COMMONWEALTH OF PENNSYLVANIA
HOUSE OF REPRESENTATIVES

HOUSE ENVIRONMENTAL RESOURCES & ENERGY COMMITTEE HEARING

STATE CAPITOL
60 EAST WING
HARRISBURG, PENNSYLVANIA

MONDAY, APRIL 29, 2019

IN RE: NUCLEAR WASTE

BEFORE:

HONORABLE DARYL METCALFE, MAJORITY CHAIRMAN
HONORABLE GREG VITALI, MINORITY CHAIRMAN
HONORABLE CRIS DUSH
HONORABLE JONATHAN FRITZ
HONORABLE R. LEE JAMES
HONORABLE RYAN MACKENZIE
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I N D E X
TESTIFIERS

P R O C E E D I N G S

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MAJORITY CHAIRMAN METCALFE: This meeting, this public hearing of the Environmental Resources and Energy Committee, is called to order.

Before we take the roll, if everybody could please rise.

Representative Zimmerman, would you lead us in the pledge, please?

(Pledge of Allegiance)

MAJORITY CHAIRMAN METCALFE: Thank you, Representative Zimmerman.

Representative Dush, could you call the attendance, please?

(Roll call)

MAJORITY CHAIRMAN METCALFE: Thank you, Representative Dush.

This morning's public hearing is in regards to nuclear waste. We have a number of testifiers that we appreciate joining us today to discuss the issue and provide us with input on the issue and testimony on that issue.

If I could ask our first panel to join us at the table in the front there where the microphones are.

All right. Good morning.

We have Mr. Rodney McCullum, Senior Director of

Fuel and Decommissioning, Nuclear Energy Institute; we have Mr. Tom Chiomento, Director, State Government Affairs, Exelon Corporation; Mr. Doug Brown, Manager, Nuclear Fuel and Analysis, FirstEnergy Solutions; and Mr. Jeffrey Hirt, Engineering Manager from Talen Energy.

Thank you, gentlemen, for being with us.

Whoever is taking the lead can go ahead and begin when ready.

MR. RODNEY McCULLUM: That would be me.

Thank you, Chairman Metcalfe, for this opportunity to come and speak with you folks today about what we call used nuclear fuel, also known as nuclear waste.

I think anybody that's looking at decisions about the future of nuclear energy in their state, this is an issue --

MAJORITY CHAIRMAN METCALFE: If you could just pull the microphone a little closer and make sure the green light is on.

MR. RODNEY McCULLUM: Can everybody in the back hear me? I was just simply thanking the Chairman and the Committee for your attention to this issue particularly.

This is an issue that, if you're facing decisions about the future of nuclear energy in your state, you want to be as knowledgeable as possible. And hopefully I can help to an extent there.

I have 35 years of experience in the nuclear industry and the last 20 with the Nuclear Energy Institute. I've worked at three commercial nuclear plants and the Department of Energy. So I would be happy -- I'm going to provide you some pictures and drawings and facts about used nuclear fuel and I would be happy to answer any of your questions as well.

Starting out with the relationship between used nuclear fuel and clean air and carbon-free energy, nuclear energy provides over half of the nation's carbon-free energy. It provides over 90 percent of Pennsylvania's carbon-free energy. Nuclear fuel is intrinsic to this.

The reason that we don't discharge everything is our only waste product is the radioactive byproduct from splitting atoms. Those atoms remain in the fuel. They stay there and we store them safely. That actually is a big advantage of nuclear energy, nothing goes out of stack. We keep the waste products, and the waste products are easily managed.

Now, you see off to the right of that figure -- and you do have hard copies if you don't want to crane your necks. We're on Slide 2 after the title being 1. You know, the social cost of carbon -- this is the health and infrastructure impact -- putting carbon in the atmosphere causes bodies such as the Pennsylvania State Legislature,

other Legislatures, to spend the taxpayers' money to do things because of what carbon does.

I know I come to you today from Annapolis, Maryland, which is, you know, on the Chesapeake Bay. I go jogging along the city dock often in the morning. And I used to rarely see but now see about 30 to 40 times a year is we have what's called nuance floods.

Some tides are higher than others and with the rising bay, we have about 30 or 40 times a year -- it used to be three or four times a year -- where the tidal water backs up through the storm sewers and we end up with -- I'll see some poor person who left their car parked there overnight and now he's going to have an insurance claim when he finds that car.

I don't know if that's counted in the social cost of carbon. But make no mistake about it, without carbon-free, non-emitting sources of energy, taxpayers are going to be spending money that they would not otherwise spend. And again, that's because of this issue you're here to talk about today. All of the byproducts of nuclear energy stay in the fuel.

So if you look at the hard copies -- going to the next slide -- the nuclear industry had its best year ever in 2018 even though we had only 98 plants. We once had as many as 104 plants. We generated a record amount of electricity.

We've done that because, you know, we've gotten good at managing outages so the plants don't have to be down as much. We increased the power of several of the reactors and we manage the fuel better.

We've gone to a world of zero effects where we make sure the fuel stays in pristine condition throughout operator lifetime. That makes it better as nuclear waste, too. And it keeps the reactors online and less problems in their coolant.

So, you know, again we discharge -- and we discharge probably less than 2,000. That's a round number we've been using a long time. It sounds like a lot. I'll have some factoids later in the presentation.

Uranium is at the far end of the periodic table so it's actually very heavy. So that's really not a lot of material. And because we are getting more out of the fuel, that's one of the reasons we're generating more power with the same reactors. We're actually discharging a little bit less.

In fact, we had to recently adjust our numbers for Pennsylvania downward, not because we got rid of used fuel but because we were making the same assumptions year after year and those assumptions aren't true. We're getting more energy out of the fuel so we're producing less nuclear waste. But still around 2,000 is pretty good.

For those of you not familiar with nuclear reactors, there's two types. They're easy to identify by their titles, boiling water and pressurized water reactors. Throughout most of my career -- I'm more a fan of boiling water reactors but I won't get into my personal engineering preferences there.

The difference is quite simple, as the names would imply. The boiling water reactor would produce the steam right in the reactor. It boils in the reactor. And the pressurized water reactor would keep the water under pressure and produce the steam in the steam generator. So it's again differences only engineers could love.

Here's what used fuel is again -- and I think it's important to note a lot of folks will tell you scary things about how much radioactivity is in a given used fuel assembly or a given container of used fuel assemblies. It's important to remember what form it is in. These are solid ceramic pellets, fingernail-sized pellets, stacked in 14-foot-long rods. Each assembly, which is a matrix of, you know, 14 by 14, 17 by 17 rods is, you know, between 5 and 8 inches square.

You know, BWR assemblies are smaller than PWR assemblies and there's more of them in the reactor. You get about the same amount of power for the same amount of fuel. It's just the way the assemblies are manufactured.

There is an error on this slide. I still have 104 reactors. That's a reminder that I need to update my fundamental slides as well as we need to stop shutting down reactors.

Here's some more specifics. And this goes into a little more detail. Those are the ceramic pellets inside the stainless steel tubes. We keep those in pristine condition. If we ever do identify a fuel assembly with a defect in it, we put it in -- we take it out of the reactor and put it in what's called a damaged fuel can so you have another layer of containment.

Again, there are few gaseous molecules in the tiny gap between the pellets and the cladding. But the vast majority, well over 90 percent, of all the radioactive molecules in that fuel stay in the ceramic and they have no way out. They have no way to be mobile. And we put extra layers of containment around them nevertheless. You'll see more about that.

But, you know, 17,000 cubic feet of natural gas, 149 barrels of oil, and a ton of coal out of a thumbnail-sized piece of used fuel. So, yes, it becomes nuclear waste and we have to take care of it. But I think that's, you know, over 90 percent of Pennsylvania is carbon-free energy. That's a fair trade to have. And I'll tell you a little bit more about what is in Pennsylvania and

how we store it.

So the point here is that a used fuel assembly, which you see on the right, and a new fuel assembly, which you see on the left, there's not much difference between them. We keep it that way because, again, the zero defects mentality helps us more effectively operate the reactors, get more power out, provide more power for the fuel.

And then, of course, you have something that's very robust and sound when it becomes nuclear waste. You know, the only difference is that you've split some uranium atoms in the middle, some uranium atoms have absorbed neutrons and become things like plutonium and americium and curium, and, again, stuff that only engineers care about.

But all of this radioactivity -- and, yes, it's long-lived -- stays in the fuel assembly. And the fuel assembly doesn't look discernibly different. So it goes from the reactor into what we call a spent fuel pool.

You have 20 feet of water above the fuel. That's all you need to block the radiation is the 20 feet of water. You can see people working on the refueling bridge. The fuel initially -- because most of radionuclides that are radioactive molecules that are in that fuel are, you know, very short-lived, they decay away fast.

The fuel -- and those also from radiation decay produces heat, so the fuel becomes less thermally hot quite

quickly so after only a couple years, it doesn't really need to be in a pool. It can go into what we call a dry cask. And you see a dry cast there, Independent Spent Fuel Storage Installations, or ISFSIs, one of those acronyms that you just love to say. That's transported in the cask out to the ISFSI. Those things go at 2 miles an hour but our safety conscience is we never run them flat out.

You can see the gentleman behind there looks like he's kind of annoyed because that cask is moving too slow. But, you know, we have a lot of eyes on that, a lot of focus on the safety even though there really is no potential for a release. There's no event involved in a dry cask that can cause an offsite radiological consequence. There's just no energy to drive any radionuclides out of that solid ceramic.

So here we have, you know, more detail. There's 20 feet of water, the pools, they're lined. There's no drains. There's anti-siphon protection. There's all kinds of redundant measures.

The interesting thing about the Fukushima accident in Japan, there were seven spent fuel pools on that site. They were subjected to the fifth worst earthquake in the history of the world, the fifth worst tsunami in the history of the world. And because that wasn't enough, we blew up three of the buildings in which those pools existed. And that was all very tragic but no fuel in the pools was

damaged because of that. No radiation was released from those pools.

Now, there are a lot of people -- because we didn't know they were amidst the rubble of those buildings, there was a lot of angst over those fuel pools. So we put even more measures in there to track and add water. We call it flex equipment. If you've been briefed on nuclear -- all your plants here have even more equipment, so if something that we didn't even anticipate happens, we can keep the pools under water.

And there's analysis that shows that, you know, a fully drained pool, a few months after the fuel has been out of the water, you would be fine because you're ready to go into dry storage, which the air cooled.

The dry storage casks are separately regulated. There's a whole Part 50 (unintelligible) of our Part 50, the Federal regulation regulates the reactors; 10(c) of our Part 72 regulates the cask.

You're going to hear some folks from the NRC so I won't steal their thunder. A lot of regulatory attention. Every ISFSI pad has to be licensed and inspected by the NRC. Every cask has to have a license. And even small -- and, you know, we've got three vendors that manufacture. It's a very competitive industry, which is good for us. It's like Ford, GM, and Chrysler, except we have Holtec, TN Americas,

and NAC International making casks. They're always innovating. And that's keeping NRC busy because every -- even small design changes require regulatory review, even though these are very simple casks. There are no moving parts. But we take it that seriously and we take care of these materials for the long term.

Here's the used nuclear fuel in the United States. As you can see, we have about 80,000 metric tons out there. About half of it is going into dry storage in 72 sites. So while I showed you earlier that all this inventory would fit on a single football field 10 yards deep, we don't have it on a single football field.

You see a couple blue stars on the map down there in Texas and New Mexico. Those are a couple interim storage sites I'll talk about a little later that are seeking licenses. These casks are dual-purpose systems. They can be transported.

We have a long-term commitment to ISFSIs. They can be -- we're extending licenses to 60 years and the Nuclear Regulatory Commission has determined in the continued storage rulemaking that they would be safe for at least 100 years with no repackaging.

Zooming in on Pennsylvania there, there's your situation. TMI does not have the dry cask. It was designed for two reactors and only had one reactor for most of its

time. And, you know, you have licenses extended at three of those independent spent fuel storage installations to 2057. And you would have -- if they were still there in 2057, you'd have an option to extend it again.

It's the industry's sincere hope that that fuel moves to either interim storage or Yucca Mountain. So, you know, Pennsylvania, you're a little bit less invested in dry storage than the rest of the country but your plants continue to operate. Certainly if Three Mile Island shuts down, they would, at some point, move the fuel into dry cask but, you know, there's no space constraints in the pool there.

Again, there's another picture of the used fuel pool. The people working above the pool protected by the water, they're wearing only life-protective clothing, which you'd wear in that part of the nuclear plant. Again, nuclear waste that you can actually look down and see it and not that far below you.

These dry casks actually come in three flavors -- I mentioned we have three highly competitive vendors -- the vertical cask and the horizontal cask. All three of the vendors make the vertical cask. You have some of each in the State. Peach Bottom you have the vertical systems, which those are not the ones at Peach Bottom. Those are welded stainless steel canisters with inside concrete,

silos. You have the integral all-steel canisters at Peach Bottom but they are vertical. And then you have the horizontal storage modules made by TN Americas at three of your sites.

As I mentioned, these are all modular systems. You know, it's a bunch of different components. You have the inner canister, stainless steel canister. Unless it's -- and I'll show you a schematic of the interval steel ones. But you have an inner stainless steel canister that's welded shut to very high specifications. You have a transfer cask, a storage cask, and a transportation cask.

So whether I'm storing it or moving it out of the reactor and onto the pad or putting it on a rail car -- these are all designed to go on rail cars -- and shipping it to Texas or New Mexico or Nevada, I'm using the same system. I'm just taking the same stainless steel canister and putting it in a different overpack. So it's a very smartly designed modular system.

There's what the internal looks like. Again, these are passive systems. No moving parts. It's filled with inert gas helium so it's both very simple and very intricate at the same time. This is it. You just put the fuel assemblies in those grid slots there.

A lot of very sophisticated science goes into the materials for the structure of the materials, the

neutron-absorbing capacity of the materials, the heat-transfer capabilities of the materials. Some of the newer -- and then the three competing vendors are always trying to build a better mousetrap here. So again, that's good for the industry. That's good for the country.

I mean, I got a coaster, a drink coaster, made out of something called Metamic that Holtec makes and, you know, it's stainless steel. It's unique for this purpose. It is noted for its neutron-absorbing, heat-transfer capabilities. I use that more than any other coaster because it transfers heat so well it keeps my drinks cold. You know, I pour an icy drink and the coaster gets cold to the touch. So there's a lot of sophisticated material science but at the end of the day these are simple.

Here is the canister being -- we put it down in the spent fuel pool. You can see on the right here a fuel assembly being loaded into the canister. You will never see a used fuel assembly outside of water or not surrounded by a lot of concrete and steel, in which case you won't see it because it's surrounded by concrete and steel.

Then after we get it out of the pool, we weld the lid. Then you can see -- I told you it was a modular system. You can see on the top there, that's the transfer cask. Again, you have to have shielding at every point. That's a steel shielding.

And it's now being lowered into the storage cask. And this is the schematic of what that looks like. It's a very simple operation. You have single failure-proof cranes here. You have it analyzed for what happens if an earthquake occurs during this iteration.

You're basically talking about a full-scale nuclear operation for something that is very simple.

So there it is on its way out to the storage pad in a very slow-moving transporter. You can see a couple different designs there. These are a couple standalone ISFSIs. Once you get the fuel to the pads, it doesn't impact the decommissioning of the plants. Both of these sites -- the only thing that does is the ISFSI, Independent Spent Fuel Storage Installation.

The entire reactor building and all the other buildings have been taken down. These simply await transport to one of the sites I mentioned earlier. They're ready to go. And there's certainly an organization that monitors them. You know, there's seven sites that are in this status where all there is is dry casks. All the buildings are gone. All the other radioactive material has been disposed of as low-level waste. And we've never seen anything on any of these systems.

Again, they are licensed for your cask here in Pennsylvania until 2057 and NRC has done work to indicate

they can be stored longer but that's not what this industry has in mind.

So here you can see a schematic of Holtec and the NAC. You see some of the sophistication that goes into the material design of these casks. And this one here on the right, those are the ones you have at Peach Bottom, the TN-68s.

As you can see, that's a bolted system as opposed to a welded system, but it's also integral. It doesn't need an overpack. The only thing I need to do to transport the TN-68 is to turn it on its side -- it's structurally analyzed to do that -- and put impact limiters on it so it absorbs the impact there.

Although I'll show you something in a little bit that indicates even without extra packaging, these things are pretty resilient.

Here we have one of the horizontal systems. It's the same thing. It's modular. It's in its transfer cask at this point. That is another slow-moving conveyance. I think in a race it would be a dead heat with the vertical crawler. We're talking two miles an hour here.

And there you can see they simply take the transfer cask right up to the horizontal storage module. That's a little difference in the vertical situation where we're moving the horizontal storage module. We put those in

in a plant or some other facility near the plant. And in this case, we move it out to the yard in the transfer cask. The horizontal storage modules are already built and waiting for it in most of these cases.

They actually have concrete plants locally that make the silos. There you can see what that looks like on the inside, going into the inner canister sliding out of its transfer cask. Again, they're both simple but very rigorously and robustly designed at the same time.

And there it's all buttoned up and folks are wondering what to do next.

A little more detail on the internals here. As you can see -- you saw a picture of one of those baskets. And here's some of the design. You're worried about heat transfer, you're worried about radiation shielding, neutron absorption, you're worried about structure. All of that goes into the design, even though it will do nothing but sit there until it's ready to be transported.

Now, I told you I would talk a little bit about missiles. Here we go. Holtec took one of their canisters and, as you can see there, its, you know, no impact limiters are absorbing materials on it.

There's your missile. It was fired and it did knock it over, which you would expect. And the people in -- the last people are smiling because it passed the test.

That was a pretty substantial missile that was fired into a cask and it did survive that test as we would expect. These things are very much over-designed. Everything in the nuclear business is over-designed.

So as I mentioned, it is not the intention of the industry to keep these things onsite forever, even though we can safely store them onsite for up to 100 years. You can see the three different types of ISFSIs there, the bolted and the integrated systems as well as the horizontal systems, the other two vertical. They look like that.

I mentioned impact limiters. Those are the -- it's like the crush zones in your car. They put those at each end of the cask. And there's a whole other series of pictures I don't have in the presentation of test data that, you know, we've put trains on rocket sleds and run them into other trains at 80 miles an hour, run them into walls at 80 miles an hour. And once again, the casks maintain their tightness. The transportation is well-proven.

As you can see, I showed you the two stars on the big map. Those stars I've given you a little close-up there. Those facilities have been designed. They are in NRC's licensing review. Right now I understand that review is proceeding on schedule.

They will be ready or could be ready to receive fuel in 2023. Will they be? Well, that's a question of,

will they proceed as private ventures or will Congress enable DOE to become their customer? That's an interesting question in Washington, D.C., right now. I'm very confident we'll be able to start moving these casks off of current plant sites early the next decade.

Of course, these sites are interim. They will get licensed for 40 years at a time with 40-year renewals. Eventually you have to go to permanent disposal. All of the safety reviews of the Yucca Mountain Repository have been completed. And in environment reviews, it's passed all regulatory tests. It's not being built because Congress won't fund it. Congress won't fund it because of not-in-my-backyard objections from the State of Nevada.

Interestingly, most of the population in Nevada is in Las Vegas. But the nine local counties, including the host county, Nye County of Nevada, strongly support the Yucca Mountain project. Nye County has done its own independent science and is convinced the project would be safe. And it's probably the biggest economic opportunity Nye County would ever have. It's a $100 billion project that has been paid for, by the way, through the Nuclear Waste Fund. There's a surplus of money in there right now and it continues to grow by a billion and a half dollars a year.

So, you know, this is our fact sheet on

transportation. In addition to the Department of Energy and the Navy moving spent fuel all over the country in France where they reprocess England fuel moved from Japan to France and England through processing on ocean-going ships, there's a lost experience with transportation including right here in Pennsylvania.

Many years ago, probably 30 years ago, Limerick received a shipment of spent fuel from (unintelligible) had start up and it had done only low-power testing, but we split some uranium atoms so it was technically spent fuel but it was spent fuel that still had a lot of life left in it so it was shipped into Pennsylvania to go to Limerick.

Also Progress Energy -- what was Progress Energy in the Carolinas is now Duke -- for many years shipped used fuel between two reactors, one that had extra pool space and one that had a shortage of pool space until they built up dry cask storage at both sites. So a lot of good experience with transportation.

I mentioned Yucca Mountain. It's a very good site. You know, you'll hear a lot of scientific disagreements. There's a lot of complicated subjects where you can get a scientist on one side and a scientist on the other side to tell you different things. You will not find competing groups of scientists on this issue of geologic disposal for nuclear waste.

Since 1955 when the NAS came out with the first authoritative study, there's been strong and longstanding international scientific consensus. And you see the quote from the International Atomic Energy Agency more recently. The deep geologic disposal inner-repository is the solution to this problem.

It's technologically or geologically simple. It's politically complicated, but not too complicated. Finland, the Finnish will finish first. They have licensed their repositories. It's under active construction now. I've been to the site. It's, you know, actually a coastal site. It's a gorgeous site near where they have some reactors and other facilities.

When I look at Yucca Mountain, I'm like, we got a better site out there in the desert. Yucca Mountain is uniquely well-suited for this. And with the local support, hopefully we can overcome the State political issues. But that's not your concern.

I just want to tell you guys there are solutions. Every other country in the world that has used nuclear fuel is pursuing deep geologic disposal because that is the scientific consensus. So we've done it here in the United States. You can see some of the progress the other countries have made.

You know, we've actually done it here in the

United States. The same molecules you get when you make energy in a nuclear reactor get produced in all kinds of defense activities. They end up in lower quantities in what's called long-lived transuranic waste, you know, that stuff at the end of the periodic table.

We have a low level -- you know, a facility that -- a deep geologic repository here in the United States at the waste isolation pilot plant in New Mexico very near where they're considering the interim storage site so there's also a lot of nuclear expertise out there. In fact, they make fuel out there as well.

We've disposed of the same molecules in deep geologic disposal already in the United States just in lower levels, not in the form of spent fuel but in the form of the residue of certain defense activities. So deep geologic disposal is the ultimate solution to this. I'm confident we'll get there. I'm even more confident that we have all the measures in place.

So as you guys are looking towards nuclear energy in Pennsylvania, I think you should be confident that what you'd call nuclear waste, what we call used nuclear fuel, is well managed.

I would look forward to answering any questions you might have.

MAJORITY CHAIRMAN METCALFE: Thank you.

You said that the dry cask systems have not been fully embraced in Pennsylvania like they have in other states?

MR. RODNEY McCULLUM: I just said you're not as far along. You're only at about -- because you have one reactor that doesn't need dry cask. You know, they've been embraced. Everybody loves them. It's just that they haven't been in place I think is what I meant to say.

MAJORITY CHAIRMAN METCALFE: Okay.

MR. RODNEY McCULLUM: Yeah. And you -- I think the figures are on the charts. In Pennsylvania you have 39 percent of your fuel in dry cask, whereas nationwide we have 45. You're just a little behind but that's because of that one reactor.

MAJORITY CHAIRMAN METCALFE: Thank you.

Representative Dush.

REPRESENTATIVE DUSH: Thank you.

Just a couple on the technical side. The transfer into the transfer casks, does that rod ever come out of the water or does that move strictly from one transfer?

MR. RODNEY McCULLUM: In that transfer, it's already in the welded stainless steel inner shell. And I apologize if I went too fast through all of the schematics. Once the stainless steel shell is dipped in the spent fuel

pool, the fuel stays under water until it's welded in the inner canister. So you have a complete seal around it. You have multiple layers of -- you know, you have the sealed stainless steel shell, you have the cladding. Some of the fuel assemblies, if there was questions about them having additional shells inside the shell, so, yeah, you are already contained by the time you get into that transfer cask.

REPRESENTATIVE DUSH: So from the reactor core to the temporary facility and then into the thing, it never leaves the water?

MR. RODNEY McCULLUM: Well, they dry out the dry cask. So when they pull the cask out -- yeah, I forgot to talk about the drying process. When they -- once they pull -- it's under water until it's sealed in the cask. And then they dry out the cask. They have a drying process and then they have ports that they seal off after that's done.

What you want is it in an inert atmosphere. You don't want it sitting in water. You want it sitting in helium. The helium doesn't do anything to it. It also has good heat transfer capabilities.

So, yeah, it does get dried out only after it's sealed in the inner canister though.

REPRESENTATIVE DUSH: Okay.

On the second question I had, that missile test.

I don't see -- is that just with a missile body without any explosives it looks like?

MR. RODNEY McCULLUM: Yeah. That was just -- and I think it says on there. If I had my reading glasses, I'd tell you. But it says how fast the missile was going. It was going pretty fast.

REPRESENTATIVE DUSH: Right.

MR. RODNEY McCULLUM: Yeah, that was just a large mass into that. They've done analysis of airplanes crashing into the cask.

MAJORITY CHAIRMAN METCALFE: So it was more like a crash and not a literal missile test?

MR. RODNEY McCULLUM: A very high-speed crash, yes.

MAJORITY CHAIRMAN METCALFE: Because I know when we lost a load of missiles on the Autobahn when I was stationed in Germany, we had to send everybody to be checked out and make sure they weren't harmed.

So I know it's a lot different hitting somebody with a piece of metal traveling at a high rate of speed and somebody that's got explosives on them.

MR. RODNEY McCULLUM: Oh, yeah. And I can tell you there have been tests with explosives, smaller scale, fired into these. The type of explosive missile you would need to damage a cask would be capable of doing way more

destruction than a damaged cask would.

So if some terrorist wants to fire that missile into that cask, that's probably not his best choice of target.

MAJORITY CHAIRMAN METCALFE: So regarding the money that -- you said the Yucca Mountain has been paid for?

MR. RODNEY McCULLUM: Yeah.

MAJORITY CHAIRMAN METCALFE: But then there's a surplus and it's about $40 billion?

MR. RODNEY McCULLUM: There's $40 billion in the nuclear --

MAJORITY CHAIRMAN METCALFE: So just -- sorry. We have a limited amount of time for questions. That's why I'm kind of --

MR. RODNEY McCULLUM: Yeah.

MAJORITY CHAIRMAN METCALFE: So when I talked to Mr. Chiomento before, he said that Exelon had, I think, filed suit at one time to get some of that money back that they were hoarding from the Feds that they weren't actually using to store radioactive materials that are now being stored at -- what did you say, 70, 73, 76 sites across the United States. Exelon had a settlement out of that.

How much money did Exelon receive out of those funds to actually do what the Federal Government is supposed to be doing in the mountain and storing on your own sites?

MR. RODNEY McCULLUM: I'll let Tom speak to that.

MAJORITY CHAIRMAN METCALFE: The microphone is right there.

MR. RODNEY McCULLUM: Basically what happens there is the Federal Government, according to the 1982 Nuclear Waste Policy Act, was supposed to begin removing fuel from Exelon's and everybody's sites in 1998. They weren't done with Yucca Mountain. They're still not. They didn't. So they're contractually liable.

Tom has contracts. So you get paid. His settlement pays for the cost of storing it at an operating reactor. I think he gets made whole. And, of course, once he goes into decommissioning, that changes and his settlement stays the same. So what he's getting reimbursed for is a very nominal cost of storage.

And you may have more on the figures there.

MR. THOMAS CHIOMENTO: So to answer your question, I think it's -- we get reimbursed for the cost that we expend to store it.

MAJORITY CHAIRMAN METCALFE: So it's an ongoing reimbursement?

MR. THOMAS CHIOMENTO: Yeah. It's for the -- yeah, for the cost of maintaining and storing it.

MAJORITY CHAIRMAN METCALFE: So do you know how much you received since the settlement started?

MR. THOMAS CHIOMENTO: I don't have that figure. I can get you that figure, though.

MAJORITY CHAIRMAN METCALFE: How about the other gentlemen? Either of your companies been successful in securing some of those funds that the Feds have been collecting in surpluses of to actually pay for the storage of the radioactive materials that's spent?

MR. JEFFREY HIRT: Yes, sir. Talen Energy and Susquehanna, we did petition and sued the DOE and our costs are reimbursed for the dry storage.

MR. DOUG BROWN: And that's also the case at Beaver Valley as well. It's no surplus. We get the cost associated with the dry storage system and that's the extent.

MAJORITY CHAIRMAN METCALFE: Do you know how much money you've received since those settlements have been initiated for storage of the spent fuels?

MR. JEFFREY HIRT: I don't have those exact figures but I can get them if you need them.

MAJORITY CHAIRMAN METCALFE: If you can. And then we'll be able to share that with the Committee members.

MR. RODNEY McCULLUM: On an industrywide basis, it's $7.4 billion. That's for all 72 sites. And that does not come from the Nuclear Waste Fund. That comes directly from the taxpayers out of something the Federal Government

calls the Judgment Fund.

MAJORITY CHAIRMAN METCALFE: So the tax -- Federal taxpayers are paying into that fund?

MR. RODNEY McCULLUM: That's correct.

MAJORITY CHAIRMAN METCALFE: Are there monies being collected from the ratepayers and taxpayers in addition to that for storing fuel or is that the totality of what's being collected to store the fuel, spent fuel?

MR. RODNEY McCULLUM: In 2014, the U.S. Court of Appeals ruled that the Federal Government can -- there was a nuclear waste fee on operating reactors of one-tenth of one cent per kilowatt hour. In 2014, because the Federal Government at that point had put Yucca Mountain aside and wasn't doing anything, the Federal Court said because you have no program, you can't charge the fee.

However, the balance that's now at 40 -- actually $41 billion and continues to grow earns over a billion and a half dollars in interest every year. So, you know, if you were to build a repository, you would not spend in most years a billion and a half dollars. So the interest of disposing waste is a -- the investment income of disposing waste is ahead of the cost of disposing waste right now.

You would go deep into -- you'd be done pretty much building a repository before you'd start to eat into that principal.

MAJORITY CHAIRMAN METCALFE: Thank you.

Representative Vitali.

MINORITY CHAIRMAN VITALI: Just to make sure I heard you correctly and to bring this issue to what we're dealing with in Pennsylvania right now, so if I'm hearing this correctly, TMI does not have onsite storage but Talen -- Beaver Valley does?

MR. DOUG BROWN: Beaver Valley currently uses dry cask storage for Unit 1. Unit 2 still does not need the space in the spent fuel pool to utilize dry cask storage, but it does have the capability.

MINORITY CHAIRMAN VITALI: Right.

MR. JEFFREY HIRT: And at TMI, we have twice the capacity in the spent fuel pool. Okay. So we don't have to build onsite storage, dry storage, until the end of the license. That's what we're planning on doing. Because the Unit 2 reactor no longer -- we used that spent fuel pool. We have twice the amount of pool space basically.

MINORITY CHAIRMAN VITALI: Right. Because what I was trying to get at is should you shut down, would you have that piece of the decommissioning problem, getting rid of the spent fuel? So in other words, you still have what you've produced over the years onsite and you would have to deal with it. It's just not in the dry storage system cask?

MR. JEFFREY HIRT: That's correct. The plan

would be if we shut down, we would defuel and we would move all the spent fuel into dry storage.

MINORITY CHAIRMAN VITALI: Onsite?

MR. JEFFREY HIRT: Onsite. That's correct.

MINORITY CHAIRMAN VITALI: Okay. Thank you.

MAJORITY CHAIRMAN METCALFE: Thank you, Representative Vitali.

Thank you, gentlemen. We appreciate you being with us today. Thank you for the presentation.

Our next panel will be Mr. Jim Trapp, Director of the Division of Nuclear Materials Safety, Region I, Nuclear Regulatory Commission, and Ms. Katherine Warner, Health Physicist, U.S. Nuclear Regulatory Commission, Region I, Division of Nuclear Materials Safety Decommissioning, ISFSI, and Reactor Health Physics Branch, and Mr. David Allard, CHP, Acting Deputy Secretary for Waste, Air, Radiation and Remediation, Department of Environmental Protection.

Thank you all for joining us.

Whoever is going to take the lead with the PowerPoint that you have prepared there, feel free. I know you have some impressive resumes there, so I'm sure that will come together for you.

Thank you for joining us today. You can begin when you're ready. Thank you.

MR. JIM TRAPP: Thank you.

Good morning. My name is Jim Trapp. I work at the Nuclear Regulatory Commission. I appreciate the opportunity to speak to the Committee today discussing the NRC's important role in ensuring safety of spent nuclear fuel at our Nation's nuclear power plants, including the five sites located in Pennsylvania.

Along with me today is one of my colleagues, Katherine Warner. Katherine is one of our highly trained, qualified spent fuel storage safety inspectors. Katherine spends her workdays traveling the reactor sites throughout the northeast ensuring the safety of spent nuclear fuel.

Next slide, please. The Nuclear Regulatory Commission is an independent agency created by Congress. The NRC regulates the Nation's civilian, commercial, industrial, academic, and medical uses of nuclear materials.

One of our major activities is licensing the design, construction, and operation of spent fuel storage casks and interim storage facilities for spent fuel and high-level radioactive waste.

The NRC is headquartered in Rockville, Maryland, and has four regional offices. I'm the Deputy Director for the Division of Nuclear Materials Safety in Region I, which is located in King of Prussia, Pennsylvania.

What our group does is conduct periodic inspections of dry cask loadings and facilities'

constructions and operations.

Next slide, please. The commercial spent nuclear fuel, although highly radioactive, is stored safely and securely throughout the United States at each reactor site. When the U.S. nuclear power plants were first built in the 1960s, the plan was to have spent fuel only be temporarily stored in water pools onsite and then subsequently transferred offsite for reprocessing.

However, the U.S. halted any reprocessing in the 1970s due to concerns over proliferation of nuclear materials. Eventually the fuel storage pools began to run out of space. As spent fuel accumulated in the pools, plan operators began to explore different options for storage of spent fuel.

One alternative was the dry cask storage systems. In the United States, dry cask storage was first used in the '80s, 1980s, so there's been several decades of experience with fuel storage in dry casks.

Currently most of the U.S. power plants store spent fuel in both spent fuel pools and dry casks. The spent fuel storage pools are of robust construction made of reinforced concrete several feet thick with stainless steel liners. The water is typically about 40 feet deep and serves both as shielding of radiation and to cool the spent fuel.

As the pools near capacity, plant operators routinely relocate some of their older spent fuel into dry cask storage. Fuel is typically cooled between three and five years in the spent fuel pools before transferring to the casks.

The NRC has conducted several safety studies, all of which have concluded that storage of fuel and spent fuel pools or dry casks provide adequate protection of public safety and the environment.

Slide 4, please. Most reactor sites currently store fuel in dry casks, in Independent Spent Fuel Storage Installations, or ISFSI. Fuel is loaded into specifically designed canisters. Each canister holds several dozen spent fuel assemblies depending on the type of fuel. Water and air are both removed and the canisters are then filed with inert gas helium, sealed, welded, or bolted shut and placed outdoors on a concrete pad.

The design objectives of the dry casks are to maintain confinement of the spent fuel, prevent nuclear fission, provide radiation shielding, maintain the ability to retrieve spent fuel if necessary, resist earthquakes, tornados, floods, temperature extremes, and other postulated scenarios. All cask designs must be submitted to the NRC for approval. The NRC reviews the application to ensure that the design objectives are all met.

Next slide, please.

There are many varieties of spent fuel casks but two of the basic designs in wide use today -- with two basic designs in wide use today, welded canister-based systems feature a thick stainless steel inner canister that contains the fuel surrounded by 3 feet or more of steel and concrete.

These graphics show two of the types of dry cask storage systems used today. On the right is the vertical unit and on the left is a horizontal unit. Both systems are convective air-cooled and keep spent fuel storage inside properly cooled.

An advantage of these systems are that they are passive, requiring no active pumps, valves, or electricity to function. All the cask systems designed are thoroughly reviewed and approved by knowledgeable NRC staff.

Slide 6, please. The NRC oversees the design, manufacturing, and the use of dry casks. The oversight ensures licensee designers are following stringent safety and security requirements, meeting the terms of their licenses, and implementing quality assurance programs.

The general license authorizes storage of spent fuel and casks previously approved by the NRC that are at sites already licensed to possess fuel to operate nuclear power plants.

Licensees must perform evaluations to show the

NRC that it's safe to store spent fuel in dry casks at their sites. All the reactor sites currently licensed in Pennsylvania are generally licensed for ISFSIs.

A certificate of compliance is issued by the Commission approving the design of spent fuel storage casks after a thorough review of numerous areas of cask performance. Certificates of compliance are initially licensed up to 40 years and may be renewed for another 40 years.

All aspects of the design and operation are scrutinized by compliance and are routinely verified by the NRC inspectors during oversight visits.

Slide 7, please. This slide indicates the reactor sites throughout the United States that are currently storing spent fuel in dry casks. Three Mile Island, as I think I indicated to you before, is the only site that currently does not have an ISFSI in Pennsylvania.

If a future ISFSI is constructed, it would hold only Three Mile Island Unit 1 fuel, as the Three Mile Unit 2 fuel was shipped offsite. All the other sites, Beaver Valley, Limerick, Peach Bottom, and Susquehanna, have spent fuel storage stored in ISFSIs.

Slide 8, please. The NRC conducts a comprehensive inspection program of all aspects of ISFSI's operations at nuclear power plants. These inspections cover

the dry cask storage manufacturers' inspections, design, and construction of the concrete pad, preoperational testing, cask loading, and routine monitoring of operating dry storage facilities.

The NRC headquarters Division of Spent Fuel Storage and Transportation conducts inspections of dry cask systems, fabricators, as the system components are manufactured.

The NRC periodically reinspects the manufacturer programs, procedures, and processes to ensure that quality of construction is adequately maintained.

For inspections at sites, regional inspectors like Katherine follow inspection procedures and guidance for the different phases of ISFSI construction and operation. Regional inspectors are significantly engaged during the initial phases of construction.

Initial inspections cover the design and construction of concrete pads or modules that support the storage casks as well as lifting cranes. Before casks are loaded, inspectors with site-specific knowledge of ISFSI operations assess the adequacy of preoperational testing or dry runs by licensees.

NRC inspectors monitor dry-run activities, specifically reviewing training and qualifications for efficiency in cask loading and transportation, assuring

technical specifications and cask requirements are all being met, and verify the licensee has adequate procedures to safely conduct all associated tasks.

After successful dry runs, inspectors observe all initial cask loadings. Once an ISFSI becomes fully operational, periodic inspections are conducted of routine activities during scheduled cask loading campaigns about once every two to three years. They include direct observation of onsite work, such as cask floating, vacuum drying, welding, and transferring the ISFSI cask pad. Routine operational inspections also include a review of security systems and emergency preparedness.

Slide 9, please. Security controls remain in place until spent fuel is removed from the site. Some key features that remain as part of the site security controls include intrusion detection, assessment, and alarms and response for intrusions and offsite assistance when necessary.

Inspections by NRC. Security experts will continue for as long as spent fuel remains on the site. ISFSI operators are also required to maintain emergency planning. However, due to the vastly reduced risk of an offsite radiologic release, these plans are appropriately reduced in scope and complexity compared to those of operating reactors.

Slide 10, please. There's been some relatively new developments regarding the storage of spent nuclear fuel. Last year two organizations approached the NRC with applications, consolidated interim storage facility for spent fuels. One will be located in Texas and the other in New Mexico. If approved, the interim storage facilities would allow site owners the option of sending fuel to one of these locations. Both applications are currently under review by the NRC.

The Department of Energy is ultimately responsible for the permanent storage of spent fuel. The previously proposed Yucca Mountain project permanent storage location remains under heated political debate, as our colleagues from NEI indicated.

Final slide. Since the late 1980s, the nuclear industry has effectively demonstrated that spent nuclear fuel can be safely stored in dry cask storage systems. The NRC has extensive experience in regulation and oversight of ISFSIs and plans to continue performing ongoing comprehensive inspection activities at all Pennsylvania sites.

Again, the NRC appreciates the opportunity to discuss our oversight role with you today and looks forward to answering your questions.

MAJORITY CHAIRMAN METCALFE: Thank you.

MR. DAVID ALLARD: I'll try to get this done before the concert starts.

Mr. Chairman, thank you. My name is Dave Allard. I've got a couple colored copies for you here. My slides are in the package I brought over. I also included a little white paper we did on the TMI decommissioning process.

In addition to that, my slide set, we did e-mail over all of this. We included a couple nice NRC fact sheets on nuclear power decommissioning and the Yucca Mountain.

Mr. Chairman, it's an honor to be here. I'm the Director of the Bureau of Radiation Protection for the past 20 years. I'm currently Acting Deputy Secretary for Air, Radiation, Waste, and Remediation.

Let me get my slides up here. So I'm just going to quickly take ten minutes to do an overview of what we do in the Bureau of Radiation Protection, DEP, our roles, the accident at Three Mile Island, overview of our Emergency Response Environmental Surveillance Programs, give you a little overview of types of radioactive waste that are generated at a nuclear power plant, and then possible scenarios with the Three Mile Island Unit 1 shutdown.

So DEP basically, as NRC said, they have the authority over the nuclear power plants and one research reactor of Penn State. We do all the rest, the radioactive materials, x-rays, radon, and emergency preparedness.

In the NRC and the State Radiation Protection System, our goal is to protect workers, the environment, patients, and the public. Clearly we've got -- as we do this, being informed from accidents such as Three Mile Island, there is always societal and political impasse.

So as we all experienced last month with the 40th anniversary of Three Mile Island, Unit 2, all of that fuel actually went to Idaho National Engineering Laboratory. We spent almost ten years defueling the debris and damaged reactor. That went to a DOE facility up in Idaho.

Post Three Mile Island, the Legislature actually revised two statutes on radiation protection and atomic development and rolled that all into Act 147 of 1984 and gave the Department clear authorities over environmental surveillance and emergency response. And we shared that with the Pennsylvania Emergency Management Agency.

In addition to the Radiation Protection Act, we have several low-level radioactive waste statutes on the books. We are actually the host state for a low-level radioactive waste site.

You may remember in the '90s we were trying to develop a low-level radioactive waste site. And actually I'm the alternate commissioner for the Department for the Appalachian States Compact Commission. We're compacted with Delaware, Maryland, and West Virginia for low-level

radioactive waste.

Again, the NRC retains authority over the nuclear power plants. We have actually five -- nine operating nuclear power plants on five sites, as you know, here in Pennsylvania. This is a graphic of the emergency planning zones. There are 10-mile EPZs and 50-mile EPZs within the State. The 10 miles typically follow sort of geographical boundaries, where the 50-mile EPZ is a clear 50-mile ring.

Again, with Act 147 as the major driver with these power plants in the State, we are required by PEMA to have a graded exercise. So we actually practice a nuclear power plant accident two or three times a year. And then once every eight years we'll practice a suggestion phase exercise.

We actually just did that for Beaver Valley and we have a plume phase exercise coming up for Three Mile Island. We also do hostile action exercises. Again, PEMA grades us, grades the State. NRC grades the utility within the fence.

Again, because of our drivers with the statute, we have a very robust environmental surveillance program. We're co-located with the utilities. We bring the five nuclear power plant sites. We collect thousands of environment samples, air filters, food stuffs, water samples, sediments, and analyze those in our Bureau of Labs

here in Harrisburg.

You've seen this map. This is actually from an NRC document. These are the decommission sites where you have decommissioning going on. We actually had the Shippingport reactor out at the Beaver Valley site. It was the first commercial nuclear power plant fully decommissioned in the '80s.

Additionally, there was a prototype power pressurized water reactor, small power reactor out at Saxton. Those two plants have been fully decommissioned. The fuel has been removed offsite and sent to DOE facilities so there's no ISFSIs at Shippingport or Saxton.

Regarding waste, again, there's several types. We've heard about spent nuclear fuel. There's also high-level radioactive waste. This is waste when you process nuclear fuel such as the commercial site that was up in West Valley in the '70s that were shut down. It's a little bit different. They've extracted the uranium plutonium and you're just left with high activity fission products.

Low-level waste, there's three types of level waste based on concentration A, B, and C. Right now we have access to Class A waste out in Utah and disposal Class B and C waste in Texas. There's also two other types of radioactive waste greater than Class C. This would be

components that come out of a reactor that can't go to a low-level radioactive waste site. And we heard about the transuranic waste in New Mexico.

Again, these are the types of the various spent nuclear fuel or high-level waste storage facilities around the country. We saw some pictures of those. Because we do not have the Yucca Mountain permanent repository constructed or a temporary storage site, we're forced to leave the spent nuclear fuel on our reactor sites.

This is actually -- the photo on the left there is actually the Peach Bottom spent nuclear fuel storage facility down in Delta, PA. That's Susquehanna in the middle. And again, a spent nuclear fuel pool on the right.

In that we are second to Illinois in the number of nuclear power plants. As of 2013, we had over 6,400 metric tons of spent nuclear fuel at our nuclear power plants. NRC does a nice digest. I'm sure it's more than that right now, perhaps over 7,000 metric tons of spent nuclear fuel in the State.

And lastly, again, we have a nice little white paper we did should TMI Unit 1 shut down. There are actually three drivers here. And it's not if, it's when TMI Unit 1 shuts down, whether it's a half a year from now or ten years from now at the end of its operating license, there are three options that the NRC allows, entombment,

decommissioning, or SAFSTOR. There's only one reactor -- it's in Puerto Rico -- that's actually allowed to be entombed. It was defueled. And they actually filled the reactor vessel up with concrete to monitor storage down there.

Decommissioning, some of the plants actually do early decommissioning like Vermont. Yankee is going through that right now. Connecticut, Yankee, Maine, Yankee. We saw some pictures. They'll actually dismantle the plant, ship the low-level radioactive waste out for disposal. But again, we're forced to keep spent nuclear fuel on the ISFSI.

The most likely scenario for Three Mile Island is SAFSTOR where the fuel will come out of the reactor core, go to the spent nuclear fuel pool. Once it's thermally cool -- and that takes three to five years for that thermal cooling to occur -- all that fuel then will again be dried and put in a dry cask storage and have to stay onsite.

Systems will also be drained, all the liquids, all the reactor coolant will be drained and cleaned up. And all that low-level liquid waste will go out for low-level waste disposal. But during SAFSTOR, the large components, the steam generator's reactor vessel itself, all that, all those systems will have to stay in the plant.

So that concludes it. I just want to read this one statement. Pennsylvania I believe is one of the best

prepared states for nuclear radiological incidents, accidents, or events. DEP will continue to actively monitor the situation of Three Mile Island and all the nuclear power plants that may shut down during operations.

Mr. Chairman, thank you for your attention. I will take questions.

MAJORITY CHAIRMAN METCALFE: Thank you very much.

Do we have additional presentations at all or just here to assist?

MR. JIM TRAPP: To answer any difficult questions you might have.

MAJORITY CHAIRMAN METCALFE: Thank you.

So low-level radioactive waste, high-level radioactive waste, Class A, B, and C, greater than Class C. I mean, like a lot of this terminology is foreign to the majority of, I would say, us, at least to me, and I would assume many others and probably most of the constituents. So we have a low-level waste radioactive site in Pennsylvania that we've worked with other states to utilize?

MR. DAVID ALLARD: No. Actually we are the host state should we have to develop a low-level radioactive waste site. We're the host state. Right now as long as -- we actually suspended that process in 1998 just before I got here. So as long as we have access for our Class A waste -- that's the really low concentration, low-level waste -- that

goes to Utah. As long as we have access for Class B and C waste disposal, which right now goes to Texas -- it was going to South Carolina -- we will remain in a suspended state. But should we ever get to a point where we actually need, you know, disposal, we will actually restart that process.

MAJORITY CHAIRMAN METCALFE: So is the radioactive waste you're talking about from nuclear power plants?

MR. DAVID ALLARD: Yes. The low-level waste is the -- the Class A is typically the booties, the contaminated, you know, devices and such. The Class B waste is typically the ion exchange where you're cleaning up the reactor coolant and you're putting all those products in a very concentrated state. That gets shipped to South Carolina now and Texas. So it goes by concentration, A, B, and C.

The greater-than-Class C waste exceeds the NRC's limits for concentration for C. So that actually has to stay onsite. That will eventually go to the Yucca Mountain repository.

MAJORITY CHAIRMAN METCALFE: So the spent fuel rods are not the only form of nuclear waste that we're dealing with?

MR. DAVID ALLARD: Exactly.

MAJORITY CHAIRMAN METCALFE: Which seems to be what I heard earlier --

MR. DAVID ALLARD: Correct.

MAJORITY CHAIRMAN METCALFE: -- that the nuclear waste is in the fuel. But we have -- I mean, I thought we had nuclear waste beyond just the fuel.

MR. DAVID ALLARD: Correct. So the spent nuclear fuel is in the core, in the pool, spent nuclear fuel pool, that will be removed again into dry cask. But all of the systems, all of the reactor coolant systems, the secondary systems that may have been contaminated by radioactivity, that is the low-level waste.

Some of that will obviously be shipped off as they drain systems and clean up the liquids. But the remainder of those big components, the steam generators and such, will have to stay in SAFSTOR until the plant is dismantled.

MAJORITY CHAIRMAN METCALFE: So the DOE owns the spent fuel?

MR. DAVID ALLARD: Exactly.

MAJORITY CHAIRMAN METCALFE: Who owns the other levels of radioactive waste?

MR. DAVID ALLARD: The utility. In fact, the NRC requires financial assurance that at the end of the day when they do dismantle, that they have financial funds for the

labor, for the waste disposal.

Jim, you may want to add to that.

MR. JIM TRAPP: Yeah. Just the greater-than-C waste is what can't be shipped offsite now. There's no repository that can accept greater-than-C waste. And typically what I've seen -- and Katherine can weigh in. But typically about two or three of those canisters, when you're done deconstructing a plant, contains that greater-than-Level-C waste.

MAJORITY CHAIRMAN METCALFE: So the greater than C isn't the spent fuel rods, it's other materials that are there onsite?

MR. JIM TRAPP: It's the internals to the reactor vessel. There's certain parts of the internals that are highly radioactive that need to be disposed.

MAJORITY CHAIRMAN METCALFE: And the utility owns those?

MR. JIM TRAPP: Correct.

MAJORITY CHAIRMAN METCALFE: Okay.

MS. KATHERINE WARNER: And it should be noted that the greater-than-Class-C waste and the spent fuel rods don't go into the same canister. They're separate.

MAJORITY CHAIRMAN METCALFE: And we're not looking at Yucca Mountain for the greater than C, just the spent fuel or is that also being looked at for the other

materials?

MR. DAVID ALLARD: I think the greater than C does go to -- or is that -- I'm not sure. We'll have to check on that.

Do you know, Jim?

MR. JIM TRAPP: Yeah. The greater than C will need to be in a repository such as Yucca Mountain.

MAJORITY CHAIRMAN METCALFE: So why is there talk of temporary sites when we have been working on a permanent site for many, many years and from the earlier testifiers he thinks he sees a light at the end of the tunnel early in the next decade? Why are we looking at temporary sites in between?

MR. JIM TRAPP: I think what he was referring to -- and I don't want to put words in his mouth. But I think he was referring to these interim storage facilities, not Yucca Mountain, early in the next decade.

You could ask him to verify. You know, Yucca Mountain is still under a heated political debate right now.

MR. DAVID ALLARD: And legal challenges. There's lots of legal challenges. In fact, that's sort of the problem. DOE and NRC have not been funded to take the next step. The DOE has applied for the license for Yucca Mountain. And you've done your review. But now there's all the legal challenges from Nevada.

MAJORITY CHAIRMAN METCALFE: So there are costs associated with all of this nuclear waste beyond what's being collected or what has been collected by the Federal Government for the permanent Yucca Mountain site or wherever it ends up being that they've spent money to develop but then they have the surplus left over now and we were told it's generating about a billion and a half in interest a year. But there's monies that are needed beyond that to deal with all this additional waste?

MR. DAVID ALLARD: Exactly. And that's where the NRC requires the utility to have financial assurance to deal with the dismantling.

MAJORITY CHAIRMAN METCALFE: Is that information public for what each utility has been assessed for what they need to have in a fund available for that type of waste cleanup? Is that public that the Committee can have access to those numbers?

MR. DAVID ALLARD: I believe it is. In fact, I just saw Beaver Valley decommissioning funding plans for Beaver Valley Unit 1 and 2. I think Unit 1 or 2 is a little bit short. And I think next year they're going to have to make it up.

MAJORITY CHAIRMAN METCALFE: Do you have access to those?

MR. DAVID ALLARD: Yes. It was just submitted to

NRC.

MR. JIM TRAPP: Every March each utility would give a report on the status of their Decommissioning Trust Fund to the NRC and almost every document we have other than safeguards.

MAJORITY CHAIRMAN METCALFE: In round figures, are those trust funds millions, tens of millions?

MR. DAVID ALLARD: Hundreds of millions.

MAJORITY CHAIRMAN METCALFE: Hundreds of millions?

MR. DAVID ALLARD: Yeah.

MAJORITY CHAIRMAN METCALFE: Okay.

MR. JIM TRAPP: Like a typical decommissioning would be three to five hundred million. So, you know, they run in hundreds of millions.

MAJORITY CHAIRMAN METCALFE: Thank you.

Representative Dush.

REPRESENTATIVE DUSH: Thank you, Chairman.

I actually have got several different questions here. You mentioned the financials for the parts. Does that include security, transportation, how they're planning on the disposal? One, are there detailed plans on how those things are going to be taken care of and are all those costs incorporated? Where can we get that information on the financials?

MS. KATHERINE WARNER: Based on the financial assurance like we talked about each March and then our headquarters reviews their financial assurance each March with the Decommissioning Trust Fund. But also within two years of shutting down, each power plant is required to submit a post shutdown decommissioning activities report, which goes through their expected pathway toward decommissioning and how they would be spending some of that money.

REPRESENTATIVE DUSH: Is that money actually secured in something separate, a separate financial pool?

MR. JIM TRAPP: Yeah, absolutely. And there's different elements but it's basically in a trust, Decommissioning Trust Fund. So it's in a trust controlled by the bank.

Some of our large licensees, we actually require a similar decommissioning funded plan. We have letters of credit and financial instruments that we have access to pull if we need to.

REPRESENTATIVE DUSH: And my final question, the plume that you were discussing earlier in the exercises, out at Vandenberg I was in charge of doing the plumes if we had an explosion. What I don't see is that plume going downwind. And I'm kind of curious where you come up with that 10-mile limit. Because I cannot tell you when you've

got something, you've got to take the downwind side of it. And that plume actually is more like a cone than a circle.

MR. JIM TRAPP: Absolutely. In fact, we have modeling software. It depends on the wind direction. The planning zone for the plume phase exercise would be ten miles. But for sure the disposition would be beyond ten miles. That ten miles is just to protect the public from external radiation from that plume, like Three Mile Island with the noble gases.

The next phase would be that we possibly could evacuate people within that ten miles. Post-plume ingestion phase is where the disposition and the environment we start looking at food stuffs and such and do the protective actions there, embargo food and water if we need.

REPRESENTATIVE DUSH: Well, those particulates when they get up into the atmosphere and then start moving downwind, are you exercising people beyond that ten-mile limit because of the possibility of that radiation?

MR. DAVID ALLARD: Yes, we just did a week. In fact, those are week-long exercises. PEMA grades us. We demonstrate our ability to sample, air samples, soil, food, put that into our laboratories.

REPRESENTATIVE DUSH: Okay.

MR. JIM TRAPP: We just did that for Beaver.

REPRESENTATIVE DUSH: That's why I had that.

Like I said, I've had some experience with that and I wanted to make sure that you were --

MR. JIM TRAPP: You're exactly correct. The model, we have a RASCAL model at the NRC that actually predicts -- you know, you put in the wind direction and it gives you the plume and would give you the concentration of the radiation.

REPRESENTATIVE DUSH: Thank you.

MAJORITY CHAIRMAN METCALFE: So TMI, there's talk of TMI being decommissioned, TMI 1?

MR. DAVID ALLARD: Most likely. I can't speak for the utility. But I suspect that it's complicated because TMI Unit 2 is actually owned by FirstEnergy. So the plan was once TMI Unit 1 shuts down and whether it's early decommissioning or SAFSTOR, it's probably most likely that -- we're thinking probably most likely a SAFSTOR, allow radioactive decay.

The longer-lived products are about 30 years so you allow another 30, you know, 50 years, that activity decays away and the workers that are going to pull it apart get less radiation exposure.

So the TMI Unit 2 -- and I've actually been inside the vessel. There's still a lot of contamination in the containment of Three Mile Island on Unit 2. So that's going to take some special decommissioning techniques.

MAJORITY CHAIRMAN METCALFE: So TMI 1, if they move forward with decommissioning it, won't be really totally deconstructed until 30 years from now?

MR. DAVID ALLARD: In 60 years.

MAJORITY CHAIRMAN METCALFE: In 60 years?

MR. DAVID ALLARD: Yes.

MS. KATHERINE WARNER: It does depend on what way the utility choses to do it, either SAFSTOR or DECON. The NRC allows either one.

MR. JIM TRAPP: I mean, traditionally SAFSTOR had some advantages because, like Dave said, the radiation decays so it's a little bit easier to decommission.

I'd say more recently we have some examples with Vermont Yankee and Oyster Creek. Oyster Creek in New Jersey and Vermont Yankee, obviously in Vermont, where the utilities are choosing or the owners of those plants are choosing to get more into active decommissioning.

It seems like there's been a trend towards active decommissioning.

MAJORITY CHAIRMAN METCALFE: And then TMI 2 wouldn't be dealt with until after TMI 1 60 years from now?

MR. JIM TRAPP: I suspect. We should probably ask FirstEnergy.

MAJORITY CHAIRMAN METCALFE: Which is a more challenging project than TMI 1 would be?

MR. JIM TRAPP: Most likely.

MAJORITY CHAIRMAN METCALFE: For the radioactive contamination?

MR. JIM TRAPP: Right.

MAJORITY CHAIRMAN METCALFE: So like I know we've given awards to like our Century Farms. So just thinking out 60 years from now that a company is still around to deal with that and they talk about there's a trust fund set up to deal with that, is that trust fund adequate to deal with that 60 years from now and then to deal with TMI 2 later than that?

MS. KATHERINE WARNER: One of the benefits of waiting the 60 years is that trust fund can grow so much. So then when they go back and decommission it, not only would a lot of radionuclides decay a significant amount, but you'd have an even bigger trust fund to deal with those lower levels.

MR. DAVID ALLARD: And it's re-evaluated every five years or so. At power plants you look at the adequacy of the Decommissioning Fund.

MAJORITY CHAIRMAN METCALFE: So that's updated?

MR. DAVID ALLARD: Exactly.

MR. JIM TRAPP: There's a lot of science that goes into the Decommissioning Trust Fund to make sure there's adequate funds.

MAJORITY CHAIRMAN METCALFE: So this generation and the next will never see that area back again for use by anybody in the middle of the river there. I mean, it's going to be 70, 80, 90 years before, if it's decommissioned, that you actually can deal with the site that did melt down and deal with the additional site that's been operational?

MS. KATHERINE WARNER: At the end of decommissioning, they can either do unrestricted release to the public, which means that the land can totally be used again, or they can do a restricted use, which means they would still have some industrial security in place. But those are the two options.

MR. JIM TRAPP: For example, Katherine was down at Crystal River two weeks ago and they're releasing 4,000 acres of that reactor that's no longer operating. They're releasing 4,000 acres of that. Katherine was out in the swamps doing recent surveys.

MAJORITY CHAIRMAN METCALFE: So they've reduced the footprint --

MS. KATHERINE WARNER: Yes.

MAJORITY CHAIRMAN METCALFE: -- of the site and secured that area that they've reduced it to?

MS. KATHERINE WARNER: That's exactly correct. They had over 4,000 acres down in Crystal River. And they've applied for a license amendment to shrink that

footprint to really just where the reactor is.

MAJORITY CHAIRMAN METCALFE: Okay. We had one of the previous presenters talking about his carbon speculations and the societal costs. I think there's a societal cost when -- I mean, there's a societal cost that this region has been paying for as a result of that meltdown for decades now. So I think we can't miss that there's a societal cost to that.

If it's not dealt with and -- was there an accident, almost an accident as far as handling fuel, handling the San Onofre in 2018, where they almost -- like they bumped into a cliff or something and they got fined because they didn't have proper safety measures in place if they would have dropped it. And they ended up not dropping it it sounds like.

MR. JIM TRAPP: San Onofre is kind of a unique ISFSI. All the pictures you've seen have the fuel stored on a pad out in the open. San Onofre actually they put their casks down into like a bunker. And when they were lowering one of the casks down, there was a baffle plate that the cask got caught on so they got a slack cable on the frame. And that was the genesis for our violation and our scrutiny.

MAJORITY CHAIRMAN METCALFE: So even though I'm on the previous pictures, we had what they thought was an irritated worker where it was going not full bore two miles

an hour to move that dry cask but these folks were lowering the cask and it still caused some issues for them?

MR. JIM TRAPP: Correct.

MAJORITY CHAIRMAN METCALFE: So do we have -- have we learned some things from what happened there to make sure that's not going to happen in Pennsylvania?

MR. JIM TRAPP: Well, it can't happen in Pennsylvania because they don't have that type of ISFSI. They don't lower -- in Pennsylvania we don't lower the cask down into underground storage.

MAJORITY CHAIRMAN METCALFE: But, I mean, overall handling issues?

MR. JIM TRAPP: Correct.

MAJORITY CHAIRMAN METCALFE: I mean, whether you're lowering it or you're moving it on a two-mile-an-hour high-speed rail or whatever?

MR. JIM TRAPP: Correct. And we certainly take lessons learned seriously. That's why we put people like Katherine in the field to make sure that things are being done correctly.

MAJORITY CHAIRMAN METCALFE: Great.

MR. DAVID ALLARD: I'd also add even if they'd go to SAFSTOR to maintain our environmental surveillance, obviously, you're going to have drain systems. You're going to have ISFSIs there. But you're still going to have

contamination within the containment within the containers. So our environmental surveillance, we're looking very hard at offsite and working with the utilities to get a handle on the onsite issues.

MAJORITY CHAIRMAN METCALFE: So you mentioned in the presentation that the pools were meant for temporary storage. Is the temporary storage just because of the capacity issues?

It sounds like because they only have one reactor that's been working for so many years at the TMI site that they have double the pool capacity to store so they haven't needed to go to the dry cask. Is that -- I mean, it sounds like you don't want it in water indefinitely either, that you want to move it out and slow it down and put it into those -- into the dry cask where you inject helium in there to stabilize it?

MS. KATHERINE WARNER: So the NRC has looked at both storage in water, so that would be the central pool, or storage in casks with the inert helium gas. We found that they are both safe. When we say temporary storage, when these facilities were built, they were meant -- the fuel was meant to pool in there for a couple of years and then go off site to a Yucca Mountain or to a reprocessing facility.

So while it was originally for temporary storage, it should be noted that these are very robust structures and

NRC inspectors are onsite and operating reactors. And one of the systems that they look at is the spent fuel pooling. So it's being looked at at all stages in life.

MR. JIM TRAPP: And actually the spent fuel pools when they were originally designed were with lower capacity. And they've actually upgraded capacity by putting new racks in the fuel pools. And some of the utilities have actually re-racked their pools twice because nobody really, I think, back in the '60s, early '70s, thought that we would have 40 years of fuel stored in a fuel pool.

So that's really the reason why. And now really they re-racked as much as they could re-rack so you need somewhere else to put the fuel.

MAJORITY CHAIRMAN METCALFE: Kind of like we put the cart before the horse 40 years before the horse then.

Thank you. Thank you all for your presentations today and for the great information. We appreciate it.

Have a good day.

MS. KATHERINE WARNER: Thank you.

MR. JIM TRAPP: Thank you.

MR. DAVID ALLARD: Thank you.

MAJORITY CHAIRMAN METCALFE: Our next panel is going to be Mr. Eric Epstein and Ms. Katie Tubb. Eric Epstein is the Coordinator from EFMR Monitoring Group, Incorporated, and Ms. Katie Tubb is a Senior Policy Analyst,

Energy and Environmental Institute for Economic Freedom, the Heritage Foundation.

Thank you for joining us. You can begin when you're ready, ma'am. Thank you.

MS. KATIE TUBB: First, thank you all for having me here. It's nice to be back in Pennsylvania because I went to Grove City College on the western side of the State so it's nice to be back in Pennsylvania.

I organized my written testimony according to Q&A hoping that would be easier for you-all to navigate. I'm not going to read it all. It basically covers the process of decommissioning, what are the radiological standards for closing a plant, termination, what you can use that land for afterwards depending on how you clean it up according to the NRC standards, what other communities are doing, financial requirements to ensure decommissioning happens, and then just an update on what's happening in Federal Government with nuclear waste management and things like Yucca Mountain.

I think what I'll do is just cover a few things to address some of you-all's questions from earlier. If you look at Footnotes 8 and 9, that gets into what Three Mile Island has done with their Decommissioning Fund.

Unit 1, the NRC has estimated about $467 million for decommissioning costs. And their trust fund right now

has $625 million in it. And as was mentioned earlier, NRC routinely checks up on those funds to make sure that they're adequate, so two years before closure and then annually thereafter. So this isn't something that's going to get lost in the weeds and not provide for the decommissioning.

Unit 2, NRC expects decommissioning to cost $486 million. The fund has $834 million in it. And in that section, I've looked at a few. NRC reports a few examples of power plants that have fully decommissioned and their license terminated. We have ten of those in the country.

So this chart on page 3 looks at some of those costs for plants that have fully decommissioned. Those are in current dollars so it's 2019. But that gives you a picture of what you're looking at.

It was mentioned earlier, so Exelon has in a press release anyway said that they'd like to go the SAFSTOR route. There's three different routes to decommissioning. SAFSTOR is the longer-term decommissioning route so we're looking at 60 years from now. They said they'd like to get fuel into dry cask storage by 2022 and do some dismantling of large components beginning 2074.

I think an instructive example for you-all is Oyster Creek. They initially were going the SAFSTOR route, so again 60 years out from now. But Holtec, who was here earlier, is considering buying Oyster Creek from Exelon.

NRC is currently reviewing that. And Holtec's vision is to decommission the plant in the next six to eight years and release that property except for the spent fuel storage, which again is a Federal Government issue.

So there are options. I think most plants in the United States have gone the SAFSTOR route. And to give you an example that I'm more familiar with, my family lives in southwest Wisconsin. So I drive by one of the smallest nuclear power plants in the United States every time I go back home. It's owned by Dairyland Power.

They closed in 1987 so they've had fuel onsite since then. They moved that into dry cask storage. And they spend about $3 million a year maintaining that. And that's what they sued the Department of Energy for to recover those costs. And as was said earlier, that comes from Federal taxpayers, not from the Nuclear Waste Fund.

So when we're talking about final storage, we're not -- those fees, those lawsuits, aren't pulling away from final storage resources. They're pulling away from Federal taxpayers. I think what Dairyland has done is two things.

First, the community is generally very comfortable with that situation. They routinely hold public interest meetings. And they're not particularly well attended because people aren't quite comfortable with that situation. But Dairyland has switched to being pretty

federally active as far as advocating in the Capitol why we need storage, long-term storage.

I imagine that's what it would look like in Pennsylvania as power plants begin to close. Energy needs to go to the Federal Government to get this ball rolling again because that's the ultimate solution for this problem.

Just one other thing on what sites can be used for. As was mentioned earlier, depending on how you clean it up, the NRC allows for uninhibited public access. And then they also have a couple grades of restricted public access depending on how extensive the cleanup is.

In the past, you know, in those reactors that have closed, Fort St. Vrain in Colorado is now a natural gas plant. As I mentioned, Dairyland is a coal facility, coal power facility.

I love the example earlier of Crystal River having those 4,000 acres reopened. And to that point, Hope Creek in New Jersey is an incredible estuary and natural resource facility almost. Like, it's a park in and of itself so I could see even power plants becoming parkland. The point is, there's a lot of options post-closure.

With that, I think I'll just close with Pennsylvania has a lot of resources. You all have an incredible history with nuclear as far as -- not just being the home of the first commercial power reactor, but also

having the worst power plant accident in the United States. I think you managed it successfully. And now I think looking into this new chapter, you-all have resources with Three Mile Island happening and with shipping -- Pennsylvania contracted with the Department of Energy to remove that fuel. And I think that's an important legacy for the rest of the country to see that you can successfully close and remove fuel.

So I'm hoping that that continues to be the case in Pennsylvania, that you can show the rest of the country that it can be done safely and successfully. I have full confidence that there are resources within the state to do that in addition to the states around you that are in the process of decommissioning.

So I'll leave you with that and let you fill the rest of the time.

MR. ERIC EPSTEIN: Thank you.

MAJORITY CHAIRMAN METCALFE: We don't control the level of the concert music.

MR. ERIC EPSTEIN: Can you hear me? I'm usually very vocal. Do you need the mike?

MAJORITY CHAIRMAN METCALFE: We need the mike for the cameras.

MR. ERIC EPSTEIN: So let's do this. You all know me, Eric Epstein, Chairman of Three Mile Island. What

you don't know me as is I am the Chairman of Three Mile Island. We were organized in '75, incorporated in '77. We monitor all the nuclear plants on the Susquehanna. And I'm going to fill in some facts that were left out by the other two presenters.

We have PPL, which owns actually only 90 percent of the plant. This is going to be a problem for decommissioning. 10 percent of the plant is owned by a rural electrical cooperative and they do a poor job of coordinating.

TMI 1 and TMI 2 are pressurized water reactors. The company that built them is bankrupt, Babcock and Wilcox. Not a good thing. TMI 2 is not cleaned up, not cleaned up. It's been defueled. The plant operated for 90 days. We spent $700 million to build the plant, two and a half times over budget, five years behind schedule, litigated this. I've been around for a while.

In 1981 Governor Thornburgh came with us. We supported the bailout of TMI 2. We paid $987 million. There was no Decommissioning Fund. This goes to the vision of the industry. No decommissioning funds at the time of the accident. We were tied with another 1.2 billion. So Three Mile Island has cost $3 billion for a plant that operated for 90 days.

It's highly radioactive. The fuel has been

removed. There's still argument about whether or not you can reach -- the fuel movement was not flawless. I can send you a chronology. It was fraught with difficulty. Nobody wanted our fuel. And INEL is a research reactor. So this was a one-off. It's not going to happen again. In addition to that, we've had to dip into the Decommissioning Fund to pay for failing gaskets. So this is 40 years out. We're talking a long time when we started talking about time.

Also, to make some corrections, our first nuclear power plants weren't in the '60s. Shippingport came online in '57. Peach Bottom 1, we've talked about boiling water reactors, pressurized water reactors. Peach Bottom 1 was a gas-cooled reactor. So we actually had three different kinds of reactors. It's a prototype, only 40 megawatts.

Yucca Mountain is not going to happen. We're either going to get real or we're not going to get real. I'm not here to assess blame or assign shame . I'm here to find solutions. We're a solutions-based organization. How we get here doesn't matter. It's where we go from here and we have to do it cooperatively.

That's why, as you'll see in my testimony, I have 11 recommendations. Also, I'd like to point out something that we don't usually talk about. And let me just back up. During the course of my career, for 35 years I've litigated nuclear decommissioning issues as an expert before the PUC.

So my expertise is in economics.

The NRC's model is flawed. When you look at the NRC model, it doesn't factor inflation, it doesn't factor recession, it doesn't factor volatility in the markets, it assumes a rate of return of 2 percent. During the recessions of 2008 and 2009, almost all of these funds went belly-up. So you've got to realize every seven years of recession, let's get real.

So let's -- can we do the first slide or do I have to fire you? All right. Let's do this. We'll work through it because you may have the presentation right before you.

I think first you have to identify what the problem is. The problem is -- and if you look at the annual report, I'm a shareholder for all utilities in Pennsylvania although I don't really think we should be calling them utilities. They're limited liability corporations.

And, you know, in Pennsylvania we are just blessed with wonderful resources but we never miss an opportunity to miss an opportunity. We got wood, we got oil, we got gas, we got nuclear. Maybe we should learn from the anthracite experience where we still have five coal mine fires raging. We still have 5,000 miles of water destroyed. This is a very serious issue.

High-level radioactive waste facility is not

going to happen. It didn't happen in Lyons, Kansas, in the '70s. It's not going to happen in Yucca. Right now the Governor and the Senators from Nevada are suing the Federal Government over recent shipments from a nuclear waste site, Savannah River to Nevada. If you go out to Nevada -- and I'm out there -- there's not a lot of public support for this. Nevada is one of the fastest growing cities in the country. Suburb Henderson is very, very big.

So what we're dealing with here is 80,000 metric tons. A metric ton is more than a U.S. ton, which is 2,000 pounds, a little less than a British ton. So this is a lot of waste. We generate about 2,000 metric tons a year. I know the director was unable to answer this. But this is what we do. We now currently have 7,560 metric tons of radioactive waste.

And as we were getting into this before, one of the things that's interesting, you have some plants that have a lot that has been transferred to dry cask. Peach Bottom is over 50. Limerick is at about one-third. TMI made a decision. We began negotiating with them in the '90s not to build dry cask storage. That's in my testimony.

They re-racked their fuel three times. They made a conscious decision. They should have the dry cask storage up now. Why is this important? Because TMI wants to raid their decommissioning funds to build dry cask storage.

Beaver Valley built their dry cask storage in 2014. They used transnuclear. It was supposed to cost 30 million. It went way over budget. So when you hear exactitudes like we hear from the industry, I'm here to bring you a little what I feel is economic reality so it balances it out.

So you've heard enough about the plants. So just to go through, the Susquehanna 1 and 2, boiling water reactor; Three Mile Island Unit 1, a pressurized water reactor; Unit 2 is down; Peach Bottom 2 and 3, boiling water reactors; and then at Beaver we have two pressurized water reactors.

So we do strongly support moving the fuel to dry cask. We've been saying this for years. Definitely support moving the fuel to dry cask. The thing you have to remember is the spent fuel is still there. So normally when they move the spent fuel, they're moving the older, not the newer, stuff. The newer stuff is hotter. So this is very much a difficult challenge.

You don't have a vision of this. But if you go to the slide, I'll show you what we're supporting. That's hardened onsite storage. We've offered this solution from Day 1. We believe -- if you look at what happened in Barnwell, South Carolina, if you look at Maxey Flats, I mean Maxey Flats was a nightmare. It's a Superfund site. That's

where we began storing nuclear waste.

Pennsylvania has 95 Superfund sites. We're No. 3 in the country. I have no desire to make us No. 1. Okay. This is real. We used to -- the industry said, we can just bury the barrels in shallow -- I mean, it's insane. So when I hear people telling with certitude what's going to happen down the road, I'd like to show you a little visual.

This is an environmental timeline of Pennsylvania that we constructed. We first found coal in 1750 in Nazareth, 1750. So let's just say 250 years out we're still dealing with coal. I mean, we've been ravished. Those companies have gone away. All right. You would need up to 400 of these maps to get to 10,000 years, talking about the half-life of nuclear waste. It's a serious issue. This is a funeral where the pallbearers have to stand in place for a very long time. My major concern is that the companies as we know them will even be around.

So let's keep moving. We want to get ahead here and beat the band and I want to get a lunch special. Keep going. All right. Now go back to the hardened, HOSS. One more. There you go. All right. I'm not firing you. How much am I paying you? Nothing. All right. You get a raise.

So what you have here, above ground, above grade. One of the things we haven't talked about is most of the

plants now are within a floodplain that they weren't before. Those 100-year events are happening more and more frequently especially at Three Mile Island. Remember all the nuclear power plants in Pennsylvania feed into the Chesapeake Bay, the most productive estuary in North America. There's some economic dollars there.

So what we're saying above ground, above grade. And monitored retrievable storage in the event that there's a leak, in the event there's a problem, you want to be able to go back and get the waste. That's something we didn't do before. That's why we had a huge problem not only at Maxey Flats but at West Valley, which, by the way, was our experiment with reprocessing which failed, not decommissioned. Again, operating 66. Google West Valley. It was a nightmare. We don't have a good track record.

Let's go to the next one. So this is the thing that we aren't talking about, the elephant in the room, or for you Democrats, the donkey in the room. It doesn't really matter to me. So we're thinking about moving to what's known as consolidated interim storage. Two sites are up. One site is in Texas. One site is in New Mexico.

What wasn't told to you today is we had the Nuclear Waste Policy Act in '82. That was passed. In '87 we had amendments. The law that would authorize this has expired. So the fact that we're even considering a license

for either site is likely illegal. It's likely illegal. It's likely illegal.

Go on to the next. And let's go to the next. I want to speed it up a little. So there's three problems with these interim storage facilities. If you know nuclear parlance, anytime you say temporary, it means forever. Nothing is ever temporary. So once it goes somewhere, it stays.

There's also post-9/11. We haven't talked about this, serious security and transportation issues with taking waste to Texas, with taking it to New Mexico.

Secondly, this process would actually expose the taxpayers. One of the things we haven't talked about today is the utilities didn't pay into the Nuclear Waste Trust Fund. The utilities did not pay a penny. That was a (unintelligible) on all utility customers. So when they won their suit -- the suits began in 1998 -- they didn't have the number. I'll give you the number. For Limerick, for Peach, and Oyster Creek, they got $500 million for just those three plants, $500 million.

To date actually the payout has been 9 billion. We projected it to be about 21 billion. I think the payout will be 50 billion.

So the Nuclear Waste Trust Fund, all money that came from ratepayers, this is a State's rights issue. Our

money was taken and then our money didn't flow back to us when they settled the cases. I still have a problem with that.

The second issue with nuclear decommissioning, again, it all came from ratepayers. TMI right now is asking to raid that fund to build the dry cask. A, they should build the dry cask with their own money like Beaver Valley or they should use the trust fund money but they shouldn't raid our buck.

So to me -- I mean, the conundrum is that we do have to find a solution. Yucca is not going to happen. Lyons, Kansas, is not going to happen. WIPP may happen because I know they have an application out for transuranic waste. It may happen. That's in New Mexico. Texas looks eager to take it and so does New Mexico.

Let's hit the next one. Transportation routes. Nobody talked about this today. All right. So we have nine units. They have to get there somewhere, either through rail or either through transportation. We need to talk about it.

We're going to go to the next slide. This is why. We have three videos for you. We're not going to do it today because I know I was told it's Monday. You may be a little groggy. You may be disappointed the Sixers lost. The band may be getting on your nerves. I don't know what

the deal is. But at any rate, this is what the transportation looks like.

This is the Peach Bottom route. So we prepared three videos. So in Peach Bottom you're going on Route 74, which, by the way, is transversed by Amish. I don't know it's such a great idea. Also we talked about emergency planning. Hard to get ahold of people that don't have a telephone. I just want to point that out.

Let's go back one. So essentially you're going through all these municipalities, Chelmsford, Red Lion, until you get to York and then it goes Norfolk Southern.

Go to the next one, soon to be former intern, and then the next one. On your own time -- we made these videos for you. We contracted -- actually, if you look at the first one, we've documented rule-breaking in transportation of radioactive waste, documented. A lot of coordination goes on. It rarely happens.

The second one, these are the routes for Central Pennsylvania, Peach Bottom, and TMI. You should physically see what we're talking about. And the third one is just a generic video.

Let's hit the next one. Okay. We have 11 recommendations. I don't want to get too far into the weeds. So Recommendation 1 is pretty obvious. Anything the NRC does, the PUC, our ratepayer money, our folks are being

apprised within ten days.

Next slide. This is the big one. The Department of Energy. All of the money they're collecting we actually feel should either go to the Decommissioning Fund or it should be used for the purpose they said it was going to be used for and that's maintaining and isolating nuclear waste.

Next one, please. Slide No. 3. Actually, you can go to your first energy report. I'm a shareholder. I have copies for you if you like. FirstEnergy actually has a guaranteed $500 million at Davis-Besse. These are limited liability corporations. It keeps them on anthracite.

One of the things we should be doing is having the parent -- the parent posting a $500 million guarantee. I have Exelon's annual reports with me. Exelon and FirstEnergy acknowledge that they may have to do this.

Next slide. All right. Annual payment. Right now it's 650 grand a year. That payment probably goes away when the plant goes into radioactive waste storage where it's basically arguing that payment should stay. That payment, by the way, is probably about half of what they pay in Illinois. The fee should be larger. And I'll show you why that's important.

Next slide. Thank you. Because we're going to have to pay PEMA and DEP to do the emergency planning and the monitoring. As one legislator pointed out, the problem

with emergency planning -- and we have five petitions before the NRC -- it doesn't really account for nonambulatory. It doesn't account for sick. It doesn't account for daycare. I'm a School Board Director. And a fast-water-moving event when we tell all the parents -- we have instant messenger -- to stay home, they'll come to the school.

Most of these evacuation routes we have haven't talked about, it will not allow you -- this is what we experienced at TMI. Parents went back to get their kids to go to the elementary school and middle school or high school. Again, what we didn't talk about today is that there is a rendezvous site outside of the zone. Most parents have no idea what the rendezvous site is.

So if you go to our website on EFMR Monitoring you notice that we have five petitions. We did have one petition passed when Governor Rendell was here but emergency planning is a challenge. And I would just remind you if you were here -- I think you were in session on November 15th when it snowed -- the weather had the audacity to snow in November -- it took everybody four hours to get home.

Try doing an emergency plan on a Friday night when everybody is at a high school football game, the Friday before Saturday's Homecoming at Penn State. Main evacuation routes for TMI, Route 30. Brilliant. Tourist season. Nobody knows where they're at. 11/15, please. First day of

buck, first day we kill anything, you can't get up there. I used to live in Perry County.

Next slide. All right. So this is the money deal. We can look at it later. But I would keep that in place so we can fund emergency management.

And 7, site restoration, which I think you talked about for a moment, we strongly encourage DECON. SAFSTOR in 1987, the owners of TMI said, look, we're not going to clean up TMI 2. We'll come back in 2014.

Again, it's kind of incongruent. If nuclear is so safe, why did you have to wait 30, 40, 50 years for it to decay? You lose the institutional memory of the workers. When you get a license at the nuclear power plant, it's only good for that plant. You lose the institutional memory. You lose the property tax.

So what we're encouraging is for the plant to be cleaned up immediately. Also, this is an industrial site. If you look at the permits that all these plants have, plastics, solvents, chemicals, there's a lot that we have to clean up.

Next slide. All right. Radiation monitoring. We believe onsite/offsite monitoring, they should follow plume pathways and actually wind roses, the direction of where the radiation goes. That's how we do our monitoring.

Next slide. All right. Offsite emergency

planning. In our mind, there has to be reimbursement for the counties and the State to continue the planning.

Let's hit the next one. I am going to read this one because I don't know that we really talked about it. Licensee agrees to monitor in real-time each cask for heat, helium, and radiation. At TMI 2 we don't do it anymore. We used to monitor for temperatures to make sure we weren't getting a decay effect. So even if we go to spent fuel in dry cask, we're going to need to reimburse DEP and PEMA to look at helium, to look at radiation, and also to look at heat differentials.

And then the final slide is the only one I'm going to read to you. To reduce the potential of a line-of-site attack, either the casks shall be stored in a building for additional security and environmental protection, or, at a minimum, a barrier not less than 5 feet higher than the height of any cask at the facility shall be constructed around the facility. While fuel remain s onsite, security shall include a protected area, concrete vehicle barriers, lighting, cameras, and intrusion detection, etc.

The reason I'm saying this is -- this wasn't discussed today -- when a plant is decommissioned, they usually retreat to the fence line. What I mean by that, outside of the fence line, they will tell you that it's not

their problem.

Well, emergency planning is their problem. And in addition to that, I don't want my local community to be tied to pay for their fire protection, their police protection, their EMT protection. So there's a lot of financial consequences to decommissioning a plant immediately or letting it sit.

So in 1987, we were told by, the guy's name -- and unfortunately he's passed away -- Frank Standerfer that they would clean up TMI 2 in 2014. It didn't happen. Now we're being told -- and there's no reason why they can't clean up TMI 2. There's an MOU between FirstEnergy and Exelon. By the way, nobody works at TMI 2. We had 1,050 workers there at the time of the defueling. So you have a situation where they leave. They go. They're not coming back.

Also I just want to point something out. TMI is probably the only site in America where one company, FirstEnergy, owns one site and another company, Exelon, owns the other site. So they're going to have to coordinate.

What I'm saying -- and I think maybe Representative Metcalfe was indicating -- this plant is not going to be cleaned up until 100 years after the accident. That's not responsible. There are social consequences to that. The basement isn't a little highly radioactive. It's

lethally radioactive. Nobody has entered it. The building is radioactive. The building is radioactive. So when we look at decommissioning there, the current estimate is 1.2. We're saying it's for like 5. I don't think it's going to happen.

So what I'd like to do is preserve time. I know you guys probably want to get out of here. We have testimony outside for everybody who wants to get it. The 11 recommendations come with substantial footnotes.

Finally, we would not be opposed to recycling the facility. If you look at TMI, you have to realize that the location is ideal. It has transmission capability. It has access to water, which we haven't talked about today because I was told we weren't talking about carbon or any other things. But you're talking about plants that have an agreement with SRBC or the Delaware River Basin Commission, a lot of water.

TMI could be recycled for gas combustion or some other kind of plant. Delaying it means that doesn't happen.

So I guess we'll both be open to questions .

MAJORITY CHAIRMAN METCALFE: Thank you, both.

A lot of fast talking towards the end. We appreciate that, Eric, to leave us a few minutes for some questions.

Any members have any questions?

Representative Fritz.

REPRESENTATIVE FRITZ: Thank you, Mr. Chairman.

Eric, you mentioned the River Commissions, the SRBC and the DRBC. Do you know whether or not they currently regulate and oversee the water usage?

MR. ERIC EPSTEIN: Yeah, they do.

Excuse me. We went through this -- I don't know if you remember -- back in 2008. PPL was going to build a nuclear power plant, Bell Bend. Original cost was 8 billion. They cancelled it when it got to 15 billion. But you have to do surface withdrawal. They can order you to so it's a huge issue.

Actually, both Susquehanna and Peach Bottom have been fined for taking water illegally. What they did is in a power plant you can upgrade. They never talked to the SRBC about it, so they're withdrawing more water.

So the SRBC meets quarterly. It includes Maryland -- gosh, I don't know -- New York, D.C., everybody involved with the Susquehanna River. So it's a huge issue. They use tons of water. But we have MOUs now with the Susquehanna River Basin Commission.

So I don't know if that addresses your question. But, you know, you're talking a place like Susquehanna, that's 28 million gallons a day. Half of that doesn't get returned. If we're talking about the environment, we want

to add carbon. Maybe we should talk about water. Water is a precious resource.

REPRESENTATIVE FRITZ: Relatedly, what do they do with the water now after it's used? I assume it's toxic.

MR. ERIC EPSTEIN: The water?

REPRESENTATIVE FRITZ: Yeah.

MR. ERIC EPSTEIN: Not really. The water -- more the problem with the water is like TMI using climate control so there's chemical additives. But the big issue with it is heat. You know, it be superheated.

There was times at Peach Bottom where they couldn't actually operate because the water was too warm. And I guess the thing that's most disturbing are the aquatic fish kill especially at Peach Bottom.

So with nuclear power, a lot of water use, return superheated, sometimes with chemicals, and then fish kill. So it has a significant impact.

But, you know, the big issue when it comes to like a fluid is probably tritium that's leaking from nuclear power plants, not so much water that's returned into the environment, to be fair.

REPRESENTATIVE FRITZ: Thank you.

MAJORITY CHAIRMAN METCALFE: Thank you, Representative Fritz.

Ms. Tubb, with the numbers, I appreciate you

giving us the numbers for the various reactor sites. It's been mentioned a couple times the money that's been collected to pay for the spent fuel storage, at one point it was said it was taxpayers' dollars, another point I think ratepayers' dollars. So is it taxpayers? Is it Federal tax dollars that were collected for that, do you know, or is it ratepayers' money that's been collected?

MS. KATIE TUBB: So it's a little bit complicated. Going into it, ratepayers/customers have to pay for their electricity bill, which includes things like waste management. Because of contracts signed with the Department of Energy, nuclear power companies can then go sue the Department of Energy for not collecting waste as promised, which was supposed to be done in 1998.

They've successfully sued. The Federal taxpayer has covered the cost of those power plants. So initially ratepayers are covering costs. Then a power plant gets reimbursed through these lawsuits for those costs of interim storage.

Does that make sense?

MAJORITY CHAIRMAN METCALFE: So the -- but there was a fund set up initially for the storage that never materialized?

MS. KATIE TUBB: So that fund is entirely separate.

MAJORITY CHAIRMAN METCALFE: So that fund is Federal tax dollars that filled that fund?

MS. KATIE TUBB: No. That fund is for long-term disposal and storage. So the Nuclear Waste Fund was set up in the '80s with this Nuclear Waste Policy Act. Power plant companies were required to set aside a certain amount of money according to how much waste they produced -- or how much electricity they produced. I'm sorry.

So presumably a ratepayer is contributing that money through their electricity bill. That pot of money, which is about $40 billion, is held by the Federal Government for the long term and final disposal of waste, which is separate from interim storage, which is the dry cask and spent fuel pools.

Is that clear?

MAJORITY CHAIRMAN METCALFE: Yes.

MS. KATIE TUBB: There's long term and then there's intermediate.

MR. ERIC EPSTEIN: Essentially the utility was a pass-through. So you collected the money from the ratepayer. The utility didn't put any money into this. Then they gave it.

You know, one of the problems I have is like building a house without a toilet. I get that the government was supposed to come back and build a toilet.

But, you know, it's been filled up with nuclear crap and at some point you have to stop making the nuclear crap.

So what we did as part of deregulation settlement explicitly is we took Beaver Valley, Susquehanna, and TMI 1 out of the rate base. The only plants that are still in the rate base for decommissioning are known as the NDCA plants. That's Peach Bottom 1, 2, and 3, Limerick 1 and 2. And then again, we haven't talked about this. Peach Bottom may be operated by Exelon but 42 and a half percent is owned by PSEG. This gets pretty complicated when you're looking at the formulas.

So when you're looking at how much money is saved and who does what, who does when, Representative Metcalfe, it does appear to be a bit confusing. But at some point you have a fiduciary obligation, if generating the waste, to help come up a solution. So that money was all ratepayer money.

MAJORITY CHAIRMAN METCALFE: So when the DOE ultimately at the end of the life cycle of all of us and our children and grandchildren, when they're still dealing with all of these spent fuels in the future, the DOE owns that. Now, this money that they've captured over the years is going to be enough to deal with it or, as you mentioned, because of the markets and because of the recessions that ultimately you are not seeing --

MR. ERIC EPSTEIN: What my colleague was talking about is decommissioning so far has happened to small reactors, not big ones. We haven't got to the big boys yet. So they're small and a lot of times they come off early.

I think you're getting to, there's an opportunity cost. If we delay decommissioning, it means that site isn't generating electricity, isn't employing people, isn't paying taxes. I think the reality is that TMI 2 will never be cleaned up. TMI 1 likely will be delayed.

And that's my fear. Because, you know, we don't have a facility where there's a funding challenge that the waste is just going to reside there. I wish I had a magic bullet and a solution. My belief is that -- I've been doing this for almost four decades -- is that each plant is probably going to be a radioactive waste site. The NRC said they could store waste up to 100 years. It wasn't designed to store waste up to 100 years.

There's also a fairness document here. You know, if we're going to get the exposure -- there's a risk reward -- there should be -- some states have required the utilities to store the waste.

MAJORITY CHAIRMAN METCALFE: So ultimately the DOE, backed up by the taxpayers federally, are going to be responsible for this spent fuel someday, if companies don't exist any longer, to actually deal with if their trust funds

go belly-up at some point. I mean, ultimately the DOE owns it, which means we own it as Federal taxpayers.

MR. ERIC EPSTEIN: Right.

MAJORITY CHAIRMAN METCALFE: Just one point. With the 70-some odd sites that we're now using as sites to store spent fuel, the security and all the additional costs has to -- and the social cost, as our carbon speculator had mentioned earlier, the social cost that we have, having 70-some odd sites where you don't have the same type of use of that land any longer because we haven't went to one site where the Federal Government actually had the backbone to go ahead and say we're doing this here and it's going to happen now so we don't have 70-some sites across the U.S. that's storing it with all of the risks that come along with that, it's got to be a lot more expensive for us to be doing this. It's 70-some odd sites in one site.

MR. ERIC EPSTEIN: Let me just point out, first of all, where the NRC saves -- the NRC doesn't really have a lot of chops. They don't have actuaries or accountants. I've been doing this for a long time. It's really disturbing. I would just point out the amount of money they're saving for is the minimal amount. They're not saving for the sealant.

So what they get approved of, it is a very rudimentary formula. It's very basic. It's not as

sophisticated as it should be.

I've filed what are known as DFIs, demand for information, to make sure. Because as you move forward and as you delay, the labor costs go up, transportation costs go up. And that's what we found. So there is no guarantee. I think what you raise, Representative Metcalfe, is a good issue. The Federal Government owns the waste. It's not owned by the utility. I mean, the low-level waste is a different issue. But we're going to eat it. And I think it's going to be a huge bailout.

MAJORITY CHAIRMAN METCALFE: Ms. Tubb, did you have something you were going to interject there when I hadn't finished my total point?

MS. KATIE TUBB: Understood. So by law, yes, DOE has to take ownership and title the waste and they do long term. But by law utilities have to pay for waste. So as we said earlier, DOE is essentially a middleman in this situation where they have made themselves owners of the waste and responsible for Yucca Mountain. But at the end of the day, the cost falls on utilities, not on the federal taxpayer. And that's confined in the Nuclear Waste Policy Act.

But I think you make a good point in that we don't know how much long-term storage is going to cost because of the way the DOE has billed for it. It's this

flat fee that we don't know is associated with any real, meaningful sense of what storage actually costs. So I agree with you-all there.

Heritage has proposed that utilities be responsible for waste management rather than the Department of Energy because DOE honestly has zero incentive to get this done. It's politically toxic. Congress has very little incentive to get it done because, again, it's politically toxic and the constituencies are not quite diverse.

But where we are seeing it get accomplished is in Finland where utilities are responsible for waste management. And the reason it works is they're legally required to pay for it. They also have the incentive to get it done. They have the know-how. And because it's part of their business model and profit, they think about, A, how they're creating the waste, aka generating electricity, because it impacts the bottom line when they have to store it.

So that's what we're trying to advocate for in the United States rather than this socialized, centralized plant, which, as we have all seen in the last 40 years, hasn't gotten us very much.

MAJORITY CHAIRMAN METCALFE: So Finland actually has a market-based solution?

MS. KATIE TUBB: They do. It's market-based. It's run by the utilities. It had to get public consent. And they do that through a lot of public education, a lot of negotiating, so that you come to mutually beneficial terms with the host facility. And they're actually getting it done unlike the United States.

MAJORITY CHAIRMAN METCALFE: Representative Dush, we have two minutes left.

REPRESENTATIVE DUSH: Okay. Real quick.

Katie, you mentioned about Dairyland. If all the other -- if the trust fund had to pay for the waste management for all of those that are already closed or currently due to close within six to ten years, what would happen to that fund? Is there enough money there to take care of all of them?

MS. KATIE TUBB: You're talking about the decommissioning site of things or the spent fuel?

REPRESENTATIVE DUSH: The spent fuel as far as the fund that the Federal Government --

MS. KATIE TUBB: Well, I think that kind of gets back to my point. We don't actually know what it costs to dispose of all of this because DOE has put a flat rate on the utilities. There's $40 billion in the fund.

Department of Energy, last time they did a financial estimate of what Yucca Mountain would cost from

finishing licensing processes to decommissioning, that was done in 2008 so I don't find it very accurate anymore.

I think the fees haven't been collected since 2014 because the government hasn't been able to prove that they're pursuing Yucca Mountain so they can't charge for something they aren't doing.

So what the Trump Administration has tried to do is refund Yucca Mountain to show that they're doing something so that they can start the fee up again to start paying -- or collecting fees from utilities to then go into this Waste Fund again to continue the construction and operation of Yucca Mountain so that it would cover costs.

But again, I find it an arbitrary fee, that we don't know what it actually means.

REPRESENTATIVE DUSH: And one last question to Eric. I'm glad you brought up the defense of these places because there's no defense in-depth the way I'm seeing the plants.

MR. ERIC EPSTEIN: There used to be.

REPRESENTATIVE DUSH: Do you know, are there any plans for having pools onsite so that whenever some of these casks start failing over time that you can take those old casks and dunk them in, transfer the stuff, put them into a new cask, and bring them back in?

And I like your hardened onsite storage designs.

But do you know, are there any plans with any of these facilities to be able to do that?

MR. ERIC EPSTEIN: I think you probably could do it. It's a great question. I never thought that out. Essentially as we're emptying the spent fuel pools in the event we need them to basically repopulate them; is that your question?

REPRESENTATIVE DUSH: Well, to switch whenever you've got a failing cask.

MR. ERIC EPSTEIN: Right.

REPRESENTATIVE DUSH: You know, take that thing out, dunk it, bring in a new one, make the transfer, and then put it back onsite in another dry cask.

MR. ERIC EPSTEIN: Technically I think you could do it financially. I don't know if they would. I think it's a good question. I can't answer it. I'll be honest with you. I haven't thought of it.

I mean, that's thinking outside of the normal boundaries. But I think what you said is the most important thing. When I started in this, there was redundancies and safety used to be the mantra. That was a long time ago.

REPRESENTATIVE DUSH: Thank you.

MAJORITY CHAIRMAN METCALFE: Thank you, Representative Dush.

Thank you both for your testimony today and for

entertaining our questions. We appreciate it. Welcome back to Pennsylvania.

MS. KATIE TUBB: Thank you.

MAJORITY CHAIRMAN METCALFE: Good to have you back. We appreciate it.

Thank you to the members.

Motion to adjourn by Representative Dush. Seconded by Representative Zabel -- Warren. Sorry, sir.

This meeting is adjourned. This hearing is adjourned. Everyone have a great day.

Thank you.

(Whereupon, the hearing concluded.)

I hereby certify that the proceedings and evidence are contained fully and accurately in the notes taken by me on the within proceedings and that this is a correct transcript of the same.

Jean M. Davis
Notary Public