, I am sorry if I rushed your lunch but thank you for coming up to the table.

It is my pleasure to serve as your facilitator for this session and Miriam Juckett from the Southwest Research Institute is going to be assisting me and I just wanted to cover a couple of meeting process items before we get into the substantive discussions today.

And I would like to tell you about the format for the meeting, tell you about some simple ground rules to help us to have a constructive session over the next day and a half, do some introductions around the table and then go through the agenda for you to make sure that we are all fairly clear on what is going to happen, when, and to answer any questions that you might have about the agenda.

In terms of format for the meeting, we are using what we call a round table setting and obviously not literally, but a round table format as opposed to

the sometimes traditional town hall format that the NRC uses, is meant to encourage dialogue among the people around the table and so the format is designed to allow all of you to talk to one another about the issues rather than just talking to the NRC.

And we have around the table representatives of interests who may be affected or concerned about reprocessing issues. The NRC staff is also with the table today to serve as a resource for all of you.

And so we not only want to hear each of your opinions on the issues, but we want to get your reaction to other participants' opinions and perspectives on the issues.

So it's a modest attempt to try to develop what I call a richer form of data than the NRC normally gets through written comments on the issues and the staff is also taking written comments on these issues and I believe the comment period closes no November 5 of this year.

And although the focus of the meeting is at the table, we are going to go out to those of you in the audience for any questions or comments that you might have on the issues that are being addressed up here.

In terms of ground rules, if you want to speak I would just ask you to turn your name tent up. I think most of you are familiar with this method. If you could just put it up like that. And that allows me to know who wants to talk and you don't have to worry about jumping into the conversation.

I may not take the cards as they turn up in order because we may be following a particular discussion thread, which is what we want to try to do, is develop those discussion threads rather than the unrelated monologue type of thing that can happen at these workshops.

I would ask only that one person at a time, so that we can give our full attention to whomever has the floor at the moment, and also so that we can get a clean transcript.

We are taking a transcript. Our stenographer is Jim Cordes over here, and one person at a time, Jim will know who is speaking. At the beginning as we go around, beginning of the session, I am always going to be referring to your name so that Jim can know who is talking and eventually he will get used to who is at the table.

And I would just encourage you to participate fully in the discussion, talk to one

another. You may have different views on the issues but let's try to understand what the concerns and interests are behind those views so we can consider that.

And we are going to have the typical parking lot over here, where if an issue comes up, a comment that doesn't fit into the discussion at the moment, we will put it over here in a parking lot and we will make sure that we come back to it before we are done at the end of the day tomorrow.

And let's go around the table and do introductions right now. And I think I'll start here with Tom Hiltz. And you press the button on these microphones to activate it.

MR. HILTZ: Thanks Chip. My name is Tom Hiltz. I am a branch chief of the Advanced Fuel Cycle branch and my branch is principally responsible for the work associated with the revised framework for licensing a potential commercial reprocessing facility.

MR. CAMERON: Steve.

MR. SCHILTHELM: Good afternoon. I am Steve Schilthelm with Babcock & Wilcox and Babcock & Wilcox is working jointly with AREVA on the reprocessing program.

DR. FLACK: My name is John Flack. My affiliation is with the ACRS. I am primarily here to keep the committee informed of activities in reprocessing and also had worked previously with the ACNW on reprocessing so we are very much interested in hearing what goes on today. Thank you.

MR. McCULLUM: Hi, I'm Rod McCullum with the Nuclear Energy Institute. We are the trade association for just about everybody that does business in the nuclear industry here in the United States. There are certainly a lot of diverse interests in the recycling and reprocessing area in the industry.

And I really want to thank NRC for holding this workshop. I was at Blue Ribbon Commission meetings, the presidential commission looking for next steps including recycling last week, and a recurring theme was having a regulatory framework that engenders public trust and confidence.

And really the only way to get that is from the beginning, to continue to seek it out and so that is a very good first step. And as we make decisions in industry regarding our views on recycling and reprocessing, knowing that you have a regulatory framework that is capable of doing that is a very

important input for us as well. So thank you.

MR. CAMERON: Okay, and thank you Rod and I was a little remiss in perhaps offering, when you do introduce yourself, if you have any -- one or two sentences such as Rod just added on concerns that you would like to see addressed or objectives for the workshop, please add that in and I will go back over to these three gentlemen to see if they have anything to say on that account. But let's go to Alex.

MR. MURRAY: Yes. Thank you. Good afternoon. My name is Alex Murray. I am with the USNRC. I am senior engineer, senior chemical process engineer. I have been in and out of reprocessing, waste management and MOX, it seems like for centuries.

But my first job out of college was actually a MOX plant. Thank you.

MR. STOUT: I am Dan Stout, Tennessee Valley Authority. I am working with Rod and others from industry on nuclear fuel recycling task force. Prior to that I was at the Department of Energy responsible for nuclear fuel recycling.

And like Rod, I appreciate the opportunity to be here, sharing in this dialogue and it's important from industry's perspective for the NRC to continue with regulatory framework development. It's

an essential component of the decision making process going forward. Thanks.

DR. BADER: I'm Sven Bader from AREVA federal services. I also work on the NEI task force, Rod and Steve Schilthelm of B&W is one of our team partners. My experience base is really on the MOX fuel fabrication facility down at the Savannah River Site and I hope that we can move forward with the regulations here to produce a similar facility on a pure commercial field.

DR. MAKHIJANI: Hi, I'm Arjun Makhijani. I am with the Institute for Energy -- excuse me, I can't speak very well, I'm numb.

MR. CAMERON: Arjun just had surgery this morning so I thank him for being here.

DR. MAKHIJANI: I have long been interested in reprocessing from concerns regarding non-proliferation, waste and cost and have written extensively about it and it's part of the reason, I guess, Chip invited me to be here.

MR. REED: I'm Phil Reed. I am from the NRC's Office of Nuclear Regulatory Research. I am in the division of risk analysis and I am working on issues involving research for reprocessing facilities and I am also a member of the technical working group

that is putting together the technical basis documents, composed of the gaps that you will be hearing about this morning and tomorrow.

MR. FARAZ: Hi. I'm Yawar Faraz. I am a senior project manager at the NRC. Tom Hiltz is my supervisor. And I am also on the technical working group that is working towards putting together a technical basis, a regulatory basis for processing.

DR. LYMAN: I'm Ed Lyman, the senior staff scientist at the Union of Concerned Scientists. We oppose reprocessing barring really compelling reason to go forward with it and we still have seen no such reason. Our main interest here is to ensure that if a reprocessing rule is developed, that it is not watered down, diluted, weakened to accommodate the licensing of reprocessing plants which are incredibly expensive, failure-prone and a threat to the entire world for their production of fissile material that can be used in nuclear weapons.

MR. CAMERON: Thank you Ed. Marissa?

MS. BAILEY: I'm Marissa Bailey. I am deputy director for the division of fuel cycle safety and safeguards in NMSS at the NRC and I would just like to take this opportunity to thank everyone at this table for coming to this meeting and giving us

your perspective. As we move forward towards developing the framework for reprocessing, I think it's very important that we do get a wide range of comments, concerns, feedback from all stakeholders that are involved. So thank you.

MS. HANEY: I'm Cathy Haney. I am the office director in the Office of Nuclear Material Safety and Safeguards. This effort falls under my responsibilities and I'll get a chance to do opening remarks in a few minutes so I'll save them for then.

MR. CAMERON: Okay. Thanks Cathy. Jose?

MR. CUADRADO: My name is Jose Cuadrado. I am a project manager, also at NRC, division of -- office of nuclear material safety and safeguards and I will be helping with any of your IT needs or any of the organizational aspects of the workshop.

MR. CAMERON: Okay. Thanks, Jose and Jose, as the project manager, has put a lot of effort into getting us to the table here today, as well as Miriam, so thank you for that.

We are going to have some people joining us throughout the day: Jim Bresee from the Department of Energy will be here; Michele Boyd from Physicians for Social Responsibility is going to be here, she just got back from Argentina yesterday so this may not

be the first thing she wants to do today; and we have some other industry folks from GE that are going to be joining us tomorrow.

So in terms of agenda, I just wanted to say a few introductory remarks about it, and we have already heard one overarching issue, which is the issues that Ed Lyman brought up about should we even be doing reprocessing? Obviously an important national policy issue however our agenda is going to focus on the NRC responsibilities in terms of developing a regulatory framework that is the most effective possible on this.

And so all of the agenda issues focus on those aspects -- various aspects of the NRC responsibilities. Secondly, this is a complicated area, all you need to do is read any of the background documents on it to know that, and we are hoping that we help to simplify it a little bit through the development of the agenda.

We are also going to have NRC staff members do what I call a tee-up on each agenda item before we go into it, to hopefully clarify what the important issues are.

We haven't tried to address all of the so-called gaps that were identified in the federal

register notice. We really wanted to focus on issues during the next day and a half that it might be productive to have dialogue on, as opposed to issues that can be very simply addressed by submitting written comment by October 5.

And fourth, we really are also keeping our eye on the workshop that is going to be held in Albuquerque on October 19 and 20. Some of the same people may be around that table. We may have different people.

But at the end of the day, tomorrow, if anybody has suggestions on issues that we might want to give more attention to in Albuquerque, less attention, whatever, we would really appreciate hearing that also.

We are going to start off, as Cathy Haney mentioned, we are going to start with a context piece on NRC responsibilities and on this rulemaking -- Cathy is going to that for us.

The first discussion issue -- and we'll have time for questions to Cathy after she does her presentation -- the first discussion issue is the alternative regulatory framework issue and you will see some of the ideas listed there that we want to talk about.

We will have a tee-up for that and I think Alex is -- you are going to be doing the tee-up on that one.

The next topic for this afternoon is safety and risk requirements and Yawar is going to do the tee-up on that for us.

We are going to finish at 5 today. We are coming back tomorrow morning at 8:30 and basically we are going to start right in on design and operational requirements for reprocessing facility and I think Alex, that's you, you are going to do the tee-up on that one.

And then we are going to go to waste management issues, have a discussion of that and we are going to have Mike Lee of the NRC staff here with us to tee that one up for us.

We are then going to look at security and safeguards issues and we will have either Tom Pham or Marshall Cohen to do that tee-up for us.

And then we have environmental issues slated for the last topic of the day and that is a discussion of effluent limits and one of the things that all of you know or will see is that there is a lot of rulemakings, a number of rulemakings going on at the NRC that may have important implications for

not only reprocessing facilities, but all facilities.

For example the Part 20 rulemaking that eventually is going to happen that might change the NRC's radiation protection standards. One of the things we can talk about is the effluent limits. We can talk about -- I know that there are some concerns about 40 CFR 190, which is in the EPA's bailiwick.

We can focus on those issues or we can come back to discuss more fully something that you think has not been addressed. So we will be going out to you to find out whether that last agenda item is one that we should really do or whether we should go on to something else.

So that's sort of the agenda overview. Are there any questions about the agenda at this point, about where something should be covered, something that we left out at this point? And then, do that John, just for practice, with the name tent. Oh great. Good, it works. Okay. Yes, John?

DR. FLACK: Yes. I had commented earlier on this. One of the things is trying to understand what the risk really is from these facilities and what work had been done to assess that. I mean, going forward with the regulation, one needs to really understand, you know, what we are dealing with as far as the risk.

And I am not so sure that all the work has been done. I know research is involved in some of that and that's very good, but I'm not so sure enough work has been done in that area to really understand what the risk is from a reprocessing facility.

And of course my background is in reactors and there, we use PRA all the time and of course that issue is now on the table as do we need to do a PRA versus an ISA. But we are not here to deliberate -- well, that's on the agenda, but I am not here to deliberate that issue.

It is just really understanding what the risk really is and then from there, move forward to what needs to be done to protect the public health and safety. Without knowing what that is up front, I think it's going to be very difficult to get everybody aligned in the same direction on that issue.

Because everyone will have a different feeling, a different understanding, a different perspective and so that's just an opening comment, I thought, to put on the table early on.

MR. CAMERON: Okay. Thanks John. That's a very good point. As we are going through -- and we are going to go over to Rod in a second here -- but as we are going through these discussions, if there is data,

more data needed on a particular issue, research that needs to be done, please emphasize that for us.

And the NUREG report that John and his colleagues did on this, NUREG-1909 I believe, had six or seven research needs that you thought were important.

So feel free to put those research needs in if you see them and let's go to Rod.

MR. McCULLUM: Yes I will be very quick. I just want to second what John said. I think, beginning with an understanding of what the risk of these facilities really is, is important. I am not going to pretend to be able to answer the question right now. I know we have a lot of expertise in the room and I look forward to engaging them in a discussion of it.

I will say one thing: they are not reactors and I think it's important to start with that realization from the very beginning and we are going to get into some topic about new and different regulatory framework here.

But I agree, starting with the notion of what the risk of these facilities is, is very important.

MR. CAMERON: Okay, and maybe we can do that when we get to Yawar -- we can do that this

afternoon when we get to Yawar's risk safety, to talk a little bit about that. Alex, did you have something to add on this?

MR. MURRAY: Yes, if I could please. I just wanted to just make a very quick comment. It's important to differentiate between risk and hazards or consequences, okay? I think that sometimes when we use the term risk, we really are talking about hazards -- potential hazards and consequences from these types of facilities.

Whereas, as regards risk, from the NRC perspective, the risk of any licensed facility, whether it's a reprocessing plant, a uranium facility or a reactor, the risks must meet our existing regulations and be comparable, acceptable and low to members of the public, because that's an important little differentiation there. Thank you.

MR. CAMERON: Okay, and Yawar, could we -- when we get to your -- you were going to do your tee-up for your session. Is this a legitimate issue to start off with when we get to that?

MR. FARAZ: Yes, one of the items that we will be discussing --

MR. CAMERON: Okay.

MR. FARAZ: hopefully --

MR. CAMERON: All right.

MR. FARAZ: in that session.

MR. CAMERON: And Ed?

MR. LYMAN: Chip, there's one overarching issue that I don't really see addressed and it covers a lot of different areas, but that's the excessive secrecy that currently surrounds the licensing and fuel cycle facilities, in particular the designation of the ISA summary for Part 70 facilities as security-related information and many of the related documents, in almost every instance, that is an excessive designation and it's been a huge obstacle to public confidence in the licensing facilities, like the MOX plant.

So for a reprocessing rulemaking, going forward I think that is going to have to be addressed explicitly in the rule.

MR. CAMERON: Okay. Let's put that on the agenda. It's in the parking lot. If there seems to be a natural place as we are talking through these issues to talk about that, then let's bring it in, but let's not leave the room tomorrow until we do talk about that.

And as I mentioned, we are going to periodically go out to all of you in the audience for

comments and questions after we have had the discussion up here.

I am going to deviate that for Mike, so that I could remind everybody that we are going to do that periodically. But Mike, could you just introduce yourself and say what you need to say?

MR. EHINGER: Well, I'm Mike Ehinger from Oak Ridge and I was just asking the question of how you recognize us if we have some input. So you have answered the question.

MR. CAMERON: Well is this life imitates art or something like that? Okay. Good. Thanks Mike. We arranged that in advance. But, Arjun?

DR. MAKHIJANI: Yes. I would just like to support what Ed said and suggest that maybe we discuss the secrecy issue at least for 15 minutes in the context of risk discussion because I think it's assumed that secrecy will improve security whereas I am not actually in agreement with that.

I think there are pluses and minuses to secrecy in relation to security and I think we should discuss it at least a little bit today.

MR. CAMERON: Okay. Thanks Arjun. We will do that. Okay, good. That was a useful commentary on the agenda and what I do now is turn it over to Cathy

Haney who is the director of the office of nuclear material safety and safeguards to give us some context.

And Cathy, you can -- wherever you feel more comfortable. You can -- maybe you are the office director. You can do it from the podium. No one else can use it. All right.

MS. HANEY: Well I am honored to be speaking from the podium. I think others can use it if you want it. I can override Chip. But sometimes it's easier speaking from down there at the table anyway.

Well, I would like to welcome everyone to today's presentation and workshop. I think it's very important that we do this planning for the rulemaking in a very open forum and get as many of our stakeholders' input as early in the process as we can.

We have been holding workshops along the process, so this is just another couple of workshops. But we do take all the input from these workshops and consider it as we move forward, whether we are developing issues papers or keeping the commission informed about what we are hearing.

But I just want to let you know it is very valuable to me and to us in this process.

What I would like to do is to just do an

overview. Some of this information is probably not new to many of you here, but from a starting point, to give you an idea of where we are within the agency.

So if you can switch to the first slide. This is a very abbreviated organizational chart of NRC. As you can see I highlighted several of the offices that we work with most closely on this effort, but there are a few that you don't see represented here.

The one that comes to mind if our office of the general counsel as well as we will be working closely with ACRS. But at this point in our technical preparation for working on the future in this processing and recycling area, there are three other offices that we are primarily involved with, and that is what we refer to as FSME, which is our office of federal and state materials and environmental programs.

The low level waste work is one of the priorities in that office. I have high level waste but FSME has low level waste. They also support us on any environmental work that we are doing.

And then we have our two offices that deal with reactors: NRR, which is our office of nuclear reactor regulation and then NRO, which is the office

of new reactors.

NRR deals with our operating fleet that is existing right now and NRO is exactly what it says, is our new reactors that are coming online.

What doesn't appear here is our office of nuclear reactor research, but again, they are a very important player in the role in helping us right now.

In my organization -- I have three major technical groups that are reporting to me. One is the Division of Spent Fuel Storage and Transportation. This group is -- really does focus on spent fuel storage and transportation. They do the licensing for the independent spent fuel storage containers.

But what's -- we need to be working with them closely with them on this effort, because whatever waste is generated or whatever material is moving to the plant, the transportation aspects of that material would fall under this particular group as well as storage area.

The other division that I have to the far right there is the Division of High level Waste Repository Safety. This group to date has been focusing on the Yucca Mountain application -- the Department of Energy's application for the repository at Yucca Mountain.

We do continue to review the license application through this fiscal year. We will start transitioning to a closure mode, depending upon the resources that are given to us. But at least in this fiscal year, we are continuing to review our application. We recently issued Volume 1 of the Safety Evaluation Report. That was the week before last. We are working on Volume 3 to be issued in the November timeframe. Of course that is highly dependent upon the resources that we have for this effort.

But we are also recognizing that there is a changing environment, changing national policy with regards to waste. That group is starting to look at what's the future of high level waste without a Yucca Mountain. Hence again why they are very integral to looking at this recycling and reprocessing work that we are doing here today.

And then lastly but not least is my third technical division, which is the Division of Fuel Cycle Safety and Safeguards. And as you have heard we have several representatives from that group sitting at the table today. That group actually has the programmatic responsibility right now for this effort that we are here to discuss today and they have had it for a while.

That group also, in addition to the reprocessing work, does the licensing and oversight work for our existing fuel cycle facility as well as very actively engaged in licensing new facilities.

We can switch to the next slide. I want to just, at a high level, we -- about almost a year ago, started talking about how can we make all of our efforts work together. We need some type of integrated approach to looking at transportation, at short-term storage, at long-term storage, at licensing, because no matter what happens with the future of high level waste, we need to make sure that we are working. Whatever framework is developed, everything will feed into it and we will be able to approach it from an integrated standpoint.

And we wanted to do this with efficiency and effectiveness. Regulation to change rules, to develop rules, are very -- it's a very important process. It takes a lot of time but it also uses a lot of resources.

So in doing any regulatory changes to one area of the regulations, we want to make sure it doesn't have an adverse impact on another part of the regulations and in fact we asked our question, how can we work closely, so that one area -- any efforts in

one area can benefit another area.

So we develop an integrated spent nuclear fuel program. There is a paper that is publicly available. It is on our website if you'd like to review it. But it will go through much greater detail than what I will discuss today.

But it talks about the program does, what it was envisioned to do and how we plan to go forward with it. But just a real brief overview on our next slide, is there are three program areas and the reason I mention it here today is because of that second bullet.

But stepping through the three components of this program, the first one is the regulatory and analytical tools for high level waste disposal. This is really looking at something non-Yucca. Part 63 of our regulations was developed to support Yucca Mountain. We do, in the area of high level waste go back to Part 60 but we recognize Part 60 is old, does need to be updated, should we decide to go forward, should the nation decide to go forward with something and doing forward with a geological repository that is not Yucca Mountain.

The second aspect of this is the reprocessing recycling. We decided to bring this into

the integrated strategy because, again, as I mentioned earlier, the material going towards a reprocessing facility, the high level waste or the waste coming out of the facility, we all need to consider this as part of the system, as part of the cycle and the best way to do that was to bring these things all together.

And then of course the third component is the extended storage and transportation of spent fuel. And when do you say what does extended mean, you know put a time line on it, I really can't put an exact number on it but we have heard anything from greater than 120 to 300 years to 500 years.

Right now we are not focusing on what is the number, just merely that without a geological repository, there probably will be a need to store fuel onsite for a longer time period so we are looking for the -- just making sure that material can be safely stored and safeguarded while it's on site.

Now trying to focus down into just the reprocessing area, if I can have the next slide. Good. NRC does have the licensing jurisdiction over commercial reprocessing facilities. As I said, that area right now falls under my office because -- and the reprocessing facilities are considered production facilities.

From a historical perspective, back in 1960 and 1970, NRC, or back in that time frame, if you look back with AEC, did license a reprocessing facility and issued construction authorizations under Part 50.

Part 50 still is the guiding regulation for a reprocessing facility but if you look back over time it really has evolved to focus primarily on reactors and that is to support our operating fleet. We of course have Part 52 for the new reactors.

It has not evolved for the production facilities over time, hence why it's necessary for us to look into developing a regulatory framework for any reprocessing facilities that would fall in this area.

Move on to our next slide. I touched on this a little bit in just my brief opening remarks, was the importance of public involvement. We do recognize that in order to have a better product, we do need members of the public, and our internal and external stakeholders to help inform our process.

We recognize the technical issues and policies are complex. We touched just briefly on the fact of what is the risk from these facilities, is there a risk from these facilities. They are not very easy answers to some of the questions that have been

raised under technical issues and policies.

We do recognize that rulemaking will take a considerable effort and it could touch on multiple parts of our regulations, on the code of federal regulations, and we do plan on engaging the public throughout the process and this workshop is just one way that we can do that.

We do have a second workshop that has already been scheduled and that is October 19 and 20 in Albuquerque, so I will put my plug in now for I hope to see many of you still be able to attend that second workshop because we will be building on some of the discussions from this workshop as well as bringing some new topics to the table.

We appreciate Chip's involvement in these lectures, because I think in these workshops, Chip does a great job of facilitating them and getting all thoughts on the table. It's important we hear from everyone in this particular area.

And we do plan to focus the workshops to the best as a starting point, but again we want to remain as flexible as we can, but to focus on those rulemaking issues that were mentioned in the federal register notice and also to discuss any other, to broaden to other topics that fall under NRC's purview,

as you may see some of these items going up in our parking lot today from today's meeting.

Next slide please. Just to give you an idea of what are we planning for and I think I'll start with the bottom bullet first because that's probably the one that I worried about the most on a day to day basis.

We have great ideas. We want to move forward. But our effort in this area is really contingent upon the resources that we have available. Our resources are going to be growing in `11, so I have asked Marissa and her team to try to get as much done as we can in fiscal year `11 so that is why these workshops, the timing of them, as we move into fiscal year 2011 on October 1 are very important to us.

But looking at the resources that I have available in `11 and that I hope to have available in `12, because we do NRC programs out on a two-year basis, this is the schedule that we are working toward, which is now and moving in through 2010, the regulatory gap analysis developing our regulatory, our technical basis for a potential rulemaking and then the workshops.

In `11 to `12 time frame, we plan to complete the regulatory basis, initiate environmental

activities and that would be the time when we would be going forward to the commission asking for approval to proceed with a rulemaking. Should we get that approval, a draft rule would be available in a 2013 to 2014 time frame with a 2015 as a final rule.

So those are the dates that we are working towards. Again, I'll mention that last bullet again. The resources in `11, I am fairly comfortable with, `12 get a little iffy-er and then we'll start the beginning of next year planning for the fiscal year `13 budget so we will see how it goes.

But that's the schedule for your information that we are working towards right now. And if we could go to the last slide. This is just, so you are aware, there are some additional information available should you be interested in more information on reprocessing. What you have is the website there that is specific to reprocessing and there you will find meeting summaries and presentations as well as transcripts, if the meeting was transcribed, there would be references there and then of course there's always additional documents available in ADAMS, or Electronic Reading Room.

If there is something that you are not seeing, please feel free to ask me why you are not

seeing it or staff. There could be a reason why something is not being shared. And we will be happy to give you that reason. If not, if it's something we can go back and look for to see if it's something we can put up there, but we have tried to get as much information as we can up on the website.

So with that, that concludes my formal remarks so Chip, I will take questions.

MR. CAMERON: Questions for Cathy. John?

DR. FLACK: Cathy, yes, I am just curious about the role of EPA in this and how NRC interfaces EPA. I know there is a number of things that didn't quite end some years ago with EPA and it looked like they needed to do some work and I was wondering what the interface with NRC and EPA at this point in time.

MS. HANEY: Well, we have, in fact, as recently as this morning I met with EPA talking about when the need to move forward in dialogues. At -- as we move forward in the public meetings we will -- EPA is invited to participate but we are making sure that we are not getting out in front of them just by dialogue, and my staff to their staff and making sure that we are coordinated in any efforts moving forward.

So I would say it's an ongoing basis and then formally, obviously there's the federal register

notices that another agency can comment on, our federal registers notices or information that we put out there.

MR. CAMERON: And we do have environmental issues on the agenda for tomorrow, end of the day, and to the extent that there is a question about what EPA's plans are generally, we might be able to impose upon them to give us a brief on that.

DR. BADER: Cathy, how will the Blue Ribbon Commission influence any of the schedule?

MS. HANEY: It has the potential to have a big impact on the schedule. What we -- in developing this integrated strategy, what we have tried to do is not to get in front of the Blue Ribbon Commission, but to try to position ourselves so that no matter what the Blue Ribbon Commission comes out with, we would be able to rapidly respond to it.

Should the Blue Ribbon Commission come out and say the solution is reprocessing recycling, I would expect that the Commission would move resources into this area. Should the Blue Ribbon Commission go the 180 degrees from that and say it's not even on the table, I could see potentially the Commission taking resources away from this project and possibly slowing it down.

I think if that latter thing would happen, staff would probably propose to the Commission a path forward for their consideration and make again a budgetary decision, and that really applies to any of the items under the integrated strategy we did.

The paper that I referenced lays out a plan for the `11 and `12 time frame as well as going out I think as far as 2015. But that all is based on the resources that we have right now and based on the Blue Ribbon Commission's suggestions, it could alter that.

So I guess the short answer is it could have a big impact but we are trying to position ourselves so that we would be very quickly able to adapt to whatever they come out with.

MR. CAMERON: Okay, thanks Cathy. Arjun?

DR. MAKHIJANI: I didn't understand the Blue Ribbon Commission has any direct authority on it.

MS. HANEY: No, they wouldn't have the direct authority but I would say if they come back with a recommendation, the Commission would take that into consideration and also obviously we work through -- our budget goes through OMB and the Congress.

So the Blue Ribbon would go back, it would be considered so you are right, it's not a direct, but

it obviously has a strong indication on how I think our resources would get directed.

MR. CAMERON: Okay. Thank you. Anything else, any questions for Cathy? Thank you very much for kicking it off, Cathy, and you can't take that microphone. You had the podium, but no, you have to leave the microphone. All right.

Why don't we just move into the first agenda item, regulatory framework? And Alex, are you going to do that for us? Okay.

MR. MURRAY: Yes, I will, Chip and I will even put my card up and I will even quickly say, Cathy, I have my minivan, if you want that podium, it's yours.

I will be very quick since we are little behind schedule. Jose, it's in there somewhere. Ah, there we go.

Input 1 is always nice. I just want to give a very quick TR for presentation for discussions, a little bit of an overview about regulatory and licensing approaches, framework and so forth. Next slide please.

We use the terms of reprocessing and recycling in the context from the ACRS/ACNW&M, basically those are the advisory committees of the NRC

and they put out this NUREG about two years ago.

I have listed there reprocessing. Basically reprocessing is dissolving spent nuclear fuel and separating it into various constituents and recovering those constituents.

We use the term recycling to mean making some or maybe even all of those recovered constituents and reusing them somehow. Next slide please.

In the Nuclear Regulatory Commission, many of our regulations actually go back to what we call the Atomic Energy Act or AEA, which has been amended many times. The AEA defines production facility and has some very specific requirements for them.

Reprocessing facilities meet the definition of a production facility, hence any of the AEA requirements apply to a production facility. I should add the Atomic Energy Act is a law, not a regulation. It is above, more important, more powerful than a regulation if you will.

In Part 50 some of those minimum requirements are codified. I have listed some there. Part 50 also applies to a nuclear power reactor and for comparison, you have heard Part 70 and fuels mentioned. Those are considered special nuclear materials and they are regulated by a different part

of the NRC regulations, which we refer to as Part 70. Next slide please.

On this slide, I just listed the two main regulations that might apply or would apply to reprocessing and recycling. Part 50 in the left column, Part 70 in the right column. As you can see Part 50 has some very specific requirements, deterministic, DBA, that's Design Basic Accidents.

You can adjust some of the analyses by using PRA, which is Probabilistic Risk Assessment or Risk Analysis depending which school you go to, has some minimum requirements which we call GDC, so General Design Criteria.

Other aspects, technical specifications and so on and so forth. QA represents Quality Assurance.

Over the past three decades, as Cathy mentioned, the focus of Part 50 has become Light Water Reactors. Having said that, it still remains the current regulation for reprocessing and recycling.

Part 70 is a regulation which applies for special nuclear materials. It's actually called domestic licensing of special nuclear material. Special nuclear material means, in simple terms, enriched uranium. It also applies to plutonium. It

also applies to an isotope of uranium called uranium 233.

It basically applies to the processing of non-irradiated materials, non-spent fuel if you will. In its current version -- it was revised in 2000, it has a risk-informed process based upon an integrated safety analysis. Yawar will discuss that in a little more detail in about an hour-and-a-half.

Most applications of Part 70 involve low enriched uranium for power reactor fuel. Next slide please.

This is just a chart. This chart was actually put out at the May public meeting as well. And basically at the top of the chart it lists low enriched uranium. Towards the bottom of the chart it lists MOX using reactor grade plutonium. That means plutonium that is recovered and recycled from commercial spent nuclear fuel that has been in a commercial nuclear power plant.

And the right column there basically lists, if you will, the relative consequence of the material in terms of what we call a radiation dose, based on ingestion or inhalation I should say via the lung pathway.

And as you can see, as you start getting

more and more of the plutonium and fission production materials in, the relative dose effects go up quite substantially.

As you go towards the bottom of the list, the material behavior, potential consequence if you will, are more like Part 50 facilities. As you go towards the top of the list, they are more like Part 70 facilities. Next slide please.

Another aspect of our discussion involves how many steps are there in licensing. Part 50 is essentially based on two-step licensing: a construction permit followed by an operating license.

That is how all currently operating nuclear power plants in the United States were licensed. About a decade or so ago, Part 50 was, if you will, modified along with another part of the regulations called Part 52, to allow one-step licensing.

Part 70 allows either one-step or two-step licensing, and I have listed the options there. Next slide please.

One of the things, when we discuss regulatory framework, is there has to be some if you will context from the different reprocessing and recycling technologies.

There are several existing processes. These were actually developed in the United States but they are currently applied on a commercial scale overseas. They involved aqueous processes and the process is generally termed PUREX -- it's a solvent extraction process.

The other processes which have been or are under development, they have shown some promise, some potential advantages in laboratory applications. These include some such as pyrochemical or electrorefining methods.

Potential domestic reprocessing plants might use some additional modifications of PUREX or they could go if you will and use one of these newer technologies. We do not know at this time. Next slide please.

Here I have just listed some points for discussion. I am not going to walk through them. We can just go straight from here, Chip. Thank you.

MR. CAMERON: Okay, let's leave that slide up Jose, thank you. Thank you Alex. Let's start with Arjun and we will try to do this semi-systematically. Arjun, go ahead.

DR. MAKHIJANI: Just a factual thing. Can you put up that slide with the relative dose? 1,5?

Yes, that one. I don't think you mean you do 3500 percent. This is by mass, right? So you do 3500 percent by mass, would have less impact than LEU because the main impact from LEU comes from U-234.

I think you mean HEU, which contains one percent U-234, which is the main radiological impact. The main radiological impact of enriched uranium comes from U-234, not from 238 or 235 and I don't think that ratio slide is correct, from my back of the envelope calculation so I would check that.

MR. MURRAY: We will check it.

DR. MAKHIJANI: It looks more like 10 or 20 to me.

MR. MURRAY: We will check it.

MR. CAMERON: Okay. Thank you. Ed, and we will go over to Steve.

DR. LYMAN: Alex, I had a couple of questions on some of the things you said. When you said Part 60 allows one- or two-step licensing, in the case of a plutonium processing facility, I mean that -- a two-step process is required, isn't that right? There has to be a construction authorization if there's plutonium.

MR. CAMERON: Yes, can we clarify that one point about Part 70 allows either a one-step or a two-

step, particularly in light of what Ed is raising. Alex, do you have any clarification on that please?

MR. MURRAY: As currently written and used, Part 70 can allow either one-step or two-step licensing. It was originally, when the revision was being worked on, the intent was to go to a full, one-step licensing approach very similar to the Part 50, 52 combination for reactors.

But there was some concern at the time that in the future, some facilities, some potential licensees might come in and still request a two-step approach, one example being the MOX facility.

DR. LYMAN: But it is true that there has to be a construction authorization if it's a plutonium processing facility.

MR. MURRAY: Yes.

DR. LYMAN: So that essentially forces a two-step.

MR. MURRAY: Yes, yes, yes. I should add, in Part 70, plutonium processing means plutonium processing and fuel fabrication. It's not a reprocessing facility.

DR. LYMAN: And my other question. You said that Part 50 is the main vehicle for licensing, reprocessing and recycling, but for the fuel

fabrication component of recycling, that would still be Part 70, right? Unless -- or it -- and what if it were integrated with the reprocessing?

MR. MURRAY: Well, you just answered your own question. It depends how any potential licensees or applicants in the future approach the NRC. If they are separate, discreet facilities for reprocessing and fuel fabrication, they could be approached as two separate facilities being licensed under two separate parts of the CFR and conceivably the fabrication part could be under Part 70.

Now having said that the, if you will, thrust of -- and I will let some of the industry folks chime in -- but the thrust of the industry as we understand it is going towards an integrated facility, where special nuclear materials such as plutonium are not kept in a separate form and shipped separately outside of being in a fuel assembly, but I'll let others speak to that.

MR. CAMERON: Okay. And I am sure we are going to get to that issue. Steve?

MR. SCHILTHELM: Yes, while we are on this -- oops you have changed the slide. Can you go back to the consequence slide? Because -- Alex, I think you brought this up earlier about understanding the

consequence and John, you have mentioned understanding the risk -- am I correct? These are effective doses or cumulative doses, they are not acute doses, is that correct?

MR. MURRAY: These are inhalation doses. They are basically 50-year doses.

MR. SCHILTHELM: Fifty year committed.

MR. MURRAY: Yes.

MR. SCHILTHELM: Right. And I think we should really consider whether that is the most useful metric. When you talk about accidents, acute doses from a reactor accident are really what dominate. So to -- I would offer that this table gets arranged. Excuse me.

I would offer this table gets a little bit rearranged on an acute dose standpoint.

MR. MURRAY: That is something we can consider, but let me just add, in NRC regulations, we usually look at what we call a TEDE, the T-E-D-E which is the Total Effective Dose Equivalent, which encloses both the, if you will, the acute external dose as well as 50 year committed doses from inhaled and ingested species and that's what this is based upon.

MR. SCHILTHELM: And I do understand that. That goes back to the old Part 20 debate --

MR. MURRAY: Yes.

MR. SCHILTHELM: of acute doses versus TEDEs.

MR. MURRAY: Yes. Yes.

MR. SCHILTHELM: But, not to revisit that or reopen that, but I think conventional wisdom is a reactor with the source term that a reactor offers would be probably the most hazardous nuclear facility from a potential consequence standpoint.

And I don't think a MOX facility typically comes to that level of hazard classification. So as you draw the arrows more like Part 50 or more like Part 70, I think we could debate this table for a long time, I think is the point I am trying to make.

MR. CAMERON: Okay. This looks like it might be central to the risk agenda item. So we are going to be revising that but let's hear from Arjun and Ed before we go on, perhaps, to the question of how should the NRC arrange its regulatory framework for moving forward with this Part 50, Part 70, new part. But Arjun, do you want to comment on something Steve said?

DR. MAKHIJANI: We are discussing a reprocessing plant, not a materials facility, MOX fuel fabrication plant, right? We are discussing

reprocessing regulations, right?

MR. MURRAY: That is correct, yes.

DR. MAKHIJANI: Okay. There are actually -- I can expand on this in the risk framework, but if you are talking about more like Part 50 or more like Part 70, there are actually specific, unique things to a reprocessing plant and there will be specific, unique things that will go according to the design of the reprocessing plant.

With aqueous processes, you have high level waste liquid -- liquid high level waste tanks on site, which would contain more long-lived radionuclides than any specific, single reactor site because you are reprocessing a lot of fuel.

It depends on how the plant is designed and how your vitrification facility is designed and whether it works or not, whether it's more like La Hague or more like Sellafield.

But I think -- I don't think you can summarize it in more like Part 50 and more like Part 70 because some of the most important hazards are very specific to the reprocessing plant.

So you are going to have to have that, in any case in your regulation.

MR. CAMERON: Okay. And that seems

consistent with what Steve was saying but from what you just offered, Arjun, the implication for you is that this should not be -- that the NRC should be developing a new part rather than trying to jury rig 50 or trying to jury rig 70.

DR. MAKHIJANI: Yes, I think you can draw on 50 and 70 but you know, recognizing that there are parts of the reactor regulation that are in themselves quite obsolete. I mean the Table S-3, which is used for reactor licensing, is completely obsolete. It was done in its waste aspects because it was written prior to low level waste regulations.

It was written prior -- some of it may be brought back alive actually, because it assumed reprocessing and you have been licensing reactors assuming no reprocessing.

So I think you can draw on what you have, but you have to recognize that what you have, even for reactors, is largely obsolete. What you have for waste is severely deficient and incomplete and you have recognized that to some extent in your paper.

And you have got new elements that have not been really properly considered, at least afresh, and after 9/11 you have got still more new elements that you need to consider so. Yes. You need to develop

a new regulation, I would say.

MR. CAMERON: Okay. Let me check in with -- thank you Arjun -- with Ed on his comment and then perhaps others have some comments on what Arjun just suggested, which is one of the discussion points here, about how the NRC should structure its regulatory framework. Ed?

DR. LYMAN: Yes, just for my understanding of this table. The table doesn't take into account relative volatility. It is just strictly one per unit mass of the material without taking into account pathways?

MR. MURRAY: That is correct. Yes. How it gets airborne is a different matter.

MR. CAMERON: Okay. Go ahead John.

DR. FLACK: Yes, and I am thinking, you know, design basis accident Part 100 releases and so on, safety, you know and SSC versus IROFS, I didn't see that comparison made either about how that is begin dealt with in Part 70.

Of course that goes Part 50 Part 100 as two pieces of that equation, and I don't see that playing out in the comparison. Now did you have something in mind on that, could you do that comparison off site to public -- well, I guess you

start with design basis accidents with reactors. All right?

Do we have design basis accidents for these facilities, where then you would have to meet certain criteria, like Part 100 release -- so I think it oversimplifies the comparison a little bit because we are not going all the way out to the end points on this and that's the public exposure, off site.

MR. CAMERON: And Alex, you have -- you are catching a lot of attention with this slide.

MR. MURRAY: This is excellent.

MR. CAMERON: Okay.

MR. MURRAY: This is excellent. It was put in there to enhance discussion.

MR. CAMERON: And it may not be -- we are going to revisit these issues -- hazards, consequence, risk -- when we get to our second agenda item. But you have stimulated a lot of discussion already and do you have anything more to say on this now or --?

MR. MURRAY: Let me just explain one more time. This is just strictly based upon inhalation does, okay? TEDE. Fifty-year committed dose for -- on a mass basis via the inhalation pathway. Okay?

How it gets there, whether we had design basis accidents or not, that's another part of the

discussions of what should be in a revised regulation for reprocessing facilities. Some of that we will discuss in the risk and safety discussion in about an hour.

MR. CAMERON: Okay. Thank you. Rod?

MR. McCULLUM: Yes, I just wanted to note quickly for the record that this is a rare instance where industry and Arjun Makhijani are in agreement. What you wrote on up there is that here is a need for new regulation.

I think as we go down this dialogue and start to talk about what that regulation should be and what it should look like, maybe some of the academic debate on this table becomes irrelevant and what we really are is looking at the most appropriate way to develop a new regulation for these types of facilities.

MR. CAMERON: Okay. Well, we will test out -- perhaps the table is not necessarily the organizing vehicle for the discussion we are going to have about risk and safety but does anybody have a different view on the need for a new part of the regulation to specifically deal with reprocessing?

Okay. How about the issue of one-step licensing? I mean we have already had some discussion,

question from Ed Lyman about the existing framework in terms of construction authorization, plutonium -- anybody have a view about the one-step licensing? Steve?

MR. SCHILTHELM: Yes I will offer some comments. These are not my own comments. I think Dorothy Davidson made these comments at a fuel cycle information meeting probably in `09.

Confidence in the regulatory process is central to any commercial entity taking on reprocessing, or taking on a major nuclear project. So just like the reactors needed a one-step licensing process to make business decisions so that they didn't get into a two-step process that could go south on them after major capital commitments, a reprocessing facility, if it is going to be a commercial facility, really does need a one-step process in order to provide that regulatory certainty. And those were Dorothy's comments.

MR. CAMERON: Okay. Thanks Steve. That's one reason, one important reason why one step would be important. I know the staff has drawn the analogy with the Part 52 process for reactors. Are there things from the experience of the NRC with one-step licensing in reactors that the NRC should make sure that it

avoids if they are going to do one-step licensing for reprocessing facilities? Arjun?

DR. MAKHIJANI: Actually, you are not actually following the original design of the one-step processing, because you were supposed to have settled reactor designs and not reopen the question of reactor designs while you are considering specific reactor applications.

As things stand currently, you don't have a single reactor design that is completely settled and I think the problem is going to be much worse with reprocessing, and let me give a different view, that one-step licensing actually is not appropriate to a technology where there has been essentially no experience in the United States and there is going to be a lot of things that are specific to here, whether you are considering waste or environment or terrorism hazards or safety requirements.

That's for a settled technology, like PUREX and you are also considering a new technology or host of new technologies that are not aqueous, that are radically different, that are in the pilot stage.

And I don't see you can actually begin to discuss licensing of these things and at least for new technologies you have to have a two-step process. You

probably have to have a three-step process, because you don't even know how to assess the risk of these technologies yet.

You have no data, other than laboratory data. You have no idea of operational problems and the frequencies of failure. So you can't have a one-step process for new technologies. I don't even think you can have one rule for technologies that are not yet commercial, that is common with technologies that are already commercial, where you have some basis for information and evaluation.

MR. CAMERON: Okay. Thanks for putting that on the table Arjun. Arjun referred to the experience in the reactor field with the one-step in terms of the designs not begin finalized and changing.

But I think the important point is how do you deal with Arjun's concerns about these are new facilities, complex, lots of information needed. Rod, do you want to talk to any of that?

MR. McCULLUM: Yes, I think there's an important distinction here between the world of reactor licensing and what would become the world of recycling facility licensing, which is the idea of having a design certification from a standardized design came from the notion that we would be

standardizing designs because you would want to replicate the same thing in a lot of places.

A recycling facility, you know, maybe we would have multiples of those. Certainly I think each of my vendors here would want to have at least one of their own.

But that would not be the intent. You know, in France you have 80 percent of the electricity comes from nuclear and they use MOX fuel and they only have one recycling or reprocessing facility.

So you can support a lot of the infrastructure without having to try to replicate a standard design in a lot of places. So in that context, I think there still is an opportunity, although I agree that there are a lot of questions that need to be answered when you license one of these facilities -- there still is an opportunity for a one-step licensing process.

I would view it more as not a design cert and then a facility-specific license or a COLA. I would view it as you are kind of melding those things into one. You are doing the types of evaluations that you would do in a design certification review and some of the types of evaluations you are doing in a COLA all in the same place, because you are looking at both

the facility and its location in a holistic manner.

So it is probably an area where the reactor analogy doesn't quite serve you but there probably are some lessons to be learned there.

MR. CAMERON: And do you have anything else on Arjun's concerns about that one-step may be too ambitious for these types of facilities? He mentioned you may need two steps, you may need three steps. I am not sure what he meant by three steps but how do you react to that? And we will be getting some other comments and we are going to go to Ed -- do you have anything that you want to add on that part of it?

MR. McCULLUM: Yes, just one thing and then I might let others who are even more expert speak, but I think that's where -- and it's on your list of things to talk about here today -- the notion of having risk-informed and performance-based regulations is important.

Clearly you have to very thoroughly evaluate the facility and determine safety and you have to have a lot in there that can assure safety. But by being risk-informed and performance-based, you are focusing on what is the result? You know, what is the level of protection that you are trying to achieve here, and making sure that you have an applicant that

can demonstrate that.

You know, the devil is obviously in the details but I think if the agency is committed to going down that path, it is possible. I mean we license a lot of very diverse fuel cycle facilities under Part 70.

It is possible to construct a regulation that can credibly support a one-step process. I would also point out, in the reactor world, I mean there are things like ITAAC, where yes you have a one-step process, but you define all these inspections, tests, analyses, acceptance criteria that you will double check back at the end there.

So there are ways to build in provisions to address those unique things you might not know at the one step. But I will go back to what Steve said, is that if recycling in this country is to be a commercial venture, regulatory certainty is absolutely a must.

And you know, there are things you can build into a one-step regulation and you know, we would encourage the staff to continue to look in that direction to support that. And being risk-informed and performance-based I think is really the key there.

MR. CAMERON: Okay. We are going to come

back and explore those and I am going to go to Steve and John and Dan. I just want to make sure that we hear from Ed either on this point or you had another point, perhaps.

DR. LYMAN: On the issue of one-step licensing -- well, I will start with what we just heard. It seems to me it's the original belief that the process in Part 52 is actually going to provide more certainty and be more efficient than Part 50. I think there is some question about it, given that the implementation of the ITAAC provisions and the closure of ITAAC and all those issues are still unresolved and are leading to uncertainty.

So I think ultimately what you may end up with is the whole ITAAC certification process is going to be really a surrogate for the second step of the original two-step licensing process, and all you have done is cut the public out of the opportunity for a second hearing, or at least raised the bar significantly.

So that's really the main outcome of going to one-step, is really curtailing the public's opportunity to seek a hearing.

With regard to fuel cycle facilities in particular, I did look up the original genesis of the

construction authorization requirement in Part 70 for plutonium processing facilities and it goes back to the Atomic Energy Commission.

And they determined that, as opposed to uranium processing facilities, because plutonium posed a significant additional radiological hazard, that they decided that they wanted an additional step of approval of the design bases for a plutonium processing facility before going forward, and that's why that requirement is in there now.

So certainly, in any new requirement for reprocessing licensing, that logic would equally or even apply to a greater extent for a reprocessing plant, and therefore that construction authorization, I think, would have to be an essential part of any new licensing strategy for reprocessing plants.

MR. CAMERON: Okay. Thank you Ed, and I think everyone should note the rationale that Ed put on the table for what the Commission thought originally. So let's keep going with this. Let's hear from Dan and then we'll go to John. Dan?

MR. STOUT: I would like to recognize that there could be different levels of maturity of any kind of reprocessing facility that were to go forward. You could range from a new technology that isn't

proven, and that would likely require a demonstration, to something much more commercial, based on things that are in existence.

And I encourage the NRC to formulate the regulation to accommodate the variety of technologies that could be put forward. And it comes to what Steve was talking about. It's a risk, a predictability of the regulatory process that is important in the business decision.

And so let the licensee decide whether or not they are going to come forward with a mature design in a one-step process, or if they want to bear the risk of a two-step process and come forward with a less mature design and proceed with construction knowing that there is another step in the process.

MR. CAMERON: So, under that view, Dan, the option would be available to either do a two-step or take advantage of a one-step.

MR. STOUT: Correct. I am suggesting that the NRC consider formulating the rulemaking to allow either one-step or two-step and let the licensee decide and to go in with a mature design in one step or a less mature design and proceed with the two-step.

MR. CAMERON: Well, going back, let me ask another question about that, going back to Rod's point

about that one-step would be appropriate given a risk-informed, performance-based rulemaking approach. And then Rod, if I am not articulating it correctly, tell me. But I am trying to connect up what Rod said about risk-informed, performance-based with your idea of the mature design.

Is there a relationship there? Or how would the NRC say that well, this is a mature design so therefore you can go one-step, or it's not a mature design and so -- how would the NRC give guidance or instruction to an applicant about what would be acceptable in that regard?

And I am not sure there is a connection with Rod's point on performance-based, risk-informed but if anybody can make that connection, please do so.

Do you want to say anything more at this point on that? Well, let's go to John and then Steve. John?

DR. FLACK: Well, I think from lessons to be learned from the Part 52 and the new reactor licensing process, there's a difference between an ITAAC and a DAC. I don't know how many people are aware of that.

And a Design Acceptance Criteria is not where you want to go. The ITAAC makes more sense

because everybody agrees up front what needs to be done and at the back end you just check and make sure it was done based on what you agreed to in the front end.

And it depends on how well-defined that design is, makes a lot of sense because how do you decide what needs to be done on the front end if you don't -- if it's still a concept.

So nailing it down at the front end, I think, is important all the way around, whether you go one-step or two-step or most importantly for one-step and you avoid what's known as Design Acceptance Criteria, where you have just a concept with the acceptance criteria, not the actual design.

Having said that, again, it comes back to the risk. I mean, what's so important here that we need to know it up front and nail that down, that everybody can agree to, and that has to take some form of risk insight.

When we look at this MOX facility, which the ACRS is looking at now, and you have 15,000 IROFS, I mean one has to stand back and say, okay, well, what is really important here? I mean, where do you get that perspective?

That is I think key to the whole process,

that and being in complete understanding and a buy-in, up front, as to what needs to be done.

ITAACs I don't think will be that much of a problem, but DACs are definitely a problem and I would avoid those at all costs at this point, getting back to your original question.

MR. CAMERON: Now, just, I -- when you said, you used a term, is definitely a problem, what term was that?

DR. FLACK: Well, the problem again comes to getting everybody aligned to what we mean by that, and what needs to be acceptable at the back end. So you are agreeing to something up front, but is everybody aligned, in total agreement up front about what that means.

We will take the I&C area, which is continuously evolving and not knowing exactly what this is going to play out at the back end, but you are agreeing to some concepts in the front end.

That presents a problem as to what everybody agreed to before, when you get to the final design. So it's ultimately important to nail the design down well in advance and not wait to the very end, a complete design or whatever you might be talking about here, I think is key to this whole

process.

And so how well one can do that at this point, having not worked in this area for 30 years now and relying on international experience, I think takes a lot of work myself.

So it may be too early even to answer this question, because I mean what are we really talking about here, you know a concept, basically.

MR. CAMERON: So are you saying that -- one of the things you are saying is that the decision on one-step, two-step, whatever licensing really has to await an exploration of risk and design and things like that?

DR. FLACK: I think we are going to need to know much more about it before we can make any decision on that. I don't know, that's my own personal view. Believe me, I am not speaking for the Committee. I don't know. The Committee has
their own views on these things. So I am not speaking for the ACRS. These are my own personal beliefs from working in these areas over the years.

MR. CAMERON: Okay. Thanks John. Steve? And then we are going to go to the NRC folks and then to Rod.

MR. SCHILTHELM: Yes, and I am not sure I

can make a direct segue between what Rod was saying and what Dan was saying, but when we sat down as an industry and put the white paper together that we sent into NRC, we had days worth discussion on this very topic.

And where we landed was that the burden really falls -- as Dan was saying -- the burden is going to fall upon the industry and the licensee. If we have a mature design, then in the end, there's a facility already operating that looks like this facility, then it shouldn't be a stretch to put forth a mature design and put forth a set of ITAACs, not DACs, but ITAACs, that you can live with.

On the other hand, if you don't have a mature design, and you try to put forth a set of ITAACs and you try to do that as a licensee, the end result would be something, I think to what Ed was alluding to in that you wouldn't have a certainty, and you would come into the ITAAC process essentially with a new design, or an evolved design from what you put forth.

So I think the real burden comes upon the industry to understand where their technology is and what they do know and what they don't know about their technology, and what they do understand and they don't

understand about the accident analysis, and the risk that those accident analyses put forth.

So that was the reason, when we put forth the white paper, we said we need to create the alternative. You can come with a one-part of you can come with a two-part. The one-part or the one-step process comes with a strong ITAAC process, and as a licensee, you have to be willing to live with that strong ITAAC process.

MR. CAMERON: And that would depend on the -- again, to use Dan's point, the maturity of the design, the experience with that particular processing technology. Okay, go ahead Arjun.

DR. MAKHIJANI: Just quickly to respond to that. I think, while the concept sounds wonderful, ultimately you can't leave it to the industry to decide whether the design is mature or not. This is something you raised earlier, Chip, when this first came up.

It's got to be -- they have got to be defined criteria that the government set forth for that and a judgment that needs to be made as to whether a one-step or two-step.

So you are going to -- you are going to wind up in a more of a regulatory uncertainty because

you will have to have a process for deciding whether it's one-step or two-step.

You can't just say, well, you know I think it's one-step and bind the government to that. The government is going to have to make a decision. And so you are going to have two steps even in that case, in my opinion.

MR. CAMERON: Okay. Let's go to the points that people wanted to make but I think, keep in mind Arjun's point there about how does the NRC structure its regulatory framework to give criteria to the industry on what they would think would be a "mature design" that might be acceptable for ITAAC.

Let's -- and before we go back to Rod, let me get Alex and Yawar and Phil on the record here in terms of any thoughts they might have about this discussion. Alex, do you want to go ahead or should we -- go ahead.

MR. MURRAY: I was going to say, as I have already spoken a lot, I would like to give my colleagues some time and then I'll --

MR. CAMERON: Okay. Let's go to Yawar and then Phil.

MR. FARAZ: On this point I wanted to add that there is quite a bit that you could learn from

the international community. We have had reprocessing facilities in France that were -- when they were introduced, they were new design.

Same thing for the UK. They have their own design, like Thorp. And there what they did was, they actually -- it wasn't really a pilot plan but it was -- it wasn't at the lab scale either. Bu they did develop a testing facility and they went through elaborate tests.

They would change the parameters and then see how the process would react. So there's a lot we can learn from their experiences and how they managed to establish unique and new designs and reprocessing and they have been by and large operating those plants fairly safely.

MR. CAMERON: Okay. Thanks Yawar. Phil?

MR. REED: Oh, I just wanted to make two points and both of them are questions for the audience and for the industry. The Part 52 has a very unique situation with regards to the early site permit and early siting.

They allow it to be either incorporated into the one-step process or they allow you to discuss and present it outside, in which you have a lot more time, you can look at different types of facilities or

locations.

And I was curious as to how we should deal with that process and is there a particular emphasis that you would like, either with the one-step or would you prefer it with the outside?

MR. CAMERON: Okay, that's on the table for people to think about. In the meantime, while people are thinking about how to respond to Phil's question, Alex, anything to add and then we will see what Rod and then Ed.

MR. MURRAY: Yes, if I could Chip. I would just like to point out that a one-step licensing process is not trivial as many of my colleagues in the reactor -- both the reactor side at the NRC and in reactor vendors have found out. Some of this has gone back to the mid- to late-1980s. It's a very extensive, very detailed process.

I remember some of the design work which was developed, you know, would fill a small library just for one reactor design and I do ask, you know, for members at this table here to remember that if one is going to consider a one-step licensing process, there is a considerable amount of information that would have to be developed and created and what have you.

And as Yawar was mentioning, what was done overseas relied a lot upon pilot plant and testing experience as well as experience with older facilities. At the present time, that does not exist in the United States at all.

If I go and look at the reactor analogue again, there were a lot of questions raised by my colleagues in the nuclear reactor regulation which required the vendors to go back and do testing to verify both the assumptions in the models and some of the results.

And I will add members of the staff, both on the reactor side and when I say staff, I mean NRC staff just for clarification, on both reactor side and the fuel cycle side, have raised concerns both formally to management, but also in various, how shall we say, means of communication to applicants and licensees and vendors, about the level or potentially inadequate level of design in the applications they have submitted.

So I encourage us all to think and discuss what is the level of design information that is needed for a one-step process? What is needed for a two-step process? Thank you.

MR. CAMERON: So that's a key question,

right Alex? What is needed for a one-step process?

MR. MURRAY: Yes, and again, look at the reactor site, 20 plus years, some of the design certifications from reactors have multiple, multiple revisions to their SERs. Now they are more evolutionary rather than revolutionary, but still, many modifications. Thank you.

MR. CAMERON: Okay. Ron.

MR. McCULLUM: Thanks. I just wanted to get back to this nexus between risk-informed, performance-based and one-step versus two-step, and also clarify that Dan and I are on the same page on this. When I was arguing on behalf of a one-step process, the regulation should provide for it, because for many applicants that level of certainty will be needed to go forward. I wasn't saying, and I should have clarified, that we should not have the option as we have proposed, for a two-step process.

I think where risk-informed, performance-based comes in, and this may go a little bit to level of information, is that in fact becomes more important in a two-step process. The idea that you are focusing on the results and the outcomes you are trying to achieve and less on regulating to specific design details of specific types of facilities or

prescriptive regulation, is even more important, I would think, for someone who wanted a two-step application.

I think that the -- as has been said here -- the burden does have to stay on industry and this has been a fascinating discussion and the common theme of this discussion is -- what we are talking about here is where regulation and business decision making come together.

And for something as complicated as this, it's very important to get that right. Certainly at the highest level, industry needs to know as much as it can about the regulatory framework to make decisions on -- you know, we broadly support recycling -- but to make decisions on what types of recycling facilities and when and all of that.

And indeed, an applicant going for a two-step process would be saying, well, I want to go -- if this level of information and maturity as Dan says, to get some more certainty, then let me invest -- and this is where the business decision making -- the reason you need the certainty at the various steps is because you are going to make decisions to invest resources.

An applicant with a mature design has

already invested a certain amount of resources in that and therefore you know, needs the certainty -- they both need to know what the regulation looks like.

And that also comes up again with this, that I am glad that the ESP was mentioned. That's something that industry is seeing of increasing value in the reactor world. At first we thought we were going to skip over that process and just go straight to COLAs. We are now seeing more ESPs because I think in industry we are seeing a value to addressing siting issues before you, again, invest too many resources in a specific design.

So it's providing a regulation that gives the public assurances that things licensed to that regulation will be safe and at the same time gives up perspective applicants the certainty they need to make the business decisions and when are we going to make these large investments?

And yes, I think that can be done with a risk-informed and performance-based framework.

MR. CAMERON: Okay. So that's partly an answer to what Phil had asked before, at least that aspect of it.

MR. McCULLUM: Yes, I think, yes, his question falls right in with the thread of the

discussion we are having because it's how do you build a regulation so an applicant can make the decisions with certainty going forward, at the point that the decisions need to be made and that's one way to build some additional certainty in.

MR. CAMERON: Okay. Before we go back to Phil, I want to go to Ed, who I think might have reacted to Yawar's point on international experience, but go ahead, Ed.

DR. LYMAN: Yes, I guess I would just like to caution whether or not a facility is based on a facility that is built elsewhere, if that really is an asset or would facilitate licensing. I think the staff needs to take a look at whether the fact that the MOX plant is substantially based on an operating facility.

MELOX has really assisted in the licensing of that plant. When the design was first submitted by the contractor, it was only that 40 percent complete anyway and there are still issues, I would say with the MOX plant here which date back to the design phase which was never -- was never adequately resolved and is causing issues with regard to granting the operating license.

With regard to a plant like Thorp, I would hope that if anyone tried to submit a reprocessing

plant application based on the Thorp design, the NRC would tear it up, given that the plant has never operated at capacity, has been shut down for years, had a major leak that went undetected for more than a year. I think that kind of experience should tell us to run screaming from that kind of facility.

And with regard to Rokkasho-mura, the full operation has been pushed back another two years in case anyone hasn't heard that yet and I think there are significant questions whether it may ever operate. Thanks.

MR. CAMERON: Okay thank you. Thank you Ed. Phil did you have --

MR. REED: Well, I just had one other last comment, which I also would like to direct to the audience and the members of the industry, and that's just so we don't forget, one of the items on the agenda is the technology neutral requirements, and we are going to face the possibility of having at least two licensees with two different aqueous separation processes and possibly a third one with a pyrochemical process.

And I am just curious as to how we are going to deal with these two issues, particularly the aqueous versus non-aqueous and what kind of

requirements should be putting into our regulations that would address these, or can we do that with no specific requirements and just go to a complete neutral. How would we handle these for the two different types of processes?

MR. CAMERON: Okay. That is one of the items, the technology neutral and I think you brought in the issue we have been discussing of, you know, the mature design I think. So how are those integrated? How are they related? Arjun, did you have a comment?

DR. MAKHIJANI: Yes. One just brief follow-up to what Ed said and then the other thing about the different technologies, technology neutral.

I think you need to step back from this idea that there is a mature reprocessing technology. The French have operated their plant at 100 percent capacity for a number of years. It works well. Their vitrification plant works well.

I have a number of issues with reprocessing but the British design is, in principle, the same. It's a PUREX process. I mean you have got the same kind of chemicals. You have basically the same flow sheets and it's operated miserably and has had huge numbers of problems.

The idea that there is a mature design, I

think, just comparing the British and the French and the fact that they are both PUREX processes should be rejected.

So I think at least going to the -- if you are going to international experience, and look at the facts on the table, you would -- at least I would not agree that there is a -- it's like looking at the breeder reactors, you know? FFTF may have worked reasonably well and then Superphenix worked reasonably well and then Superphenix was a failure and Monju had a leak in 18 months and it's just not a mature technology. There's no learning curve there.

In regard to technology neutral, you can't really have technology neutral regulations. Certainly, parts of regulations can be technology neutral, because you know the kinds of materials you are dealing with, the kinds -- some of the waste that may come out. But I don't see how you can have technology neutral regulations when the waste products are dramatically different, the risks are different, the storage is going to be different, the chemical nature of the products is going to be different and in the case of pyroprocessing, the technology itself is not even defined.

So I would say you can't even calculate

the risks. I am going to say more about this you know, after Yawar makes his presentation. But I don't think you can -- I think you should abandon this idea of technology neutral regulations as an overarching idea that you are going to do this without specific reference to even aqueous versus non-aqueous. There's at least got to be a minimal dividing line.

MR. CAMERON: Can we address Arjun's point and perhaps it would be helpful to -- then we are going to go to Rod for this -- helpful to hear what is the concept of technology neutral and how do you address Arjun's points about these differences in terms of saying well, the rules should be technology neutral. Can you talk a little bit about that and then we will hear from Steve.

MR. McCULLUM: Yes, I think Steve --

MR. CAMERON: And we are going to go to the audience. Okay?

MR. McCULLUM: Yes, Steve may be able to amplify this point even better so I will try to be brief. And I guess for the first time now we are now in an area where industry and Arjun do not agree. But I think that risk-informed, performance-based is the opposite side of the same coin as technology neutral.

We believe very strongly that the

regulation should be technology neutral and the way to accomplish that is by being as risk-informed, performance-based as possible. The less specific, the less prescriptive the regulation is, the more it can accommodate different technologies.

Now that being said, you can't just have a regulation that is two words that says be safe. It would be nice if you could but you can't. So in areas where there is a need for specificity, the regulation and the regulatory structure and the reg guides and everything that is developed underneath that can provide off-ramps to different options.

You can have a regulation that would say you know, if pyroprocessing section umptee-squat applies and if an aqueous process, section this and that applies. And in fact, we have recommended in previous meetings with NRC that in areas where the technologies are just not that well know, you may just want to put a reserved section in the regulation to be developed.

If there is something about pyroprocessing that's not well known enough, you know where you refer to something that would be more applicable to an aqueous-type process, also reserve a section, you know, 7x.3y or whatever that would be developed at a

later point.

So there are ways to do that and I would just point out that this is not something we don't have experience with. We have 104 reactors in this country and a certain, significant fraction of them are pressurized water reactors and a certain significant fraction of them are boiling water reactors and yet we manage to regulate both and there are some things specific.

I mean I know reactor sump issues are an issue at pressurized water reactors and there's a lot of regulatory infrastructure developed around that.

So I think by being as risk-informed, performance-based as possible, and by recognizing where we need to bifurcate and where we need to provide for differences in technology, you can indeed develop a technology neutral regulation.

And I will say on behalf of all of industry, and the various technologies out there, this is critically important because having a recycling regulation is an important input to decision-making and as long as that is something that is completely unknown, if you aren't going to try to endeavor to be technology neutral, it's kind of like you have a chicken and egg situation you can't move forward on.

So for -- we simply believe it can be done and the key is on doing as much as you can with risk-informed, performance-based. Thank you.

MR. CAMERON: Okay Thanks Rod. And I am going to go to Steve now but I just want to put a question on the table for Arjun. If the phrase technology neutral wasn't used to describe what Rod just said about use performance-based, risk-informed as opposed to prescriptive, but that there would be the off-ramps, okay, for particular technologies where you would have to be more prescriptive perhaps.

I guess if it was described like that, would that make sense? How much sense does that make to you Arjun? I am just wondering whether the phrase technology neutral may in and of itself be a problem. So I want to come back and ask you about that, but go ahead Steve.

MR. SCHILTHELM: To the point of technology neutral, there are kind of two pieces to a regulation. One is the process. It tells you how you go about licensing. And then there's a technical piece that says these are the things you have to be concerned about.

So you have to marry those two. When you talked about, and we offered this white paper to NRC,

we actually believe that an integrated safety process allows you to be more technology neutral than the way Part 50 is written with general design criteria.

If you look in Part 50, they never really completed the general design criteria. They thought of perhaps writing more general design criteria for reprocessing plants and never really got to it because the reprocessing went away.

But as a process, an ISA allows you to evaluate particularly chemical processes but mechanical processes as well against consequence thresholds. And Part 70 has clearly written consequence thresholds that you evaluate your processes against.

So regardless of the technology, as long as the evaluation of the consequences and the risks of those consequences is done well, you can put together an appropriate safety profile.

Now the other thing we did, we recognized that there was value in -- Part 70 calls it baseline design criteria, Part 50 calls it general design criteria -- we recognized that at least for aqueous reprocessing, we could make an educated assessment of what additional baseline design criteria were necessary, based on international experience and those

plants that are operating, and we offered additional baseline design criteria that you could apply in concert with the ISA and come to an acceptable and robust safety profile.

What industry probably did not do as thoroughly as we may have liked to, when we presented the white paper, is assess what additional baseline design criteria might be appropriate for non-aqueous reprocessing.

So there is work to be done there, but again, Part 50 was not flawed in its notion that we would develop additional baseline design criteria for reprocessing. The need for it just went away and if the need for non-aqueous reprocessing never comes to pass, then maybe there is no need to have more design criteria there.

MR. CAMERON: So are the -- to connect up with Rod again, the ISA allows you to be more technology neutral and the ISA is really your performance-based, risk-informed tool and the BDC are perhaps the off-ramps?

MR. SCHILTHELM: The BDC help you inform the ISA but the ISA has to work in concert with performance criteria. The ISA is a process. It's a process for evaluating the hazards of a particular

operation. You have to have performance criteria.

I am actually working on a Part 50 license right now and frankly there are no performance criteria in Part 50. With regards to worker protection, with regards to chemical safety, with regards to criticality safety, the performance criteria just aren't really there in Part 50 and in Part 70 they are very clearly articulated from a consequence standpoint.

MR. CAMERON: So you need the performance criteria and Part 70 provides a better model of the performance criteria?

MR. SCHILTHELM: The point is you have to have performance criteria and you have to have process for doing safety evaluation, which is the ISA process, or a PRA if you choose that process.

MR. CAMERON: Okay and we are going to talk about the PRA versus ISA in the next segment. Let me go back to Arjun in terms of what I asked originally and I may have been very inartful and perhaps it might be better to respond to Steve's description and see how much comfort or discomfort that gives you, and also I would like to check in with Ed on the same type of points plus whatever he has. Arjun, any thoughts?

DR. MAKHIJANI: I think actually -- this is

a gut reaction -- technology neutral is a term that is interfering with my understanding and is misleading because you are going to have -- if you have the basic performance criteria, whether for workers or public already specified, you have got your dose limits, you have got 40 CFR 190, you know, you have got to keep your public organ dose limits and whole body does limits, so you don't need new performance criteria for that. You have already got performance criteria.

The question is how are you going to translate that to a specific facility that you are licensing and you can't do that unless you consider technology. Now if you are going to say we are going to have one rule with one 10 CFR Part 73 or whatever and then reserve certain sections because we don't know the technology, it's really the same as saying you are going to have certain parts of the regulation that can general and certain parts of the regulation that have to be technology specific.

So to my mind, actually, technology neutral interferes with the idea that Steve was putting forward, that there is a process, there's levels of performance. The basic level of performance I guess is a dose limit, which is the health and the consequence, whether it's an accident analysis or

routine analysis.

But to translate that into technical terms, it's the NRC's job and you can't do that without reference to a technology so that's why I think this term is interfering with my understanding of what you are trying to do.

MR. CAMERON: Yes, I wondered if it was and I think from the industry's point of view, there is some concerns and interest behind the concept of technology neutral and I guess the issue is, is that if you didn't use that term, how would those concerns and interests -- how should they be met in whatever the rulemaking framework is?

But let's go to Ed and I think we have pretty much talked about a lot of the issues in this area and I want to make sure that we get the audience viewpoints and I am going to ask Miriam to go out for that, but Ed, what do you have to say?

DR. LYMAN: Yes, on the issue of technology neutral, I just wanted to second what Arjun said. I don't think it's useful. I think that in practice there would be so many exceptions, variations, reserve sections that you would essentially end up with a technology specific regulation at the end anyway and you are only kidding yourself if you think you don't.

One of the keys is uncertainty and to the extent it's linked to so-called risk-informed regulation, if you are talking about technologies whose designs are not as well-established, as you heard about before, then obviously the ability to meet a performance-based rule when there is very high uncertainty in the calculations you are doing, once again, brings you back to the issue of the technology you are talking about.

So I don't think you can escape that anyway. And there is also the issue of apples and oranges. If you are comparing aqueous and non-aqueous, it's not just the separation part, but the fact that General Electric, the proposed design would be integral with the reactor part so it's hard to see how you would have one framework that would cover an aqueous reprocessing facility that was supplying light water reactors with MOX compared to an integral fast reactor type design.

MR. CAMERON: Okay. Thank you Ed. Miriam, do you want to see what the audience has to say and we can get a reaction perhaps if appropriate from any of the panel members.

MS. JUCKETT: If you could just raise your hand. Say your name and --

MR. EHINGER: Mike Ehinger. I am from Oak Ridge but I don't speak for Oak Ridge. I speak to you today as probably the only walking, talking, living dinosaur of reprocessing and with respect to that, history and evolution are very important and going back to the idea of single step licensing, I 100 percent support everything that Rod and others have said.

And I use an example, going back in our history to when we were first writing regulations in 1974, and we didn't have them, and we were trying to license West Valley, go ahead, have your reactions, but there's a lot to be said that.

I will skip a lot of the stuff, but in the end, it was the lack of one-step licensing that killed that place and a lot of people blame it on other things, but the reality is they didn't even give them the design requirements.

And the thing that -- the one -- the straw that broke the camel's back was changing the earthquake requirement for the site. I lived through it. I can tell you the whole story. I won't bore you with it right here.

With respect to -- and then with respect to Barnwell, where it was a licensing situation where

all of a sudden an executive order killed off their investment. And even though an executive order said we can continue, they said they don't give us the rules to play by, and that killed it there.

With respect to technology, it's not the job of the NRC to evaluate the plant and the facility for operability, and I use another example from our past: the GE Morris Plant that was designed with current, PUREX technology but at the time the conventional wisdom was to put out a UF6 product and they designed -- there was a design change, in innovation with the GE Morris Plant that instead of doing the final purification step on the uranium, they went to a direct fluorination process.

And in the end, their commissioning activity said the plant won't run because we can't keep the two ends of the plant operating at the same time. It was an issue of surge.

So it met all the criteria, it met all the licensing, it's an operability problem and it's not the problem of the NRC to say whether or not a plant is going to be commercially viable.

I will give another example of that that Ed likes to point out, but I will give it from a different perspective: the idea of Thorp versus COGEMA

and it's not one of the technology, it's one of the way they have built the plant and it's totally having an intimate knowledge of those facilities, having been there, having stood on the top of the tank where the pipe ruptured and said boy, that's a bad idea.

The difference in the technology is one of surge capacity between cycles and that's one of the operator's design requirements. It's not the NRC. The NRC can look at that as a box. There are some technology things to be made. It's looking at it as a box in terms of what you want to regulate, in terms of effluents, and safety, but it's not the object to evaluate the design itself for operability.

So without -- I could probably stand here and talk for hours at a time on this history, like I say having lived it right from the beginning in West Valley right through to having spent a lot of time in the Rokkasho plant and seen it come out of the ground internally, there is a need for one-step licensing, there is a technology envelope you can look at from a regulatory perspective without having to get into the details of the facility design and the operation and the process, but one-step licensing is absolutely crucial and I support everything that has been said here.

MS. JUCKETT: Thank you.

MR. GEDDES: I'm Rick Geddes from Savannah River, another dinosaur. Former operations manager of the largest reprocessing plant in this country at F-canyon.

Couple of things. One is, I keep the reference to overseas experience and that's great. But I would like to point out that in fact there is a large body of knowledge of reprocessing in this country.

DOE does process lots of fuel. In fact it's doing it today in both South Carolina and Idaho. It's out there. It's available. Some of that came into play in helping the AREVA and the MOX licensing effort.

Secondly, the business of one-step versus two-step, I would disagree with Mike to some extent there. I think it's important to have both options available.

I think one fundamental difference that I haven't really heard come out in any of this discussion in comparison to reactors and analogies to reactor licensing, is, in all deference to Mr. McCullum, there's 100 reactors out there. To me they are all the same. Reactors are a dime a dozen. Maybe

200 of them in 20 years or 30 years.

But there's only going to be one reprocessing plant. A decade later, two decades later, there may be another one. There's not going to be 100 of them. They are going to be unique things. They are going to be one of a kind. You know, there will be some evolution to the next one.

I don't think you are going to find -- like, I've got mature technology, I've got this standardized design. They are all pretty much going to be unique. And that's why I think you are going to drive yourself to a two-step process and in fact I think there's another thing.

I don't think anybody is going to say I am going to go out and build one of these commercially and make a profit on it. I think the MOX model is much more likely. This is going to be maybe a privatized operation, NRC-licensed, but probably government-funded on a government reservation, at least for the next century, you know, who knows after that but there's not going to be very many of these things. So I think they are going to be fundamentally different in the licensing aspect than the reactors as we look forward.

MS. JUCKETT: Other audience comments?

MR. CAMERON: Okay. Whoops. Could you just try to be brief?

MR. EHINGER: Very briefly. Very briefly. Just responding to what Rick said. One of the difficulties that we have is that the only experience we have is in the weapons program, with very low burnup fuel and that's another part that I could speak to on the evolution of design, West Valley to Barnwell, Barnwell to Thorp, Thorp to COGEMA, COGEMA to Rokkasho, the evolution of design.

We can't take -- we have to look at the evolution of design. One of the difficulties that we have is we stay in locked into the experiences of our weapons reprocessing, which is, again, very low burnup fuel with very characteristic processes. I will leave it at that. We do have to look to the evolution. We do have to take into account the evolution of design.

MR. CAMERON: Okay. Thank you both for those valuable perspectives on this and what if we take a break and is that what you were going to suggest, Alex?

MR. MURRAY: No.

MR. CAMERON: No. Okay.

MR. MURRAY: I just wanted to add one very quick comment.

MR. CAMERON: Okay.

MR. MURRAY: And then we can take the break.

MR. CAMERON: Okay.

MR. MURRAY: If I could, please. I think both of you have made some very good comments. I think it's important, though, to understand the viewpoint of what I like to term your friendly nuclear safety regulator.

In terms of the old experience, okay, I would be very cautious about trying to say, hey, everything went wrong from the regulatory perspective there.

While to some degree the regulations were evolving, all -- I will say two of the three facilities had some -- I will use the term significant issues. I will phrase it politely like that. Like, portions of the process did not work behind shielded cell walls, things like 80 percent of the plant was contaminated. Things like doses which were not ALARA.

So I think we have to tread very softly. When we go forward, we are going to have to make sure that things like ALARA are appropriately considered and enacted. I think while yes, obviously the regulatory framework and path forward has to be

defined, so too does the design and so too do the safety attributes of that design.

Much of the work which has been done on processes is process-related not safety-related, okay? What was brought up here had to do -- also included a discussion about high burnup fuel. Most DOE facilities -- I don't want to get too much into jargon for the majority of our audience, but most DOE facilities went with fuel that had maybe a 1,000, 2,000 megawatt day per ton burnup.

West Valley, the hottest fuel reprocess there was 20,000 and that was from Indian Point. In the case of La Hague and Thorp we are talking about 45,000 or so megawatt days per ton.

We have commercial reactors in the United States which are discharging fuel with burnups approaching 60,000, 62,000 megawatt days per ton. Okay?

So yes, things have changed. Yes, we have to consider fully all the safety attributes, not just the process attributes. And we can discuss those more in upcoming sessions. Thank you.

MR. CAMERON: Okay. Thank you. Thank you Alex for that context. We are obviously behind time. We started late. But I think that was a productive

discussion in a lot of ways and we are sort of testing out how much time we need for each of these, so I wouldn't be worried. I am not worried about it.

And so why don't we come back at 3:15 and we will have Yawar tee up the next item and that's the last item on the agenda for today. Thank you.

(Whereupon the above-entitled matter went off the record at 2:58 p.m. and back on the record at 3:24 p.m.)

MR. CAMERON: Okay everybody. If we could get started again. Okay we are going to the safety and risk agenda item and Yawar Faraz is going to tee that up for us and he is going to pose a couple of questions for you that we will discuss.

But we had the issue raised during the agenda check about secrecy and we were going to address it during this agenda item because obviously how is someone supposed to know if the facility is safe if they don't have access to the data.

So after Yawar is done with his tee-up and the two questions, let's take a little time to just talk about that secrecy issue and then we will go to Yawar's two questions. Yawar?

MR. FARAZ: Thanks. I have 10 slides so I will try to get done in about 10 minutes. Slide two.

John Flack and Alex were correct in that we need to understand the hazards associated with reprocessing facilities.

And in fact the NRC is doing that. We are looking both domestically and internationally to try and learn to see what those hazards might be and we are improving in that regard day by day.

Over the following discussions, what I think would be most useful is if we can focus on two items. One is how NRC could meaningfully regulate risk and what the methodologies might be to do that. So those are two questions that I think we should try and focus in on.

The third bullet on this slide gives you a website where you can get some background information on risk, how NRC addresses that. Slide three.

This slide identifies five NRC documents that address risk and what I will do is I will try and summarize these in the following slides, one by one. Slide four.

In 1986, the NRC established the Safety Goals for nuclear power plants as follows: qualitatively speaking, there should be no significant additional risk to a member of the public; and the risk to society should be comparable or less than

other electrical generation risks.

Quantitatively speaking, for a member of the public, the prompt or acute fatality risk should be less than one tenth of one percent from all other accidents that that individual might be exposed to.

And from the standpoint of cancer and latent fatality risk, that should be less than, again, one tenth of one percent of the total cancer risk to that individual.

This roughly translates to an annual fatality risk of one in a million for cancer fatality and a little less for acute fatality. Slide five.

In 1995, the Commission issued its PRA policy statement, encouraging the risk of PRA, which is probabilistic risk assessment, using state-of-the-art methods. PRA is a useful tool for determining with reasonable assurance that the safety goals would be met.

For this, clearly PRAs would need to be as realistic as practicable, is what they had recommended in the policy statement. Slide six.

PRA has been used for power reactors for the last 30 years or so and it is particularly useful for assessing complex systems with active components. When you come to passive systems, PRA clearly needs

some additional development and that is ongoing.

When you compare PRA to ISA, clearly the way PRA has been used is it has been extremely quantitative. Slide seven.

This is the third document in the list and it's on the risk-informed, performance-based evaluations, which was issued in 1998. It provides guidance and insights on how to identify and focus on the most important activities, monitor performance and focus on the results. Slide eight.

In 2000, the integrated safety analysis or ISA requirements in Subpart H of 10 CFR Part 70 were issued. In an ISA, all credible accident sequences are identified and binned according to their consequences.

Items relied on for safety or IROFS are identified to make the high-consequence accidents highly unlikely and the immediate consequence accident sequences unlikely.

Now methodologies that can be used to assess the accident sequences can be quantitative, semi-quantitative or qualitative. So the ISA requirements do not specify that you shall be qualitative or semi-quantitative or quantitative. It's open.

But most ISAs conducted so far use the

semi-quantitative approach, more of the order of magnitude type evaluations. For such ISA risks are estimated on a pure accident sequence basis and the total risk or the aggregate risk from all accident sequences to an individual cannot be estimated, especially if you're following the semi-quantitative or the qualitative route.

So how are we -- considering the uncertainties and the resulting conservativeness involved in assessing risks using the ISA process, one would expect the facility risk to a member of the public to be in the order of one in a million per year range. Slide nine.

This is the fifth document on the list. It's the Risk-Informed Decision-Making document that the NRC issued in 2008, or the RIDM document. It provides three regions of risk: unacceptable, tolerable and negligible.

It's very similar to how risk is regulated in the UK. The RIDM document identifies quantitative health guidelines, or QHGs and for an individual, it discusses unacceptable fatality risk, tolerable risk range and also discusses where the negligible risk would arise.

For a U.S. worker, a general worker, the

fatality risk is four, 10 to the minus 5 per year. Slide 10. And I think these are the discussion topics that we would like to concentrate on. We could carry that on after the one on the secrecy item.

MR. CAMERON: Okay. Thank you very much Yawar. Before we go to those points, can we just spend a few minutes on the secrecy issue, access to data and does anybody need Ed to put a finer point on what his concern is there before we discuss it? I mean, Ed, do you want say, just say some more on it?

DR. LYMAN: The concern here is with regard to fuel cycle facility licensing, one of the basic components of the application, the ISA summary is now entirely considered as an official use only, security-related document, and is not available to the public.

And the rationale behind this is that it would provide -- could provide information that is useful to terrorists who want to sabotage the facility. But it is also the fundamental document describing the safety case for this facility, and as such, it's something that is really -- is really something that the public has a right to see.

And to use the argument that anything that is safety related could potentially be used by a terrorist is an absurd argument, and has been used in

my judgment to conceal a great deal of safety information and is really of little use to adversaries at all.

And there are numerous instances. There's one instance where the NRC inadvertently distributed a document associated with MOX facility licensing that was marked official use only but was distributed publicly so I can talk about it and it just described deficiencies in the applicant's method of calculating a certain chemical safety -- doing a certain chemical safety assessment.

Now anyone who could say that that was security-related information the public shouldn't see is -- there's no case for that. So I think that the standards being used to conceal this information from the public are inappropriately broad and therefore there has to be a much more specific threshold for withholding information that should be built into this reprocessing rulemaking to ensure that important information related to the safety of the facility is not withheld from the public.

MR. CAMERON: Okay. Thank you. Thank you Ed. And I will just emphasize Ed's last point, which is that a new threshold for accessibility or inaccessibility as the case may be, needs to be built

into this rulemaking for reprocessing facilities that right now, the criteria is inappropriately broad and I don't know if anybody around the table wants to start, but let's -- Arjun do you want to just amplify on what Ed said and then we'll see if anybody has anything to say on it.

DR. MAKHIJANI: I want to amplify on the comment that I made earlier, is there's an assumption that if you keep something secret, that it's therefore more -- that you are going to result in higher security and higher safety. I am going to give you three, quick examples of where the contrary is true and where information that was released in the past would likely not be released today, which would have been very detrimental to safety.

And essentially all three were linked in some way to reprocessing. The first was the release of the tank farm Fault Tree Databank from Savannah River F and H Canyons from the reprocessing plants relating to high-level waste.

And I did an analysis of that Fault Tree Databank in the `80s and found that Savannah River wasn't keeping very good track of the hydrogen evolution in the tanks and that twice, the hydrogen had reached close to or exceeded explosive levels.

This is from memory, from 25 years ago.

But essentially, the availability of that information with the safety analysis report on the tanks led to -- and their appearance in the Washington Post and the Wall Street Journal and the New York Times of these, my findings with Bob Alvarez and others that resulted in improved safety for its procedures at Savannah River site, because they were not paying adequate attention to turning on the ventilation systems in the tanks after maintenance, as I understand. That was more informal.

The second example relates to criticality risks in high-level waste tanks. It was the same problem -- not keeping track of the amount of plutonium that was going in there, both Hanford and Savannah River site.

The third relates to inadequate accounting of plutonium within the weapons complex, and still an unresolved issue. Now today, the kind of information that Hazel O'Leary made public with plutonium and highly-enriched uranium may not be made public.

But I would argue that in all cases, this is not just a public right to know. It's much more than that. It's the systems become safer. Tanks were put on criticality watch in Hanford because we had the

information in the public that the government's idea -- - Hanford's idea of what was in those tanks was wrong, and I happened to be part of the technical advisory panel on tanks, and I said, your numbers can't possibly be right. You have to revisit that.

And then they put tanks on a criticality watch. Well, you cannot as a basis for this, you simply cannot assume that keeping something secret is going to make you safer and more secure. I think there's a very strong argument that information should be released to the public unless there's a very specific case that some terrorist couldn't find it in a simple Google search.

I think your rule has to be biased in the direction of disclosure for the sake of public safety. That's the point that I want to make.

MR. CAMERON: Okay. Thank you Arjun. Anybody -- yes Steve?

MR. SCHILTHELM: I'll speak as a licensee and I'll just speak in general terms. In a sense I agree with what you are saying Ed and in a sense NRC is in a very difficult position. The threat is dynamic. The post-9/11 pendulum, if you will, swung, and as pendulums swing, it may have swung too far.

But I can tell you as a licensee, NRC does

create a high hurdle for us. When we say something is classified or when we say something is proprietary or when something becomes official use only, the hurdle is pretty substantial.

And from our perspective as a licensee, NRC's default position is that the information be public. I agree it may not appear that way to you. So we are seeing two different sides or coming at NRC from two different paradigms.

But I do agree with you that it would be helpful if there were clarity from both perspectives because it's difficult for the licensees, it's difficult for the public and I'm sure it's difficult for the NRC.

I'm not sure you can build it into this particular rulemaking. There are other areas in the regulation that deal with the public access to information but in a sense I agree with what you are saying, that certainty would be helpful across the board.

MR. CAMERON: Okay. I guess a question for the NRC. And I've been looking at you Marissa, but I don't need to be I guess. But how would this issue be addressed, or could this issue be addressed in this rulemaking or would it be you know, a companion

rulemaking or whatever? But if you could just give people an idea of how the process might work.

MS. BAILEY: Actually I don't really know and maybe Cathy can chime in. I am not quite sure how this issue would be addressed in this particular rulemaking and it's something that we would need to take a look at.

It is a difficult struggle for us because we do strive to be open and so we want to make clear, we want to make clear, we want to put out into the public the basis for any of our conclusions.

But on the other hand, there is -- we also want to make sure that we preserve security and that we protect security. So, it's something that we will just have to continue to struggle with.

I don't know Cathy, if there's anything else you'd like to add, or Tom? But I guess this is you know, the issue of secrecy hasn't really come up in our working on reprocessing and so I would be the first to say that we haven't really given that much thought but it's -- I appreciate the issue coming up and it's something that we will have to think about.

MR. CAMERON: And thank you. Thank you, Marissa, and it's good that the issue is being put on the table now. Ed, you heard Steve's comment about the

high hurdle and that he agrees that clarity would be useful for both the NRC and the license applicants.

Do you have any suggestions for how the -- how NRC would go about looking at a new threshold?

DR. LYMAN: Well, I think one problem is that right now the definition of this SUNSI security-related information is not in the regulations at all. It's all -- it's regulatory guides and less formal directives, and as opposed to, for instance, the definition of safeguards information. So I think this is an overarching issue.

It's not -- it would be a companion, the right part wouldn't be Part 70x but it would be an accompanying rulemaking possibly to have a consistent definition of security-related -- non safeguards, security-related information that is more specific than just any information that could possibly help an adversary do something. That's just too broad.

I'll give another example. Shaw Areva MOX Services last year submitted a request for an exemption from certain material control and accounting requirements. Now there's a provision in NRC regulations that any information pertaining to material control and accounting should be treated as proprietary, OUO.

That document, at least 95 percent of it, was -- contained information that was previously made public that was in the construction authorization request. We went through it and found out that there were about maybe five lines that were appropriate to withhold. Most of the document should have been made public, yet it isn't. So there's a lot of inconsistency going on.

MR. CAMERON: So there's not a whole lot of quality control in terms of -- even under the existing threshold, whatever that is, that there is some inconsistency involved here.

So there's two issues, really. I take it that if there was going to be a rulemaking on SUNSI that people could comment and that there might be a way to improve the implementation of the present system.

And is this something that the NMSS staff can bring to the attention of the people who, at the NRC, who are in charge of this particular area? I mean, will you take this message to them?

MS. BAILEY: Yes, we can take this message back but I do want to emphasize that when we look at a document, there are a set of criteria that we follow to make a determination as to whether or not a

document is OUO and I think the staff tries very hard to follow those rules, because really our first reaction to a lot of these documents is that you know, we do want to make it public.

Again, openness is one of our values so we do try very hard to apply those criteria for determining whether a document should be released to the public or not. But it's -- we will bring it back and --

MR. CAMERON: Okay.

MS. BAILEY: Consider the comment.

MR. CAMERON: Thank you Marissa, let's -- yes Arjun?

DR. MAKHIJANI: Could I make a specific suggestion. The comment that Ed made kind of reminds of me other things that I have been involved in which I won't go into, but the proprietary as well as the other security-related kind of withholding supposedly security-related withholding documents from the public, results normally in the withholding of the whole document.

I have been involved in situations there were whole documents that were completely public that were granted proprietary status as a blanket matter by the courts, just because the company asked for the

documents to be.

I think in a proceeding before the NRC, if you are serious about your commitment to openness, you would not grant either proprietary or secret status or OUO status to any document as a whole.

There may be, in this case, five sentences or may be five paragraphs, or it could be five pages or half the document that could legitimately be withheld, but to grant a blanket request to a license applicant that something should be proprietary or the whole thing should be secret, when it is easily available -- so a minimal threshold could be, how much of this information is available to the public already that is in this document?

And as a minimal thing, the party asking for the secrecy should be able to show that none of that information is already public and whatever is public at least should be returned to the public in the context in which it belongs.

That should be a minimal practice. I am not suggesting that it should be the whole thing, but it should be a minimal -- the burden should be on the NRC and the applicant before holding it and so far as I can see, from Ed's example, you are not fulfilling that burden.

MR. CAMERON: Okay, thanks Arjun, and we are going to go to the first of Yawar's questions. But we are going to hear from Alex. Go ahead.

MR. MURRAY: Thank you. I just wanted to add to that. I do think that as a member of the NRC staff, I do think that the majority of the staff and management of the NRC do want complete openness, or openness as much as possible.

DR. MAKHIJANI: I agree with that.

MR. MURRAY: And I do agree, over the past five years, there has definitely been a trend where instead of redacting small portions of a document that clearly have some proprietary or security-related link, the trend has been to, if you will, remove the whole document.

And that is something that we as an agency are going to have to look at in our policies and procedures and so forth.

As regards reprocessing specifically, let me just throw out something for people to think about and maybe comment on later on. We can -- we have a couple of approaches that can be followed.

We do things where we have regulatory guides or NUREGs which give, if you will format and content of applications, or recommended format and

content of applications. It is possible, somewhere in there, we can outline if you will the guidance -- it's not a regulation -- but it's guidance to -- as to what would clearly be considered proprietary or non-proprietary with the intent that as much as possible would be in the public domain.

We could also put something in there for, to use a term, a summary of the ISA summary, where instead of being very specific to safety controls, IROFS, design safety requirements what have you, it's at a slightly higher conceptual level, where if you will the intent or the mechanism whereby the staff considers safety to be achieved, or the applicant considers safety to be achieved, is evident. That might -- but I throw that out for discussion.

MR. CAMERON: Oops, your mic has to be on. Did you catch any of that at all?

DR. MAKHIJANI: Just like the NRC's commitment to the value of openness, and I am here because of it.

MR. CAMERON: Thank you very much, Arjun. So, we had some suggestions on how to deal with the secrecy issue, including Alex's suggestion that perhaps would not require rulemaking. So good discussion, and let's go to Yawar's first question and

I'm going to state it the way I think you did, Yawar, which is how can the NRC meaningfully regulate risk? Is that --?

MR. FARAZ: You said it right. It's how could the NRC meaningfully regulate risk to an individual.

MR. CAMERON: Okay. And this -- the follow-on question is about the methodology, the PRA, integrated safety system or some combination. So on the first issue, what can be said? Does anybody have something to say on how can the NRC meaningfully regulate risk, is the way Yawar is asking it. Anybody want to start us off on that?

And maybe, can you put a finer point perhaps, on that, Yawar, in terms of you know, you have total safety and risk, aggregation, summary, overall safety goal, how does that safety goal play into all this? We heard hazards and consequences from Alex a little while ago, clarifying what he was thinking about as risk. I am just trying to figure out where we should start with this discussion.

And Flack has an idea. So we will go to him.

DR. FLACK: Well, I think the first thing one needs to understand is what the risk is. I mean,

without knowing what the risk is, how do you make any meaningful decisions about it? So I think knowing what it is, is -- now, you know, what do we mean by risk, I guess, you know, and the bottom line is we talk about different, what, different kinds of risk.

I mean if you use reactors as the way risk is defined, we are talking about risk to the public outside, around a facility, out so far from a facility and the risk that that imposes to those individuals living around that facility.

Now, you can also talk about worker risk and the risk they are exposed to during operations. We could talk about accident risk, likelihoods of accidents and their consequences, and then you can talk about the risk of working at a facility, which could involve long-term exposures.

So I mean it's -- I think we have to define what we are really trying to achieve and define risk. And then once defined, what is it, and then set the criteria about it, including defense in depth, uncertainty, defense in depth. All that comes after the fact, so it's a very broad general question, I think, when you just pose it as how do we regulate the risk, I mean, maybe we could be more specific on that, as it applies to say, a reprocessing facility.

MR. FARAZ: What I would offer is, you said it right, you provided the entire gamut. I would narrow down to maybe risk to a member of the public from accidents.

DR. FLACK: Good. Okay, so that's the starting point. That's what we are trying to understand and -- okay, good.

MR. FARAZ: Maybe if you can have a discussion on that, that would be really helpful.

DR. FLACK: Yes, right. And how do you go about determining what that is. What tools do you need to do? Now, if you are talking about the integrated risk, the total risk of all accident sequences, or do we, like at an ISA divide them in by one by one, and define the threshold from which it's greater than, you know, there are different approaches to dealing with that.

But in reactor space, you do a Level 3 PRA. If you want to do the whole assessment and go from there, and then you can compare those results with the safety goals and that would be the next step.

But first, being able to do that I guess is the question, or do we need to do that, I guess is the question, for these reprocessing facilities. Does that make sense, that question?

MR. FARAZ: Yes, exactly, yes.

MR. CAMERON: So are we jumping right to -- is everything wrapped up in doing the PRA or ISA or some combination of that? I mean, is there a larger issue here that we need to talk about, or are we -- should we jump to the ISA PRA issue which Yawar referred to as a methodology. What methodology do you use to determine risk? I just want to make sure that we are not missing a larger point and go ahead Alex.

MR. MURRAY: I think we should take a step back and ask ourselves the question, okay, which is essentially the first question on there, and that is are there are should there be a total risk or risk and safety goals, be they to a member of the public, to a worker, what have you, in some manner analogous to the safety goals that exist to reactors? Maybe they would be different ones, maybe there would be an environmental version as well as there is in Part 70, I don't know.

But I think we have to first ask ourselves, is there some ultimate goal for safety/risk, some total risk that we are shooting for?

MR. CAMERON: Okay. Let's go to Ed and then Arjun and Mike, we know you are out there and we will get to you, so you don't even need to raise your hand.

We won't ignore you. Right Miriam? Okay. Ed.

DR. LYMAN: Yes, well I wonder whether that, looking at individual risk is the only appropriate endpoint or if the field is wide open, why don't you start talking about other issues which may be relevant to accidents at reprocessing plants, for instance, long-term land contamination.

Right now there are no NRC regulations other than those pertaining to NEPA and SAMA, which even touch on long-term land contamination from fission products, yet in a reprocessing plant, a tank accident could well lead to significant economic consequences as well as long-term land denial and perhaps there should be an explicit endpoint in the reprocessing rulemaking having to do with restrictions on the aggregate release of fission products with regard to land contamination.

MR. CAMERON: And Ed, I'm sorry, I just couldn't hear that, in regard to, that one word you have been using.

DR. LYMAN: Land.

MR. CAMERON: Land.

DR. LYMAN: Contamination.

MR. CAMERON: L-A-N-D.

DR. LYMAN: L-A-N-D.

MR. CAMERON: L-A-N-D. Okay.

DR. LYMAN: Right.

MR. CAMERON: And let's hear from Arjun and get some reaction to Ed's point from Yawar and then go down to Ron. Go ahead. Go ahead.

MR. FARAZ: It's a short point I wanted to make. In terms of part 70 we do have performance requirements for environmental contamination or the environmental performance requirements are there, which would, you know, address the land contamination issue.

MR. CAMERON: And let me ask Ed if something similar to what Yawar is talking about --

DR. LYMAN: Sorry, what provision is that? I mean I am familiar with 7023 but --

MR. FARAZ: Yes, it's 7061, those are the performance requirements, and it addresses both the -- it addresses the worker, the member of the public as well as environment.

DR. LYMAN: Anyone have the regulations here?

MR. CAMERON: While we are doing this, let me hear what Rod has to say and then we are going to come back to Arjun, but we are sort of going from this overall safety goal and now we talk about land

contamination. I just want to make sure that we get on the same page and welcome to Jim Bresee, who has joined us from the Department of Energy. Thank you Jim.

MR. McCULLUM: Jim, before I speak, do you want to introduce yourself, since the mic is on?

MR. CAMERON: Just tell us a little bit about what you are doing and --

DR. BRESEE: I am with the fuel cycle R&D program of the office of nuclear energy and our purpose in life is to develop advanced technologies for possible future recycle of used fuel and we have a variety of alternatives and developing criteria by which we could do a down selection of alternatives. I hope I can contribute in that area.

MR. CAMERON: Great, and you know anything that you want to suggest will be a useful contribution. Right now we are on the issue of risk, safety and risk from the facility.

MR. McCULLUM: And I think that -- am I getting stereo here? I heard an echo of myself. But I think a lot of it does go to the tool you use to evaluate risk and a lot of that is where our risk-conformed, performance-based regulation can talk about the use of the tool, the regular use of the tool.

However I think that there's probably elements of all of the above in that first question in there, and I think it is important that we be consistent with established precedent. I mean, the tools you use to determine the risk may be unique for a recycling facility I think, even though in terms of whether you should ISA or PRA and things like that and we certainly would have a lot to say on that.

Clearly ALARA is going to apply and again, that's an area where you don't have to do a lot different for one of these types of facilities, you know, you don't have to specify in detail the technology, for example, to put ALARA in place. You know, we have methodologies for looking at ALARA that would translate.

I think a lot can be accomplished on risk to an individual and we saw that in Part 63, the repository safety regulation. You know, you have a complex, geologic system and you could attempt to regulate it at all sorts of different points in the system, and in Part 60 there was an attempt to do that, to specify what were called subsystem performance requirements.

But if you end up specifying the right tool, which in the case of the repository, was total

systems performance assessment, case of recycling facility might be an integrated safety analysis, or of PRA in some instances, you can use -- you can get a lot in terms of what is the risk to the individual from an accident in normal operations.

And then being consistent with established precedent out there, I mean, we have 10 CFR Part 100, we have a lot of things out there where we kind of know what doses are appropriate and that shouldn't change a lot for recycling facility. A neighbor of a recycling facility should have the same expectation of safety that a neighbor of a reactor does.

So I think really the discussion on this does go to the tool, the methodology. Recognizing you are going to apply ALARA in any case and recognizing that a lot is already known about what levels of individual risk are acceptable and a lot can be done with accident analysis, acceptable risk.

What you are really trying to do -- and this gets back to the point Alex made at the very beginning -- you are trying to make sure you have adequately captured the hazards, and again, in the technology neutral, risk-informed regulation, you wouldn't specify please evaluate the following 16 hazards because this would vary.

But you need to specify a regulation that will drive confidence that the methodology will identify the hazards and will appropriately evaluate those things that stand between the hazards and the public and provide assurance that those things -- and in an integrated safety analysis they would be called IROFS -- that those things will function with the adequate defense in depth, adequate assurances.

So I think this is doable, again in a risk-informed, performance-based way and I think that and I think that a lot of that goes to the methodology, is providing a regulation that will specify a level of rigor that indeed the hazards will be -- the applicant will communicate an understanding of his hazards and will provide assurances that the things that come between those hazards and the public are adequate.

MR. CAMERON: So your approach is that there would be something in the rule that would require the ISA to identify hazards or perhaps there might be, I think, the word semi or the phrase semi-quantitative was used and that would be the way to approach the controlling the risk from the facility?

MR. McCULLUM: Yes, correct, given that the overall goals are also that you are going to use that

tool to demonstrate that you are providing a level of protection that is also consistent with the level of protection you have provided other facilities, and so that should be articulated, but I don't think there's a need to reinvent the wheel there.

MR. CAMERON: Okay, because that wheel is already been invented. All right. Let's go to Arjun and then we will go over to Steve and come back to Yawar and Ed. Arjun?

DR. MAKHIJANI: Yes, a couple of concerns. The idea that you can do a risk assessment, especially an integrated one, has an underlying assumption we never talk about that you can add up all the risks, that when you have different types of accidents, let alone routine releases and risks, that you can add them all up, that you can multiply the probability of an accident with the consequences, assuming you know them both well enough and come up with a risk.

Whereas, you know, a lot of people don't trust risk assessments and don't want them done. I don't belong to that group, but I do have reservations with this idea that you can add up all the risks. It doesn't correspond to how we live and it doesn't correspond to common sense.

The small probability of getting AIDS from

a transfusion that hasn't been screened for the virus multiplied by the probability of the consequences -- multiplied by the probability, the consequence could give you the same number as the large probability of getting a cold by going to work in winter.

And the two -- we clearly protect ourselves very differently from those two risks and we don't add them up in practice and if a hospital told you they weren't going to screen blood to save money, you would be outraged, even though the probability were very small, and the average damage might be 10 bucks or whatever.

I think the fact that risk assessment mixes up large consequences, like the Mayak Explosion. Let's talk about reprocessing and not AIDS: 6,000 square miles contaminated for decades, 30 towns and villages which had to be evacuated, long-term land denial from a high-level waste tank explosion, and I think that can't be equated to the consequences of a leak.

The different kinds of accidents and the fact that we are adding all of these things up, I would say that for high-consequence accidents, the risks -- the consequences themselves have to be represented as a certain kind of societal risk, if it

is credible that it can happen.

And the second problem is something I referred to earlier, is can you calculate the probabilities of these accidents? I think the Challenger accident showed that the prior calculations of these accidents did not correspond to the actual risks.

Now we have had one explosion in a high-level waste tank. We had a problem at La Hague with a failure of electrical power for several hours in April 1980. Fortunately there was no accident that resulted from that. How are we going to take those events and actually calculate the probability of a high-level waste tank explosion at a commercial facility?

I am not quite clear. You don't have enough data points. You have some indication: two types of tanks were kind of different; their cooling arrangements were different; and the regulatory arrangements were different.

So I think these problems are -- when we say risk assessment, there are certain routine kinds of things that can be evaluated pretty easily and or without much difficulty and added up, and I would agree with that.

But when you mix up that with severe

accidents and consequences as is routine, I think this specially needs to be revisited with reprocessing plants, and especially aqueous reprocessing plants.

MR. CAMERON: Okay, thanks Arjun and we are going to go to Steve and I guess I would just put out a general question for all of you, is how would the approach that Rod suggested, how would that take care of Arjun's concerns or do we need to worry about those concerns?

But go ahead Steve.

MR. SCHILTHELM: I think I agree with a lot of what Arjun said. We tried, when we presented this white paper to the NRC, we tried to deal with that -- those concepts from the standpoint of thresholds, trying to recognize that maybe protecting workers against accidental things that might happen in the plant required a different set of tools than protecting the public against things -- large accidents that could actually affect the public.

We offered thresholds consistent with the performance objectives that are in Part 70 for high and intermediate consequences. But I think what you are offering is maybe there's an ultra-high sort of consequence concept that may be appropriate.

But we tried to deal with that thought

process within the white paper, because if we look at the MOX facility and we look at the licensing in the MOX facility, although the standards for protection of the worker and protection of the public are written in the same construct -- there could be a high consequence to the worker or a high consequence to the public -- the practice seems to be that protection of the public needs to meet a higher standard than protection of the worker, even though the consequence bin is the same.

So we tried to deal with that in the white paper by creating some thresholds and offering that for events that could affect the public, there needed to be more thought given to a quantitative analysis, versus qualitative. Whether or not we hit the mark doing that, that was our attempt and that was what we were trying to recognize.

MR. CAMERON: And I am going to -- yes go ahead. Go ahead Arjun.

DR. MAKHIJANI: How do you deal with an issue where you don't have very much data to be able to calculate a probability? That is one of my big problems with this whole exercise.

MR. SCHILTHELM: I will take that on because I was the safety manager at an NRC-licensed

facility and I was deeply involved in the conception of Part 70 and the ISA concepts.

There is a significant danger to giving engineers tools that result in a number and letting them run with the number. My number is good, therefore I am safe. That is not safety.

And there is a danger to believing that the input is good enough to justify the output. It's just what you said. So I am not a huge advocate of quantitative risk analysis, particularly when people are involved and it's not a machine, and particularly when the data to support the failure of the machine is not well-understood.

And I am just echoing what you said, so I am not a probabilistic advocate from that perspective.

MR. CAMERON: And just a follow-up on that Steve, so that you would think that an ISA -- let me put it, a non-quantitative assessment might be more effective. I don't know if I can do that but -- to you.

MR. SCHILTHELM: No, I think we did believe that an ISA is more effective, absent good data, and I think the MOX experience -- and Sven is over there nodding -- that the lack of data for some of these chemical processes really inhibits the ability to do a

good PRA.

A PRA can be done well, don't get me wrong, but it has its limitations.

MR. CAMERON: But you said you talked about the danger of giving an engineer -- and maybe there's other people that they would be dangerous to, too -- give them a number and then you are going to run with it and just assume that you are safe.

Before we go up to Yawar and Ed, I want to hear from Rod and John and then we'll go up to that end of the table.

MR. McCULLUM: Yes. Thank you, Chip. And I will say, without getting into detail at this point, that industry will be further weighing in on this topic of ISA and PRA and to what level can you quantify things and to what level you may not need to quantify things.

I think Arjun's example is an outstanding test of this very question, in that if a tank exploded and did the ruinous damage -- and I am not familiar with the Mayak incident, but you know -- obviously either one of two things did not happen.

Obviously the hazard was not understood or appropriate mitigative features were not put in place in between the hazard and the public, and an

integrated safety analysis, and if the regulation required enough rigor, without specifying the details because you want to be technology neutral, you want to be risk-informed, performance-based and I am sorry for being a broken record on that, but I think it is possible to put in place a regulation which would require the applicant to assure that he had identified all the hazards and understood -- he or she had identified all the hazards and understood them, and placed in a defense in depth manner sufficient barriers in between those hazards and the workers and the public.

And one can look at the old Soviet Union as an example where maybe that kind of thinking just didn't happen as often as it used to or should have occurred, but given that example I do believe, again focusing on your idea you are going to protect an individual, be that individual the worker, or be that person who lives on your fence-line and will stay there for 30 days after an accident, whatever the case might be -- you can indeed put in place a regulation that will require that the hazard be understood and communicated publicly and that those measures are in place.

And this is a subject we do look forward

to additional dialogue. I think you will hear from industry on this subject and we would like, with the same folks around the table perhaps in the future to discuss in more detail, but yes, again, if you put the right amount of rigor into it and you understand your hazards, this can be done and accidents like that can be prevented and certainly in that case, should not have happened.

MR. CAMERON: Okay. Thank you. Thank you very much, Rod. John and then we are going to check in with Ed and Yawar.

DR. FLACK: Yes, a few things. Just to clarify a few points, at least in my own mind to make. Well, one is completeness and being able to capture all the hazards. It goes without saying, I mean that's a very important part of the process.

But the part about not having the data and therefore not wanting to do a quantitative analysis, to me, I don't think it justifies it in a way that there is uncertainty with the data, and one needs to know what that uncertainty is.

Now we could say, well, it's very difficult to deal with that uncertainty. That's fine. But at least I know it's there. And I also know when somebody is trying to write down a quantitative value,

I know what his thinking is and what he thinks he needs to achieve, and therefore I get that feedback from the analysis.

Without that information, I don't know how to deal with it. I mean, it's just a matter of opinion. It's very difficult to get people to agree on things. And John Garrick once made a comment. He said that well, I can get people to agree on a number, but it's very difficult to have them agree on the uncertainty.

And how true that is. And what we are dealing with is uncertainty, and I think by not recognizing that, I think there's a tendency to push it under the rug, and say well, okay, since we can't quantify, we don't have the data, we have got -- let's do it this way and let's get -- resolve the issue.

But I think that's a mistake and I think that by trying to quantify something, you not only write down what you know and what you don't know in that way, by looking at the values and the uncertainties about those values, but also it tells you what you need to achieve.

And the sensitivity of that to the end result, because now I have a model, now I have an understanding, now I can play with sensitivities and

understand what effect that has on the system, which I couldn't do without this model.

So to me, I think resisting that and saying well, it's just too difficult to do or we don't have something, I don't think that justifies not doing it. Well anyhow, that's my opinion on the matter. Thank you.

MR. CAMERON: Okay. Thanks John. Ed, do you want to chime in on this and then we will see what Yawar has?

DR. LYMAN: Well I mean I think the question that you have to deal with is if you are going to be creating some hybrid of Part 50 and Part 70, are you going to go with a deterministic set of design basis accidents? Or are you going to go with a semi-quantitative hand-waving approach with regard to likelihood?

And I would say that from what I have heard, at least, there seems to be some sentiment that we are not going to be in a position to estimate the likelihoods well enough that you can actually use that Part 70, at least until there's significantly more operating experience with some of these facilities.

So I would think to err on the side of caution, that a Part 50-like approach, you specify a

set of events which could lead to high consequence for the public and that you have to demonstrate that there are controls in place so that the dose will be limited in a deterministic fashion and not try to play this game of highly unlikely, unlikely, likely, if you don't have the inputs to be able to make those determinations reasonably.

MR. CAMERON: So you would prefer seeing a deterministic approach used?

DR. LYMAN: I think that that should be the foundation of the new regulation for -- the fundamental safety basis should be a set of deterministic events.

MR. CAMERON: Okay. Thank you. Yawar?

MR. FARAZ: Yes. In terms of identifying the hazards and the accident sequences, clearly, in a chemical-like plant, or a chemical facility, clearly the approaches used for ISAs have been very effective.

They have been used in chemical facilities. They have been used for fuel-cycle facilities quite effectively in identifying the hazards and the accident sequences.

However, the methods that we have used have some very significant shortcomings. One is that the methods that are typically used are semi-

quantitative. They only have two levels of criteria, performance criteria: high consequence and immediate consequence. They don't address, or they don't differentiate between a high consequence event that might impact one individual versus a high consequence event that might impact 10s or 100s of individuals. They are treated the same.

So that's clearly a shortcoming in the methods that are used. Now, for existing fuel cycle facilities, that's fine because they tend not to have a lot of off-site risk. But in a facility like a reprocessing plant, where the inventories are very large and off-site impacts can occur if they are not properly protected against, then we need to think about something much better than the existing approach that they use for fuel cycle facilities.

MR. CAMERON: Okay. Let's go to Alex and then Sven and then Arjun. Alex?

MR. MURRAY: Thank you very much Chip. I appreciate it. Just a couple of points. And first, just by way of clarification, I think the event at Mayak is better known to more people as the Kyshtym event if I am correct. Yes? Okay.

So, one can easily search on that and find out details about that in any one of a number of

servers. Just also for clarification, it was for -- it was a high-level waste tank from a different type of process than is being considered by anybody that we know of today. It's basically a historical process.

What I am hearing, and I have heard several people mention it now, about uncertainties and so forth. And again I throw it out, we get back to Part 50-like space in some areas, this concept of a design basis accident, the high-level waste tank shall not explode. Okay? The chemical cloud cannot happen. A criticality event cannot occur.

And I ask the assembled group, are they -- is the thought that there should be some accidents that should be design basis like, deterministic analyses, some others which should be ISA or PRA-like? I do not know. But I throw that out there.

I will also add, getting back to numbers and I have heard MOX mentioned a couple of times, having been intimately involved with MOX, being an observer with MOX, being involved with MOX going back 30 plus years, I can tell you that when ISA analyses were done and presented without quantification for non-linear or more complicated event sequences, the staff, in order to support their safety determination, were asked, either by management or review committees,

to do a quantitative analysis.

And again, I throw out to potential applicants to consider, in some situations, do you want to do your numerical analysis yourselves, or do you want to rely upon the staff? It takes time. It's uncertain, what have you. Staff should be reviewing. We should not be designing based upon numerical analyses. Okay? But I throw that out and I think basically --

Oh, last thing, I have heard a couple of people mention threshold, different products for members of the public. Is there a threshold? Should we consider a threshold for different types of analyses? I don't know. Thank you.

MR. CAMERON: Very helpful though, good food for thought. Sven?

DR. BADER: Thanks Alex for stealing a lot of my thunder there. Just from the MOX fuel fabrication experiences, yes, we are -- we definitely did an ISA summary and we had considered doing a PRA and it got to the point where we were, as Steve said, had an engineer sitting around manipulating numbers and it goes back to the uncertainty quote that I think you used, John, from Mr. Garrick.

Another problem we have is this is a

chemical process and it's not a Boolean logic often. Often we didn't have a valve turning off or on. We had several different combinations of chemicals having to be mixed in a certain pattern that would cause an event.

And really, the only way we found a meaningful approach to it was through the ISA approach, where we did a detailed HAZOP on this, looking at all the sequences and then we had computer models that actually went and modeled the deviations that we assumed are in the HAZOPs.

So it was an integrated approach and yes, we did have some numbers because that's what our models were showing, but they were not probabilities. They were, you are not going to have a runaway, red oil or hydroxylamine nitrate type of event explosion hazard.

So from the MOX facility, our main emphasis or our main insight that we saw was that for mechanical devices, yes, we could do some sort of PRA, those are the good devices that we could do a mitigation on certain events, certain release events.

But on chemical processes, we really didn't see any alternative to the ISA process. And I will leave it at that.

MR. CAMERON: Okay. Thanks Sven. Arjun?

DR. MAKHIJANI: Yes. I didn't want my remarks to be misunderstood, if they were, that if you don't have sufficient data that you shouldn't do a quantitative assessment. It might be you have a lot of other options. Maybe you should look for a different way of doing things. Maybe you should look for ways to generate data that are more reliable from similar facilities.

It's not an invitation for hand-waving. That's not my intent for raising the question, just in response to what John said there. I think ultimately some form of quantitative handle on the consequences of accident sequences is very important, and so I just wanted to clarify that, that I don't think industry or anybody else should misunderstand my position that if you don't have the data that you can just decide to do without it.

You have to have -- maybe just tell the licensee to go back and know more about their process before they make a license application.

The second thing is that if you have extremely high consequence accidents that are possible, and it's true that PUREX is different than what they had in the Soviet Union and -- but the high-

level waste tanks still contain fission products that have some potential for explosion in an event of loss of cooling, and that's simply there.

And I think maybe a design requirement, if you have extremely high consequence accidents, should be that the consequences should be reduced, that the design should be such that you can't just rely on the multiplication of a -- calculate a low probability and say, oh it's 10 to the minus 7 or 10 to the minus 8 and it's not design basis, or 10 to the minus 6 multiplied by 10 to the 10 and your damage is $10,000 or whatever.

I think you have to go back to the drawing board and come up with a different design that doesn't have high consequence accidents, and maybe you need to put a containment dome around the tanks. I don't know. Something, a different process that doesn't generate the same kind of liquid waste, that if you lose the cooling it might explode.

MR. CAMERON: So that would be one bottom line for you, is that for high consequence, require mitigation? Okay. Rod, and then we will go to Sven and then we will go to John.

MR. McCULLUM: Yes, thanks for coming back to me and I just wanted to real quick note another

instance of agreement here between industry and Arjun. What you just wrote down there, I think that's the same thing I was saying where you have got to understand the hazards and assure you have put appropriate measures in between the hazards and the public and the workers.

And again, that's probably what was not done in either case, or at least in one of those cases at this Mayak facility. But we believe that integrated safety analysis and a regulation that requires an appropriate amount of rigor in an integrated safety analysis, could in fact assure that that gets done.

And without having to specify a bunch of predetermined, design basis accidents for facilities you can't in a technology neutral know in advance what they will be.

But I would agree with that. You need to be able to demonstrate you understand the hazards and that you have mitigated them. And so I think that's notable.

MR. CAMERON: Okay. Thank you Rod. Sven?

DR. BADER: I just wanted to add, one of the things about mature technologies is that you don't solely rely on prevention. You have these defense in depth mitigated features available to you as well.

Then NFFF is designed with many of those features that are found in the mature plants in France AREVA runs.

And another point was when we did these PRAs -- we have done some PRAs -- is that under Part 70, where you have IROFS, it's very difficult to distinguish in an PRA, what you are crediting as IROF when you are trying to do a PRA and credit everything, that includes your defense in depth features.

So there's a fundamental issue that we had, what do you pick out of your long list of action items or long list of fault trees, what items do you pick out of that to be the actual IROF? It's not a simple task to perform.

MR. CAMERON: Okay. Thank you. And John?

DR. FLACK: No, I agree with that. I think it's more of a process and it's not risk-based. It's a risk-informed process. So you are using that information to make decisions on defense in depth. You are not saying it's just a low number, we are not going to do anything about it.

So I think that basically goes back to the Commission guidance, not to just base things on probability, but also just to be informed by that in making a decision and then from that, decide how much defense in depth you need.

So high consequence events would get a certain level of defense in depth in any case, depending on how much it's the likelihood, whether it's credible and so on, but of course that you have that on the table to make those kinds of decisions, it's another piece of information to use that if you didn't go through that process, you wouldn't have. That's all I wanted to say.

MR. CAMERON: Okay. And let's go to Tom, Tom Hiltz.

MR. HILTZ: Thank you Chip. I just have sort of a question. I mean the discussion for me has been very interesting, but it sort of hasn't punctuated on any real solution. I have heard that ISA is very useful. I have heard talk about the limitations of PRA.

I guess my question is, if anybody has any insights, if we want to be faithful to the Commission policy statement that PRA should be used to the extent supported by the state of the art, what is the state of the art that we can use PRA for reprocessing, for a potential reprocessing facility?

And what is necessary for us in order to make a safety decision using PRA?

MR. CAMERON: Let's get opinions on that

point, as Tom called it, a punctuation. Rod?

MR. McCULLUM: Yes. I think PRA can complement ISA and I think consistent with the Commission policy statement. I think there may be areas where, when you do have systems that are analogous to things that exist elsewhere in industry, that you do have data on, you can use it to get risk insights.

And again, I am getting a little ahead of some things that we are working on right now in industry, where we would want to get back to you on a greater level of detail.

But we would say that ISA should be the core of what you would call the safety case and then that you might also look for areas of opportunities to gain additional insights through PRA.

But again you have got 104 commercial reactors, and that policy statement was written against that backdrop: 104 commercial reactors that have between 20, 30, 40 years' experience each. They could fall into two flavors: BWRs and PWRs most of them, well, Fort St. Vrain shut down.

So you have this incredible population of data on very similar systems and we are not going to come at you with 104 applications for recycling

facilities and we don't have 104 existing ones that you can compare them to.

So you have to start out recognizing the limitations, and what are the tools to again assure that you understand the hazards and you put the right measures in between the hazards and the people and to use PRA for insights.

But to expect that PRA can play the same role for a recycling facility that it plays for reactor, probably you can't get here from there.

MR. HILTZ: And I just want to be clear, that's not my suggestion and I think the policy statement says PRA shall be used to increase in all regulatory matters to the extent supported by the state of the art.

So I am not suggesting that we would want to use where we are in the reactor world to say well, we have to have something directly analogous to that as we consider how to license a reprocessing facility.

My question is, where are we with the state of the art and what is the level of application that we can reasonably apply for a commercial reprocessing facility that provides us meaningful safety insight, provides us meaningful safety benefit and helps us make informed decisions?

MR. McCULLUM: Yes, I just wanted to clarify. I didn't mean to imply that's what you were saying. I was trying to draw an extreme contrast there. And I think that's an area, if we recognize that the heart and soul of the safety case is going to come from ISA, then you have the task of saying okay, where are the areas we can apply PRA? Where are -- how do we trigger, okay, the system is something that we have experience with and/or is associated with a hazard where we might want to know more, making it worth it as well, again, just generating a number for the sake of it.

And I think that that's something that both industry and NRC as well as the stakeholders need to continue to look at. But I think if you recognize that you are starting with this pretty good tool in integrated safety analysis, and you are looking at how do I complement it with a PRA, it's a lot more manageable of a task than oh my gosh, how am I going to quantify all this stuff to make a safety case.

And yes, I didn't mean to misapply what you were saying with an extreme example there.

MR. CAMERON: So Tom, is it you are looking for some more specifics on where PRAs could be used in this process than just well, we will use them where it

is feasible to use them? Are you looking for areas of examples for where a PRA could be used?

MR. HILTZ: I think I am hearing that we should do quantitative analysis that we will potentially learn from it, that we can manage the uncertainties and maybe we can understand the sensitivities.

To me that's not the -- I mean, ultimately I think where the fine point that we need to point on this, we need to figure out, I think, what the right balance is between the quantitative and the qualitative, to what extent we can use the PRA by the state of the art consistent with the policy statement, and sort of reach some consensus about how to move forward with balancing that quantitative and qualitative. So I hope that helps.

MR. CAMERON: Okay, well that's good and I know that you have to leave a little early so let me get Sven and John on the table quickly with comments.

DR. BADER: I just have a real quick question. I know you guys went to Japan and Rokkasho, I know, does some selective PRA. Is there any lessons learned that you guys gained from that experience?

MR. HILTZ: Yes. What Sven is referring to is that last December, we went over and did a vertical

slice at the Rokkasho facility on risk assessment and materials, controls and accountability, and yes, we did bring insights back that will help inform our ultimate decision.

But I think we are also looking at this forum, to help inform that decision and while it did bring back insights, there is still I think arguments on both sides of the scale here about to what level we should use quantitative and to what level we should use qualitative.

I mean I think if we had gotten all the answers, we probably would say hey, we don't need to have any more discussion on this. But we didn't. We just -- it just continued to help inform our process.

MR. CAMERON: Okay. And John?

DR. FLACK: Well, I think there's one thing at least I will speak for myself and my own views on this, and I think for reprocessing, ISA does not go far enough. I think -- I don't know if everybody agrees with that, but I just don't think it is going to work by itself. I think more has to be done, number one.

And I think it's more, not only for licensing the facility, but also how do you demonstrate how well it operates downstream in the

FCOP? I mean they are running into trouble with that right now. I think you have to do some more analyses than just an ISA.

I understand there's a lot of information in ISA. You can build on that. I mean it's there. It's great. It's like the PRA notebooks, you have got tons of information there to build on. You are pretty far there.

Now the question is, is how much more value going the next step will provide you, right? So I think that when you start to look at what you already know and what you don't know from what you have done, and what you would like to know in order to give that extra bit that you are going to need, both in licensing and for operations later on, when you go inspect these facilities, and how do you know there's an issue there, you have got to do something about that.

I think you can't just look at just one piece and then say this is good enough for this and now you are going to have to deal with it later on. I think you have to make that determination now and I think it's a very important question that needs to be answered.

And it's not just quantifying everything

in the plant, I mean the facility, but there has to be a way you go about providing some of that insight in order to understand it, understand what risk this facility presents and when it does, if it should get into trouble, how do you know it?

I mean, that's a very fundamental question that needs to be answered. And I think the technology is there to do it. People say you can't use it because I can't treat human error. But we have been dealing with human error within the nuclear facilities, power plants, from way back, you know that Tom, I mean, we started way back when we were talking about these PRAs.

So I think one has to go back and really do the work and look at it and see where the value could come from and how you would use it and then take it to the next step and then say okay, here's where the criteria should be.

So I think we are pretty close but I think there's more work that needs to be done on this.

MR. CAMERON: Okay. Let me ask Rod a quick question. Rod, since you mentioned it a couple of times, that the task force was trying to put more flesh on the bones so to speak on this particular issue --

MR. McCULLUM: Yes.

MR. CAMERON: and that you would be submitting that to --?

MR. McCULLUM: Yes, we are envisioning another white paper on this topic and I think we are hearing some things here today that we want to be sure we reflect onto that.

FFC. When you submit the white paper, and I don't know whether it would be part of the November 5 comment or whatever, but will there be a possibility that others around the table who aren't on the task force, that there will be some opportunity for people to respond to that?

Because you may be moving the ball forward in trying to answer Tom's question, and I'm just thinking that it would be, will others have an opportunity to comment on that?

MR. McCULLUM: Yes, I mean obviously we will send it in a letter that will be public, but rather than just say, you know, watch ADAMS, I think I could distribute it to some of the others who are on here. And I would further encourage NRC to set up a specific public meeting in reaction to it.

MR. CAMERON: Just to work on that one part --

MR. McCULLUM: I mean this is one where --

MR. CAMERON: Okay.

MR. McCULLUM: I think we all recognize what tools what we have. We all recognize the limitations of those tools. We all kind of see a vision of where we want to go, and I think if we continue to put the right amount of experts in the room together as well as the stakeholders, we can get from where we are to where we need to be for the type of regulation that again, can be technology neutral, risk-informed, performance-based and provide assurances of safety.

MR. CAMERON: Okay. And that would be -- that could be a focused discussion. We need to -- I am going to ask Miriam to see about the public, and while she is going to do that, Alex, wave your tent. Yes, go ahead.

MR. MURRAY: Thank you very much Chip. I just wanted to comment a little bit about state of the art, PRA, ISA and everything. In general, many of the methods which we are using for fuel cycle facilities started in the chemical industry. The chemical process industry basically has continued to develop and refine its techniques.

In general, when they do use an ISA, they

don't just have the three by three matrix that we have in Part 70. They generally have at least a five by five matrix, much finer if you will binning or gradation or categorization of events and probabilities, consequences and probabilities.

Having said that, the chemical industry has also gone more towards what I would call a poor man's PRA. They use the term layer of protection analysis, or LOPA, where instead of doing if you will fault tree analysis or PRA analyses based upon components, they tend to do it more at a system or multi-component level.

And that is perhaps something that we should kick around here or consider as we move forward on this, but definitely it is done.

And the last thing I would say about the level of capability of PRA, I would say in both theory and practice, if one has the time, one can do it on anything. The Japanese in the `90s, for example, they went and did a very good PRA on red oil events. Okay it is out there. Very detailed at the component level.

One -- if you look at the chemical industry again, for some of the -- I will use the higher hazard operations -- they look to doing a PRA type analysis because it is very complicated, it's not

if you will more of a linear logic, it's a very complex logic. They have to -- and it's potentially a high consequence event. You blow up the refinery. Or you blow up the phosgene production unit. Those are bad events. So they want to make sure they understand what is important and they go to a full quantitative analysis, PRA analysis, so they know what is important to safety ultimately. Thank you.

MR. CAMERON: Thank you again.

MR. PIERSON: This is Bob Pierson. I wanted to make one point, and that is that we are tending to use the term ISA and PRA interchangeably and really they are two different analyses.

An ISA is a valuation of a process. You are looking at whether a process will fail and you assign items relied on for safety to prevent that process from failing or causing a consequence.

A PRA looks at all the components of a facility, all the processes of a facility, and measures the overall risk of the facility. So from the start, you are not -- in a PRA and ISA -- you are not even looking really at the same thing. You are looking at a piece of the puzzle with an ISA, and assessing whether each piece of that puzzle will prevent you from having an accident, and that constitutes the

integrated portion of your safety analysis.

In a PRA you are looking at all the intermediate pieces of the process, and evaluating a failure mode of them, and coming up with a total failure mode of the whole facility. But that is not what an ISA does.

So I think it's important to make the distinction there, because if you don't do that, you are really -- you are comparing apples and oranges.

The other thing is, an ISA or a PRA, there's always going to be uncertainty in both of them. There's always going to be some sort of analytic pools that you can use and I think what you need to avoid doing is thinking that somehow an ISA is inferior to a PRA which is somehow better.

I worked with PRAs many years ago. In fact, the gentleman talked about the space shuttle. We did PRAs on the space shuttle and at the time we were coming out ostensibly about one in 25 missions would end up with a failure.

Now those were probably more like an ISA not a PRA, because we couldn't assign failure indices to each of the components. But I think an ISA represents whatever the technique, if it's applied correctly, it's certainly as rigorous and as

appropriate for a highly complex system as a PRA, because I think, going back to what someone said earlier, if you are not careful, you can be mesmerized by erroneous numbers which give you a false sense of security if you are applying simply a PRA.

But that doesn't mean that you want to throw all the quantitative analysis out. I think in some cases quantitative analysis helps significantly.

So what I would suggest is, be careful about trying to compare ISA and PRA. What you are really trying to determine is what the consequences of an accident are and how you are going to prevent that.

Whether you achieve that with an ISA or a PRA really isn't as important as doing that correctly and I think for most facilities, where you don't have as the gentleman said, Boolean processes, an ISA is probably a more usable process because it doesn't depend on a series of events that lend themselves to a Boolean process, which classically a PRA does and you are probably going to -- if you are not careful, you are going to be lost with -- you are going to be mesmerized by data which really isn't relevant to the overall safety judgment. So with that I will close. Thank you.

MS. JUCKETT: Is there anyone else on this

side before I wander over?

MR. EHINGER: Mike Ehinger from Oak Ridge. Chip, I think I should have taken your invitation to be at the table, because I have written down a lot of notes here on what has been said.

I guess to start -- I guess I will start, I think I agree with what Rod said, I think. I don't know that this whole probability discussion is really generic to the reprocessing issue. I mean it's a bigger issue, and I think that we are seeing that there's a lot of uncertainty in the way things are done.

I am really surprised that you guys used the Mayak tank explosion even in this discussion. One little aside. I think it was the very first visit anybody made to the RT-1 plant at Mayak. We had -- we were sitting in the office with the director and he was recounting the history of Mayak and the RT-1 and RT-1 was the first reprocessing plant the Russians built.

And his comment was -- this was 1948 -- and his comment was, "We were a little unhappy with the performance because the workers were receiving 150 hour per year average exposure, so we shut it down two years later and built another one."

But so, I don't even know why you even bring up the Mayak tank explosion and relate that to the issues. But I will come back to the whole.

You started out in the very beginning with some very hard criteria. About less than one tenth of one percent of a risk in this way. These seem to be something you can hang your hat on.

When we get into this whole idea of probability risk assessment and things that can happen, you know, our history over the years is that things happen that weren't being considered. You didn't analyze for it. Big accidents happen because it's something that we didn't even know was going to happen.

And so what is the real value of this? And I will come back as a last comment in this thing. I am kind of troubled by all these discussions of probability risk assessment or whatever we want to call it.

I have in my memory, after TMI, one of the NRC commissioners made a statement that he was the only victim of TMI because the stress caused a heart attack with him. And I bring that up in terms of this whole probability risk assessment and everything else.

I happened to be in Vienna two years after

Chernobyl, and I won't bore you with that story, but I will bore you with the story that I read -- it's not my job, but I go back and look at some of these things every once in a while -- and I read a summary of Chernobyl and what happened. This was a meeting in 1996.

And all of the things that went on, and all of the hype and everything about Chernobyl and all the things I heard about when I was in the plume in Vienna, and all that other thing, they essentially concluded 10 years later, that the only real hazard or only real risk was -- or only real event -- was an increase in childhood leukemias, which is essentially 100 percent curable.

But their real concern was the additional health effects due to change in diet, stress and other things that were brought on by the event and the publicity of it. And this ties back I think to one of the first things I heard, was a discussion of secrecy versus press versus what people do with data when they are given it.

And one of the things that we continually see is that the stress and the press and the hype and everything else, far outweighs any of the consequences of the actual -- other than immediate deaths from

something like crashing a plane into a building.

But it really comes down to the fact that we can't even put into these probability risk assessments the real factors which is the way we use them and the way we portray it to the general public. And I guess that's as many notes as I can remember from the long discussion.

MS. JUCKETT: Any other comments?

MR. CAMERON: Thank you. Thanks Miriam and thanks to all of you for today and your contribution and we are going to get started at 8:30 tomorrow and we will get out of here so that people who need to be in by sundown -- Rosh Hashana -- will be able to do that.

We have parking passes at the desk for anybody who parked in the facility.

MR. CUADRADO: Also an alternative arrangement, if you have your ticket, you can go to the executive meeting center right down the hall and get it validated or at the front desk. Alternatively you can take one of the already validated tickets to get parking free of charge.

MR. CAMERON: So if you didn't park here today, park tomorrow because it's free. Okay. Thank you all. We are adjourned. Miriam, another?

MS. JUCKETT: There is going to be a lunch downstairs if you bring your own lunch or if you want to pay for lunch tomorrow.

MR. CAMERON: And will we have coffee service tomorrow?

MS. JUCKETT: -- tomorrow morning.

MR. CAMERON: Okay. Great, thanks Miriam.

(Whereupon, the above-entitled matter adjourned for the day at 5:00 p.m.)