BLUE RIBBON COMMISSION ON AMERICA'S
NUCLEAR FUTURE

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TRANSPORTATION AND STORAGE SUBCOMMITTEE
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MEETING
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THURSDAY,
SEPTEMBER 23, 2010
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The Subcommittee convened at 8:30 a.m. in Ballrooms A and B of the Washington Marriott at 1221 22nd Street, Northwest, Washington, DC, Richard Meserve and Phil Sharp, Co-Chairs, presiding.

MEMBERS PRESENT:

RICHARD MESERVE, Chair

PHIL SHARP, Chair
MARK AYERS
VICKY A. BAILEY
ALBERT CARNESALE
ALSO PRESENT:

TIM FRAZIER, Designated Federal Official
PHILIP BROCHMAN, US NRC
GORDON THOMPSON, Institute for Resource and Security Studies
CHARLES PENNINGTON, NAC International, LLC
CHRISTOPHER EARLS, NEI
BOB HALSTEAD, State of Nevada

TAMARA BAKER, South Carolina State Law Enforcement Division
JACK EDLOW, Edlow International

ALSO PRESENT (Cont'd):

JUDITH HOLM, formerly of the US DOE

CHRIS WELLS, Southern States Energy Board

CASH JASZCZAK, Nye County, Nevada

KEN SORENSON, Sandia National Laboratories

PUBLIC COMMENTERS:

PIERRE ONEID

IRENE NAVIS

C-O-N-T-E-N-T-S

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

8:29 a.m.

MR. FRAZIER: Well, good morning. We're going to go ahead and get started since enough commissioners are here and seated and the panel is here. So, I will just go right ahead and turn it over to Mr. Sharp.

CHAIR SHARP: Thank you very much. My co-chair, Richard Meserve, opened up our last session and so it's my duty to open up this one and we certainly welcome the folks to another meeting of the Transportation and Storage Subcommittee of the Blue Ribbon Commission on America's Nuclear Future.

Today's subcommittee is going to be focused on two issues critical for storage and transportation of used nuclear fuel, namely security and risk. We've assembled two panels of experts to help us explore specific questions regarding these important issues.

First, there are security concerns raised by the storage and transportation of

used fuel and we want to explore what experts consider to be so-called hardened on-site storage or the acronym HOSS and how it's different from current storage configurations.

We want to hear about the different siting, security, worker exposure, operations and cost implications of so-called hardened sites and we want to discuss what security issues specific to transportation could affect decisions about moving used fuel instead of storing it at current locations.

I need to briefly note that this is an open meeting and we welcome the public into this meeting and, although we will be discussing security issues generally, we obviously will not be discussing or asking questions about any information that requires protection under the Nuclear Regulatory Commission or the Department of Energy security requirements.

If the need arises to discuss such matters, we will do so in an announced, closed

session sometime in the future.

The second expert panel will focus on issues of risk and risk perception. While the risk posed by potential security threats and safety issues at storage sites and during transportation is generally considered to be quite low, opinions vary widely as to whether this risk or these risks are acceptable and we want to hear about what benefits there may be to consolidated storage, related transportation or even upgrades at current sites which of course could involve significant handling of fuel and worker risk-- if we made any changes to the status quo, what would be the consequences for these other items?

We'll be hearing from panelists who have been involved in significant shipping efforts and will learn how they have been dealing with these issues in the past. I want to note that these proceedings are being webcast and can be accessed via the

Commission's website, www.brc.gov.

We have a busy agenda today and we will be keeping on schedule so I ask presenters and everyone involved to keep this in mind. We will, of course, accept any written statements or supplementary materials that anyone wishes to offer. We can take them today, or you can send them to the Commission at the website or by mail.

All the materials we receive, and the transcript from today's meeting, will be made publicly available as well as available to the other commissioners. At the end of this meeting, of course, probably sometime around noon or 12:30, we will have a public comment period and if an individual in the room wishes to sign up, there is a registration table outside. The amount of time available will depend on the number of those wishing to make a statement but will not exceed five minutes. We also reserve the right to limit the number of speakers, so be advised the list is first-

come, first-served.

We're glad to be here and we look forward to an interesting discussion today. I'd like to ask my co-chairs and fellow Commissioners if there's anything they'd like to add.

If not, I'd call upon our first panel and the first speaker on that panel is Mr. Phillip Brochman, who is with the Office of Nuclear Security and Incident Response at the Nuclear Regulatory Commission. Mr. Brochman, welcome. I would remind members of our panel we have a lighting system and, Tim, remind them what happens, because I can't--

MR. FRAZIER: When you have two minutes left, the green light will start blinking. When you have one minute left, the yellow light will come on, and when you are out of time, red light and a very nice buzzer.

CHAIR SHARP: And the lights close down and the place shuts up.

MR. BROCHMAN: And then you cut my

sound off.

CHAIR SHARP: That's right.

MR. FRAZIER: We do have the capability to.

MR. BROCHMAN: Then I'll move briskly. First off, Commissioners, welcome. On behalf of the NRC, I want to thank you for this opportunity to present information on what the NRC is doing with regards to security. Can I have my first slide, please? Okay, all right. This is how I get to do it. Thank you. All right, let's try that. Point this at the--there we go.

Overview. From an NRC perspective, NRC regulations and security orders establish--we've got a combination of those two at the moment--establish the requirements for storage of spent nuclear fuel at NRC-regulated facilities.

The security requirements are intended to provide a high assurance of adequate protection of public health and

safety, the common defense and security and the environment. Right now, the Commission is in the process of developing a rulemaking to update the security requirements for spent fuel storage.

The three broad goals are to make generically applicable the measures that were imposed by security orders following the events of September 11th, 2001. Also, lessons learned from previous NRC inspections of the security measures, of force-on-force inspections that were accomplished at reactors and could be issues that could be applied to spent-fuel storage facilities and security assessments that were preformed in the past.

One of the big goals is regulatory consistency and clarity. We have two different types of licenses for these spent-fuel storage facilities at the NRC and that has caused some challenges to both industry and to the NRC in the past.

In terms of the term hardened on-

site storage, you had mentioned it in your introduction, the term HOSS or hardened on-site storage is not a term of art the NRC uses. In our world, we tend to speak in terms of protective strategies; denial strategies; detect, assess, and communicate protective strategies; mitigative strategies, and so a hardened on-site storage system is not something that the Commission necessarily has recognized in the past.

We do not that there is a petition for a rulemaking, which is currently active before the Commission, PRM 72-6, that does specifically ask these questions. It will be considered in the context of the rulemaking that I just mentioned.

In terms of the status of the rulemaking, the rulemaking is under way. The draft regulatory basis for the rulemaking was published for public comment in December, 2009. The NRC received significant comments on the rulemaking that challenge--that differed

or opposed the principal technical approaches that were, that the Commission had set forth.

So, the staff has recommended that we pause this rulemaking effort to assess in detail the particular impacts and other issues that could arise from this, from these comments.

Right now, we have a paper in front of the Commission, you see the number up there, and the reference to it. That just went up in August, so we are still awaiting a decision from the Commission at this point, and that's all, about all I can say on that particular one.

Protective strategy. Overall, protective strategy for a spent-fuel storage facility will be achieved through a number of means. They can involve security personnel, weaponry that those individuals use, and security systems: screening, as well as standalone or remote-operated weapons systems.

There can't, in choosing a

particular system, a licensee can trade off hardware costs for personnel costs. That is a big issue. Also, capital costs versus O&M. Things like vehicle barrier systems are capital, are considered capital expenditures.

Remote-operated weapons systems are capital expenditures as opposed to personnel costs from individual guards' training salary and other issues.

One of the big questions that is confronting the NRC right now is denial strategy versus detect, assess, and communicate protective strategies. Those are the two principal protective strategies we see today in NRC facilities.

Denial, as it says there, the security force is required to interpose, interdict and neutralize the threat or the adversary, whatever term you want to use. That strategy is currently applied at power reactors and Category 1 special nuclear material facilities.

The detect, assess, and communicate strategy is applied to spent fuel storage facilities today and, as it says there, the success in that strategy is the licensee detecting an issue and contacting local law enforcement, who are the parties that respond to the threat and would be responsible for neutralizing any issues or any adversaries that may have penetrated the spent fuel storage facility.

As you can understand, that may take a bit of time for law enforcement to show up and for them to be in a position to neutralize any adversaries.

One of the questions that we're considering right now is whether we need to require a denial strategy for all ISFSIs--for some or all, I should say. This may be due to the ability to assess what are the dose consequences from releases. The NRC's view at this point is that there is a potential for some degree of release due to certain security

characteristics or certain threats at these storage facilities.

This particular information is tightly controlled and so, if the Commission has desire to discuss it further, we would need to do that in a closed session.

The other, another key point is how big a footprint or how much space they have on the site. There is the ability to trade off distance for dose, and for some sites you have a very small footprint, a very short distance from the storage casks to the site boundary. Other facilities have a much larger distance and that will impact the individual site's ability to implement security measures.

Rulemaking process is still in an early stage, I talked about that. Changes in technical direction may significantly impact the cost that industry is seeing and we are still in the process of assessing the costs. Our sense is that this will take us most of

this year, we will be having outreach efforts with industry and other stakeholders as well to talk about these issues.

And I think that wraps up my presentation, and I didn't get a red light, so. Thank you.

CHAIR SHARP: If there are no clarifying questions from my fellow Commissioners, we're happy now to turn to Mr. Thompson.

MR. FRAZIER: By the way, if you're more comfortable going to the podium, you certainly may.

MR. THOMPSON: Thank you. I think it's fine here. Thanks for the opportunity to speak to you. This is just for scale, it's interesting that we've created about half a million bombs' worth of plutonium. Just something worth thinking about.

I am focusing on a statement made by the co-chairs when they invited me here; the risk posed by potential security threats

and safety issues at storage sites and during transportation is generally considered low. I'm going to address the validity of that statement, focusing on what the NRC knows about the subject and what is said about subject.

Starting with spent fuel pools, I'll tell a little anecdote. In the winter of 78-79, I was part of an independent group of scientists commissioned by the government of Lower Saxony to review a project to construct a nuclear fuel cycle center in Lower Saxony.

This center had lots of components including reprocessing, MOX fuel fabrication and fuel disposal. We addressed a variety of issues, one of which was compact storage of spent fuel, and I chaired the subgroup that addressed risk issues.

Some things emerged quite clearly. Firstly, there's a tremendous amount of cesium-137 in these pools. Secondly, due to the compact configuration, if water is lost

from a pool, then inevitably, in a packed pool, a fire will follow. The fire is initiated because the compact configuration prevents cooling adequately.

The chemical energy released is sufficient to evaporate a large fraction of the cesium-137 in the spent fuel and this creates problems far downwind, of land contamination. It also became clear to us that the worst case was one of partial drainage or blocked-flow case, and not total drainage.

The way we presented this finding was the government set up a forum in a big public hall where the technical people, the scientists, the proponents sat on one side. The independent study group sat on the opposite side. The government officials sat at the end. The whole event was chaired by a prominent German physicist and for a period of several days, the scientists on the opposite sides debated directly on public television and in front of the licensing authorities.

The point I just made about the pool fire were aired thoroughly. The industry had plenty of opportunity to critique it. They weren't able to shoot any holes in our arguments and within a few weeks of this, the Government issued a ruling that they would not tolerate compact racking of spent fuel in this project proposal.

There were various other aspects of the ruling because it was a very complicated project, but I'm just focusing on the spent fuel. So, this all went very quickly. It was--beginning to end of the hearing process was just a few weeks and it was an open, scientific airing of issues.

And, I thought, okay, well, I'm done with that issue. This was spring of 1979. I don't ever have to deal with this again. And it happened that later that year, I moved to the United States for a short time and wound up staying and here we are, thirty years later.

And I've dealt with this spent-fuel issue in a number of hearing processes. Never have I been able to testify before an NRC panel, never have I been able to engage in direct dialogue with proponents or industry scientists or NRC scientists or anybody else in any regulatory setting.

The focus has been on pools adjacent to reactors. This is a pretty typical PWR layout. You'll see the pool is outside the building. About a third of the nation's plants are BWRs and in most of those, the pool is in the building, high up, elevated above ground level.

These are coupled-risk systems. With this configuration, you couple the risk of the pool and the reactor and I can elaborate at any length necessary about what that means. In terms of the regulatory proceedings, I'll give you a few snapshots. In 1989, we're in an NRC hearing in Brattleboro, Vermont about the Vermont Yankee Nuclear Power

Plant and almost the entire day is taken up about the admissibility of witness Thompson's testimony.

And at the end of the day, the board makes a ruling that Thompson is a qualified witness and part of his testimony is to be admitted and that's the part that just states his qualifications. All the remainder of the testimony is struck for complex legal reasons. So, that issue goes away.

Move forward another decade. A similar proceeding, in this case for the Harris plant in North Carolina. Again, in that instance, I never get to testify, I never get to speak, we never have any cross-examination, there's no running, open debate. This is twenty years after the German instance I described.

In the spring of that year, 2000, the staff of the NRC says that witness Thompson is the only person that they can identify who says that spent fuel aged more

than five years can ignite in the event of water loss. That's part of their Thompson's-an-idiot strategy. It turns out that, for that entire twenty-year period, the NRC had assumed falsely that total instantaneous loss of water from the pool is the worst case, which is not true at all and was quite evident to us in the German proceeding.

So, for that and other reasons, all of the technical analysis they produced in that intervening period is essentially worthless. In the fall of that year, the Advisory Committee on Reactor Safeguards invited me to testify. Which I did.

And suddenly, the NRC staff discovered that they had misunderstood this issue of worst case, and they said that indeed, spent fuel aged more than five years could in fact ignite and burn.

No apology, no retraction of all the previous work, and, it turns out that back in 1979, the spring of 79, Sandia published a

study and if you actually read it, it shows very clearly that total instantaneous drainage is not the worst case. For whatever reason, the introduction to that report misrepresents its content and all the subsequent analysts, evidently, read the introduction and not the report.

No discussion of accident analysis was permitted in any of these proceedings, even though in a generic EIS in 1979, the staff had considered accident analysis.

Moving on to dry storage. I'm trying to cover a lot of ground here. This is a typical dry storage module. This is a way you could attack this module. This is, this shows you quite clearly that a standard shaped charge is capable of opening up this module.

This brings us forward another few years to a proceeding before the Commissioners in 2008 where we argued that the greatest threat to this sort of module is again, a fire, and that you can, using a technology

such as the shaped charge I just showed, open up this cask and with an incendiary device, initiate a fire, creating the same problem that I described for the pool, mainly downwind land contamination.

The NRC staff, although by this stage they were wrapped in secrecy, acknowledged that they had not looked at land contamination. Commissioner Jaczko, during the hearing, asked if they had any capability to model downwind land contamination using the MACCS code, which would be the simplest, standard code to do this, and the staff acknowledged that they had no in-house capability to use this code at all.

HE also asked what their capability was--I'd like to continue a little bit here.

CHAIR SHARP: Take another minute or so. But we need to wrap up.

MR. THOMPSON: Yes.

CHAIR SHARP: But we will come back

to questions.

MR. THOMPSON: And cutting it, cutting it short, it's a--and I've sent a lot of supplementary material, four different documents to the staff here. But the staff did not have any technical, scientific basis for stating that this is a low-risk issue.

Moving forward, this bears careful thought, this historical picture. A lot of recent work on bunker-busting. Why is this relevant in strategic terms? The National Infrastructure Protection Plan lays out very carefully the role of hardening facilities and building resistance into the design of facilities as a threat-deterrent measure.

General McCaffrey, who has served this country in many violent capacities, makes the same point. Richard Meserve, a member of your panel, takes a different view. I'd recommend reconsideration of this view in light of our experience over the years since 2002.

Brings us to risk-reducing options. The pool is very simple. Just revert to low-density, the way the pools were designed in the first place. And for dry storage, hardening--this is an example. There is a system ready to go; the Holtec 100U system is now proved by NRC and is actually ready to use at this moment, and I'd be glad to elaborate on any of these points. Thank you.

CHAIR SHARP: Thank you very much, Mr. Thompson. We now turn to Mr. Pennington.

MR. PENNINGTON: I would prefer to use the podium, if it's acceptable. Chairman Sharp, Chairman Meserve, distinguished members of the Commission, I appreciate the opportunity to participate here today in the discussions on this matter.

I have experience and expertise in both spent fuel transport and dry storage. Because of the extent of the comments requested, under topic 1, I will spend these,

I'll confine my remarks this morning to the issue of dry storage.

These are the topics I plan to cover, because, again, of the breadth of the subjects and a ten-minute limitation, I will go through these slides very quickly and rely upon the presentation summary that I provided earlier for your use.

First item to look at is design-basis versus beyond-design-basis events. A design-basis event is simply those types of events that we design our systems to, they are designed to those designed-basis events because of regulations and perhaps some specifics with respect to the technology itself.

Hardening is typically referred to as a means to bolster a system in the face of beyond-design-basis events. Again, beyond-design-basis events can be an infinity, or at least a semi-infinite number of addition events beyond a design basis.

One cautionary subject is, you may design for one set of hardening features for certain design-basis events, and other design-basis events may be made worse by those hardening effects. So, anyway, hardening, I think has, been pretty well covered by my predecessor discussion, predecessor speakers.

It is important, I think, to understand the approach to, that industry takes these days, and Phil Brochman has touched on that, on how he approached beyond-design-basis events, and this is, by the use of an effective, tiered, deterrence and resistance approach involving security systems both national and local, security forces, national and local, and the use of conservative, robust, and resistant technologies.

Why do some people feel hardening is necessary? Well, perhaps some people are unaware of the system design margins that are available to address beyond-design-basis

events. We use very conservative codes and standards. The materials that we use have much greater energy absorption capabilities than the codes and standards and regulations that we use allow for.

Second of all, we have protective overpacks. Protective overpacks are layered with external shells of materials. These external shells are not really challenged by design-basis events, and why is that?

Well, there is a unique feature with respect to nuclear packagings. We have to shield for gamma radiation. Gamma radiation is shielded by heavy, dense materials. These shielding materials have to be part of the structure and remain in place.

Therefore, they provide structural support well beyond the confinement/containment boundary that we have in a nuclear packaging. This is why a nuclear packaging is more structurally robust than other hazardous material packagings.

We've demonstrated this with aircraft impact evaluations of our systems, showing that under aircraft impact, we do not have any releases from the containment/confinement system. Do a quick look at typical NAC technology. Two components that are visible here, the inner one is the canister system in which the spent fuel is retained and contained and confined.

The outer system is the vertical concrete cask, or VCC as it's known. This is where we have the protective overstructure. We see there concrete with density-improving aggregates. We have rebar cages, either single or multiple.

And finally, on the inner part there, we have a thick, steel shell, a thick steel shell. I typically refer to it as canister armoring in terms of beyond-design-basis events because it does provide a substantial amount of protection for the inner canister.

Other people feel hardening is required because we are in the nuclear business and nuclear seems to be associated with some unique, very large radiological risk for the public. There is a public health and safety threat that is viewed as being highly unique to nuclear.

Once again, let me reemphasize that design-basis events do not result in releases. We're talking strictly about beyond-design-basis events. Many analyses have been done for beyond-design-basis events, a lot of testing has been done over the last two or three decades.

Most recent analysis done by the DOE was in the Final Supplemental Environmental Impact Statement for Yucca Mountain, doing a terrorist attack with one of the weapons described by Mr. Thompson. They did the analysis with a transportation packaging, transportation package showing a variety of outcomes depending on population

density.

The peak was 47,000 person-rem for a high-population density. The lowest was 92 person-rem for a low population density.

Since storage packagings and transportation packagings have roughly the same penetration resistance you might associate the lower number here, the 92, with a storage site, since the population densities within fifteen or twenty miles of all reactor sites are less than 150 people per square kilometer, typically in the range of 110 to 125.

So, there are far more analyses that have shown a variety of numbers and a lot of them much lower than the DOE numbers. The DOE numbers were done fairly conservatively, I believe.

But, at any rate, taking any of these range of population doses and putting any kind of credible sabotage probabilities associated with it, you see a fairly low risk.

But, again, this is looking at the nuclear experience in a vacuum. Anything that happens with the nuclear is automatically a threat.

We need to take a comparative look at things and see, is there some standard, some reasonable, objective standard, to which we can resort that shows the society's comparative radiological risk from a beyond-design-basis event? And I would submit there is.

A reasonable standard arises from non-nuclear industries. Non-nuclear industries, those select fifteen or twenty industries that expose populations to very large doses annually, decade after decade. These industries are not regulated to control their population dose characteristics.

I've listed the industries here that you can, you can see. All of these industries produce population doses that are log-normally distributed, which means that we have some very potentially relatively high

population doses out in the tail of the log-normal distribution.

So, what I would suggest here is that, one reasonable standard, is that we compare hypothetical, hypothetical dose consequences from a beyond design basis event with actual numbers that we experience in a number of non-regulated, non-nuclear industries.

I put together this table from published research and shown the seven industries. You can see a range of exposures there, from annual doses to exposures over the last fifty years, to prospective exposures over the next fifty years.

I've compared that to some, to, to some radiological releases that might occur with respect to storage and transportation systems that are in support of a growing economy, a growing use of nuclear energy. I've shown breach events and non-breach events. On a comparative basis, you can see that some of

these beyond-design-basis events are not a terrible threat to the society's accepted comparative risk with respect to radiological releases.

Are there liabilities of over-structure hardening? And, again, I'm really just addressing the HOSS concept. As Phil Brochman pointed out, this is not a terminology that's used by the NRC or the industry. Rather, this is a development by Dr. Thompson. This is his concept, and you can see his figure that he proposed, which is really just an 80-year old munitions bunker design that has been reconfigured to store vertical concrete casks.

I show here some of the liabilities associated with over-structure hardening, with the HOSS concept. Operational -- besides installing it -- the difficulty in that, the routine, the normal operation problems are significant.

The largest threat, though, the

potential concern that I would have most highly on my list, is the response of recovery staff after a beyond-design-basis event. It is fairly likely that the HOSS structure is not the ideal structure for a certain range of beyond-design-basis events and that there is collapse possibility.

Once you have a collapsed, hardened over-structure around a storage module, you've perhaps compromise cooling flow, you perhaps make it very difficult for recover staff to get access to the storage system to make sure that the system can be up righted if necessary, can be repaired, can be properly shielded.

So, my own personal concern is more along the lines of the recovery staff health and safety. With these types of liabilities, the benefit cost ratio does not appear particularly attractive for the HOSS concept, which is all I'm talking about.

Conclusions follow the

presentation. There is a number of issues associated with the HOSS concept. There is really no discernable, clear benefit to public health and safety or worker health and safety. Therefore, it would be my suggestion that the industry is best served to continue with it's effective, tiered deterrence and resistance strategy, effective security systems, effective security forces, and the continued use of the conservative, robust, and resistant technologies.

That concludes my remarks, thank you very much.

CHAIR SHARP: Thank you. We now welcome Christopher Earls.

MR. EARLS: Thank you. Excuse me. I want to thank you for inviting me here to talk to you about security. What I would like to do today is give you a brief overview of the security measures that we employ at power reactors and how those measures apply to current ISFSI facilities and may apply in the

future.

I'll really build upon some of the concepts that Phil mentioned earlier. The starting point is the design-basis threat. What the NRC does for the power reactors, and does this on a routine basis, is that they collect information from the various intelligence agencies and other groups that identify the various threats, both foreign and domestic.

They take this information along with studies and assess what the real threat is the commercial nuclear power plants. In addition to that, they look at the various threats and consider to what extent can a commercial facility address those issues.

All of those factors go into developing what we call the design-basis threat. And, as I said, that's assessed on a yearly basis and frequently changes. Since 9-11, we've changed that a couple of times.

The DBT, or design-basis threat, really

lays out the foundation for how we build our defensive strategies for the plant. Once we know what the design-basis threat is then we know how to establish measures at the plant. You know, what are the appropriate strategies.

But, in addition to that, the NRC provides us with detailed regulations. Everything we do in security is driven highly by regulations. 10 CFR Part 73 is the base regulation that covers most of it, and in fact, we've just had a recent revision of that that went into effect in 2009.

What I'll do now is describe some of those measures that we employ. At a typical site, we have various zones on the, on the property. Each of the zones get a different level of security.

I'll start with the outermost zone in what we call the owner-controlled area. You can think of that as just, as the name states, it's the property on which the plant sits on. That's the owner-controlled area.

For that, we have what I would call a basic industrial security. You might have a fence around the site. You have a vehicle access point where vehicles entering the site, the individuals are asked to identify themselves and are subject to a random search.

Inside the owner-controlled area, you would typically find your administrative buildings, your warehouses, some of the support structures for the plant. The next zone that you enter into at the plant is what we call the protected area and that's the real focal point of security at a power reactor.

That, that is where we, we, we strictly control access and make sure that only authorized folks get in there. To enter a protected area, first, and individual must go through an extensive background investigation. It involves a criminal history check with the FBI, checks with terrorist watch list.

There's also psychological evaluations that are done. We employ a fitness for duty or drug and alcohol testing program. An individual has to go through all of that before than can become authorized to go into the protected area unescorted. Once an individual has received that authorization to enter into the plant, they have to go through a typical security search process, similar to what you would find at an airport.

They'll go through an explosive detector, a metal detector, and can be subject to patdown as necessary and appropriate. Once an individual has gone through that process, they then enter the plant through, typically, a turnstile situation where they use their badge, and they have a biometric type operation, typically a hand geometry. So, that what we do is verify the individual is, that's trying to use the badge is, in fact, the right person.

All right. So, the protected area.

As I said, that's the focal point of the security defenses. What you will see, we have a protected area barrier, it's typically a series of fences. You will have isolation zones, you will have various intrusion detection methods and not just one, there are multiple layers.

In addition to that, we have camera systems that include thermal imaging, closed-circuit TV that allows us to do playback of any potential intrusions. If we, all of these systems have an alarm function. All of this information is fed into a central alarm station that's manned 24 hours a day, you know, 365 days a year.

In addition to that, we have a secondary alarm station which has all the same functionality as the central alarm station, and, so, you can think of it as a redundant system so if we have a problem in our central system, we have a backup that maintains all the command and control and surveillance.

In addition to the intrusion detection systems that we have at the fence, we also have an extensive response team of security officers that are highly trained. We have various positions throughout the planned that are manned 24 hours a day in bullet resistant enclosures typical of what you might see at a prison, you know, the overlook watch.

In addition to that, we have roving officers, all of which have been factored into the defensive strategy. There is an extensive training program for these officers. Each officer is required to participate in a minimum of four exercises a year, and that's in addition just to the various drills they might run for certain aspects.

The, I think, right now, we probably have upwards of 8,000 officers manning the various plants. They received over 200 hours of training a year, so these guys are very, very well trained. In addition to

that, we have the NRC come in on a tri-annual basis to conduct force-on-force exercises.

Those of you familiar with DOE facilities are probably familiar with this type where we will take a mock adversary force and have them come in and test the site's protective strategy. You know, it's not enough to say that you can do something, you have to be able to demonstrate that you can do it, and we run those on a tri-annual basis.

And I can tell you those are very, very challenging. The folks that, that consist -- the adversary folks are highly trained. The team leaders are typically special operations folks, so while we expect our typical adversary will be not that well trained, the folks that are testing our facilities are that well trained. And, as a result, they really challenge us and we, we learn a lot through those exercises.

In addition to, to the background investigations that I told you, all of our

employees are trained on behavioral observation. That's particularly important in today's environment. As the homegrown terrorist becomes more and more of a concern to us, we are more and more focused on the insider threat and so we have a behavioral observation program. Every employee is trained to look for aberrant behavior and report that.

We also monitor any problems individuals may be having off-site in terms of arrest and that sort of thing. And, finally, in the interest of time, I will shift to ISFSI security. So, how is all that matter to ISFSI? Well, in the various configurations that we have today, the, it's a direct impact and then there's an indirect.

For the ISFSI facilities that are located within the protected area of a power reactor, they are able to take the full benefit of the security measures that we use for the plant.

So there isn't a separate response

force in terms of that, so while the basic requirements for an ISFSI facility is to deter, detect, and notify, in the case of a facility that's inside a protected area, there's also an interdiction piece to it, just by the nature of where it's located.

With regards to the ISFSI facilities that are outside of our protected area but within the owner-controlled area, there's also a tie between the power reactor, security force, and that facility. Typically, there are armed responders that are segregated from the power reactors force, whose primary duty is to respond to any alarms or any indications of intrusion at our facilities. And, so, there is what I'll call a modified response there.

And then, the final situation is, is for standalone decommission site and that falls into truly, the category that Phil described which is the detect, deter, and notify.

What I would tell you in conclusion is that with the way we do business and security, if we determine that the risk or the treat to the ISFSI facilities is increased from what we believe it is today, we are well-prepared to adjust to that, and, in fact, that's what we do routinely at the power reactor so it's not a, not an unusual situation for us to make changes like that so in the event that rulemaking requires a interdiction strategy, we're well prepared to deal with that.

I'll be glad to answer any questions at the end, if you have any. Thanks.

CHAIR SHARP: Thank you very much. Now turn to Bob Halstead.

MR. HALSTEAD: Well, thank you very much for the opportunity to be here today, members of the Commission. I'm going to do something different based on my past experience of getting to the bottom line in my own presentations, which is, I'm going to

start with the conclusions first.

How do we manage and reduce the risks of transportation security? First, perhaps the major lesson learned from all the Yucca Mountain transportation security and safety risk analysis is to select sites and design transportation systems that are designed to minimize the number of shipments, reduce the number of shipment miles.

Secondly, radiological risk reduction is most easily achieved by shipping the oldest fuel first. Now, this is not necessarily convenient for the utilities, particularly as more and more of the older fuel has been gone, has been put into dry storage, so maybe I'd rephrase this to say ship the oldest available fuel first.

But, the reason for this is that there's an enormous radiological hazards reduction shipping fifty year cooled fuel as opposed to ten year cooled fuel, particularly because of the half-life decay of cesium-137

and strontium-90.

So, you get at least a 50% reduction in the release that would occur in a successful terrorist attack and you also get some other benefits in terms of routine radiation to workers and the public during shipments.

Maximize rail, requiring use of dedicated trains, is a recommendation that has come from many parties, not the least of which are the railroads, who are not anxious to ship all of this spent fuel, but certainly prefer to have it shipped in dedicated trains.

NRC regulation of all repository or storage shipments as if they were NRC utility licensees is very important because DOE shipments are at present exempt from the physical protection requirements. Assessing the implications of the new transportation security pipeline and hazardous material safety administration regulations for rail shipments of hazardous materials in urban

areas and through -- along routes that are in close proximity to what are called iconic targets and places of congregation is also important.

On the one hand, these regulations offer some real benefits in terms of reducing both the probability of an attack and the consequences of an attack. On the other hand, they are so complex and we don't know at this point how these regulations which were just adopted, really just went into effect about eighteen months ago, they actually posed the potential that they're so complex that they may complicate the logistics of transportation planning.

My last three points apply to security as well as safety. We believe that full scale cast testing should be required, regulatory sequential testing for the rail casks, an extra-regulatory fire test for the truck cask. This basically follows the decision that the Nuclear Regulatory

Commission made in their final enactment on the package performance study recommendations.

Secondly, adopting the transportation protocols for accident prevention and emergency response which have come out of the deliberations over, really, twenty years, between the effective states, the State regional groups in the Department of Energy, for shipments of transuranic waste to the Waste Isolation Pilot Plant in New Mexico.

Now, it's true that TRU waste shipments are considerably less dangerous than spent fuel, but a lot has been learned about the advantages of those extra-regulatory protocols.

And, finally, a comprehensive human factors management plan similar to what the Federal Railroad Administration adopted by rulemaking in 2008 for railroad shipments of all materials, should be developed, targeted on all aspects of loading, shipment, and unloading.

And, all right. Having gotten the bottom line out of the way, I'm going to quickly go back to my original slides, if I can do this. Most of what I have to say is summarized in my pre-filed, one-page statement. But I want to say a few things in general and show you some pictures.

It's important to understand as we look at all these different aspects of security, that once a repository opens, transportation and transportation security are concerns for at least fifty years, and that means that security planners have to deal not only with unpredictable events but the realities of history, that security systems have to operate in periods of prosperity and recession, peacetime and war. They have to accommodate natural disasters and civil disorders. They have to assume that there will be continual changes in the threat environment that require changes in strategies and tactics.

One thing that does seem to be safe to assure, however, is that there will never be enough funding for transportation infrastructure, maintenance, and upgrades, and there will never be enough funding for police and fire services.

Now, turning to the debate over the last thirty years on transportation security, it's basically focused on radiological sabotage, which the NRC defines as "any deliberate attempt to directly or indirectly endanger the public health and safety by exposure to radiation", and the debate within the debate has focused on the vulnerability of shipping casks to attacks using a variety of explosive devices.

This is not to say that theft for purposes of diversion, theft for purposes of extortion, violent protest demonstrations, and other security matters are not also a concern. I'd be happy to talk about those. But the issue that's gotten the most attention has

clearly been radiological sabotage.

Now, you'd think in thirteen bullets I wouldn't have missed anything significant. In fact, I did. In 2005, the Energy Policy Act adopted a list of twelve factors that the NRC had to consider in their design-basis threat update, and one of these is very important for transportation.

It says that the NRC must consider the potential for attacks on spent fuel shipments by multiple, coordinated teams of a large number of individuals, and this really brings a lot of the last thirty years' debate into focus.

And, over the last five years, with that decision, the way the DOE approached these issues in their Final Supplemental EIS for Yucca Mountain in the TSA and FRA rail regulations, the fact that the NRC Construction Authorization Board admitted sixteen transportation contentions posed by the State of Nevada, nine of which directly

related to transportation security, and would presumably be fully discussed if the licensing proceeding were to resume.

And, finally, there is the recent action in July of this year by the Commission to move forward with a proposed rulemaking developed by their staff which incorporates pretty much all the recommendations that the State of Nevada made in its 1999 petition for rulemaking, plus the accumulated experience since 9-11, plus the findings of all the classified NRC consequence assessments.

So, the good news story is, after thirty years of debate, in the last five years or so I think we've moved towards a resolution of issues that is generally satisfactory to most of the people who have been adversarial combatants in this debate. It's nice to see that occasionally the rulemaking process and these policy debates actually move, you know, toward some resolution.

Let me quickly address the issue

of why repository operations, regardless of location, raise special transportation security risks. Any repository transportation plan is likely to involve about the same number of shipments that Yucca Mountain would have, which is 100 to 150 dedicated trains, 200 trucks per year, every year, for fifty years. Dramatically different than what's happened in the past.

And while this is a map showing the impacts of transportation to Yucca Mountain, it's not that different from the nationwide impacts that you'd see if the repository were located in the Wolf River Batholiths in Wisconsin, or at Davis Canyon, Utah, or at some of the other sites, or even the PFS site in Utah.

So, one thing to keep in mind is there will be large numbers of shipments affecting millions of people in hundreds of jurisdictions, and certain cities like Chicago that are rail hubs are going to be affected.

Let me show you just a couple pictures from the tests that were done on explosives against casks.

The real importance of this 1982 test is that the Army ballistics research lab at Aberdeen did a peer review which triggered the thirty years' debate over how to define a maximum credible attack scenario. And this test, which was done by a private company, ironically to demonstrate hardened target techniques where two tests were done, a Vietnam-era warhead missile against a German castor cask and its transport configuration, where you see it penetrated here.

But then, when the same test was replicated with a concrete jacket around the cask, barely the outer skin of the transport cask was damaged. Finally, just referring to the same consequence assessment that Charlie talked about, on the one hand, the DOE environmental impact statement is the best available document that summarizes all these

issues.

At the same time, the State of Nevada has critiqued all of those. We think the consequences of a successful event would be at least ten times greater, possibly 100 or 200 times greater, and the economic impacts of cleanup are much likely to be of great concern than the radiological health effects. Thank you.

CHAIR SHARP: Thank you very much. We now welcome Captain Tamara Baker.

MS. BAKER: It's Tamara.

CHAIR SHARP: Tamara.

MS. BAKER: Yes. I would like to start by giving you a little background. I am a Captain with the South Carolina Law Enforcement Division, and we are State police in South Carolina. I've been employed by SLED, as it's affectionately called, for 28 years, and I've been in my current position for over ten.

I have participated in four fixed

nuclear facility DHS comprehensive reviews, and I've had numerous -- too many to count -- hours of training in enhanced threat and risk assessment, threat vulnerability, terrorism and terrorism trends and tactics. I am a certified train-the-trainer in shipment tracking program. I'm responsible for the coordination and development of the DHS buffer zone planning for critical infrastructure in South Carolina.

I've also participated in the Southeast -- Southeast Transportation Corridor pilot in South Carolina by the DHS Domestic Nuclear Detection Office. Our agency has also participated in numerous force-on-force exercises that Mr. Earls was talking about earlier at the nuclear facilities.

My unit, the Protective Services Emergency Management Unit, coordinates and provides escort and security for spent nuclear fuel from foreign research reactors from around the world. It arrives in the port of

Charleston, and security is provided for that shipment -- whether it is transported by rail or truck -- between the Charleston Naval Weapons Station and the Savannah River site, which is located in Aiken, South Carolina.

We have also participated and assisted, and assisted with MOX shipments of plutonium. We conduct law enforcement escorts for domestic research reactor spent fuel from universities from their arrival at our State line of South Carolina to the Savannah River site. We are also responsible to provide escort for commercial reactor spent fuel shipments.

In addition, we have established emergency response plans to back up the physical security posture of stored spent nuclear fuel at five of the commercial reactors that we have present in South Carolina. Over the last seven years, I have participated in or coordinated ninety-four shipments of some type of spent fuel. In all

of those, we have had to incidences, two incidents and no accidents.

The incidents involved a flat tire on a truck and, with no accident, and a train fanatic in a small town. We believe that the risk -- and I'm not sure if that's the right word, I'm not supposed to use "fanatic" anymore, I think it's something. Okay, we believe the risk to the public from transportation of spent nuclear fuel is low and manageable, especially when compared to the risk presented by other hazardous materials that are, is transported throughout our State on a regular basis.

So, to address the security concerns or issues relative to transportation, I would like to -- I would like to examine the issues one at a time. The first one is threat assessment. Both SLED and DOE request threat assessments prior to our foreign research reactor shipments, in addition to all the others.

And there, we actually ask for the threat assessment. We believe this provides us with an understanding of the security environment relative to our activities.

The second is operational planning. Prior to each shipment, we coordinate and develop an incident action plan. This coordination is done with Federal, State, and local officials and law enforcement agencies, who assist us in these escorts. We also conduct separate meetings, one for the civilian activities that are associated with the transport, and one for the agencies involved in the security detail.

We review our plans and provide a -- a reminder of the pertinent details to ensure all personnel know their position and their roles and responsibilities. We carry all the proper equipment, and we and specialty personnel have the equipment they need for that. We do not become complacent, and everyone is cross-trained in each other's

responsibilities.

Equipment that we're issued are personal dosimeters, and some of the trained officers carry radiation detection equipment just in case. And there are also rapid assessment teams, both Federal and local, that are present and available if needed. The third topic or issue is transportation routes and timing.

Routes are determined with regard to the type of the highway, the location of schools and hospitals, the length of the route, and selection of appropriate safe havens in case there is a flat tire or some kind of mechanical issue with the vehicle or the mode of transportation, and those have been used in the proper way before.

All of these items can affect the risk management. The routes should also avoid towns with heavy traffic periods, like a rush hour and/or special occasions. If there are campaigns with numerous shipments, it is

advisable to alter schedules so they do not become predictable.

Number four is information availability. It is important to balance public need-to-know with security interests. We believe the public has a right to know that the spent fuel will be moved, but they have no right to know the schedules or other information that would jeopardize our security plan or aid a potential adversary.

It is important that each person or group involved with the spent nuclear fuel have a knowledge that they need to do their job, and awareness of the legal obligation to protect that knowledge. This includes notification of law enforcement agencies, to make them aware of the shipment so that, if help is needed when we pass through their jurisdiction, that they understand the nature of the activity that they are going to be called on to support.

The fifth is accessibility.

Foreign research reactor shipments are typically carried in a very heavy transport container. This both protects and limits access to the material. A crane is needed to move the transport containers. These containers provide considerable protection for the material inside, and prevent release in accident conditions.

The sixth is communication. Foreign reactor shipments have a global positioning locator. This provides continuous position information to our communications center and multiple means of communication between the security detail and local law enforcement. Assistance can immediately be requested in case of a need.

I believe that the associated security concerns related to the transportation of spent nuclear fuel are manageable with proper planning, and should not be an impediment to decisions concerning moving used nuclear fuels.

Most of the foreign shipments that I've been talking about are highly enriched. They have about a 20 percent -- and I am not technical any way, shape, or form by the rest of the members on this panel -- but I do know that it is some bad stuff compared to what, the other ones that we have actually transported, which are from the university, which is also highly enriched, and then from the nuclear facilities or the commercial power, it's, I understand, a three to five low enriched uranium.

If the shipments increase, we will need to be more careful, change our plans around, conduct monitoring -- and utilization of additional resources may be needed. And at a time when the economy is so bad, our resources are low and of course we, as everybody, we would need additional resources.

The benefits of having fuel at an alternate site is that it is not close to the public or stored close to the public, and

considerations is just the fact that it's going to cost us more resources with more shipments. Thank you for having me.

CHAIR SHARP: Thank you very much, Captain Baker. We're now ready for questions from our panel. Are there, members of the Commission like to ask? Co-chairman Meserve?

CHAIR MESERVE: I have a few questions. Mr. Brochman, you indicated that there is a paper that is currently before the Commission. Will that paper cause the Commission to address this issue you mentioned about whether the strategy should be denial, versus detect-and- communicate? Is that, is that, is that issue before the Commission now?

MR. BROCHMAN: No. I, let me -- the Commission in its 2007 decision recommended or directed the staff to use a dose-based approach. The comments we got from the public and other stakeholders were opposed to that.

The paper before the Commission right now is to basically recommend -- I'll

call it an interim step. Should the staff pause, or should it adopt the comments that were given by industry, or proceed with the original direction. The likelihood is that we will take nine months to a year to do that analysis, have the interactions with stakeholders, and then potentially, if we're going to change directions, submit a supplemental paper to the Commission.

CHAIR MESERVE: Mr. Earls, you had mentioned that ISFSIs that happened to be in the protected area have the benefit of the full capabilities of the protective system that exists around nuclear power plants. Do you have data at hand as to how many of the ISFSIs at plants are within the protected area, versus those that are outside and are subject to ISFSI strategy?

MR. EARLS: I can't answer that, but Phil might be able to help with that one.

CHAIR MESERVE: No, that's one of the questions.

MR. EARLS: Yes, I'm sorry. I don't, I don't know, it's --

MR. BROCHMAN: A third to a half.

MR. EARLS: Yes. My guess would have been a third, so it's not a large majority or anything. I think there's just a handful of the decommissioning sites and then the, the rest of them are split between inside the PA and the owner-controlled area.

CHAIR MESERVE: If you had more specific data on that, that would be useful--

MR. EARLS: Oh, we can, we can absolutely provide that information, I just don't know it off the top of my head.

CHAIR MESERVE: Mr. Halstead, you mentioned that for DOE shipments, that they're not subject to NRC regulations, and you recommended that they be subject to NRC regulations. I don't think there should be any implication, I want to clarify this, that the DOE shipments are not subject to security controls. I'm very confident that there are

DOE orders that cover them, that provide for security of such shipments. Am I -- do you disagree with that?

MR. HALSTEAD: Yes and no. DOE's own regulations require them -- where they are not subject to the commission's regulations -- to adopt their own, supposedly equivalent, regulations. It has been our position since 1999 when we filed the petition for rulemaking that not only would there be a material improvement in security if the DOE shipments were regulated for safeguards purposes as if they were utility shipments.

It also would enhance public acceptance and confidence in those shipments. As it is now, no one enforces DOE's self-regulation, and in fact, you may recall that you addressed this matter in some great detail in May of 2002 in your letter to Senator Durbin, and that is still the key document in discussion of this portion.

CHAIR MESERVE: Yes, I believe that

there was an issues as to self-regulation, but that does not mean that they're not requirements that the DOE is required to impose, and I don't -- there's no independent assessment by a different, by a separate regulatory agency.

MR. HALSTEAD: Well, let me add on that the Commission in July of this year, in adopting SECY 09-0162 -- and forgive me, it's the only shorthand way to refer to these documents, because they have such long titles -- the Commission adopted the draft enhancement of physical protection requirements proposed by the staff in December.

And then they had one of the longest list of add-ons for specific things that the staff had to address before they proceed to rulemaking that I've ever seen, probably Phil, too. And they specifically said "oh, there is this issue about the DOE shipments," so, in the proposed rule and the

draft regulatory guidance to accompany it, supposedly the staff is going to give a description of how the DOE safeguards planning is similar to and different from. So that, that I think will enhance our understanding of this point.

CHAIR MESERVE: Okay. Mr. Thompson, Mr. Pennington, in his comments had made some -- an analysis or assertions about the risks associated with hardened systems, and that they might compromise the cooling of, of the storage casks, and in fact would enhance risk. I wondered if you had a response to that.

MR. THOMPSON: Well--

MR. FRAZIER: Turn your mic on.

MR. THOMPSON: I welcome the fact that he opens up this issue of comparative risks. In order to compare them, you have to know what they are to begin with, and the burden of my testimony was that the NRC simply does not know what the risks are, of storing spent fuel in pools or in dry storage modules.

And, until such time as this risk is properly understood, it's impossible to have a comparative analysis. And that's a lengthy subject, and I could go on at any length necessary. Trying to cut to the chase, the -- and it would help if I could bring up one of my slides, I don't know if that's possible. Is that possible, sir?

MR. FRAZIER: Just a moment.

MR. THOMPSON: If it's not possible, let me know, and --

MR. FRAZIER: No, they'll take care of it, just a second.

MR. THOMPSON: Thank you. Okay, this is a Holtec module, relatively typical. The -- you'll see the bulk of it is concrete, the outer layer is maybe three-quarter or an inch thick carbon steel, maybe 25 to 30 inches of concrete in a level inch, inch-and-a-half of carbon steel gap, half- inch stainless steel for the inner module, and then you're into the spent fuel zirconium cladding, highly

combustible.

You'll see air enters at the bottom, leaves at the top. We're all familiar with how you start charcoal on your charcoal grill -- you have a little can with holes in it, you put your charcoals in, you light it, and it burns very nicely and gets your charcoals going nice and hot. Knowing that, anyone who wants to attack one of these modules is obviously going to say, "let's start a fire in it."

And they're going to open it up, top and bottom, and they're going to use an incendiary device, and they're going to ignite the zirconium. There's enough chemical energy that's going to be released that way to boil out a substantial fraction of the cesium-137 in that module.

Typical module has about one to one-and-a-half million curies of cesium-137, which is about half the release from the Chernobyl accident of 1986. The land

contamination from that one incident would be very substantial, because it's a low level release, and NRC has never analyzed the scenario I just described.

They specifically rejected that scenario in testimony before the Commissioners on July 1st of 2008, and under questioning from Commissioner Jaczko, the staff admitted that they hadn't done the relevant analysis as to -- he asked specifically, "Can you tell me what will ignite a fuel assembly, and what are the consequences if you ignite it?" and the staff said they'd have to do additional analysis on that subject.

What did emerge is that they looked at a crashing aircraft on the cask, and they looked at a light truck carrying a truck bomb placed adjacent to the cask. Neither scenario would be expected to initiate the fire that I described. Both would be spectacular events with fireballs and smoke and noise. I'm talking about a much more

sophisticated, targeted attack designed to exploit the intrinsic threat properties of the material itself, mainly that it will burn. Thank you.

CHAIR MESERVE: Mr. Pennington, would you care to reply?

MR. PENNINGTON: I would be happy to reply. First of all, I think we've had a very substantial and thorough security discussion here, so the cavalier statement that it's easy to get access to these systems, open them up, and put some incendiary device in there is, is not appreciably credible.

I would also submit that there is not a person on this panel that is an expert in zirconium chemistry or in zirconium fires. Having said that, I don't think that there is a convincing case to be made, either, that the NRC has not looked at this particular event.

My principal concern is that we have a very good system in place, from security systems through security forces, and

a robust technology. I don't think that we need a HOSS-type concept to improve the performance of our present security systems. So, I understand what Dr. Thompson is saying, but I do not agree with his conclusions.

CHAIR SHARP: Dr. Carnesale?

MR. CARNESALE: Mr. Halstead, you referred to the disagreements you had with the DOE analysis, both of the likelihood of sabotage and terrorism event being successful -- you said by a factor of ten, perhaps by a factor of 100 -- and also about cleanup costs.

I wonder if you could describe a bit the -- what is it, other than the conclusion that you disagree with, what is it about their analysis with which you disagree?

MR. HALSTEAD: Thank you for that, that, that question, Commissioner, and I'm going to be somewhat careful in answering it because, as I explained, we're in a peculiar situation where the status of the NRC

licensing proceeding for Yucca Mountain is somewhat unclear, until the Commission determines this -- and I'm likely to be a witness for seven contentions that directly address this, and two others that address it indirectly.

The easiest way to answer it -- without getting into the new studies that the State of Nevada has developed -- is to state that the Department of Energy's key reference on this matter is a 1999 report prepared by Sandia National Laboratories, and that's the, the primary basis for their attack scenarios and their assumption that the attack they've studied, which uses one explosive device, would deeply penetrate, but not fully perforate, the shipping cask.

They go on to say, however, that if the shipping cask were fully perforated, the consequence of the attack would increase by a factor of ten. We can get into some of the physical mechanisms why that occurs, but

that, in and of itself, is sufficient reason why they should not have artificially constrained their analysis to assume that only one weapon was used, particularly after the Congress, in the Energy Policy Act of 2005, required the NRC's design-basis threat to accommodate a still somewhat vague but much more robust attack scenario than had previously been in the design-basis threat.

We took another approach, because we did not want to get into the area of classified information, and on our study team we have people who are ex-military, tank and explosives people and also nuclear engineers. And we began with an assumption that there were weapons that were available that could completely perforate a cask, and then we calculated the, the, from the lost mass of the spent fuel assemblies that would be in the path of the jet from the weapon as it perforated the cask, what the maximum percentage of certain radionuclides released

to the environment would be.

And, the good news is that this helps put an upward bound on a debate that goes back to 1977, 1979, where -- when we didn't know enough about these mechanisms so we assumed there could be a 100% release of the most dangerous radionuclides. So, the good news is that the worst case scenario is probably about a 10 percent release of the cesium-137.

But just as a fractional release of 140 curies of cesium-137 in an urban area is a potentially catastrophic event -- and that really is the event that DOE assessed in their SEIS -- we believe that release could be up in the 10- to 20,000 curies.

Now, understand the rail cask contains, depending on which model it is, one and a half million to two and a half million curies of cesium-137, and that's why I go to our number two argument for risk reduction.

Best way to reduce the impacts of

these shipments is to ship the older fuel first, essentially take advantage of the decay time, the half life, and simply reduce the amount of these dangerous vision products that's in a shipping cask.

And by the way the waste program has evolved, and the way that the utilities have chosen to manage their fuel on site, and the Commission -- the Nuclear Regulatory Commission's decision to look at extended storage, this in fact is one of those problems that may help play itself out.

If we're shipping older fuel, then, regardless of the depth and diameter of the breach in the cask or whether incendiary devices, if we reduced the amount of fission product, we've directly reduced the event.

I'm sorry, that's a long, involved answer, but I'm trying to put it in the context of managing the risk rather than exploiting the fear of the risk, which I think is a very important. We're going to have to

ship spent fuel at some point, and we need to focus on how to do it safely and securely, and not argue that it can't be done.

MR. CARNESALE: Would you care to comment?

MR. PENNINGTON: I would like to amplify upon Bob's comments. Interestingly, a number of things that Bob said today, I would agree with. This, however, is -- we need some realism here, and let's refer now to the one big test case that we have in this world for the effects of cesium, and that is the Chernobyl event.

The Chernobyl event, if you look at the total cesium that was, that was spread, you will find based upon the excellent work done by Dr. Zbigniew Jaworosky and his staff on the UNSCEAR report, 2000, Annex J, which is subsequently solidly endorsed by the Chernobyl Forum, you will find that the cesium impact -- just the cesium -- over a fifty-year population dose, amounts to somewhere between

one and one-and-a-half person rem per curie. I apologize for non-SI units, but I think better in curies.

So we have one to one-and-a-half person rem for 5.2 million people exposed over a fifty-year life. Now then, we as designers, we like to have safety margins in our calculations, so sometimes a 200-percent over-prediction and safety analysis codes -- maybe even 300 percent -- that's what we would prefer to see in, in the conservatism of our codes.

If you look at some of the analyses that were done for the State of Nevada, you will find that one of the studies that they commissioned showed, for a cask terrorist attack in Nevada, the population exposures were greater from cesium, greater than the entire Chernobyl event, greater than the entire Chernobyl event, with about 1.2 percent of the content of the cesium that was in the Chernobyl event.

Second of all, if you look at their codes, or their results, I should say, and you see what result, their population doses are two orders of magnitude, two orders of magnitude greater than the population dose per curie that resulted at Chernobyl.

That is, they're up around 140 person rem for the -- let's say one and a half to two million people in the State of Nevada, the entire State of Nevada, 140 person rem per curie of cesium released. Now, I submit that when you see numbers like that -- at least as a designer and an engineer -- you say, something's going on here. And I'm not sure what it is, but I do know that the very sophisticated safety analysis codes that we used can be played with, to the user's delight and to produce results that you might feel you want.

I don't know what happened there, but I submit that two orders of magnitude higher than the actual Chernobyl outcome is a

bit extraordinary.

MR. HALSTEAD: Might I make a brief comment? Again, Charlie and I may well be arguing this out before the Administrative Law Judges of the Nuclear Regulatory Commission, so we need to be careful here, but what I want to stress is that in Nevada's analyses, we have not focused on health effects, latent cancer fatalities or otherwise.

And this, as -- Charlie is right -- this much more concentrated deposition of the release is the result of a number of factors, including the release height and the assumptions. But, the key issue here is, we're not arguing primarily that the health effects are why attackers might try to carry out one of these attacks.

We've argued, it's a case of economic sabotage. In the United States, if we have an incident like this, we're not going to allow a city to be shut down for a year or two, we're going to clean up the release. And

it's the dollar cost of the release that we think is the, the impact that is most likely to be the intent of an attacker, and in fact this is one of the reasons why we've asked the NRC -- and I haven't seen the final results in the rulemaking -- to change their definition of radiological sabotage, which now assumes that you worry about an attack if it's successful in terms of inflicting population damage.

And we think that the intent to do economic harm probably ought to be explicitly recognized there. But, I would agree with Charlie that there, there, there are, there are some valid technical debates about the way various parties have used the codes, the assumptions, and at some point it would be useful to have some of those resolved.

CHAIR SHARP: Excuse me for jump -- oh, go ahead, yes, please, Doctor.

MR. THOMPSON: Just very briefly, Pacific Northwest Labs on behalf of the

Canadian Government did a dirty bomb release in downtown Toronto of 1000 curies of cesium-137 and they calculated the cleanup costs to various levels of cleanup standard.

And for what one could regard as cleanup damage the public might insist on, the cleanup goes into the many tens of billions of dollars, and I could supply that analysis if you wish.

CHAIR SHARP: Excuse me for jumping the queue for my fellow commissioners here, but help me understand a little more clearly the potential impact you were, Dr., Mr. Pennington, you and others have been talking about the dosage at Chernobyl of cesium, and I don't have a good appreciation -- lacking a technical background of -- just give me some sense of the argument, I hear the argument about the economics.

It's very costly to clean up, but most of us, as citizens, our main and overwhelming concern has been the health

impacts of what happened, and that's what we've heard most about, about Chernobyl and the other places. Help me understand what that -- the implications are -- of what you said, and what ten times that would do.

MR. PENNINGTON: Well, the implications are the subject of --

MR. HALSTEAD: Great debate.

MR. PENNINGTON: -- a number of debates. Clearly, there is a -- it is the objective of the nuclear business and cask manufacturers in particular, as well as reactor manufacturers, not to have any radioactive releases.

CHAIR SHARP: I know, but let's get to the case where there was a release, and what was the impact of that level that you were talking about, and the level that you were talking about. Just give us some sense -- I don't expect a, you know, a highly technical thing here.

MR. PENNINGTON: Well, the sense

is, from the release from the, from the DOE analysis, from those types of population doses there would be no radiation injuries, no radiation deaths. Nobody's going to die from those types of releases. They are very small.

Bob made an inference about, oh, let's, people impute latent cancer fatalities. The ICRP and a number of other units of expertise have said, "That's not the right thing to do." You cannot extrapolate low doses to large populations and impute some form of latent cancer fatality. You cannot imply or infer health consequences from these types of doses.

And we're talking abut doses that are less, to an individual, less than ten to fifteen rem, maximum, for this would be for the recovery types. So, for these types of events, we are not talking about deaths or significant personnel injury, we're talking about exposures that we would like to prevent, but for beyond-design-basis events, they can

happen.

And, as other people have pointed out, weapons systems can penetrate just about anything, so there is, there's not a huge level of public harm from this, but there could be economic consequences, there's no doubt about that.

CHAIR SHARP: Mr. Halstead?

MR. HALSTEAD: Yes, that's the key point here. I, I'm sorry we're so limited in time, because I think for example it would be very useful for you to have a discussion of this measure of harm, the latent cancer fatality number, and the way it is used and misused.

Let's stay away from that. The issue here is: at Chernobyl, you had a large amount of fission products distributed over millions of square miles because of the height of the release and the extent of the fire. We're talking here about a small amount of fission products, probably dispersed in a fire

over a small area, a couple of square kilometers, maybe forty square miles, at the maximum.

So, it's a completely different type of situation, and I believe that it I -- I believe, there just isn't much technical basis to focus on the population dose and relating that to latent cancer fatalities a measure of harm. There is the case of emergency people who are likely to be close to the cask, and, remember, the surface dose rate of the spent fuel in the cask -- if it's ten years out of reactor, you're talking 25,000 rem per hour, which is a big, a big point source of radiation.

Even after fifty years, it's still likely 8 or 10,000 rem per hour, but it's more manageable. But, it's likely that you'd have some emergency response people that get doses in the range of 20 to even possibly up to 100 rem, although if the on-scene commander is properly trained, he or she will likely keep

her or his people from receiving a dose in excess of 20 to 40 rem, which is what we shoot for in a worst case scenario.

So, the point is, we're talking about economic sabotage, and it could be very, very costly and, in fact, the numbers in our models and our outputs that Charlie doesn't like are the numbers I don't like, which show that the worst case scenario costs 400 to 500 billion dollars to clean up, but that's precisely the range of numbers you get from almost all the competent studies of dirty bombs in metropolitan areas.

And so, I'm not saying that those numbers are crazy, they're just, they're numbers that are very disturbing when you consider fission products, even a small number of curies being transported and deposited in a relatively small area, unlike what happened at Chernobyl or unlike what would happen in any reactor accident.

MR. PENNINGTON: May I--

CHAIR SHARP: One more shot, yes.

MR. PENNINGTON: Let me rebut some of that. The characterization of the Chernobyl accident is not accurate there. There were two components of the release, there was the huge explosion occurring about a minute into the accident. There was a steam explosion, there was a subsequent explosion eleven seconds later due to vaporization of the center of some fuel assemblies that caused the fuel to explode.

On the basis of those two explosions, somewhere, depending on your experts, between thirty and sixty percent of that core took up residence physically outside the reactor hall. They began to have as many as thirty fires, small fires, graphite burning, and those types of releases really were very similar to what you would expect from a spent fuel cask.

Now, the first two plumes, the first two plumes of the radioactivity released

at Chernobyl were released in two separate directions. The population density in those two plumes was very high because at Russian reactors, cities are built close to the reactors to get workers there.

You've got numbers of 3,000 people per square kilometer in the first two plume areas after the release. And, for the releases after the initial explosions. Yes, there was high atmosphere injection from the, from the first two explosions, for the subsequent burn.

And this went on count them, now, for forty days. Ten days of intense release, thirty days of continuing release before they managed to stop all that. Forty days, and yet, at that, with forty days of a completely consumed and burning core, only 30%, thereabouts, of the cesium was released.

Forty days of open, full-core access to the atmosphere, 30%. That just indicates the absorption coefficients that cesium has. Cesium loves to glom onto stuff,

and hang on, so.

CHAIR SHARP: The, this is, I know, an extremely important issue, but I need to let my colleagues into the question, Mark Ayers, who is next, and then Vicky Bailey.

MEMBER AYERS: Thank you, Congressman. I'd like to direct this to Mr. Pennington. You stated that the extra-structural protection of the HOSS potentially, if it is partially or fully damaged, could pose increased risk to first responders and that the cost benefit ratio for this approach appears unfavorable. Does your supplemental material, which I have yet to receive yet, provide quantitative and or qualitative details?

MR. PENNINGTON: You haven't received it because it is not yet delivered but it will be delivered.

MEMBER AYERS: Thank you.

MR. PENNINGTON: First of all, the, the issue is if you harden for weapons

protection, there is a potential for jet fuel causing very large fires, and I don't care how you design that HOSS structure, aviation fuel at 500 miles an hour is going to do a pretty good business of getting into structures.

We have had some very nice experiences recently, and I use the nice term guardedly here. The experiences were not nice, but the fact is that large aviation fuel type fires and concrete over-structures, that is, that are support structures, physically supporting weight in the presence of fires, do not do well.

First incidence has been made apparent by the World Trace Center event, in which a lot of heavy aviation fuel burning, all it had to do was collapse one floor, pancake effect. We also have the MacArthur Maze fire that NRC has analyzed, in seventeen minutes, outside, only 8400 gallons of gasoline caused this very large superstructure of highway to gradually fold and bend and come

down on top of the tanker.

These types of events in an aviation fire inside an enclosed structure become, essentially, a furnace, and you get an amplification of the temperature because of that event, and those structures might very well--we haven't done an analysis to support this, but there is reasonable, there's a reasonable conclusion that for that type of an event and a HOSS over-structure you might be doing yourself more harm than good.

Not to say that's a fact, it's just a possibility. The defense against a weapon is certainly a much lower probability event, and the defense that might be determined by the security folks to be important later on. But I'm simply saying you need to be careful when you talk about hardening a structure that's designed for one set of events.

Now, again, as I said, and I think I said it appropriately, the canister won't

fail under those fire events. The canister will not fail, there will not be a release of radioactivity. You're simply complicating and making it, life very tough on the recovery staff following the event.

DR. THOMPSON: I conclude my slides with a schematic of a hardening option. And in the accompanying description, when I wrote that up in 2003, I specifically recommended that the configuration be designed so that jet fuel did not pool to avoid precisely this issue.

MR. PENNINGTON: 500 miles an hour jet fuel is going to gain access, you can see the cooling ducts, it's a long torturous cooling duct that will impair cooling, first of all, but will provide plenty of access since there has to be multiple openings for aviation fuel at 500 miles an hour.

DR. THOMPSON: What I said was that you can configure it so you don't get pooling, and therefore you'll have a very short fire

impulse which does not raise the concerns that Charles has talked about.

MEMBER AYERS: Okay, this is a related, related question. I guess it would be to you, Dr. Thompson. Do you have any capital or overhead estimates for this superstructure that you showed in a presentation?

My concern is that, that, and it is a concern that we have to keep in mind, that the cost of this superstructure could, in fact, increase the estimates for the cost per kilowatt hour of the fund, the waste fund. Have you done any cost estimates?

DR. THOMPSON: Short answer is, is no. The, these analyses I do are paid for by citizen groups, local governments, state governments. Budget's always very, very limited. We, we just don't have the resources to do that kind of thing. I would say that our gravel, dirt, riprap, rocks, concrete are all pretty cheap.

There is a greater land

requirement that most, most sites have plenty of land. So, in terms of cents per kilowatt hour, nuclear electric, you're looking at a very, very small increment.

MEMBER AYERS: Okay, thank you. Again, coming from the construction industry, particularly on nuclear sites, I would be concerned that the impact it would have on consumers if, if we went to such a superstructure, went from, for example, one mill to 1.001 mill, which would be a big, big cost.

MR. PENNINGTON: May I just comment? Is that acceptable?

MEMBER AYERS: Certainly.

MR. PENNINGTON: Thank you. I first heard of this in 2003, and made some presentations to one of our decommission sites. I did some calculations back then, these numbers are no longer relevant today, but I would say that the cost is not insubstantial just for the construction.

You're working in a security site, labor costs go up by a factor of at least 30% because you're working in such areas. If you had to rearrange a current ISFSI, part of the real cost however is the up-front licensing issues, the impediments to the present design caused by this particular structure's design.

So you've got a lot of up-front costs associated with redesign, re-analysis, submittal, review by the NRC, the NRC rates are now $250-plus dollars an hour, so that is not insubstantial. And then the actual cost itself for installing this, which is a, would be a very significant operational impact on any operating utility.

MEMBER AYERS: Thank you. And, Congressman, one last--I guess I'm making a point, more than anything. Mr. Pennington, you used the common industry approach of doses to people, relevant but only part of the consequences of a release.

But it would seem to me that far

more important will be either the cost of the cleanup of the land, or, more likely, the economic cost or loss if the download land is cordoned off for decades or even centuries.

MR. PENNINGTON: That is true, and I do not presume to be an expert in this area. However, the standards that you set for the cleanup should probably be determined by other natural type contaminations as well.

Mother nature is not very nice about how the radioactive waste which is left on earth from creation has been distributed either, so we have lots of, lots of capabilities to make appropriate cleanup decisions which can either increase or decrease the costs of the cleanup.

CHAIR SHARP: Let me turn now to Vicky Bailey.

MEMBER BAILEY: Thank you, and let me pick up on a point that Commissioner Ayers has just raised, and to Mr. Brochman, I had

the opportunity to visit one of the ISFSI sites, the Maine Yankee site, and I was struck by the perimeter, the safety perimeter, that's actually used, and in some of the discussion, it went to the fact that this perimeter is so, so wide that it also is a challenge for economic development around the site, from the standpoint of jobs and other issues.

So, I guess my question goes, I know you're saying there's a rulemaking currently in front of the NRC. Will it deal with this issue of the perimeter? Where, how large, how is it determined how wide the perimeter is, and what are the assumptions behind that?

And, I mean, these perimeters are, are, are, the security has considerable weaponry which is also very intimidating to the community surrounding it as well, so I'd like to hear your, your comments on that.

MR. BROCHMAN: I'm not sure-- parameters or perimeter?

MEMBER BAILEY: Well--perimeter.

MR. BROCHMAN: Perimeter, okay. Well, let me take the second question first. I think the NRC's desire with regards to people being concerned with the weapons is, that can be viewed as a good thing. We have a, and that may be a bit humorous, but the idea is that an adversary looking at one of these facilities as a potential target, when he looks at it carefully, should go, "there are better targets for me, as an adversary, to choose".

And, so, deterrence, defensive capabilities serving a deterrent function as opposed to actually defending can be an important issue.

In terms of the size of the facility, right now, the regulations establish a, basically, a minimum distance from the storage containers and the question becomes whether or not any consequences from a release are acceptable at that point, or the site

boundaries beyond that, wherever that is, or do you need to go to a denial strategy as I indicated earlier.

So, that question can depend on type of events you're talking about, what the, and what's the specifics of the site.

MEMBER BAILEY: So, it would vary with each ISFSI, is that what you're, you're saying?

MR. BROCHMAN: Yes, and, and that may lead to conclusions that, you know, the NRC's perspective is, all ISFSIs need to be regulated to an acceptable level of safety and security. The question your posing is, are the costs the same for all ISFSIs at all locations? That's a different issue, and that's really beyond what the NRC would look at.

MEMBER BAILEY: Okay. Mr. Thompson, and maybe Mr. Pennington, you each have talked to this subject, but while I was there and in the presentations that we heard, obviously

each of these dry cask storage units are monitored continuously, and I believe they're monitored for heat level, what have you.

So, I guess I'm going to Mr. Thompson. Is, are you stating that concern that an individual might be able to compromise this or are we looking at the chemical reactions being able to compromise this?

DR. THOMPSON: I focused here on the, the potential for a malevolent event affecting an ISFSI dry storage module and this would be a team, knowledgeable team equipped with weapons of destruction. So we're talking here an unusual event, a beyond-design-basis event.

It's not an everyday event, it's relatively improbable, but remember that there are ISFSIs all over the United States, more being established all the time, and they'll likely be in place for many decades, perhaps beyond a century. So you have to consider the cumulative possibility of this malevolent

event over that long period and over these many ISFSIs.

MEMBER BAILEY: Mr. Pennington?

MR. PENNINGTON: Just to go right to the heart of your question there, there's nothing chemical that can happen within the canisters that would cause the types of events postulated by Dr. Thompson.

I would also rely upon the expertise we've heard today from our security experts. We have a constantly changing environment with respect to national security and specifically homeland security-type events.

Site, national, and site security systems are constantly being upgraded for these types of alerts and warnings and postulates of possible organizations. That's why, as I talked about, this tiered response where we've got not only the security systems, we've got the security forces and then a robust technology to back it up.

I believe that the right focus is to keep the security systems and the security forces upgraded and constantly ready for such events that Dr. Thompson concerns himself with, and that is probably the best approach.

MEMBER BAILEY: Mr. Halstead, you talked about from the standpoint of moving. My question goes, you know, moving the spent fuel twice, moving from an ISFSI facility to storage and then from there to a permanent repository.

Are there concerns there related to heat levels, other things that I may not technically be aware of, but maybe you can address your comments to?

MR. HALSTEAD: Well, we're supposed to focus on the security issues on this panel, and I think there are some statistical transportation safety issues that occur with multiple movements, but I think we'll leave that for the second panel.

I think from a security

standpoint, again, trying to make a very complex situation simple, as a general rule, it is easier to protect spent fuel on-site than to protect it when it is in transit.

And it is easier to protect it in transit when it is moved once rather than twice, or if it is moved for a smaller number of miles than a longer number of miles, and if it is moved in a truck--in a rail cask rather than a truck cask, because of the thickness and the materials of the walls and some other considerations, which have to do with the ability to provide security on rail lines versus providing security on highways.

That said, I think that the Commission's exploration of the special issues that have been created by spent fuel being stranded at storage installations that no longer have operating reactors, is the, the one case where I think the minimizing shipments rule might not be the overriding factor.

It may be that the desirability of removing fuel from those sites, even if it means that that fuel then ends up being moved twice, is one area where I think there's a case to be made for moving more than once.

Secondly, we have a lot of spent fuel stored at reactors that don't have rail access. Maybe one third, depending on how you evaluate the sites. And, in the past, when DOE proposed to monitor retrievable storage facility at Oak Ridge to operate in a system with a repository that received shipments by rail, it seems to me there was an argument in terms of the security of the entire system, that having a facility in the east, relatively near where the spent fuel was, where you could deliver fuel to that facility by truck, and then it would be repackaged for ultimate shipment to the repository by rail, thereby eliminating those long, 2-and-3 thousand mile cross-country truck shipments.

That's a second case where moving

fuel twice might have lower overall risks than moving it once, so it's hard to find a rule that applies in all instances. Generally speaking, moving the fuel the fewest number of times and the shortest number of miles enhances both safety and security, but there are those exceptions.

MEMBER BAILEY: Mr. Pennington?

MR. PENNINGTON: I would agree, for the most part, with Bob, but let's make sure we understand what we're talking about volumetrically. There are many classes of hazardous materials out there, and the preponderance of them, in fact, I would, I don't want to overstate it, but I would say most, if not all of them, are far more hazardous to the public than spent fuel.

Let's make sure we understand that if you were to move all of the fuel, spent fuel, in the United States, and were to do so, let's say you were moving it on a regular basis and you were picking a correct number,

a correct amount to move every year, you're going to be impacting the hazardous material transport ton-miles per year by less than .008% of all hazardous materials.

You're talking about an incredibly small impact on the, on the transport of hazardous materials, in the most hazardous categories, including explosive, oxides, explosive flammable liquids, all of those major things that cause real risk to the public.

It's a tiny, tiny fraction. So, I would agree with Bob that there should be some thought put into this to make sure we do not over transport, but at the same time, there are other economic considerations that say "hey, two transports is not a bad thing, it's not going to be an increased risk, and it's going to have some good outcomes".

MEMBER BAILEY: All right, thank you. Captain Baker, having listened to all of that, in your comment and in your testimony,

you talked about the procedures that are quite extensive and the training that you've had. In looking at what you've done, have you had more experience with rail transport, or with trucks, or with both? And is there a considerable difference in procedure with either one?

CAPT. BAKER: Both. I've worked probably an equal number. There, the plans are different and I can't really discuss the differences, per se.

MEMBER BAILEY: Okay.

CAPT. BAKER: Not in an open session.

MEMBER BAILEY: Sorry to ask that, okay. Thank you.

CAPT. BAKER: You're welcome.

MEMBER BAILEY: Mr. Earls, I've obviously had a chance to experience firsthand a little bit of that security that you talked about when I got a chance to visit the ISFSI site, but are there other measures as we look

at America's nuclear future, are there other areas that we should be looking at that maybe we haven't asked about? Are there some things that keep you awake at night that maybe we haven't thought about, and maybe you'd like to comment on that.

MR. EARLS: Well, and as I mentioned, the threat is constantly changing, and evolving. You know, I mentioned one of the areas that has become more and more of concern to us, and that's the insider threat. And, and, you know, at our power reactors, we have a robust insider mitigation program.

But, even with that, you know, we're constantly redoing it. I think that, that's probably what keeps us awake more today, I believe we've had a lot of focus on, on, you know, the interdiction of folks coming from the outside, bad guys coming in, so I think we have quite a confidence level in that.

But it's the insider, and

particularly the homegrown terrorist, that's the one that is a challenge for us to look at. So we're continually looking at ways to make that better, and we continue to work with the NRC. The NRC just recently, as I mentioned, did a rulemaking. They enhanced some of the measures that we employ to mitigate the insider.

MEMBER BAILEY: All right. Thank you. Thank you, all. Excellent panel.

CHAIR SHARP: I just had one more question before we, our time is virtually up for this panel, but the tough question we face is, what is our role, what should we appropriately speak to, and what, what is, what do we have legitimate expertise to speak in.

And obviously on many of these questions a number of us certainly do not have the technical and we would not be the appropriate people to judge whether or not a specific design of security is the appropriate

one.

So, let me ask you this. One thing we might speak to is whether or not the institutions that have to make these decisions and, primary one being the Nuclear Regulatory Commission, but we are engaged with other institutions, whether there's anything that we ought to be saying about what those institutions need to either focus on, or how they need to be upgraded or reformed in order to manage what, as, as Mr. Earls just articulated, is an ongoing proposition.

And, so, I just wanted to give you an opportunity to, and fairly quickly if you could, say to us the institutional or, arrangement that we have in this country, and obviously, we're not even, have a number of the security institutions represented here, so if you wanted to take a swipe at them, you could, but the point is, is really, the decision making institutions that affect the nuclear industry, Mr. Thompson?

DR. THOMPSON: Big subject. Try to be brief. I'd focus on the National Infrastructure Protection Plan, get a stronger strategic grasp on what that means, focusing on the concept of protective defense--deterrence as an element of a balanced national security strategy.

And then, from that strategy, you distill a National Infrastructure Protection Plan that would apply across all agencies including the NRC, which actually signed up to the 2006 version of this plan and with, subsequently distanced itself in a public proceeding from that plan and the 2009 revision took away all the agency signatures, so it's a substantially weakened plan. Thank you.

MR. HALSTEAD: I would just say, Commissioner Sharp, that while the Nuclear Regulatory Commission is far from perfect, and I have often been their critic over the last three decades, I think there are two things we

can learn from the way the NRC has dealt with the transportation security issues.

And I would also say, because I have worked on some of the on-site dry storage issues as well, and that is that I have confidence in their ability to get it right in the end, but it is extraordinary that it's eleven years since the State of Nevada's petition for rulemaking was filed and we're now waiting to see what the draft rule for public comment acting on that will be.

And on the other hand, with the Energy Policy Act of 2005, where the NRC was directed by Congress to deal with these issues, as Phil can well attest, having Congressional direction doesn't make the task any easier technically, but my guess is that they will develop a good response in about half that time.

So, I guess I would give a vote of endorsement for having the NRC resolve many of the issues that will come out of your

deliberations. It will be necessary for a successful implementation of your recommendations.

But I think you need to think about how they are directed to resolve some of these issues and how they are given the resources for the enormous amounts of technical work that may be involved in answering some of those questions.

MR. PENNINGTON: I would not necessarily disagree with either of the points made previously, although it might maybe in shading. One of my passions has been, in my 44 years in the nuclear business, is that we have, we have done a disservice to the nuclear industry and to the nuclear technology by failure to educate and make sure that the public takes a firm understanding of what the real risks, the comparative risks, and you may have detected that in my presentation.

Comparative risk is what life is all about. That's what every human being does,

and yet we have historically and traditionally failed to do that with nuclear technology, be it systems, be it storage.

I would encourage the Commission to advocate for a public information and public training with respect to comparative hazards that society faces and put it in proper context. The economic arguments aside, we can, we can debate that, but the public--not those of us that have, have more education--the public is fearful, and the public should not be fearful.

This is not a technology that has that imminent level of threat to public health and safety, so I would encourage the Commission to take an active role in making some statements about getting government and industry involved in public, in upgrading public knowledge. Thank you.

CHAIR SHARP: Ladies and gentleman, thank you very much for your time and your help and your information and we will, of

course, you're welcome to provide followup information and we may have some additional questions for you. Thank you very much.

With that, we're going to take a 15-minute coffee break and then we will be back at it.

(Whereupon, the above-entitled matter went off the record at 10:35 a.m. and resumed at 10:52 a.m.)

MR. FRAZIER: Okay, We're going to go ahead and reconvene. We've sent a search party out for Ken Sorenson, when we find him, but I suggest we just go by him until he returns. He's here, we just, he's lost.

CHAIR SHARP: We're very pleased to have our second panel here, and what I think we will do is, in a moment, I'm sure Ken Sorenson will be with us. Why don't we turn to Phillip Brochman again on this panel, from the Nuclear Regulatory Commission.

MR. BROCHMAN: Do you want to load my slides up?

CHAIR SHARP: Do we have the slides up for Mr. Brochman?

MR. FRAZIER: I'll just do that.

MR. BROCHMAN: All right, well--

MR. FRAZIER: Here we are.

MR. BROCHMAN: I will continue, and then when Mr. Sorenson comes, we'll let him talk.

CHAIR SHARP: No, no, we'll, no, no, we'll just go through and then--

MR. BROCHMAN: Got you. Got you. Very well. Since I spoke in the previous panel, I will try to move quickly through some of the slides. The overview for security--

CHAIR MESERVE: We saw that.

MR. BROCHMAN: You already saw that? It's the same for both. We also are doing a rulemaking in transportation security, same basic goals, mentioned the Nevada petition that Bob talked about a number of times.

And, just to make clear, that's a

separate rulemaking from what's going on in the storage area. Status. Correction. As Bob has pointed out, the Commission has approved the issuance of the proposed rule. They did that in July. The expectation of the staff right now is working on finalizing the Commission comments. We would expect that out in the next month or two, for comment.

So, that will come out this fall. There will also be guidance documents, and definitely projected before, it's now, it will be sometime this fall in terms of when it's published.

Major elements of that rulemaking. Improvements or new requirements on advanced planning and coordination with states, increased notification and communication of shipments, continuous enacted monitoring of shipments, armed escorts required over the entire shipment route, and new requirements on background investigations for access to Safeguards information and updated

requirements -- next slide -- on training and qualification.

I would note that there's going to be a separate rulemaking in the future to apply enhanced weapons, and by enhanced weapons, I mean machine guns and other things like that to spent fuel shipments. Right now, I'm working on a rulemaking that will apply such weaponry and related things to power reactors and CAT 1 facilities.

Once we finish that, we will then do a follow on rulemaking that will address spent fuel storage, spent fuel transportation, and other, in a range of facilities. One of the aspects of that in terms of personnel qualifications is, there's a new requirement for firearms background checks for armed security personnel that uses the National Instant Criminal Background Checks System that the FBI runs.

And the bottom point here I would just mention in passing but it is something

that will be of interest. Currently, United States Code, and I'd give you the citation number there, prohibits non-law enforcement personnel from having weapons, loaded weapons in school zones.

If you look at some of the transportation routes that go across this country, especially rail routes, you may find that they cross a number of school zones. So, this is an issue We're talking with the Justice Department on. It may ultimately require a legislative solution to resolve, but it potentially creates targeting and security vulnerabilities.

This is on the premise that we're talking, NRC licensees with the increased weapons capability providing the security escorts in addition to the law enforce, the law enforcement officials that may accompany.

And, basically, my summary is, we're at the midpoint of increasing the transportation security rulemaking

requirements, improving the, incorporating the orders, doing all those things I talked about. And the rulemaking on enhanced weapons is probably a couple years away.

All this conclusion may be brought up by other persons as well, but basically, spent fuel has been shipped safely and securely for a number of decades here in the United States. Shipments are occurring both domestically and internationally, and the NRC has ongoing and both future rulemakings that, to enhance security requirements.

So that's the scope of my brief presentation. I don't know if Mr. Sorenson, we'll just go, next way? And if I, if you have any questions, be glad to answer them. Thank you.

CHAIR SHARP: Thank you very much. We now welcome Jack Edlow.

MR. EDLOW: Good morning, and thank you very much for allowing me to come to address the Commission and the subcommittee

today. My name is Jack Edlow. I'm a second generation person in the transportation of radioactive cargoes.

My father started the business in 1957. I'm involved since 1969. We ship only radioactive cargoes. We ship any form of radioactive cargo, and we ship between any two points in the world. So we consider ourselves experts on what we do.

Amongst those cargoes that we ship are irradiated, sometimes known as spent, and sometimes known as used, nuclear materials. And so, I'm going to limit my comments today only to irradiated, spent, or used nuclear materials.

As has just been indicated, the safe transportation of irradiated nuclear fuel has been carried out for probably fifty years in this country, in a regular and routine manner, without any major problems, protests, or disruptions.

It's not exactly easy to find out

how much fuel has really been shipped, because there's a wide variety of materials, but clearly, more than 80,000 tons, and probably closer to 100,000 tons of this material has been shipped around the world. Within the United States, it's probably in the 10-to-20,000 ton range, in my opinion.

Shipments occur monthly in the United States and sometimes even on a weekly basis depending upon shipping campaigns. The use of either truck or rail for transport is safe and secure. Safety measures, safety issues have been addressed through package design, testing, and certification process under the auspices of the Nuclear Regulatory Commission.

Security issues have been addressed through regulations and security plans which are modified on a case by case basis, depending upon the need to do so, also under the auspices of the Nuclear Regulatory Commission. Advanced planning involves working

with State and local officials and this is in the best interest of the shipping plan for this material.

Additional training from time to time may be needed and is provided when it is needed. This is similar to the shipment of other forms of hazardous materials, of which there are many thousands of other forms of hazardous material which move in this country as well.

Shipments are managed routinely and professionally in this country. Now, what I'd like to do, is having said that, is tell you a little bit about some of the more difficult campaigns of materials that Edlow has been involved in shipping so that you understand the context of this.

Most of these involve some form of domestic U.S. shipment as well, but generally are international. This is a shipment that took place in 1963. It was the first return shipment to the United States under Atoms for

Peace. My father performed the shipment. I attended as a 14 year old, this shipment.

It came into the port of Savannah, Georgia. Four casks, you see on the rail car, moved in regular train service, to Idaho, Idaho Falls, where it went out to the reprocessing plant out there. This was the first, this shipment came from Sweden. It was the first of many, many, many shipments.

The most recent shipment under the same program arrived a few weeks ago, so it has continued all of this time on a regular, routine basis, not, no longer going on regular train service, but we'll show some other examples of that in a few minutes.

This is a picture of those casks arriving at Idaho, my father is on the left, there. In fact, he is the only man, to the best of my knowledge, ever to have shipped spent fuel from every continent, because, yes, he shipped from McMurdo Sound when they closed the reactor there, so as far as I know, that's

the only guy, probably ever going to be the only guy.

We, we made a large series of shipments in the 1980's from Taiwan. This involved, I think, close to 300 caskloads. It was in groups of ten, moved initially on a liner service, but eventfully moved to charter service for a lot of reasons.

This is a picture of one of the casks being loaded onto a vessel in Taiwan. Came to the United States and went by rail to Savannah River. Rail or truck, I think at that time.

This is an interesting case. This is an airplane getting ready to depart Bogota, Colombia. This was some highly enriched uranium fuel which was being removed from Bogota in 1996, not a good time in Bogota. Under Department of Energy orders, NAC International and Edlow worked together on this, they packaged the fuel and Edlow transported it.

It was to have been transported by road to Cartagena to be loaded onto a ship, but at last minute a security alert was put out and we were asked to change to aircraft, which we did within 24 hours. The truck is inside the airplane. The truck with the cask drove into that aircraft.

It flew to Cartagena, where it was loaded then, the cask was loaded onto a ship, to Charleston, and then it went by rail. Interesting. Truck, air, ship, rail. All four modes involved in that transport, 1996.

This is a very, another interesting shipment, a few years before. 1994, eight casks involved from eight reactors in six countries in Europe. The emergency relief shipment required to get highly enriched uranium back to the United States, the logistics coordination in bringing all these together, to bring them into Savannah River, were massive, but easily accomplished.

This is my most recent shipment.

This was in April. This is Chile. The casks were loaded and ready to leave the day the earthquake hit. My staff down there were thrown out of bed by this earthquake. They determined that the casks were safe but that the port we were planning to use was destroyed by the tsunami.

We shifted the operations to a secondary port, checked all the bridges and roads, redirected the police, left two days late, arrived at Charleston five hours behind schedule. How were we able to do that? We had a plan, and we knew that things change from time to time. So this is what is necessary.

Other operations we've been involved with recently. After the First Gulf War, NAC and Edlow worked together to evacuate the fuel from Iraq which had been left in a hole in the field. We repackaged it, and shipped it by air back to Russia, to Mayak.

Also, recently, the other one was a shipment from the Adriatic Sea to Murmansk

by sea, Russian HEU spent fuel being returned under DOE program. We used trains, here's a picture of a train with containers involving casks. We ship, this train picture, has casks in different frame containers.

Here's another train with other containers involved. We shipped by truck. I gave a promotion to Tri-State this time, but there are other carriers that are usable as well. The cask is inside the container. Here are other casks in different frame containers. You can see the emergency, the security personnel that are involved in this process.

Casks in the ship, more casks in a different ship. I mean, this is a normal, you can see, the casks fit very easily inside the vessel. You can put a lot of casks in this ship if you really want to move a lot of fuel at one time.

So, generally speaking, I would say that there have been a lot of other campaigns in the United States as well. There

are -- we, obviously had two reprocessing plants in the U.S., West Valley operated and received a lot of fuel, some of which then had to be shipped back, and the Morris facility received I think some 3,000 spent fuel assemblies, which still reside there to this day.

Other utilities provided intra-plant, between their plants operations, and additionally to that, there have been research reactor shipments here, Navy reactor shipments here. A lot of spent fuel has moved, does move, and will continue to move in the United States as we sit here today.

Now, abroad, my friend Alastair Thomas, who used to work for British Nuclear Fuels, ran their spent fuel operation. He personally shipped more than 70,000 tons. That's correct, he personally oversaw the shipment of 70,000 tons. He had a five-ship fleet to bring fuel from Japan. He had his own railroad to move fuel around within the U.K.,

and he had a truck fleet as well.

So, he already oversaw the amount of fuel that was destined for Yucca Mountain. So this is something that has been done, there's a vast amount of experience involved, and I just thought that you should see what we do. Remember, we've already done this a lot, we do it safety, and we do it securely.

We follow the regulations as needed. All we need to know is where do we go next, just please tell us where you want it. Thank you very much.

CHAIR SHARP: Thank you very much. We now welcome Judith Holm.

MS. HOLM: Thank you. I always do better on my feet. Thank you very much for inviting me to speak today. I always love to follow Jack. He's so inspiring.

Today, what I'm talking about is institutional arrangements that have been conducted and basically built into many of the DOE shipping campaigns, and please forgive me,

it's been three years since I've really been associated with the DOE. I retired in 2007. I'm a free agent, I'm happy to say.

I had participated in a number of shipping campaigns, and been involved in planning and managing institutional program activities to prepare, if you will, the field for the kinds of discussions and arrangements that are needed. I can't claim as much as Jack in terms of longevity, but over 23 years, I've seen shipping campaigns from Three Mile Island, which I touched briefly with a piece of paper, from a headquarters standpoint, through WIPP, cesium, which I'll talk about, from Colorado to Washington State, and some of the foreign fuel shipments.

Jack, you'll be interested to know that I handled the quick EIS on some of the last of the early shipments of foreign fuel until we conducted EISes in the department, so we cross currents. It's a small community in transportation. But the fact is, there is a

history, there are ways to achieve public involvement and public acceptance that don't prevent you from shipping, that actually help your system and improve the process.

Some of the topics of discussion are risk perception and program management, and how do we gauge people's concerns about risk. A lot of the technical issues you've heard, but we're concerned about how people think about these.

And, so, we did some survey research, which I'll talk about. And we have experienced a lot of controversial campaigns, where people were adamantly opposed to shipments, but actually those shipments finally went on, and how you do that is not tricky, it's just common sense.

I think the previous panel with the Captain from South Carolina talked about a lot of the shipping protocols and security features that were included. We learned from those kind of experiences and I'm happy to say

we're still doing those.

So, the basis, where we started, was looking at groups like Peter Sandman and his -- I should stand back, perhaps -- Peter Sandman's guidance on public involvement and public participation with EPA basically focused on hazardous sites, reckless surplus sites. And what he identified was a range of interests from the public. The public is not monolithic.

People are concerned at various times and at various levels, and not all publics are the same. There are people who are only interested and want to be kept informed. Around sites, people may have more of a stake and want a more thorough involvement, and then there are people who are actually responsible for certain policies and implementation for safety, security, and other programs, so you need to involve local officials and State a different level.

And then, a lot of people talked

about informed consent, how do you get that, what does that mean. And then we also, and rather than saying we're going to have broad public acceptance for a lot of this, as a program manager and thinking about these things, you wonder, is tolerance enough? So that people may not accept it, and that's okay, but will they allow you to carry out your mission and your functions.

Some of the foundations for our plans, as we worked through the years of these activities, included some of the early civilian waste program engagement with states, with cooperative agreements, with western states, and the southeastern State regional groups, working directly with local officials, working with tribal officials, very important on a Government to Government basis for any federal entity.

We also looked at transportation planning and the protocols that everyone talks about, and had a chance to test those out, and

I'll talk about that in a minutes. And then, the national transportation programs that we managed, which included a national forum, that included all stakeholders, industry, states, tribes, and other interested parties, to talk about the process, the features of different shipping campaigns, and how to institutionalize some of these things through DOE orders, rules, and other mechanisms.

We also did lessons learned studies during that time on naval reactors and commercial shipments, and my colleague, Alex Thrower, may have some of those old studies that he could provide to the panel.

For the information that I understand you were interested in, Hank Jenkins-Smith addressed the panel earlier this year. We did Commission him to do a study, several studies across the three-year period. For historical context, WIPP had intended to open and ship in 1988. However, that didn't happen.

But they had also developed the series of protocols that Bob mentioned, and yet, hadn't tested those protocols. When the cesium shipment came along, we thought that was a good chance to test the protocols, scrub them down, and see how it works, so it benefitted not only WIPP, the states, tribes, and others, but we also learned about what people thought about that campaign and how to gauge trust, credibility, and what kind of information sources people used.

We did some similar surveys with the foreign research reactor spent fuel urgent relief shipment, and the foreign fuel shipment from Concord. There were some different results, and I think the Concord shipment was especially interesting.

But we found, one, knowledge equaled greater confidence. I think someone in the last panel suggested, we need to have a strong information and education campaign. We looked at that as, if people didn't understand

what we were doing, how could they even accept of believe or trust anyone?

We found State and local officials were the most trusted conveyors of information, and as one of the people in Concord put it, we know where they live. Therefore, we can trust them because they're going to do what we think they ought to do.

Interestingly enough, in both pre- and post-surveys, we found that both DOT and DOE were accorded a level of competence which is important, I think, for trust.

We spent a lot of time both with cesium and with the foreign fuel shipments and being in local communities and talking with people extensively, and thereby, not always answering things to people's satisfaction because we couldn't do everything they wanted us to do. But at least they understood that we were trying, that we kept our word, and the shipment was safe.

The media was the most frequent

source of information, even though the media always came in last as trusted, which is kind of interesting, but people do gain information from media. And, keeping commitments was really important to people.

The foreign research reactor program helped us understand that and change our messages and information, keeping the treaty commitments under the Atoms for Peace program was salient for people, and so the lesson is, keeping commitments and doing what you say you're going to do goes a long way toward mitigating some of the concerns.

So, how did we change our shipment plans? In cesium, we found because State and local officials were most trusted, instead of having, as WIPP had been doing, contractors deliver training to local officials, we worked with the States to develop a training program, provided funding to the State agencies in emergency management, to go deliver the training, and they worked with the local

officials along the way. That was a little different.

We had local media involvement. There was a full-scale exercise on the border of Idaho and Oregon, and we actually brought the media in and had a panel to not only let them talk to us, to the Federal agents, but also to the trainers about what their needs were, so that we had better understanding.

And, again, keeping commitments was very important. The other thing we did was look at communications pretty carefully. We had a transportation plan, part of that plan was how to communicate what role the states would have versus the Department of Energy.

So we segmented our responsibilities appropriately and planned for worst cases with communications issues, we jointly developed information fact sheets where safety was stressed, the kinds of factors that were going into the shipping campaign, including a lot of the protocols,

inspection, tracking.

The idea that states had the ability to stop a shipment if it wasn't up to snuff or if weather was bad, we didn't want to compromise a shipment from going off in bad weather. And that seemed to work effectively, too. Those messages and information pieces were included both in the training and in any other communications we used.

On the urgent relief shipments, the State was involved in radiological inspections for the shipments coming into Sunny Point at the Naval Weapons Station, and, again, keeping our information linked to the treaty commitments.

Concord, California was an interesting example because this is where we had a lot of very great public concern, 250 people showing up at public meetings. We actually had local officials who took the lead to manage those public meetings. Route selection was a joint effort between the

shipper, the carrier, the State and local officials, and the DOE.

And then, finally, the most interesting part, we did have a survey that was done by Hank Jenkins-Smith in Concord that the local officials requested in order to gauge whether or not people were concerned about economic development opportunities and the problems that might occur because of the shipments.

Basically, they found people weren't too concerned about that. So, what would I recommend to this panel? Update social science research. These are ten years old or more. I think it's important to understand what people's concerns are out there, and also how people are gathering information.

We didn't have Twitter and Facebook and all these other media. We need to understand how people get information, how they internalize information, how knowledge is transferred. And so, some interesting research

can be done there.

Establish institutional relationships early, early, often and continuously. Build that cadre of people who you're going to be working with who will be involved in shipping campaigns, and continue to work out issues with them. It's hard to be totally argumentative when you actually work together on solving a problem.

Provide funding for emergency training, like the Section 180(c) program. This was anticipated in the Act, I think it's really important. Third-party regulation of transportation is important for program consistency and credibility, and being consistent with the commercial world. Whatever kind of organization is set up, I think this is certainly an important feature.

Demonstrating shipment safety is important and finding that, shipments that you can actually use as test cases both to train the people doing the program as well as to go

through the protocols that you may set up around those programs. And keeping commitments and agreements.

Having set policy really helps with transportation. The three campaigns I mentioned all had decided policy, there was no confusion about what was going on and why we were making the shipments.

So, if you have a rational approach to, and a reasonable explanation for why these things are happening, you tend to have more confidence and acceptance from the public.

CHAIR SHARP: Thank you very much. We now welcome Chris Wells.

MR. WELLS: Thank you. Good afternoon. First, I'd like to thank Mr. Alex Thrower for extending this invitation to me today to present before you. And also, Mr. Frazier to put a face with a name and thank you for your tentative agreement to come and brief our committee at our next meeting in

December, now, I have that on the record, so hopefully you can't back out of that.

MR. FRAZIER: You notice I didn't say anything.

MR. WELLS: I think we've made a natural segue this afternoon. We began the presentation by hearing from all the scientific experts, if you will, the cask manufacturers, the regulators, those who really have the expertise and the knowledge that goes into the safety of this type of campaign.

We've heard from Mr. Edlow here, who has probably accomplished worldwide shipping campaigns before I was even born, transitioned to my old colleague here, Judith Holm, and so now I think I move one step further down the chain.

My relevance today is not so much in the technical aspect but in the political science aspect, which some of you may say is the reason for the delay in this program. But,

the political science aspect can be the, can be, I guess, the closer, if you will, if handled in the appropriate way.

And so I want to continue along the lines of Judith and show exactly how we conduct business and help with that endeavor.

My organization, the Southern States Energy Board, I've been working for them for about sixteen years now. We're a nonprofit interstate compact, we're represented, or, I guess, our executive board is represented by our Governors and Legislators in both the House and Senate in sixteen states and two territories, those territories being Puerto Rico and the Virgin Islands. We also have a Federal representative who is appointed by the President.

Our board has many different activities that we're involved in, whether it be carbon sequestration or clean coal recycling, different types of programs. I am involved in the Radioactive Materials

Transportation Program, and the way we conduct our business is we have three committees which deal with radioactive materials transportation.

Membership on these committees are appointed by the Governors of each State. They appoint someone from a State agency to serve on our committee. We have a Radioactive Materials Transportation Committee, that committee was charged with helping develop policies and procedures for eventual shipments to Yucca Mountain.

I had hoped that would be my retirement fund committee, but as we see, things have changed in regard to that. We have a Transuranic Waste Transportation Working Group. That committee is involved with the WIPP campaign, which you've heard different speakers allude about earlier today in terms of the protocols and plans that are in place for shipments from different sites to the WIPP plant out in New Mexico.

Lastly, we have the Foreign Research Reactor Committee, both a, an internal committee just for shipments within the State of South Carolina that come into Charleston and are destined for Savannah River, as well as a cross-country group which addresses shipments that would go from Savannah River to Idaho.

I think that last campaign is probably the one I'll speak about the most today and has most relevance to what we've been, been speaking about. I had the opportunity to give testimony to the National Academy of Sciences when they were creating their publication, "Going The Distance".

They actually invited me, as well as some of these other people who've spoken to give some lessons learned and information that we learned from the foreign fuels campaign, so there's more data out there if you wish to explore that information.

The relevance to what we're

talking about today. I think Mr. Pennington hit on it, we're looking at basically the public perception. I can easily place myself into that category as I start, I had no background or no insight into this field so I serve as a good example.

I can recall actually my first meeting in Augusta, Georgia, and meeting Mr. Edlow, here, and it was quite an informative meeting. And basically, what I learned from that process is that the way to accomplish this campaign is to work together. We had all of the, as I had mentioned before, the gubernatorial appointed professionals in place, so the State was on board.

If we could connect those with experts like Mr. Edlow, with experienced DOE program managers like Ms. Holm, with the NRC and with all of the other DOT and the other agencies involved, we could create a program that could move effortlessly.

Now, it didn't start like that,

from the beginning. We had some bumps in the road. But basically by having those experts in place and providing them with the information that they needed and going back and forth between what the states required and what's in the regulations and where we could somewhat stretch the rules to accommodate, you know, specific concerns, we were able to develop a very successful transportation program.

Basically, I had three points, or three keys, that I think were successful in us doing this. The first thing was teamwork. We did this on a regional basis, instead of having DOE go from state to state and try and reiterate the same program again and again, we brought together all of the states in our region and my counterparts as well, brought together their states.

We elected individuals who would represent radiological concerns, emergency preparedness concerns, transportation. You heard from Captain Baker on security, so we

had the teams in place.

The next approach we took was a prepared, unified message instead of, again, just having DOE or someone go into the states and they provide a certain message and maybe the locals have a different message and someone else in the media is coming across with yet another message, we all work together to, if you will, get in front of the campaign instead of working from behind and we all had one unified message to deliver to the public.

Lastly, training and resources, I think, was key. You heard Judith talk about the establishment of grants and funding in place to provide the states and locals with the resources that they need in terms of equipment, working with them in delivering the training and, again, having them incorporate it into the training so that it comes from their own.

As we know, there's probably been lots of studies done that the public is more

likely to trust the level of government closer to them than further away, so it was very important and instrumental that we had the locals to buy into and participate in the training.

We trained ad nauseam. For that foreign fuels campaign, we did tabletop exercises where we literally explored every aspect of the campaign, from when the shipment would hit the border until its destination, just going from, you know, participant A, what would be your role? If this happened, what would you do?

So, I think, again, just that level of preparedness is just another level of comfort that those agencies can experience and that they can relay to their counterparts in the public.

And so, basically, in closing, my message would be, the best way to accomplish these types of campaigns is to continue that regional, or that collaboration, if you will,

where you have all of the parties involved and they have, they have all of the training in place, they have all of the resources, so that they, the public can come to them and feel assured and feel that level of safety and any question that they may have, they could answer competently.

Thank you.

CHAIR SHARP: Thank you very much. We now welcome Mr. Jaszczak.

MR. JASZCZAK: Very well. Mr. Chairman, thank you for having the opportunity to be here. You've heard the experts all morning. And my comments are going to address where we, Nye County, were and are engaged in what this process is.

At the end of the day, we are where the rubber meets the road, and no different from where WIPP was, and WIPP successfully opened. By virtue of the provisions of the Nuclear Waste Policy Act, specifically Sections 116 and 117, and

cooperative agreements, we were fortunate enough to have resources provided that allowed the county to hire a bevy of subject matter experts to facilitate the county's participation in all facets of the Yucca Mountain program.

And, in many ways, this staff ended up being a microcosm of what was the Office of Civilian Radioactive Waste Management, and the, those provisions of the law as it currently exists, exist, which you are supposedly going to address at some point, is whether or not you make recommendations to change or not change.

Those provisions are critical to our involvement as the site county, and have to believe that whatever you do, those similar provisions have to be retained for a local government or whatever site is ultimately selected.

Because, without that, the local community, who needs to inform its citizens,

who needs to be, who need to be engaged, will not have the wherewithal to do what it is that they need to do to buy the acceptance or the information and to get to where you want to go.

Officially, Nye County is neither for nor against Yucca Mountain. The decision to site the repository at Yucca Mountain was the result of a process spelled out in the Nuclear Waste Policy Act, and over the period of yesterday and today, I offer to you that the Nuclear Waste Policy Act went a long way to doing a lot of things right, probably needs some tweaking that you should be able to make some recommendations to do, but a lot of this, has been, ground has been plowed many, many times before and we've all heard that.

When Yucca Mountain was designated as the nation's geologic disposal in July of 2002, the Nye County Board of Commissioners interpreted that action as the law of the land, and that was a pretty important step

because we felt that we were now in a position where this decision had been made by others elsewhere and we had a choice.

And we resolved to actively and constructively engage with DOE, to see to it that the safety, security of the citizens of Nye County and the environment were looked after and protected, that the money that we were provided allowed us to hire the experts to see to it that the repository would operate safely and successfully, and that whatever opportunities there were going to be available for economic development we wanted to pursue.

Ultimately, we wanted the people who were going to work at Yucca Mountain to live in Nye County and the businesses and industries associated with that to be located in proximity to Yucca Mountain to give us the opportunity to advance this.

And these are, were very, very, very large and detailed processes. And the more important part is, once that decision was

made, that we were going to have to actively and constructively engage with DOE. The, our county efforts became solution-oriented, as opposed to not why can't you do it, it's how can you do this, how do we make this work, how do we have an informed citizenry, how do we put this together and make it work, not only for us, but for Nevada and for the nation.

And I would offer to you that in the course of this period, up to the time when the political science entered into the equation, we were working very hard and I would offer to you that there are solutions out there and if ultimately that's the decision that gets made through the courts or whoever, we'll deal with that.

We'll continue to be pragmatically and actively engaged in this process until we get to where we need to go. However, one of the, obviously, the obstacles to that, and they are what they are, it was and will be virtually impossible to advance a repository

program where state and local governments are not aligned.

You've heard that many times during the full Commission, you've heard it during your subcommittee. Somehow, those stars need to align. Until they aligned in New Mexico, WIPP didn't happen and it's not going to happen anywhere else, whether its Nevada or anyplace else, until that does happen.

Our current circumstances proves that local governments cannot go it alone. You just can't do it by yourself, and I can give you examples of how it is well-intentioned, I would offer to you that our DOE friends work real hard, but because of the reality of the circumstances, routinely ended up with suboptimal decisions because of political expediency and path of least resistance, it's the way they had to do things to get their jobs done. No fault of theirs, just the work, the political science again.

So, state government, we can't go

it alone. And as long as state government can ignore federal government's siting decision, you're going to have these problems wherever you would site this.

As to the specific points of the subcommittee's question of the acceptability of risk at current storage sites, you heard the experts. Depending on which ones you want to listen to, but we looked at all of them and paid attention. The risks seemed to be acceptable in the near-term. They just do.

This view is consistent with that of the NRC, and you've heard them, the risks of storage could be further reduced if storage facilities were developed in more remote location, and that's pretty simple. I mean, when you take a look at the totality of isolation and being able to put things out of sight, out of mind, that are difficult for people to get to, you're going to increase the safety of that process.

And for those of you that are

intimately familiar with the Yucca Mountain project, you're well aware there was an aging pad associated with that. We felt that was kind of remote, they've already demonstrated that you can do dry cask storage almost any place you want it to be, and if you can do that there, we can do it there and obviously the PFS was the same sort of thing, so.

That was, that was just a matter of accepting the reality of the circumstances that currently exist. Our conclusions as to the acceptability of risk related to transportation aligned with the National Academy of Sciences report "Going The Distance," their conclusion that there were, quote, "no fundamental technical barriers to the safe transport of nuclear fuel."

The impacts to local traffic in the vicinity of either a storage facility or a repository, especially the provision of road and rail infrastructure improvements and emergency response associated with being the

terminus of all shipments, during construction and operations must be addressed in the integration of transportation program with a storage facility or a repository.

Consolidated storage could benefit the decommissioning of sites with shut down reactors and stranded fuel, we recognize that as a reality. The NRC just stated it's going to look at those issues that could be reasonably associated with on-site storage for the next hundred years or more.

While we suspect that on-site storage for longer durations is doable, we believe it best to do consolidated storage at only a few locations that will possess fuel handing capabilities for the same duration, and that's only sound, common sense which is what we think we've tried to approach this whole issue from the get-go.

And based on the delays that have occurred to the current repository program and the likelihood that a geologic repository is

still a long way off, as a nation and you as a Commission, probably ought to at least commit to a consolidation of the stranded fuels so you can move, solve at least part of the problem, move the process forward somewhere, somehow, some way.

We can do this stuff, we're Americans. And in the same vein, future decommissioning of nuclear power plants, and this probably applies to the NRC in recommendations that you might want to make to them, should provide for movement or the consolidation to a location that will retain the ability to handle monitoring and maintenance of spent fuel until it can move to a geologic repository.

I.E., you need to have some partial solutions. Let's make the problem smaller, let's not make them bigger as you move forward. Thank you very much.

CHAIR SHARP: Thank you very much, we appreciate all of your testimony. Let me

open it up to -- oh, I'm sorry, we, Ken Sorenson is here.

MR. FRAZIER: We were able to locate him fleeing the building.

MR. SORENSON: Yes. Thank, thank you, Mr. Chairman, and I apologize for the technical glitch. I thank you for your patience and thank you for the invitation to present today.

And I also want to thank my new best friend over here, that was able to reconvert the PowerPoint presentation to the one that would work on the machine. So, thank you for that.

I want to, in my presentation, I'm going to talk about safety and security risk assessments and assessments for transportation storage of spent nuclear fuel. I think this is an important time to look at the body of knowledge that has been accrued over the past thirty-five years.

We've heard a lot about the

operational body of knowledge. I want to talk about the assessment in experimental body of knowledge that has gone on over the past thirty-five years to assess these, these different types of risks.

So, in that context, the way my talk is formatted, I'll talk about some history that's gone over the past thirty-five years, and based on that history, what are some very general observations that we can make.

And then, given those observations, how can we apply this, this body of knowledge to moving forward in storage and transportation?

So, beginning with the history. Since the seventies, a substantial analytic and experimental work has been conducted to assess the adequacy of storage and transportation, the regulations, to protect the public and the environment from radiological material release that may stem

either from an accident or a terrorist event.

And you can categorize these into two broad categories, one safety, one security. They really are two different animals you have to look at but there is of course a lot of overlap in there.

And so, when we talk about safety and security, sometimes we talk about them together, though we have to understand that they really are distinct, different types of assessments that we do.

So, from the safety standpoint, the way I chose to kind of look at the evolution of looking at this is three NRC documents that have come out looking at the safety risk assessments for transportation. There's been a lot of work other than that, but this, this gives some, some big points throughout history of what, what's been done in this area.

The first one is NUREG-0170, which is the transportation EIS, was published in

1977. It looked at transportation risk for more than 20 different types of radioactive materials by all modes of transport, road, sea, and air. Spent fuel, of course, was one of those materials that was looked at.

And it came up with a set of risk values that were estimated. These were in the days when we did not have much computer power, we didn't know how to have a whole lot of testing, so there was lots of assumptions that went into these analyses.

And, every time you make a assumption on the conservative path to do these, or the path to do these analyses, you tend to make it conservative, and so, at the end of the day, the results tend to be conservative. So you feel that you've bound the risks, based on your analytical approach and the assumptions made in those analyses.

1987, another report was issued, NUREG/CR-4829, it's called the modal study, which looked at, again, transportation

assessments. They didn't actually do population risk but they were able to incorporate the evolving computer capability that was coming on board and finite element analyses, these sorts of things.

They actually developed event trees that assigned probability to different types of accidents and those sorts of things. So, it was a very useful document in, in the evolution of the capability to do these analytic risk assessments.

The third document is NUREG-6672. It reexamined spent fuel shipment risk assessments, and this looks specifically at spent fuel shipments. And it, I will say, it kind of completes the story in terms of using really high end computer capabilities, parallel processing, these sorts of things, so we're able to look at very discrete sorts of responses to the casks from mechanical and thermal loading conditions and having a pretty good feel for how the response of the cask

would be under certain accident conditions.

It's important to note as well that during these times, testing has been going on, and so we do develop data and use that data to benchmark the codes that are being used.

A lot of the focus is on the regulatory thresholds, the hypothetical accident conditions, is how do the casks respond to these hypothetical accident conditions. But as we've gone through these decades of assessing the risks, lots of questions come up in public fora and things like that in terms of, well, what if?

What if we had a, a train run into a truck cask that was high-centered over a railroad crossing? What if, during the earthquake in California, an upper level of roadway collapsed down on the lower level and just happened to be a transportation cask that was underneath there, what would happen?

What would happen in the Howard

Street Tunnel Fire if there had been a nuclear consys as part of that train? What would have happened to the cask and its contents?

And we've done lots, lots of those types of analyses, and by and large, what we find is that the loadings developed by those what we'd call severe actions are bounded by the regulations. And, so, the regulations, as we go through this evolution of better analysis capability, more data, better databases and things like that, what we do find is that the estimated transportation risks for safety really have come down on that basis.

And this is an analytical estimated transportation risk, it's not necessarily, it's not perceived risk, and it's something that we have to deal with as well, but these are the really accepted transportation risk analyses methods that are used in the industry.

So, through this evolutionary work

that's been done, and part of NRC's charter is to continue to look at the regulations, and determine their adequacy with real time conditions, be it different types of shipments, different types of materials, different types of threats, and these sorts of things.

And as these three documents have come out and evolved, in each case, the transportation risks have shown to be reduced and it validates the adequacy of the regulations.

And this just shows, pictorially, a little histogram, the change from NUREG-0170 in 1977 to 6672 in the year 2000. These are looking at accident risks, hypothetical accident risks. For rail, the risk has been reduced two orders of magnitude, and for truck shipments, it's been reduced three orders of magnitude.

So, let's talk a little bit about security. In 0170, way back in 1977, it was

recognized that security is an issue that needed to be addressed. It was not addressed in that EIS. And, furthermore, it was also recognized that there was not an assessment of risks in fairly, a, highly densely--well--high density, thank you. High density populated areas. Okay. Like, downtown New York, for example. Manhattan.

And so, after 0170, the NRC commissioned several studies, both internal and at Sandia National Laboratories to look at some postulated consequences due to some malevolent attacks. What came out of these analyses, again, it's not unlike the safety assessments in the early days, doing these analyses, consequence analyses.

There were a lot of conservatisms that were added in because we just did not have the data, and so we were trying to bound what we thought would be the risks associated with these sort of attacks, and there was a lot of variability in the results.

And it was hard to really understand what the true consequence was. Because of this, both the NRC and the DOE conducted studies, supported studies, actual experimental work, on different types of malevolent attacks on casks to see what the characteristics were of the cask to be able to withstand those sorts of attacks, what were the, in a gross sense, what were the dispersal characteristics of the fuel itself, and those sorts of things.

And that data has been used in subsequent analyses to try to better refine and reduce uncertainties in looking at the consequences from terrorist sorts of attacks on these sorts of shipments, has been used, as we talked about earlier this morning, on the Yucca Mountain EIS and supplemental EIS.

And, of course, after 9/11, the NRC instituted a very comprehensive analysis effort to look at what would happen for some very specific terrorist attacks on different

types of assets and transportation modes, and those sorts of things. This is, again, after the 6672, the safety analysis and those sorts of things.

It was analytical in nature only, and to a large extent there are a few exceptions, we did not look at any, any testing just because of budget and schedule and those sorts of things, but the analysis effort really was quite intense.

And looked at a broad range of different types of terrorist attacks, and also on different types of transportation cask designs as well as storage casks designs.

And I'll speed up a little bit here, but one of the issues that we deal with is being able to properly benchmark our analyses, do some real data, so we have a comfort that the responses that we're seeing in the analysis really do simulate reality.

And I will say, from the security standpoint, this was an area, still is an

area, where we are data-sparse, as composed to the safety testing area, where we really have quite a bit of data. From the security side, particularly dispersal characteristics and this sort of thing from the spent fuel, we don't have a lot of data.

And I think that's still an area that needs some work. Because we heard some of the divergence of opinions this morning in terms of what were the consequences from these sorts of events, and one of the reasons there is this divergence of opinion is because of the lack of data in certain areas.

But, I think most of you are familiar with the F4 crash into that meter thick concrete wall there at Sandia. We also, that provides some time versus distance deflection data that we can use for impulse calculations.

Also, analytically, looking at an aircraft impact into a rigid, flat surface, and then we compare those results to some

reference data, shown there on the right, the Riera model, it's called. And we come up really pretty close to what the reference data is.

And at that point, we have a degree of confidence that the modeling that's being used, the analysis that's being used, is pretty accurate and so then we can extend that modeling and analysis to real life problems.

So, the observations. The amount of work that's been done in the area of spent fuel storage and transportation, safety and security assessments really is substantial. There's been a lot over the past thirty-five years.

And based on that, I will say that transportation of spent nuclear fuel is safe. That doesn't mean it's risk free, but in my opinion, it is safe. And this is where safety maps over into the security realm somewhat.

The robust nature of the spent fuel cask, from the design, from the part 71

loading criteria for safety, and part 72 for storage, really acts to mitigate potential consequences that come from sabotage types of events, terrorist events.

And then I, the third point there is the lack of openness with security assessments can inhibit public acceptance of spent fuel transportation and storage. And, it is what it is.

I understand why we have to have this sort of level of secrecy with this information, but it does inhibit the public confidence I think in -- when we talk about sabotage issues with storage and transportation, we say "trust us, we've looked at that" and we have.

I particularly liked the presentation from Captain Baker this morning. I think engaging emergency first responders, emergency personnel, people like that, and getting them better informed in these specific issues, helps a lot with the public because

the public I think tends to trust those people.

This last paragraph is just a bit of a non-sequitur, but I want to emphasize that there's been a lot of work internationally as well, in this area, so we have a fair number of collaborative efforts with our international colleagues to move, particularly in later years, the security issues forward.

So, finally, with the conclusions, I just want to emphasize there's been a lot of work done in the past thirty-five years. I think it points to safety under a current operational scheme.

There's a regulatory process by which we look at new data as it comes along, and we impute that into the regulations as that comes along, as necessary, given the analysis that's been done and the experimental work that's been done and looking at the cost-benefit of making those enhancements for

transportation and storage. Thank you.

CHAIR SHARP: Thank you very much. Let me turn to my colleagues and see if that's a question? Any questions? No questions? Well, this panel may escape without further questions, you're all so effective in making your presentation on this important subject, and we certainly want to thank you very much.

And, obviously, this is an ongoing issue, these are ongoing issues in the Commission, and we'll probably be calling on some of you individually as well as your data and information going forward.

But, thank you very much for your time and attention and your effort to get here, in several of your instances. We appreciate that very much. Thank you.

And now, we are ready for our public comment period under our rules, in which we have two individuals who have signed up and each of whom will be given five minutes to come up to the--we sort of caught our panel

off-guard.

MR. FRAZIER: You can either sit there if you'd like, or you can take your seat in the audience.

CHAIR SHARP: When are we going to leave?

MR. FRAZIER: No, you can't leave. No, no, you can leave there, you just can't leave leave. No, it's up to you. It looks like your friends are leaving you.

CHAIR SHARP: We're finished, we appreciate it. Your obligation from our point of view is complete. Thank you very much.

Let me turn now, the first is Pierre Oneid?

Yes, five minutes. You can go up to the, probably there is the best thing.

MR. ONEID: Mr. Chairman and honorable members. First, I appreciate this opportunity. My name is Pierre Oneid, I'm the Chief Nuclear Officer for Holtec International. Our firm basically serves 44

out of the 104 operating units. To my knowledge, there's 94 units that have chosen a system, so essentially, we serve 50% of the market.

I'd like to, just to be absolutely clear, my understanding of your mission, because what I'd love to do is suggest for your consideration the answer to that question. And my understanding is, should the U.S. change the way in which it's storing used nuclear fuel and high level waste, while one or more final disposal locations are established?

And, if I may, the solution can really be said in less than thirty seconds, but certainly implementation of that solution is a little bit harder than that, and here it is.

First, it's the two things are location and technology. Location, let's take them off these sites and put them in a central interim storage, and then move them, such as

PFS, and then move them to a permanent repository such as Yucca. That's the location.

Technology, would love to recommend to you an underground technology that has been developed and has been licensed by the NRC. That's really the solution, I'd like to have a couple of more moments to elaborate a little bit.

In terms of the, in terms of the location, the, again, there has been, it's, maybe as an industry, and as a member of the public, we need to just take a look internally and say enough is enough. The idea of having a commitment not to move the fuel that was busted in 1998, busted again in 2010, and then we talk about 2022, and now, really, it is in limbo, and we have no idea when.

The location, there is a place such as PFS, that was licensed, and to the best of my information, it came in within I would say a hairline from spending the dollars and cents to make it effective, which is about

150 to 200 million dollars. And that project would have been started.

And the thing that nixed it, with all due respect, politics. The -- so from an interim storage, that's how close we came, and it was fully licensed by the NRC. I appreciate very much the two members, Mrs. Bailey and Mr. Mark, that you mentioned dollars and cents.

You know, it seems like the idea of, the notion of dollars and cents is often forgotten. The dollars that are flowing into the -- we, the taxpayers, are essentially paying for that mess, as you all know, as every utility sues the DOE, DOE turns and reimburses. At some point, that's the frustration, if you will, is why not find a solution.

So, again, the location, I just mentioned PFS, and then from a permanent repository, I understand most of you have went to CGS. From a permanent repository, I think it is the right thing to do to move them off

those sites, and yes, Holtec serves CGS, so I've been to that site many times.

And you would agree with me that as you're driving to that site, or, frankly, any nuclear site, the first thing typically you'd see is the hyperbolic tower, from miles away. And as we got closer, we see the dome for the reactor building. But that wasn't the case, was it, when you drove? You almost couldn't miss those over thirty casks, from far, far away.

And that's what's going to happen in 67 and more, about 70-some sites in this country. Again, the point on location from a recommendation is to look on moving them off those sites, and having a path. You could have a central, interim storage within few years, and then, in terms of maybe five or ten years, there ought to be a path to take them and put them in a repository, permanent repository.

And also, on the technology piece, I'd like to just show you something that's

been implemented, I hope you can see it from there, but I, but I will stick around if you don't mind, I'd love to see you after this. Got few more photos.

This is an underground, implemented storage at Humboldt Bay. At Humboldt Bay. Very robust, and is, and safe, safer, and less dose. And also, accessible and one of the NRC commissioners just recently mentioned, out of the seven things that he had done since he's been on the Commission, he highlighted his visit to Humboldt Bay and the underground storage.

So, I would urge every member of you to make that visit. You could have made it just when you were at CGS there, I made that a lot. So, bottom line, I, two more recommendations--

CHAIR SHARP: If you could--

MR. ONEID: Is one, is you would invite the cask vendors, there's only three, there's Holtec, there's TN, and NAC. If you

would invite their CEOs and better yet, their scientists, the folks that design those units, and I think you would gain a lot of insight because that is what Dr. Singh for instance, he happens to be the CEO and the scientist, that's what he did for the underground storage after 9/11. That's what spurred our company to start that R&D on that.

And the second, so, again, I would urge you to get just those three folks in a room and pick their brain. And the second thing is, we're proud of our facility in Pittsburgh where we manufacture 50% of the service in the country. It's in Turtle Creek, the old Westinghouse facility. We'd love for each of you, we'll again, stand by afterwards, would love to hand you my card, and come and visit, and find out about the anatomy of those systems. Thank you very much for your time.

CHAIR SHARP: Thank you very much, Mr. Oneid. We now welcome Irene Navis.

MS. NAVIS: Good afternoon, Mr.

Chairman, committee members, subcommittee members.

My name is Irene Navis, I am the manager of Clark County's Nuclear Waste Oversight Program, and seven weeks ago I was also appointed to be Clark County's Emergency Manager. So I am now the director of the office of Emergency Management Homeland Security for Clark County.

I am going to talk to you from both perspectives this afternoon. I listened to the presentations carefully this morning, when we were talking about risk and vulnerabilities and emerging trends, and one of the emerging trends that we're seeing in the emergency management arena is the risks associated with not just physical security but also communications and IT infrastructure that relate to potential cyberterrorism.

And, as you know, transportation systems today are heavily reliant on robust computer systems that must remain secure. So,

we want to make sure that when we're looking at security, we also address that arena as well. It's an emerging trend in safety issues and security issues, and we want to make sure that we pay attention to it.

Also, you heard about the Nuclear Waste Policy Act, Section 180(c), which related to training and technical assistance for first responders. In our experience, in reviewing those policies and reviewing the process and being somewhat involved, we're not sure that what the outcome was with 180(c) was actually adequate to address the concerns of the first responder community.

And we would urge you to take a look at that policy and consider inclusion in enabling legislation to make Section 180(c) of the Nuclear Waste Policy Act more robust in its next iteration.

I would also urge you to look at better linkages and coordination in programming regulations and funding between

DOE and DHS and between NRC and DHS. We think there are some gaps there that need to be addressed.

Also, point you to a number of GAO reports that have been done over the years on nuclear safety and security that I think would be very informative to your committee if you don't already have them.

There are also a number of county reports funded through the oversight funds that we've received over the years that I believe could and should be replicated in other jurisdictions.

We have a report on critical infrastructure identification that relates to risks and vulnerabilities related to nuclear waste transport. We have a rail vulnerability assessment that we'd be happy to share, and we have two commodity-flow studies that look at all hazards, hazardous materials, in, out, and through Clark County that could be useful in other communities as well, as far as a model

for what to study.

We also have a public safety impact assessment that is a gap analysis in police, fire, and emergency management costs. We also have a state laws report for nuclear waste transportation that looks at fees, inspections, placarding, and notification that may be useful to the committee.

We have a number of community surveys, you've heard about surveys in public perception.

We have a number of those that look at trust issues, impacts related to property values and tourism, and those property values and tourism impacts were actually addressed in DOE's final environmental impact study as it relates to stigma. Impacts, those studies were, really offshoots of the work done by Hank Jenkins-Smith that you heard about earlier today as well.

We also have a Community

Indicators Monitoring Program that looks at public safety indicators over a period of time, as well as economic and other indicators that come together to show a picture of what public, not only public perception, but actual data show with respect to community impact.

So, I offer all that to the committee for your use, you can work with your staff on providing that information, should you find it valuable. Thank you.

CHAIR SHARP: Thank you very much, Ms. Navis. We appreciate your coming today. Any other comments from the commissioners would be entertained at this point. If not, we will close out our business for now and we appreciate the imperative of these issues, and we are, of course, just remind anyone listening or watching that we welcome further information which can be mailed to us or emailed through the website. Thank you.

(Whereupon, the proceedings went off the record at 12:06 p.m.)