Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: DSFM Regulatory Conference 2019
Conference 2

Docket Number: (n/a)

Location: King of Prussia, Pennsylvania

Date: Wednesday, September 18, 2019

Work Order No.: NRC-0613 Pages 1-97

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NUCLEAR REGULATORY COMMISSION

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OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

DIVISION OF SPENT FUEL MANAGEMENT

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DSFM REGULATORY CONFERENCE 2019

(REG CON)

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WEDNESDAY

SEPTEMBER 18, 2019

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The conference met in the Crowne Plaza Philadelphia-King of Prussia, 260 Mall Boulevard, King of Prussia, Pennsylvania, 19406, Freedom II Conference Room, at 9:00 a.m., Daniel Mussatti, facilitator, presiding.

PRESENT

DANIEL MUSSATTI, Facilitator

MICHAEL LAYTON,

Director, Division of Spent Fuel Management

CHRIS REGAN,

Deputy Director, DSFM

RAY LORSON,

Regional Deputy Administrator, Region I

Session IV:

VERONICA WILSON, DSFM

BRUCE MONTGOMERY, Nuclear Energy Institute

JEREMY SMITH, DSFM

JEREMY TAPP, DSFM

MARILYN DIAZ-MALDONADO, FCSE

MARK RICHTER, Nuclear Energy Institute

Session V:

CHRIS BAJWA, DSFM

SYLVIA SALTZSTEIN, Sandia National Laboratory

BOB QUINN, Westinghouse

JASON PIOTTER, DSFM

AL CSONTOS, EPRI

MERAJ RAHIMI, DSFM

ROGER MAGGI, Orano

ALSO PRESENT

HAILE LINDSAY, NRC Staff

TOMEKA TERRY, NRC Staff

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

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

12:44 p.m.

MR. MUSSATTI: All right, we're going to get started here. This is the final session. One last time on the ground rules for what we do here. One person at a time talking, please shut off your telephones and all of your electronic devices. If you have to take a call, please go out in the hallway so you minimize the disturbance.

When you are speaking, Andrew would love it if what you would do is speak clearly and slowly, state your name and your affiliation when you start, even if you're starting again and you've spoken a little bit earlier, please repeat yourself. It helps in getting a clean transcript.

Towards a clean transcript, all of these microphones are hot. Sidebar conversations near a mic that's not talking at the time doesn't really help because we still pick it up over the microphone. So if you need to talk to somebody, please get to the far side of those doors before you hold that conversation.

Other than that, let's have a great time and finish this thing up. And I'm going to turn meeting over to its chairman.

MR. BAJWA: I'll try to speak in the mic.

Okay, well, welcome back, everyone. This is our last and hopefully best session of the conference. My name is Chris Bajwa, I'm a co-chair of this session, along with Silvia Saltzstein from Sandia Labs.

I am with the Division of Spent Fuel Management, what is currently the Division of Spent Fuel Management, that's going to change in about a month, with the US Nuclear Regulatory Commission.

Silvia is with Sandia Labs. She's been with Sandia for 25 years, and is currently the manager of the Spent Nuclear Fuel Storage, Transportation, and Safeguards R&D Department, and the Control Account Manager for the DOE NE8 Spent Fuel and Waste Science and Technology Storage and Transportation Campaign. So she has obviously a lot of responsibility there, and her experience is apropos to what we are doing here.

So we're going to jump right into our speakers. The first speaker for this session will be Bob Quinn, who's going to speak on safety margin.

Bob Quinn is the Director of Global Spent Fuel Storage and Disposal for the D&D Solutions Group of Westinghouse. He has over 40 years of experience working in the nuclear energy industry, including over 30 years in design licensing and delivery of spent fuel storage, transportation, and disposal systems and

associated infrastructure design.

Now, if you were here yesterday, we were told that Bob is going to have us jumping for joy.

(Laughter.)

MR. BAJWA: So that's a high bar, but Bob, you know what you need to do.

MR. QUINN: All right. Well, thank you for that introduction and for teeing me up for failure.

(Laughter.)

MR. QUINN: Yes, I am Bob Quinn, I'm with Westinghouse. I'm here today actually presenting on behalf of our taskforce at NEI that has been working on a white paper to look at this, what Rod called yesterday performance margin for used fuel. And I think Rod did a great job yesterday of teeing this up for us.

So I want to give you a little bit more detail about what we're doing, why we're doing it, how we're doing it, and give you our preliminary results in terms of recommendations that we plan to make to the Commission later this year. So with that said, I'll see if I know what I'm doing here. Perfect. All right.

So you saw this slide in Rod's deck yesterday, but I wanted to re-show it, and it highlights

a couple of statements. It talks about reasonably demonstrating significant margin, and if there is such significant margin, then maybe a detailed review of the specific item may not be warranted. So we're looking at that.

And the other part is that, you know, it's true, there's no regulatory requirement or expectation for additional margin beyond the regulatory standard, so. Our challenge now is to identify what this margin is, where it is and how much it is and how we use it.

So the first question is where does this margin exist? And it really exists in two specific places. And one is the actual margin in the capability of the used nuclear fuel itself. You know, it has more ability, more capacity to withstand events than we give it credit for currently in our evaluation. So we need to look at how we can identify that and take advantage of that.

And the other part of it is really something that's driven by the industry and the regulator, and it's a margin that exists in the methods that we use. Sometimes we use approaches in our analyses to make things easier in terms of bounding different amounts of fuel or different types of fuel.

We do that for simplicity so we don't have

to do hundreds of thousands of analyses of all possible permutations of what we're putting in our casks and canisters. And sometimes it has to do with looking at how we deal with uncertainties or unknowns.

But we have this tendency, and we kind of do it to ourselves, and sometimes we do it because it's either, not necessarily in the regulations but it's certainly in the guidance, that we need to use conservative values and bounding values. We need to account for all these uncertainties.

So when you stack these conservatism, maybe methods and conservatism in inputs and then you apply for your uncertainties, you build a lot of margin in there. And we see that when our utilities go to load casks right now.

We'll predict a thermal, a temperature based on the fuel that we're loading, and it'll be sometimes a factor of five or even ten cooler when it's actually loaded that what we've predicted. So I think there's a lot of room there for us to improve, so that's our challenge.

So you saw this yesterday as well from Rod's slides, and he really did point out the two things here that I was going to point out, so I didn't know he was going to do that, so he stole my message here. But

I mean the enablers of being able to do this kind of transformation, to be able to take advantage is this has to do with, you know, our maturity and our performance.

But the one piece that's missing is understanding the safety margins Rod pointed out, and that's going to allow us to hopefully be able to disposition some of these low safety significant issues quickly or with less effort, you know, and more, not say not review it, but to review it with less expectation of additional work to be done in terms of more analyses or more evaluations by NRC.

In fact, you know, one of the things that industry does is we work under an NRC-approved curate program, we have, you know, approved procedures, we do our analyses, we do our reviews, we do our design verifications and validations. And that's all done under the auspices of NRC.

We get inspected against that, you know, every so often by NRC. And yet when we submit our applications, lots of times another evaluation is done by NRC. And if the answers don't match, then we get into a whole set of questions about why they don't match and why is it different.

One expectation might be that maybe we

don't need to have a separate analysis by the regulatory, but the regulator should look at the reasonableness of the analysis results we presented that we did under our NRC-approved QA program, under approved procedures, and that's actually been inspected. So we think there's room for improvement there.

So on to the white paper that we're developing. This is the concept of basically what we want to do. So we want, the white paper's going to document things like our current understanding, talk about the methods we use, and maybe some areas for improvement there.

We also want to look at risk insights, and we've heard a lot about that at this conference so far. I think there is a lot of room for risk informing to help us reduce some of what we're doing right now in terms of work that needs to be done to get through the certification process or the licensing process.

But some areas in the guidance could be improved potentially. And then we'll put together a schedule and maybe do some prioritization at the end here. And I do have a schedule slide at the very end here, but at a high level, our goal is to try to get alignment with NRC this year.

And to that end, we did meet with the NRC at a public meeting in April and introduced this concept and talked about where we wanting to go. So this is really an update of what we've been doing since then.

And the biggest area, as you can see here in kind of in the middle of the slide, the areas we're really looking at are source term margins, and source terms are a big source of I think where we have some margins that we can maybe do something with.

And those actually feed the two next to it, the thermal and radiological. So there's thermal and radiological source terms, but there's also the thermal and radiological methods. And those have some room for improvement as well.

Fuel qualification margin is another one, and we did hear this morning that the pilot program for the TN application for the simplified tech specs, I was glad to see that the fuel qualification tables are being taken out of the tech specs and being moved into the SAR. That's great news, but I think there's maybe a little more we can do with that, and we will.

And the last one is criticality margin and what can we do there to maybe make things a little easier for everyone on the applicant side and the reviewer side.

So what we want to talk about then is maybe some of these topics, especially thermal, maybe radiological. We would want to do some PIRTs, which are -- I'm sorry, phenomena identification ranking tables, yes, okay. I had to write that down because I could never remember it.

And those would inform what we do going forward in terms of things to look at that are more important versus those that might be a little less important for safety. And how we might, and then going forward, how we implement that might be in vendor topicals or amendments to their current certificates.

And in fact we're working with EPRI as well, they're on our task force. And maybe some of these topicals might be generated out of EPRI if that's appropriate. And so those would be things that happen once we get some alignment with NRC.

So our goal here is to have, you know, risk-appropriate regulatory framework for used fuel storage and transportation.

So some of the resources for identifying what their margins are, you know, we have a lot of increased knowledge, Rod touched on this yesterday. And that comes from a lot of places, and I won't read

them all to you here, but they're shown on the slide. In our experience, you know, our, been doing this for over 30 years now, we're at 70 sites in the US, not to mention other sites internationally. We got 3000-plus systems here.

And the fact that if you look at this on a risk-informed basis, you know, spent fuel storage is one of the safest things we do. It's a very low risk, and if you look at consequences of reasonable anticipated types of events, the consequences are very low as well.

The next slide talks a little bit about what's going to be in the white paper. This is fairly basically the table of contents of it. It basically has what I mentioned before in terms of the five major areas to look at, so I won't spend a lot of time on it, that's in the materials that'll be available.

So the next step is so where did we get to here. We looked at where the margins exist and what they might be. You know, so what the real outcome of this paper is, you know, what are we going to do with that, what are our recommendations that we're going to make to the Commission later this year, to the staff later this year on what we think we can do.

So we've really, we've come up with 11

recommendation right now, that might change before we get to the final paper. It might be more, it might be less, but we've got 11 that we've kind of coalesced on here in our current state. And you can break them down into three categories.

The first category are things that industry could actually do, you know, with no assistance or input from NRC in general. So you'll see what I mean when I get to listing those. They would live within the existing regulations and the existing guidance. We wouldn't have to change anything in regulatory or guidance space.

The second category is kind of the flip side of that, and that is something that we would need NRC to take into action, and that might be related to tailoring the regulatory guidance or modifying a little bit the review practices or the inspection practices. We can't really control that, but we can ask NRC is they can do something about that.

And then the third category is the one that actually would probably take the most work, and that is things that we need to actually get together and engage in a dialog and come up with a plan, but we think it's worth pursuing.

And I would note that not all these things

are going to necessarily happen on the same schedule. I mean, if some of these things are very easy for the applicants to do, we might just go ahead and do them. You know, assuming that NRC agrees that they're appropriate things to do.

And some of these Category 3 items that are going to require a lot of collaboration and maybe some work and maybe some experiments or whatever might take a little longer. But we want to capture them all and start pursing them.

So let's see, so the first set of the recommendations, the Category 1 recommendations, these are the ones that we think industry can take on on their own without any action being required by NRC. So there's four of these in the source term, thermal, and fuel qualification category.

So just really quickly, the first recommendation for source terms would be for us, the applicants, the licensees, and CoC holder to use more realistic source terms and to

support that with our conservative modeling.

But instead of using conservative source terms, use realistic source terms, with our conservative modeling, just to remove some of the extra conservatism, if you will, and demonstrate using that

that the design is adequate for the adequate protection of public health and safety.

The second source term recommendation is related to that, and that is in cases where, you know, using a conservative source term calc, we demonstrate compliance with D2 actual dose limits that are in Part 72, the site boundary limit and the dose limit to the nearest person.

Maybe we don't also have to apply the uncertainty on top of that. We're going to use a conservative source terms, we're using a conservative method. Maybe that's enough to cover the uncertainty, so we'll look at demonstrating how that is and why that is, and maybe we can help ourselves a little bit in there.

The third recommendation in this first category is for, is a thermal recommendation. And it's to look at how our thermal modeling is currently done. I mentioned the factors that we're getting that are so far different from what we're predicting versus what we actually get in the field.

You know, so we'd be looking to develop as an industry a consensus basis to develop source terms that are perhaps a little more realistic and a little more appropriate and work with our thermal modeling

to do, to get better, more realistic results and put that into maybe a best practices guide.

And then the fourth one is a fuel qualification one. And this one I think is a pretty easy one. This one tees off of the pilot amendment that was done by TION (phonetic) through the regulatory issue resolution protocol, where we used a graded approach and we heard about the graded approach this morning.

We heard that it's about to be approved and go out the door, so, you know, the recommendation would be for the CoC holders to go ahead and use that to amend their CoCs and get some of that detail out of there so you can reduce the size of the CoC significantly, get the fuel qualification tables out of the tech specs and back into the FSAR. So I think that's a pretty easy one for us.

So, Category 2 recommendations, which you recall are the ones that, this would require some, you know, an action from NRC, and nothing that we can really do to push that, other than to provide our rationale why we think it should be done. And it touches on source term thermal and radiological recommendations.

So the first source term recommendation is where we have conservative source terms and

conservative modeling, and we document source term uncertainty in our application. Perhaps we could have a paradigm where NRC's review needs to be a little less rigorous. Perhaps you don't need to do a separate, independent, full-blown calculation, maybe just a reasonableness assessment of what the applicant's provided might be good enough.

The second one is a thermal recommendation. You know, so if we've gone through this PIRT process and identified the more important things and less important things, perhaps there could be a revision to the review guidance to limit the review to verification of the results of the PIRT and the, you know, where it's appropriate.

So some of these things that we identified from the PIRT that are less important, maybe they don't need quite the rigor of review, maybe, you know, again, a reasonableness check or a sanity check or whatever you want to call it, but something less than a separate, independent analysis.

On the third one is a radiological recommendation. And this gets down to the realistic and representative doses versus bounding dose rates, and it really has more -- this particular recommendation although it doesn't say it has to do with source terms

that we use in our site boundary calculation.

So we, you know, a lot of utilities now aren't even using the conservative numbers in the SAR, they're using their real, loaded numbers, you know, from the casks. And sometimes these, the boundary source if you actually went to measure it would be unidentifiable from background radiation because they're just so low.

So perhaps we don't need to have that same rigor in the review because we know that these are very, very bounding calculations that are very conservative, and perhaps we can maybe have a little bit of relief there, if you will. Not that we want relief, we want the review to be appropriate to the safety significance and the margin that we identify.

The second part of this actually talks, is about the implication, and it's actually in the regulatory guidance that you should use conservative source terms and conservative analyses when you're doing your boundary dose calculations -- I'm sorry, when you're doing your radiological calculations for your casks.

And other than the site boundary dose rate, there is no regulatory limit. I mean, there is ALARA principles, of course, but to say we need to do all

this conservatism in this analysis of the calculation of the dose rates for the operations or for the site is perhaps not really necessary, and perhaps we could get a change to the guidance there that will support that. And that would require a change to the SRP.

And then for the fun one, the third category, this requires the NRC and the industry to engage and collaborate, but maybe these are the bigger ones, it might take a longer. But maybe they're also the ones where we'll get the most bang for the buck, and that is a couple thermal and two criticality recommendations.

The thermal ones have to do with the parameters for thermal modeling, looking at the inputs, the modeling approaches, the modeling techniques, and use this PIRT to get that determination of what's really important.

And we do need to focus on, we do need the higher level of rigor, versus the ones that perhaps you just need to say yeah, that's good enough. It checked that box, it's, you know, they aren't that important to safety or a reasonable assurance of public health and safety, and therefore, you know, we know there's margin there and it's good enough.

The second one has to do with peak cladding

temperature limit. And this is a two-part recommendation. The first part is, you know, right now we've got this basically cliff-edge, 400 degree C limit. If you get to, you hit that limit or get close to that limit, a lot of rigor gets involved in the calculations, a lot of uncertainty, sensitivity studies.

All these things we have to do, but we really know that 400 C is not a cliff edge. So maybe some kind of graded approach where if you're in a certain temperature range, you don't need to do much for review. And if you're very close to some limit, then maybe you do have to do a review. The question is is 400 the right number.

The second question, which is even more important perhaps, is is peak cladding temperature limit the right criteria for the thermal limits. I mean, maybe there's something that's more important or more relevant. And maybe that'll come out of the PIRT, and maybe we can talk about that when we have those results.

And then the two criticality recommendations both relate to, obviously for our criticality safety calculations, the first one has to do with trying to align it more with what we do in spent

fuel pools right now. So for example, in spent fuel pools you get full fission credit, burnup credit. You get full credit for the neutron absorbers.

And while in spent fuel storage space here, we're still taking partial credit for the absorbers. And we only get partial fission product burnup credit. So that's one thing we think is worth talking about.

And the second one has to do with modeling the fuel reconfiguration and accident scenarios. Right now, I've seen all kinds of different methods that are sometimes very convoluted, very scientific or very speculative. And maybe there's a more realistic approach looking at real fuel behavior and how that might behave in a situation.

So those are our 11 recommendations. I'm hoping they'll generate some conversation at least, and or perhaps a full-blown endorsement. We'll take that too. So here's our schedule right now. As I mentioned, we met with NRC in a public meeting back in April. We talked about this at the NEI -- Management Conference in May. And I didn't switch my slide, thank you.

(Laughter.)

MR. QUINN: John's keeping me on task here. All right, so we've been drafting the white paper.

We're here at the REG CON today, in September. By the end of October we'll be getting that white paper submitted. In November review the draft, and we'll do any course correction based on feedback from NRC as needed. And then we'll get this thing finalized and submitted by the end of the year.

So the conclusions and next steps, since I'm out of time, are I think we've made a lot of progress in the last several months since April in putting some meat on the bones of this white paper and developing some ideas of the things we want to ask for. We're going to finish those up here in the next month or so.

And we're going to submit that to NRC later this year, and hope to engage in a constructive dialog to get us to a better place for regulatory efficiency. Thank you.

(Applause.)

MR. BAJWA: Okay, thank you, Bob. Our next speaker will be Mr. Jason Piotter. Mr. Piotter is currently a Senior Mechanical Engineer and Technical Reviewer for the Containment Structural and Thermal Branch of the Division of Spent Fuel Management.

Mr. Piotter joined the NRC in 2004 and has held various technical positions within the Agency, including nine years as a Structural Engineer and six

years as a Senior Mechanical Engineer in both the Office of Nuclear Materials Safety and Safeguards and the Office of Research.

MR. PIOTTER: You know, anticipatory response is an interesting thing. I thought I was going to have to come up here and go to battle stations over Bob's presentation. And what I realized listening to what he had to say is that we could probably have given each other's presentations. It's actually pretty interesting.

And I think, you know, to preface that, one of the interesting things about what Bob was saying too is that, you know, the document that they're working on has sort of been developed independent of NRC, at least up to this point, with some communications.

And I think thinking longterm, we need to rethink that process. I just wanted to make that comment about his particular presentation is that, you know, maybe the siloing effect is part of the reason that we have some of the issues that we do have.

Yesterday they talked about, in the last session they talked about narrative, and how narrative is important when you're talking to various groups. And I want to use a narrative here to sort of start out this presentation. And when I looked at the agenda

for this conference, I saw that there was going to be a presentation on margin, and my first reaction was again, what, margin?

And so while my brow furrowed, my eyes narrowed, I put on my Nikes, I stretched. And with purpose and resolve I reached over to my mouse and opened up PowerPoint to draft my response.

(Laughter.)

MR. PIOTTER: The education was about to begin, and it was going to happen again. And I laid out my view on margin, I added multiple ideas for transformative change in licensing reviews that we've been floating through NMSS for quite some time with the innovation panel, through meetings with management, branch meetings, and peer discussions.

When I finished the draft slides, it just felt, really it felt awful. It felt incongruous, disjointed, disloyal, in some ways not right. I know I've got some furrowed brows in here right now. Believe me, this'll get to a point.

(Laughter.)

MR. PIOTTER: So work continued from the slides, and they were finished mainly because of a deadline. Since turning the slides in the restless brain kept churning and churning and churning. It

couldn't figure out what was wrong. And then this morning, while packing, ironically enough, it came to me.

I've always been interested in human performance, and lately my focus has shifted to psychology. Partly to figure myself out and improve, but mainly to figure out why all the other people were crazy.

(Laughter.)

MR. PIOTTER: So this interest in my epiphany of what was giving me pause about this presentation and its messages was simply this: it was antagonism between understanding and empathizing with the positions of everybody in this room, with the public. And fortunately I got to beta test a little bit of these ideas right before this talk, so I have a good idea that this is where we want to go with this discussion.

Needing to understand what everyone else is thinking I think is an important piece. So the key takeaways for this discussion, and I want to give these up front, and this was part of the discussion in the dry run for this presentation, and I needed to do this, and I think this is important.

Review licensing and regulatory philosophy

is a spectrum, okay. It's dependent on what seat you occupy. And whether we are looking backward or moving forward, we need to move beyond the slings and arrows of these intermittent conferences to get past our differences for these issues.

We need to sit down and hammer out transformative change in moving forward, or we will not make the progress that we need. We must have a framework in place for whatever changes we decide upon before dismantling the way we've always done it.

All parties involved must employ a targeted empathy. And really what that means is you need to understand what the other person's thinking. And we need to have straight talk in what we do. And I think we've done a good job at that over the years.

And lastly, the urgency is increasing. We don't have necessarily the time that we thought we'd have on some of these issues, we have to move forward. So this presentation, and I said a lot on this opening slide, and that's fairly unusual. But this presentation is one small perspective, some mine, some an integration of others within this room and elsewhere.

I think, you know, this is a good representation of how we feel a lot of the time, right, when we're doing our day-to-day work. Sometimes this

is what we do to ourselves. And you know, yeah, I'm sort of trying to use humor here because it, you know, it sort of breaks the tension of the day. But at the same time, there are these frustrations that we have with our day-to-day work.

In brief, I want to talk a little bit about safety considerations that we all know and love, talk a little bit about margin and sort of how, as a technical reviewer we view margin. And it's more a bubble approach rather than a systems approach. Talk a little bit about numerical analysis and where I see that going. And then looking at some of these innovative tools for evaluation in licensing space.

So the safety considerations. We've heard low risk, right, provided that confinement is maintained. And I have an asterisk there, again, as a result of some comments that I got on the slides. And yes, it's low risk, but it's not low risk necessarily for everyone. So we still have to take into consideration where and when we're talking about where things are low risk and what that actually means.

We have no uncontrolled criticalities, the dose limits to protect the public and the workers, and of course, retrievability. So within these safety considerations, as technical reviewers, at some point

in time, we developed a technical review framework that didn't use risk models and data because they simply weren't available.

So we set a deterministic bar for how we do technical reviews, and our current review regime reflects that. Now, can, should that threshold change over time as we've gotten smarter? Of course, of course it should change. And it's not a lack of recognition or ignorance on the part of the technical reviewer. It boils down to in a lot of cases a difference of opinion and a desire to have specifics of the changes and the consequence of those changes.

Now, I want to talk briefly about where margin sits within steel design, for example. Load and resistance factory design is used in design of buildings. You have loads and you have capacity. And in those typical cases, what you'll do with your loads, whatever your calculated loads are, you're going to amplify those loads with a load factor based on statistical analysis.

With the resistance or the capacity side, you're going to provide a penalty on that capacity on that side of the equation. And then what's left in the middle is the margin.

What's interesting about load and

resistance factor design is because you have these calculated amplifications and penalties built in, you could have that delta be zero because you have it built in and you understand what the margins are. And they've been communicated and agreed upon by all the parties are involved.

In thermal design where we look at that these things, we don't have that. And Bob talked about the cliff edge with peak cladding temperature, PCT. That's how it's been treated. We have a cliff edge when we're looking at this.

And by and large, as a thermal reviewer, that number and that cliff edge is not something that's within our control. It's an acceptance criteria that is delivered to us as part of our review.

On the load side, we don't typically factor the loads. We don't provide amplification of the loads. Now, you could argue that conservatisms that are built into the system are amplifications, and that's perfectly fine to make that argument. But if we don't know what those are, the technical reviewers themselves aren't going to know what those are either.

So what happens is within the thermal space is that over time, when those margins are identified, the loads that are on the system start creeping up as

you get closer to PCT. And then the rig, the technical rigger has over time increased as that margin gets smaller and smaller.

But really what is PCT? It's a proxy, it's a proxy for other things that we deal with within our safety space that we don't necessarily want to have to do detailed calculations on. So PCT was an easy way to make a determination, to satisfy any issues you might have with criticality shielding or retrievability.

But because it's easy, there's also not a lot of flexibility in that PCT value. And again, this is not something that the technical reviewers on the thermal side are going to have a lot of control over. But I'm glad we're going to have a discussion, and I'm glad we're going to sort of look at what PCT means and what we can do with that over time.

Now, again, we're talking about undefined conservatisms. You might add this extra red bar in there to basically account for those things, but over time, that's going to creep up. So PCT gets eaten up over time, or I'm sorry, the margin that you find gets eaten up over time.

So if you find extra margin, if we find margin in the calculations that are done in the thermal

analysis, if we find margin in PCT, you're just going to shift the burden towards something else. If PCT goes from 400 degrees C to 570, you're going to shift that whole discussion to that next framework.

And so the question is can you achieve any real efficiencies by sort of floating around and dealing with this? Yes, you're going to achieve some efficiencies, but you're not going to receive or achieve the best efficiencies, in my opinion.

So what's the implication for technical review? We don't know a priori what the conservatisms are that industry wants to take credit for as the technical reviewer. So we have to approve it at the requested capacity. The consideration of as-loaded conditions? That's a difficult thing for us to do too, if it's not identified, justified, quantified, and proposed in the application that's submitted to us.

We're not going to know what a future action's going to be. We're not going to know whether or not a system is under-loaded based on its design capacity. What's in front of us is a 40-kilowatt system, for example, and we have to determine whether that system can support 40 kilowatts, not an as-loaded condition with 32 kilowatts. We're never going to know that.

So, you know, there are opportunities I think in taking as-loaded conditions into account, but there's got to be a framework in place on how we do that. It's not going to just be, well, the NRC should just know that and take that into account. Propose it and we can evaluate it. I mean, I think it's really in some respects that simple with this issue.

So intermediate conclusions. As I mentioned, the technical staff evaluates designs and really licensing basis or design basis. Operational experience and undefined conservatisms are not credited, they just aren't. And that's not to say that, again, we wouldn't be willing to review whatever's put in front of us.

I think if I can speak for the rest of the technical reviewers in my disciplines, we're more than willing to have dialog and see what other options are available.

Because I can tell you, when I'm reviewing heat zone loading configurations in an amendment, and I'm looking at the calculations that are done for this, do I really need to be looking at this? This is the question I'm asking myself. So there's room for improvement, there's no doubt.

With respect to numerical analysis, I think

the current state of the art for numerical analysis in a lot of ways is well established from a licensing perspective. There are significant research efforts underway by the NRC and others to inform those technical reviews, and Bob mentioned some of those as well. But the dry cask simulator and the demo project are good examples.

So why is numerical analysis by itself an impediment to licensing? You know, it's interesting, because applicants want to take advantage of advanced modeling tools to push the limits of design, but there are consequences to taking that approach. Those consequences are commonly referred to, and I'm calling this a thought-terminating cliche, academic purity.

And I fundamentally disagree with that line of thought. If these tools are used, there's a baseline of what's reasonably acceptable for using them. Best practices guidelines, ASME V&V are two examples of objective guidance that help you use these tools properly.

And it's not about necessarily getting the right answer. Although I will say that there have been instances where that has occurred, and we need to get better at that.

So reasonable assurance of adequate

protection, where do we go from here? And so these are just some open-ended questions that I want to pose. Are we collectively doing too much technical review? What would minimal or at least targeted technical review look like? How can we make technical review or at least parts of it a defense-in-depth exercise?

And again, this speaks to exactly what Bob was talking about is looking at how we're doing things up front to be able to establish sort of a new paradigm in our review process. And I've got four things here that we've been talking about internally at various phases. Acceptance review grading is one example.

So at the acceptance review phase, as we get an application in, and we can do this at the micro or the macro level, looking at what's in that application and giving a relative ranking on what the level of review needs to be from the very outset of the review. That might include multiple reviewers being involved in that process.

Scoping reviews are related to that, and that came as part of the innovation panel within NMSS. We had a staff member come up with an idea that scoping reviews are done up front by multiple technical staff in a discipline to determine what areas of review need to be focused on.

You know, a standard review plan is great, but if you don't have consistency across reviewers and how that's interpreted, you may not always get the same result.

A 180-hour review in eight hours. That's a really, really, you know, a big stretch goal with respect to doing reviews. How can you do a review that takes 180 hours in eight hours? It makes you sharpen your pencil awfully quick on what's important.

Rapid review. We had a case in June where we had to do a very, very quick turnaround on a review. But what it required was almost 100% re-prioritization of the staff to focus on that one issue. Is that always the best option? Probably not, because you still have all these other cases and all these other activities that you have to be involved in.

So again, these are some of the ideas, and again, they're sort of out in the ether, and they're very aggressive activities that are beyond what we currently do, and it's beyond the comfort zone of most technical reviewers. But again, it's part of this transformative change that I think we have to consider.

So, innovative tools for licensing evaluations. I think, you know, Bob mentioned uncertainty and conservatisms as something that we need

to consider. Operational experience certainly is one thing we needed to consider. And as I've already mentioned, level of review and how that's determined up front in the review process.

So, as a technical reviewer, how am I supposed to do that? How am I supposed to change everything that I know as a technical reviewer and move into this new paradigm? I think the technical reviewers in general have to have a transformed role.

I think we no longer need to be looked at necessarily as thermal reviewers or mechanical engineers or structural reviewers. I think we need to start looking at ourselves as a licensing engineer or a regulatory engineer.

We need to use our whole regulatory toolkit. We need to use the Inspection Oversight Program. We need to have integration with the technical review and the Inspection Oversight Program. And maybe perhaps we need to be using technical specifications in a different way. A graded approach in the technical review is an example.

The inspection communication tools to help inspectors with their sampling in their inspections is an important tool. Active inspection participation by current technical reviewers and consensus standard

participation are just examples of some of the changes that we need to make.

And I'll just go to the summary and conclusions very quickly. As I mentioned at the beginning, I don't think true efficiency gains are necessarily going to be achieved by muddling around the periphery of review procedures. And by and large, what we receive and how we do our process is a reaction to what we get from the outside.

Big thinking and big changes are required to achieve efficiencies in reviews. And at the end of the day, I think review efficiency will be achieved by reducing or eliminating what is actually reviewed and then using all regulatory tools. Thank you.

(Applause.)

MS. SALTZSTEIN: Thank you, Jason. Next, we have Al Csontos. Dr. Al Csontos is a technical executive in the fuel chemistry low level waste and high level waste group in the nuclear sector working on accident-tolerant fuels and various other nuclear wastes at EPRI. Prior to joining EPRI in 2016, he spent 16 years at the US Nuclear Regulatory Commission in various capacities.

Take it away, Al.

MR. CSONTOS: All right. So I really like

the discussion about innovation, okay. But I'm going to pose one question, okay. If you really want to think about innovation, okay, and regulatory space and the whole thing that we're doing here in paradigm is -- regulations that we need to keep the spent fuel, you know, to keep the integrity of the spent fuel there, right, during storage and transportation, how would you do that today?

Today, we're doing it by my model versus your model, my uncertainties versus your uncertainties, okay. The key here is we want to make sure the fuel remains integral, starting in storage, transportation, and then when it goes to interim storage, or wherever else it goes downstream, okay.

Well, what if I told you in three years we get a sensor? How would that change, okay? So I think that we want to think about this, when I talk about collaboration here, I want to take what, you know, what you just talked about, Jason, and take it a next step, okay. Which is you know, we're at a stage now where we're doing a lot of my model versus your model. And one of the things we learned from the demo project was measurements are really good. And data is really good.

And so I'm going to show the difference,

you know, and just talk about the nexus between what we're doing in the fuel and for fuel performance, and then also to kind of hint at what Jason was talking about, the thermal, okay.

Okay, so what, we had this project, we started off with phase I, II, III, and now we're going to IV, okay. And so what we're doing here is we started this through the ESCP Program of thermal modeling subcommittee, okay. And in there, we took a look at there were various three things here.

Christian got the Phase I started way back in, oh my gosh, two thousand and probably '12 maybe, '13, somewhere in that neighborhood. And that started us down a path of saying hey, let's do some validation benchmarking and other activities. Well, when I came to EPRI, we had this high burnup demo program back in 2016. I said, well, why don't we do some sort of benchmarking?

What the heck, you know, we're going to get real data. We're going to get 63 thermocouples inside a canister. Let's get the data and compare, okay. So that was Phase II. And then Phase III is now taking Phase I and putting it horizontal and trying to do some benchmarking and validation there.

Phase I and III are at Sandia, and there

Sandia's leading that effort. Phase II was an EPRI-led project, okay. Now, this last phase, bringing it all together, is that let's take a look, and Bob kind of hinted at it, with the PIRTs, okay.

And I'll go into that a little bit and how that's going to help us, I think, in the future, of really kind of getting a better handle on these uncertainties and the models that we're using in lieu of actual data, okay.

So now for the fuel. You saw what we've been doing for the past, you know, ten years or so for the thermal. But we've been working on the fuel side for even longer. I mean, it's been going on for, what, 40 years, maybe? Or more?

MS. SALTZSTEIN: Yeah, five I think.

MR. CSONTOS: Yeah, and then in the last five years, in the last ten years, we have been doing a tremendous amount of work getting a lot of great data. NRC and Oak Ridge have done a lot of work on the SRF test. Sandia and others have been doing a lot of work PNNL.

You know, there's just been a lot of activity. It's a sibling rod test program that right now is going on that SNL's leading, you know, with Oak Ridge and others.

You know, I just identified several of them up here, okay. These are in the millions and millions of dollars. I bet you there's at least over $100 million worth of research being done in this area, 50 million in terms of just the high burnup demo, right. And we're talking over a 20-year period, you know, a lot of money, okay.

And what we're learning is a few things, you know. Things are not as bad as we once thought, you know. The fuel is more robust that we maybe gave credit to, okay. And so what we're looking at here is, hey, let's take a step back. We've been doing all this good work. Let's get all the experts together and see where we are, okay, and that's what the PIRT's for, okay.

So why are we doing this, okay? Well, I want to give this to you because thermal connects to everything in the back end, okay. What you do in thermal, and if we use design licensing basis calculations, and they're the, you know, the calculation of record for each system, okay.

And if we keep on using the design licensing basis type of approach and we use that higher end, you know, high end I wouldn't call it conservative, but just design licensing basis type of calculation, we're

going to be off in every step of the way here. We're going to be over-predicting temperature during transport, during all these different pieces here.

And I think that a better handle of the back end and all the engineering decision points that we have to do here, okay, will be impacted by using a calculation that was based upon to try to ensure that we had spent fuel integrity by ensuring we don't meet a 400 degree C PCT limit, or go greater, okay.

So I think that in this case, there are a lot of potential benefits, okay, and I'm going to go through a couple of them here. One is occupational dose, okay. Right now, in and utilities -- others, you can chime in here, okay, you know, some places can't put more shielding blankets on canisters to shield their workers from dose because they're going to surpass their criteria that was based upon the design licensing basis thermal calcs.

And in that way, even if you're well below that decay heat that you've analyzed for in the thermal calcs, you still can't do it, okay. And so you're not really, this is not helping safety, okay. We ought to be trying to reduce the occupational dose, okay.

Another one is the keep the mating (phonetic) door open. You have to keep the mating door

open because you need to have the air flow through, and so you're dosing workers up, okay. If we can get a, figure out a way to see what these margins are and do these certain things to help out safety, that's I think a big area for benefits.

Now let's take a look at, you know, other things in dry storage space, okay. We're talking about drying times, time to boil. We're talking about supplemental cooling requirements. The vent surveillances. We had someone, an individual get hurt a couple years back because they had to do 24-hour vent surveillance inspections, okay.

We're now precluded from closing off the vents to keep the temperature higher, okay, because maybe one or two locations may be considering and concerned about chlorodized CC. And so you're now getting to a point where your design licensing basis calcs after you have a sufficient cooling time and you want to raise those temperatures up so you get away from deliquescent-induced corrosion, you're not allowed to.

Because tech specs say to keep it up because of the thermal calcs, okay. And then we're showing you have to stay there. That was a static event, not something that you're looking at the k heat over 40

years or 30 years, all right.

The other areas are in the reactor space. And this is something that, I know that we're, you know, I heard from Sylvia I do both sides. I'm ATF and reactors and over here on dry storage.

And one of the things that we're missing here is that in a lot of cases, you know, we can reduce the time-to-boil calculations, you know, or improve safety for spent fuel pools by getting the hotter fuel out faster, okay. Allowing the flexibility for the utilities to pick and choose which ones they want so that they can go and load hotter fuel so that the pool, you know, can also have more open spaces but also reduce the time to boil or increase the time to boil for, you know, reduced, or for increased safety.

I'm going back and forth on this. But there are things like that that we can do. Also, act as a passive coolant, okay. We're talking about here an active system with pumps. And I'm looking at mostly decommissioning here for this case. But looking at we have active systems to cool the fuel versus putting them into passive systems.

And that right there, you know, they're both safe, but you know, this is something that you know, you're going from an active to a passive system.

Okay, so there are benefits to this, okay. And why did we focus on thermal, okay? Because here's the results. Can you?

So these are the temperatures during the drying cycle, okay, I think many of you've seen them, okay. But in this case, you know, this was the design licensing base calculations where this is, you know, where the heat load that was assumed was 318 C. The best estimates were probably I would say 50 degrees higher than this number, okay. But you're looking here.

The max temperature we're seeing during this, this is the drying operations, is 237 C that you saw. Then it dropped down when the helium was placed in, okay, placed in. And what you're seeing is that there's only a small percentage, this little tiny piece right there is the one that's at the peak cladding temperature. The rest of it is much lower.

So the question is are we worried about this one point, or are we worried about a larger integral of that surface area? So that's real data, that's not a model, okay.

So what we learned from the Phase II program, okay, is that you know, we're getting reasonable results, okay. The models are doing a

decent job. It's the input to the models, and what you assume, and whether it's a design licensing basis assumption or if it's a real data point.

For example, decay heat, okay, so decay heat, all right. This is the design license basis for the original license application, what is it, license amendment request, okay. And in that case, that was 318 C, that was a different -- in fact, I'll show it to you right here. That was the calculation here. And the heat load was 32.934 kilowatts, which was the assumed thermal load, okay.

In reality, it was down less than two and a half kilowatts lower. So of course that's going to have a difference, you know, in the results, okay. And so you're seeing here that these were, this is the measurement and these are the model results, okay.

And all the model results are what we, the term that we use, that we all agreed to use, was that we are biased on the high side because of the assumptions that we placed into the models, okay.

And so what we're learning here is that they're biased, and that there are some things here that we're learning that if by doing additional, well, by doing a PIRT, and I'll go into that next, I think we'll be able to go ahead and document all the different

parameters and all the different assumptions that go into these models, okay, and to come up with a better handle of uncertainties.

Bob hinted at it, okay, in terms of the coupled effects of cumulative assumptions. As engineers we're taught in school that we have all these assumptions and you take it, if you want to have a safety factor on your final result, you take them all and you put a safety factor, either on the assumptions that you're putting into the model, or you make a conservative estimate, okay.

In this case, your assumption is that each independent parameter's independent of each other, okay. They're not, okay. And in reality, what you have is you have multiple cumulative coupled assumptions that do have a major impact on the results. And instead of having a additive, you're actually multiplying conservatisms, okay.

And so in our PIRT, one of the things we're going to be having is we're having an uncertainty expert who has done work on the reactor side that I've known in the past, who's done work on the reactor side. Works for Sandia, okay, excellent, excellent engineer, who's going to come in and provide the kind of knowledge that we've used on the reactor side, okay, for a long time.

And to try to bring in some of that understanding of how uncertainties and how they propagate when you put the assumptions and the uncertainties and you multiply them down on one on top of each other, okay. And so what we're finding is that there are margins, okay.

But the question is well, what do we do about it that. You know, I think, Jason, you hit it on the head. We're not going to just come in and just say give us the margins. We need a technical basis, okay. And maybe it's the licensing approach stays the same.

But maybe there's an additional ability to allow to improve safety for the workers and for others. But allow us to go after that margin by approving a methodology, okay, for that. And I'll get into that next.

Okay, so this is the PIRT. Bob hinted at it, Jason, I think everybody's hinted. I mean, come on, you got to bandwagon this thing, you know. So, oh, by the way, I am wearing this because I was in Pennsylvania, I am in Pennsylvania, so I know the Steelers are mourning.

(Laughter.)

MR. CSONTOS: So I have to wear yellow and black. It's odd that in Western Pennsylvania they have no quarterback but they have wide receivers. But on the east side of Philly, they have a quarterback but no wide receivers, so. They're all hurt, so.

Anyway, the PIRT. What we're doing with the PIRT is that we want to provide everybody an independent, objective, and technically defensible position, okay. We are not going to go at this. Spent fuel integrity is in the rule, we need to make sure that it's maintained.

And so what we want to do is get a group of experts in three different areas, okay, to provide the technical, you know, judgement, all right. And these are world class, well-known individuals, okay.

Three areas: thermal and decay heat modeling, okay, and then fuel performance, okay. Each one of them are going to be separate, each one of them has a group of five or more experts, who will be participating. And then we will be writing up a report, okay.

This is the structure. I don't want to go into it in gory detail. We have a steering committee, I have myself leading the effort, and then we have three team leads who are running this show

individually with their teams.

We had a meeting with the steering committee, they briefed all the names, the projects objectives. NRC's on there. Mike Layton. You're here somewhere, Mike, I know. There you are. And so there is an agreement, a joint charter that we've created to create this PIRT panels. And we're going through and going to be collecting all the data.

The goal here is to write a report on all three panels separately and provide it out there so everyone can see what the experts say, okay. And define, have a basis for whatever we do in the future, okay.

And what are we doing in the future, okay? Ideally, in the first year here, we're talking about identification of these gaps, identification of these, the PIRT phenomena. Get the technical experts to provide that.

And then we had to figure out what is the approach here mid- to longterm. Maybe it's license amendments from the vendors. Maybe it's CoC amendments. Maybe it's a 72.48 for something simply. Maybe it's a topical report where we look into how to create a methodology that allows to take some of that margin and use it for other purposes, okay.

And that's going to take time, and it's going to take effort. This is not something that you, we're going to need the technical experts to be able to provide us the way that we can do this, okay. And that's why the PIRT's so essential to this.

And so in summary, what I wanted just to bring up is that we had an opportunity, we found some things out in the high burnup demo. It provided early benefits from the demo, not ten years from now, okay. We found what we call this bias, okay. But it's not because of the models. The models are, they work well. It's the inputs that you put in.

And as Jason said, the inputs that they're putting into the models is based upon their applications that are coming in, and it's based upon the highest heat loads, okay.

So is there a way where we can, you know, for example, I guess the way I would characterize this, Oak Ridge did a bunch of calcs looking at all the canisters out there based upon what we learned about in Phase II, and found out all the canisters are, you know, no canister, no fuel has seen greater than 325 degrees C, okay.

And remember that's, that only that one percent, maybe on the surface area of the cladding.

And so with that, hydride reorientation is not an issue, because we never got to temperatures high enough, okay. And so if well, if we know that now, you know, maybe there's a way where we can innovate here to help safety. This is to help safety, okay, in terms of all the things I showed you, all right. There are opportunities to do that, okay.

So in that way, what we're finding, what we found is that that's where our licensing basis calcs were, this is where we actually are, okay, in terms of this is a schematic, okay. And then you have this spread. So what, you know, we heard that there is no cliff-edge effect, you know. And I agree with that. Who said that? Is that one? Okay, I'm looking. So I'm bandwagoning on that one, okay.

There is no cliff-edge effect, okay. And especially if we don't, if we're not enough, we're not having hydride reorientation, okay. And so this is not a line, it's more like a curve, okay, a Gaussian curve with distribution. I know that's what's in the regulations now, but in reality the data -- and we'll see what the PIRT panel is saying, okay. And then you have that margin there, okay.

And so we believe that there is margin here. I think the data, the model results, the Oak Ridge

work, the DOE work on this all show there's margin here. The question is what do we about it, okay.

There is benefits, there are benefits, okay, to getting some of these margins back, okay. But not in a way maybe that it's tied to licensing. Maybe it's something else that the utilities have the ability to take that information and use it to, for enhancing safety at their plant or their site or changing designs, okay.

With that, I got the one-minute timeline, time up, so I'm good. Okay, I think that was it.

(Applause.)

MS. SALTZSTEIN: Thank you, Al. You're always engaging. Our next speaker is Meraj Rahimi. Meraj Rahimi is the Chief of Renewals and Materials Branch at the NRC. He is responsible for overseeing the technical review of applications for the storage and transportation of spent fuel and radioactive materials.

Prior to joining the NRC, Meraj held senior engineering positions at JAI Associations and Jacobs Engineering. He's a graduate of the University of Tennessee.

MR. RAHIMI: Thank you, Sylvia. Good afternoon. Actually, I enjoyed last night's session that Yoira chaired, especially Carlyn's talk and Neil, in terms of speaking in plain English, plain language. So, Carlyn, I'll try not to use too much technical jargon, in the hope that you could improve my grade.

(Laughter.)

MR. RAHIMI: So, actually, my presentation is simple. What I want to do, just go over some of the, briefly, regulatory research activity that they were doing in support of the spent fuel storage and transportation.

Every single of research activity, it has a licensing nexus to it and we do research to come to a regulatory decision. Let's see. So, you can see that I'm going to kind of briefly go over about half a dozen, or eight, research activity currently underway.

And again, I want to give a lot of credit to our Office of Research, we work closely with our colleagues in the Office of Research. And we rely on their really technical expertise to help us to make licensing decisions. And then, I have -- I'll go over upcoming research activities about the issues.

So, the -- as most of you know, a few years ago, a number of years ago, that the NRC identified chloride-induced stress corrosion cracking, especially for dry storage casks in a marine environment.

This was the first experiment that we did at the Center for Nuclear Waste Regulatory Analysis to demonstrate that the phenomena is real. So, since then, industry really has picked it up. And so, we have continued to do research independently to confirm some of the follow-on activities.

The objective of the current research activity in the chloride-induced stress corrosion cracking of steel, stainless steel, is we're evaluating inspection system that the industry is developing, the NDE

methods.

And we are going to assess the mitigation and repair option, what the industry going to come up. And the idea is, we independently do the research, what the industry proposes comes up, we have an independent confirmation that indeed that is an effective method.

Right now, actually, we are also, at the same time, we're focusing on the crack growth rate, that's another area we're doing. We're doing tests at PNNL. And as you can see, that's the status, I don't want to go on every little line.

And we also, we are continuing to participate in EPRI ESCP NDE mitigation and we generally go to every ESCP meeting and we are participating in the working group. And indeed, we don't want to sort of work in silos and we do share our findings.

And so, that's the, right now, the path forward is, actually, we've done some tests and we're documenting, actually, the results of an assessment, inspection assessment, which, actually, goes back to we participated in inspection demonstration with EPRI, I mean, we observed that, and its contractor back in August 2018.

So, that document is going to document our observation and also is going to include the mockup and development of the CISCC flaws. And so, we're going to continue research in this area, especially measuring the flaw size, what can be measured, with robots. And so, we're going to continue our effort in this area.

The next topic of the research, this has been going on, actually, for a few years, I think this research is started back in 2012, as part

of the, it was the cooperation between the U.S., our international regulator colleagues, on the taking a full-size cask at BAM, they dropped it, one was a German cask, one was the Mitsubishi, Japanese cask, half-scale.

And the objective of this is really to see how well or accurate the models predict. So, it was kind of a benchmarking the models. And so, we are right now, NRC, preparing the final report.

But since some of the information is proprietary, I mean, it's not going to be available to public, but the staff are going to put out papers and show the results of comparison. And so, we're going to continue, actually, our interactions with our German colleagues, the regulators, and this is going to be really a good benchmark for our structural codes.

The next area that we've been doing research, what we -- spent fuel cladding. And we started this, actually, this few years ago, two-three years ago.

And the reason we started this in the cladding area, it was, what initiated this, it was some of the kind of events that the licensee were detecting krypton gas during drying. And the question was, are these kryptons being released through the hairline crack and holes or is it a gross rupture?

But I mean, our analysis actually showed these are the releases through the hairline cracks, but we started to really study this and -- because we normally do a confirmatory research, we always are in the mode of confirming our positions.

And so, the codes that we use is the FAST code, is the predecessor is the FRAPCON FRAPTRAN code. And so, we're going to

have our Office of Research to do finite element modeling.

And also, another question that we're trying to answer is the criteria that was being used for the one millimeter, that was the criteria for gross rupture for low burnup fuel, and is that still a valid assumption for the high burnup fuel?

Then, actually, as you see, a task are listed. As you look at the tasks, Number 6 is what Al alluded to, that we're going to embark on developing technical basis for the peak cladding temperature tolerances. Right now, currently, it's 400 degrees C. So, we want to look at having done the test, the surf test, the simulating normal condition of transport, and those mechanical tests.

But in this case, as Jason mentioned, we in the Materials Section, that's the limit we have specified, 400 degrees Celsius. So, the thermal reviewers are using that limit. And we're going to look at the basis for that limit, as Al mentioned, that was in ISG-8 Revision 3 --

MR. CSONTOS: Eleven.

MR. RAHIMI: Eleven, 8 is burnup credit. So, I work on burnup credit so long. ISG-11 Revision 3. And the reason for that temperature limit, again, was hydride reorientation, creep. So, we're visiting those phenomena that the -- so, that's what we're going to look at in terms of the peak cladding temperature limit.

John, keep me on time. Am I on pace? Okay. I'm spending too much time I guess.

The other one is the horizontal dry cask simulator. That is the Phase 3 that Al mentioned, which we are participating jointly with DOE

in doing the horizontal dry storage experiment. And as indicated, the experiment will be actually, the final NUREG/CR for CFD, let me see, is that the -- no, okay. I skipped one. So, let me finish this one. So, the horizontal, this the Phase 3 that we're participating with DOE. So, going back one slide.

So, we are finishing, really, the vertical one. This is the Phase 1 that Al mentioned. And so, we have issued NUREG/CR-7250 last year, which was about the experiment. And so, by the end of this year, we are going to issue the validation report. That is the final report for validation of CFD, by the end of 2019.

So, another area that we started, I think it was about a year ago, it was in the radiochemical assay measurement of high burnup fuel. So, we use, what we're using at Oak Ridge, these are the sample pieces from the DOE sister rod program.

And what we want to do, to beef up really the data on the burnup credit. And because those samples, the burnup range is in the mid-50s.

And so, there will be chemical assay measurement on the actinide and fission product. And this data will be used to update ISG-8, which is the burnup credit, ISG-8 Revision 3. And that's the status of that.

And the plan is, once we use that data to update ISG-8 Revision 3, then eventually, actually, also update the NUREG/CR-7108, which is one of the burnup credit technical reports. And the task is on track.

Another area that we're doing some tests, on the Boral, we're doing some tests. It was, what prompted that, it was some indication

that, I think in the early casks, that there were loaded in the early 2000, that they had used older Boral.

And there was a potential -- actually, it started with a DPO that was submitted to NRC. And that is public. Differing professional opinion, that's what DPO stands for. About the blister of these Boral under the loading.

So, we're doing some testing at the University of South Carolina on these older Boral, to make sure about the effectiveness of these Boral when the time comes to transport these canisters, because that's when they need to rely on that Boral as the criticality, as part of the criticality safety.

Let me go through this quickly. Review of storage/transportation. This is another area we started about a year ago on advanced fuel. These were some funding that -- I mean, we were asked by Office of New Reactor to look at the storage, transportation, and disposal of the advanced fuel.

So, we're -- the type of the fuel that we're focusing on are the TRISO and metallic fuels. So, we're at the phase of basically information gathering.

Then, these are the upcoming research activities. One is quantifying uncertainty and safety margin. That's also working on that. This is in the heat and radiation source. Actually, it goes back to Bob's presentation.

This is the NUREG/CR, is the shielding technical report. And we are, actually, we started recently, user need, to look at the

uncertainties for the radiation source for the shielding analysis purposes.

Another, actually, task we recently were about to start that is the developing a risk tool. I think Jeremy Tapp mentioned that this morning. This is for doing a licensing review and inspection. So, we are right now working on, it could be quantitative, qualitative, semi-quantitative.

So, because we need to come up with tools to give to staff. When we ask the staff to do a risk-informed review, they need to have the tools. I mean, they have the SRP. So, that's what we're going to develop.

Accident-tolerant fuel, John McKirgan talked about that. In the area of specifically the research we are doing, we've written a couple of user need for our Office of Research to help us. One, on the ATF cladding, chromium coated.

The other one is the high burnup high enrichment. And the high burnup, what I should say higher burnup, and the burnup range we're talking about up to 75 gigawatt days, higher enrichment, we're talking about up to eight percent. And which that is the last bullet, the high burnup high enrichment.

With that, did I make it? All right. Thank you.

(Applause.)

MS. SALTZSTEIN: Thank you, Meraj. Next, we have, next and last --

MR. MAGGI: Last, woo-hoo.

MS. SALTZSTEIN: -- but not least, Roger Maggi. Roger is a 30-year veteran of the nuclear industry and has spent those years between the Areva family of companies, with all of their various names. He has

spent many reactor years traveling the U.S. and Europe performing inspections and repairs on commercial and Navy NSSSs. Thank you, Roger.

MR. MAGGI: Thank you. So, you know what last rhymes with? Fast.

(Laughter.)

MR. MAGGI: So, nothing I'm going to present today has not been discussed previously. Yesterday, Jeremy went through a lot of the inspection equipment updates and possible repair techniques. This is a practical look at applying the aging management inspections and the things that we're going to have to do.

What I want to do is kind of relate my experience yesterday, I wasn't here, I was down in North Carolina with three of my utility partners, who have gotten into a group we call the Aging Management Program Family, so AMPFAM.

This is AMPFAM Number 1 for the CFC 1004 NUHOMS license. So, this is their renewal period. This particular group of plants will have their inspections performed in 2020.

So, right now, in 2019, we are doing our program documents, our procedures, and getting everything together, so that when the inspections are done, the programs look the same, feel the same, they follow the 1004 requirements the same.

So, hopefully, when the regulators come to the site to do their inspections, they'll kind of have an epiphany, like, hey, I've seen this before, I just saw this last month. And then, again, next month, they'll say the same thing, because we intend to work together to ensure that we're going

to implement consistently across our fleet of dry fuel storage canisters.

So, just to kind of reiterate, the inspection requirements have us looking mainly at the canister, that's mostly what we're concerned with. We do look at the inside of the HSM, when we have the opportunity and we're in looking at a canister, we have the tools in there and we'll look at the inside of the HSM components also, to see what effects the heat and age have had on the concrete. But again, our main focus is the canister.

Some of the components are listed out here. There are, in the AMP itself, there are charts. As you go through each of the elements, there will be charts that tell you your structure, systems, and components that are required to be inspected per your AMP, that could not be addressed just through your AMR or your TLAA process. These obviously are areas that we are mainly concerned with, chloride-induced stress corrosion cracking.

But even plants that screen out of that AMP and they just fall under the normal canister exterior surface inspection, we're still looking for evidence of corrosion, because that is the one thing that would lead us to further interrogate a specific area, a weld, where there is a possibility in the future, we don't believe it's possible any time soon, that we could initiate potential flaw. I'll call it a flaw, we're not going to call it a crack just yet.

So, this -- there was discussion yesterday about tooling, right? Robotics, things that EPRI's working on, things that the NRC is taking part in, witnessing demonstrations.

What I just want to kind of point out, we're also working with EPRI on the TN side, but we're also capable of developing our own delivery systems. So, the robotics are just a means of delivering a camera,

right?

So, the aging management program requirement for these inspections is a qualified exam, typically done in accordance with or close to ASME Section 11 requirements.

So, when you hear VT-1, VT-3, that's what we're referring to and that's how we qualify whether these techniques that we're using are good enough to see basically potential flaws in metal. Generally, the VT-3 level of exam is what we're using, which is general visual.

This is actually a plate that goes on one of my tools, that allows me to go ensure that my system, my lighting, my distance is adequate for doing my inspection. I have that card with me in my bag, after this, if you want to see it, just come up to me and ask. This is about the size of your cell phone. So, that's an 031 line.

This is a VT-1 set of characters that you have to be able to discern at the distance and with the lighting that your camera's going to be subjected to. So, if you take that card, and I wear readers, I couldn't read that card yesterday.

When we were all in North Carolina, when we were talking about the exams, I pulled the card out and I couldn't read it. Put my readers on, I still couldn't read it.

But darned if I couldn't take my iPhone, from about this far away, and just zoom in on it, without any extra lighting, and I could read that card at the VT-1 level. I just qualified my iPhone with no additional lighting to do a VT-1 exam.

(Laughter.)

MR. MAGGI: That's how that works. So, the robotics, the delivery systems, they ease the inspection and allow you to get more coverage and allow you to track where you are, so that you can go back to that spot in the future if you need to keep reevaluating a flaw or a potential flaw, or if you need to eventually deliver some volumetric technique, you have mapped out where that location is.

But the camera itself, as long as you are qualifying per whatever your AMP says you have to, then you're doing a qualified exam. Unfortunately, I cannot physically do a direct examination, because apparently my eyes aren't good enough.

So, again, that's kind of how we get there, right? Different robotics and techniques, but those are more for ALARA purposes and coverage purposes, how much area can I get to? And obviously, I'm looking at the horizontal systems.

So, in order to get up here and look at areas that we might be most concerned with, where you could have deposits, chlorides, would be most likely to come in through the top vents and work the way around and settle on that top surface. A lot of these should roll off, but they could roll off into this crevice right here, where the canister sits on that beam.

We need to be able to inspect the areas that are most likely to have the chloride deposits and then, mixed with the humidity or moisture, could start to deliquesce and lead to the cracking. Or the corrosion, let's just stop at corrosion.

So, there's a couple ways to do it. There is robotics that are very attractive that we're also working the EPRI and others on, to go from

the ground up.

But if you remember, I'm just going to flip back quickly, that heat shield actually wraps around that whole canister. So, there's about a four-inch clearance right here to get under the heat shield and get on top of that canister. This looks like a great way to go, right? Can't get there.

So, as we're looking at these inspections, and we established a decision point yesterday in our meetings that by the end of October, we will have decided, based on tests with the other robotics that are available, whether we're going to be able to go from the bottom to get onto the canister or to get to the top, or we're going to have to do a door-off, where we take the door off, and approach that way.

So, Calvert Cliffs did this inspection four years ago, I think, three years ago, and it's the second time that they inspected by pulling off that door and actually inserting, in this case, they were doing salt sampling on top of that canister.

So, this isn't something that has never been done. They picked up 35 millirem to do that inspection and that sampling, it's not a scary dose. If you came from the reactor side, you know that's pretty reasonable for an inspection of this type. So, that's a possibility.

Bottom line is, you've got to get to where the chlorides could be and the susceptible areas are and those are defined in your AMPs, and we just got to get there.

So, when we develop our tooling -- this is our South Carolina facility, we've got all of our loading equipment down there. We also have mockups down there that we can use to develop the equipment.

Obviously, ALARA is the number one goal. And I'll say ALARA slash safety.

But we want to be cost effective, generic, we want input from our inspectors, and consistent and repeatable exams, right? So, we want -- these exams, we're going to do them across this fleet, with this family of plants. We want those views and the access to those areas to be consistent, so that we can start comparing to one another.

We strongly believe we're going to have, next fall at this time, we're going to have a whole lot of data of a bunch of shiny metal. But we need that, we need that as a baseline, because maybe my son or somebody's son 40 years from now is going to be looking at it and may need to go back to reference what was seen today to see if that, what they're seeing might be corrosion or might be some other issues. But for tracking and trending, we just would like to have consistency in the images, the fields of view and angles and that kind of stuff.

So, we've launched that AMPFAM1. We are through the basis documents. We are into the tooling development phase here. We've already started some of these procedures.

And what we'll do is we'll do common training for this crew that then will go, this inspection tour is three sites, end of June, end of July, and early October of next year. So, by the time we come back here next year, we'll have two of those exams done and gearing up for the third.

And if you saw, there's a timeline that goes out here, and it basically says wash, rinse, repeat. And then, you get into your tollgate assessments and that sort of stuff.

The code case, I just mention this, I talked to Kent Hunter yesterday, he gave me an update that the goal for this code case, which covers the chloride-induced stress corrosion cracking AMP for stainless steel canisters, could be approved as early as October 28, at their next meeting. If not, then hopefully certainly by the end of the year. So, it only addresses the CISCC AMP.

But the one -- I may end up eating these words. So, based on the conversations yesterday, the code case does not replace what the requirements are in your aging management program. If you have a renewed license, those are your requirements.

If the code case gets done and the NRC endorses it, then you could actually do a 72.48 and point to that code case, because there are some aging management programs out there that are, I would say inconsistent with the goals of 1927 Rev 1. So, you can either enhance through referencing the code case.

In my case, what I may be doing is looking to change from a specified VT-1 requirement on certain welds, where it probably was -- it's not needed. I need to be able to do a VT-3, general visual, and if I find anything, then I go do a VT-1 to see if I can resolve it.

So, I may be able to point back to this code case and actually get a little bit of relief from that VT-1 requirement that is in one of my AMPs and be able to do a VT-3, which is what's approved through the code case. So, I'll let you know if I have to eat my words on that one.

So, what are we going to do with all this data, right? So, we talk about all of the work we're doing in analysis space and studies and

we're sharing it with each other. A big piece of this is the actual physical data we're going to get off of these canisters.

And it's not just visual, we're going to hopefully be in a position to go in there and take dose levels, radiation levels on the canister at certain points.

We can start looking back at our thermal models and seeing if they're holding true. Same with temperature measurements, what did you calculate it should be 22 years later and what is it now actually? So, there's a lot of data that we're going to get.

Where are we going to put it? And the short answer is AMID, the Aging Management INPO Database. So, this is actually -- well, it's probably in the bullets.

So, you're committed through the process to do your tollgate evaluations. Now, these tollgates don't take place until you go from your first inspection to your second. So, five years from 2020, I'm going to do another set of inspections.

Prior to that, I'm going to do my tollgate assessment and I'm going to go look at this aggregated data that the industry has developed in the science and in the labs and also in the field, to see if my aging management programs are still okay.

Because you own the aging management program at your site level, at the licensee level. I could change it at the CoC holder level and flow that down to you, but really, you're managing your ISFSI, you're supposed to be going and looking at this data.

That's a tall bill if it's just out there and you just have to call around

to different sites and say, hey, how did your inspection look? or what did they say at this conference or that? So, AMID allows us to aggregate all that information into one place, but it is truly user-dependent in terms of the quality of that tool.

So, you go through your tollgate process by basically surfing through AMID and pulling the relevant inspection data, the technical reports, and comparing them to your AMPs to make sure that you're okay. And your, obviously, your cask vendor or canister vendor is going to be able to help you with that as well.

I just said all that. So, yes, I said that too. We're rolling, absolutely rolling.

So, I want to emphasize the fact that, yes, we own it, TN, NAC, Holtec, and I think maybe even Energy Solutions, pays for all this. We cover this for INPO. And it's the right thing to do and it's not very expensive.

But it does allow some administrative rights, in terms of who gets access. So, it should only be our customers who get access to this, users of casks and canister systems.

We don't want the general public surfing around this thing. This is actually from out in the industry and if some people saw that, they'd probably use it against you. But actually, most of us know there's nothing wrong with that, that's an overpack that will get some discoloration and some rust on it.

The point is, the inspection results, and this was brought up at one of the other conferences where I talked about this, the inspection

results belong to you.

As the administrators, we only look at -- so, you give us the data, TN, you give us your inspection data and you say, I want to post this to AMID. We look at it only to see if there's any propriety information within that report or that data that we need to protect, not the data itself, right?

So, the inspection data, it goes straight up to AMID, we just do a scan for proprietary information. And I can tell that everything that we have posted so far, nothing has been taken out, nothing has been redacted, it's all just gone straight up from the utility to AMID.

There are some very good reports out there. I would take some time to go look at what PGE did, the guys from Diablo Canyon, did Humboldt Bay and did an inspection report they posted. It's excellent.

As far as just in general, an ISI report, the quality of it and how it communicates exactly what they did and what they did with what they did, as far as their Corrective Action Program, et cetera, that's the model.

So, take some time, get permission from your cask vendor, get your rights to log in, and start taking a look at some of this data. And there's a lot more coming, right? So, the inspections really are just starting. There's a pile of them that come up in the next two years.

And we would like the upload to AMID to be proceduralized at the site level, so that this gets done and we can verify that we've got all the data that's available out there, so we can be as smart as possible.

This is just what it looks like, it's very user friendly. There's a lot of drop-downs, you can filter for a lot of different things. But

we can all see each others systems. And I think that's the way it should be. You should be able to look at the results of NUHOMS canister inspections and vertical canister inspections, all of it.

There are also, there are some technical reports that have been posted. So, we want to encourage all the things we discussed in the last two days, that as reports are generated, that we consider posting them to AMID.

I'm not sure if we should centralize that or ask any particular group to own it, but if you are the owner of a report that's being posted to a public database, NRC or otherwise, consider posting it in AMID as well for future tollgate use. Don't do it, John.

(Laughter.)

MR. MAGGI: So, making it relative. Add as many relevant records as possible. It's not something where you want to post any OE for your loading campaign, this is strictly aging management information.

Again, if you can proceduralize it for entering records in AMID, that would be great. And it's going to be as helpful as we make it. So, bang. Thank you.

(Applause.)

MR. MUSSATTI: We've got about 15 minutes, according to the schedule, maybe closer to 20 minutes on the schedule, for questions. So, let's see how fast we can talk. Sir? No, you? No, him. You're next.

MR. PHEIL: Me? Oh.

MR. MUSSATTI: No, you're first. He's next.

MR. PHEIL: Okay. Ed Pheil, Elysium Industries. Just

want to provide a caution. I heard some discussions about trying to take out excess margin in one field and related type questions and stuff.

But remember that the original code case was made as a code case to reduce the need to do extra calculations, which cost money also. So, the name of the game is to reduce the cost, not necessarily to reduce margin.

And in particular, reducing the dose of people by adding more shielding is not necessarily reducing risk in that. It's increasing costs by having to put more shielding, buy more shielding, install it, maintain it, inspecting it.

There's typically a lot of margin in shielding and radiation level dose calculations, as well as in the LNT dose damage or harm to people as well, especially ALARA. So, we have to look at it from a cost-benefit perspective as to whether or not that is reducing the cost and actually increasing safety on those.

MR. MUSSATTI: Okay, thank you. You're next.

MR. McCULLUM: Yes, good caution from Ed, we don't want to go through this exercise and actually not gain something. Jason, my question is for you. You can't hear me, Bob?

MR. MUSSATTI: What's your name?

MR. McCULLUM: Oh, Rod McCullum, Nuclear Energy Institute.

(Laughter.)

MR. McCULLUM: Thank you, Bob. And I, yes, I agree with Ed from Elysium. The question is for you, Jason. I agree there's a lot

of synergy between your presentation and Bob's presentation. I think you may have hit on a recommendation we didn't think of.

One thing you said that intrigued me is the idea that you could have something where at the very beginning of an NRC review, you categorize the review into one or how every many categories, based on margin or risk insights or whatever.

Is this something you think could be incorporated that NRC could -- we could make a Category 2 recommendation by incorporating that in NRC's review procedures?

MR. PIOTTER: The short answer is yes. The difficulty is that that's an idea that Mr. Bajwa and I came up with less than a week ago, in brainstorming some of the options that we might have.

Now, it is related to the other items that I had mentioned, where you do an eight-hour review or a 180-hour review in eight hours or something along those lines.

The idea is, at the very beginning of a review, have an option where you're involving multiple technical reviewers in a discipline, for example, and to try to get a head start on what that review might look like.

And so, I think having a ranking system, what again I mentioned micro and macro, it would allow you to look at the review as a systems approach, but it would also allow you to look at the review at a discipline-specific approach.

And I think there's an advantage to doing that, because I think what it does is it gives the reviewer out of the gate an objective sort of checklist on what the level of review needs to be.

And it might point them to a certain part of a guidance document, for example, to say, these are the areas that you need to focus on for Level 1, 2, 3, 4, or 5 review, and then move forward.

It may that a Level 1 review might require almost no technical review, provided you have a quality model in thermal, for example. A Level 5 gradation might be something that you have to reject out of hand, because it's just not ready for prime time. So, I think it's a viable option, but we'd have to work on the details.

MR. McCULLUM: Got you. Just because it's a young idea, let's not throw it out --

MR. PIOTTER: Understood, yes.

MR. McCULLUM: -- let's think about it.

MR. PIOTTER: And that's one of the things that we learned, incidentally, within the innovation program and within transformation, is that the, kind of that core, that acorn of an idea has an opportunity to transform into something else.

MR. McCULLUM: Okay.

MR. MUSSATTI: Somebody else in the room? There you go.

MS. WILSON: Hi, this is Veronica Wilson with the NRC. I have more of a comment on Bob's presentation, and I think this is going to make me very unpopular in this room.

But I want to a clarification, because you had said that, as part of the graded approach, that we were relocating the FQTs to the FSAR. And I just wanted to clarify that that is not -- it's true, but not in the way I

think you had presented it. And so, I just wanted to clarify to you and to the room that it's not a complete relocation of the FQTs to the FSAR.

What we did was part of, for the amendment for 1004 is we looked at the numerous number of FQTs that they had and we relocated or we allowed relocation of the ones that were non-limiting. And there was a lot of work that had gone into determining which ones those would be and why.

And so, I just wanted to caution more the message being put out that the NRC is now no longer requiring FQTs to be in the tech specs, because that is not the case.

And I actually have another comment, can I say it or --

MR. MUSSATTI: Go ahead.

MS. WILSON: -- is there others waiting?

MR. MUSSATTI: Go ahead.

MS. WILSON: Okay. So, this is related to presentation, and also to the FQTs, so maybe it's a good segue, but this is in relation to something both Bob, Jason, and I think Al, all touched on a little bit.

And they talk about, we've heard a lot in this conference about thermal margins and the temperatures are really this, even though the calculations are this, and the dose rates are this, even though the calculations are that.

And I think for us, I am a technical reviewer with the NRC, and one of the challenge that we face is that we have to license the system that's in front of us and that's always the design-basis system.

So, you ask us to license a car that can go 200 miles an

hour, I can't control that you're going to actually drive it at 50. And so, I think it's a little misleading sometimes to say there's all this margin, when in our day-to-day job, it's not up to me to know what you're really going to load versus what you're asking us to license.

So, I think one of the interesting lessons that we have with the FQTs is, I think it's always being portrayed in a lot of these conferences that I've been sitting in listening, that this giant regulatory burden that's been propagating for years. And I sort of look at the FQTs in a different way, I think it was actually an attempt to be more realistic about our source terms.

And I think Al was the one had mentioned that, oh, we can't put blankets on casks, even though they don't have the design-basis heat load and that makes them, some of these requirements a little less safe. And so, in my mind, I thought, well, why not just say at the lower heat load, you can have the blankets, at a higher heat load, you can't?

Well, I think that's what happened with the FQTs, was they came in and they were like, well, there's really no assembly that's one percent enriched, burned to 65 gigawatt days for MTU, that we're going to discharge in two years, so let's create some intermediate fuel qualifications so that we're not overly conservative.

And so, that kind of did get out of hand, in the sense that we have tables and tables and pages and pages of all of these fuel qualification tables. And so, I think that, in general, I think a lesson can be learned from the FQTs, in that the more we try to sharpen our pencils to make the analyses more realistic to what we're actually loading, it then just creates a burden somewhere else.

So, I don't have any recommendations or any comments on how to solve that problem, it was just an observation that I had when I was listening to your talks. That's it, thank you.

MR. MUSSATTI: Well, thank you for presenting a problem with no chance for solution here.

(Laughter.)

MR. PIOTTER: Yes, and, this is Jason Piotter, I wanted to comment on that too. And that was sort of my reaction to the one slide that Al had up there, talking about what the real margin was.

And in my view, it's only real margin if then you limit your system to whatever that as-loaded heat load is. If your system is a 40-kilowatt system, and you had a great analogy, Veronica, if your system's a 40-kilowatt system and you only load it to 32 kilowatts, then, yes, you've got margin. And then, your thermal analysis can then be considered defense-in-depth and you don't have to have that rigor.

But what happens then when you sharpen your pencil on the loading scheme and then you load it to 39.75 kilowatts? Now, all of a sudden, you don't have that margin any more.

So, that margin only exists if then you're static in time with that loading, at that lower heat load. So, I think we need to be careful about when we're talking about what real margin is. We look at it differently.

And I'm not suggesting that we can't do certain things to look at what we might have in the field. And I think as technical reviewers, we would welcome options to not have to do a great convergence index and so forth, when we're sharpening our pencils to that degree. So, thank you for

your comment, Veronica.

MR. CSONTOS: Yes, and, this is Al Csontos, EPRI. I don't disagree with either one of you, okay? I think that the reason we did what we did, especially with thermal models, was for ease, okay?

MR. PIOTTER: Yes.

MR. CSONTOS: Put in those conservatisms, put them in there, let's get the models to see and do an upper bound, okay? The thing is is that what we're finding now is that I think we can be smarter, but not work as hard, okay?

We can still do these types of design license calculations for the upper bound, but know that all the decisions that we make downstream, that that is a high bound, okay? Knowing that is first, that's the most important, okay?

But second, after that is, what can we do but not -- like I think someone was mentioning about cost. There's a real cost to sharpening the pencil, okay?

But are there ways that we can create a generic methodology or something where then vendors can, or I'm sorry, utilities and vendors can use that margin if they don't load to those heat loads, okay?

So, the question is, how do we make it so that there's -- we can utilize that, but not have to spent inordinate amount of money and time and effort to justify it on each -- doing it on each canister basis, it's a nonstarter.

But if you went in there and tried to create some sort of generic methodology, knowing the uncertainties associated with all the

parameters, then I think we can go forward with something that might be useful.

But until we get the PIRT done, understand the uncertainties with all the parameters that are associated with the models, to get to a better generic approach, I think we got to do all these before we can go and try to get and do that, because we need the technical basis.

MR. PIOTTER: Right.

MR. CSONTOS: But I understand where you're coming from, but I don't want to put in all that extra, like what you said, those tables, put all that extra work into it. I think that we can figure out a way that will help all of us.

MR. PIOTTER: And this relates back to -- this is Jason Piotter again. This relates back to my comment to Rod on the ranking system during acceptance review. And I call it a quality model.

And so, if you have a quality model that you have criteria for and you're able to evaluate when an application comes in that you have a quality model, you might get a ranking that's a ranking number one or two because of that quality model, and it would dictate what direction you go in the technical review, so then, you don't have to have the level of rigor that you might have to have if the quality model was less.

MR. CSONTOS: And I would just say one more thing, because we're here today because of -- the way that we do our business today is because of the way that we've always had to, because we never were able to collect data inside the canister, okay? Those days are changing, okay?

And as we start to embrace maybe data collection efforts,

rather than model-to-model benchmarking and validation, and benchmarking to one test or something, I think the shift is going to happen in the next ten years or so, where we're starting to collect the data, okay?

MR. PIOTTER: Real-time.

MR. CSONTOS: And -- real-time. And that way, that will short-circuit a lot of this effort. And I think that if we want to go forward with something that may be beneficial, it's the sensors.

MR. MUSSATTI: All right. One more from the floor here, and then, I'm going to probably have to make a decision.

(Laughter.)

MR. MUSSATTI: Go ahead.

MS. LEBLANG: Suzanne Leblang from Entergy. So, Al, I'm glad you added that last little piece there. But I totally understand and agree with the NRC's comments that you can only review what's put in front of you and that you have to look all the way to the design-basis limit.

I think, from my perspective and I think some other utility perspective, is we're looking at it a little bit differently, in that the way we look at it is we see the fact that -- and these are totally not based on technical limits, I'm just going to throw numbers out there, so don't anybody say that this is what you really see or whatever, like that.

If I load a cask to a system that's licensed for 20 kilowatts and I'm only loading 14 and the model and all the licensing and calculations showed that at 14, I was supposed to see 200 degrees and I'm only seeing 100 degrees, those same calculations would show me, at design-basis, something similar, right? And in reality, I'm seeing something much less.

So, what we're trying to point out is, somewhere in there, there's something that we can all gain and benefit from. So, that's what we're looking for.

So, I don't know, Al, so much that I'm looking for a reduction in a lot of limits when I load something less than the design-basis, I'm looking to gain what we know from data exists out there and really we see in casks. Both from dose and thermal.

MR. MUSSATTI: Okay. I don't really understand what everybody's said here all day long, but that made a lot of sense.

(Laughter.)

MR. MUSSATTI: It's all good. No, that kind of made sense. Everybody's adding on their little margins and we want to know what the real truth is. I have to make a decision now.

The schedule was set, we've got folks that might need to talk to us that are on the phone, and we're running right up on a deadline here. And people have made airline arrangements out of Philadelphia based on the time that we get done here, and we're going to start running into rush hour if we stay too much longer.

So, I would like to make a brief invitation to the folks on the phone, if they would like to talk. But please keep in mind that we need to keep it brief and on-topic. Where's my operator?

(Laughter.)

MR. MUSSATTI: Well, deja vu all over again.

(Laughter.)

MR. MUSSATTI: Hello, is the operator there?

THE OPERATOR: Yes. If you'd like to ask a question or make a comment, please press *1 and record your first and last name.

MR. MUSSATTI: All right.

THE OPERATOR: We have one question in queue, I'll grab that name, one moment. We have Kayleen Walker on the line. Kayleen, your line is open.

MS. WALKER: Hi, thank you. As a concerned citizen, it's been very interesting to listen in on this NRC regulatory conference. I was curious to see the industry's influence over the NRC's regulatory policies.

I really liked hearing from the technical people from the NRC, just the comment that was just made recently. I think in the future, it would be really good to have the technical people speaking on the regulatory policy of the NRC.

I have so many questions and I'll just say, I'm wondering why you don't require ASME codes for these nuclear power vessels, nuclear pressure vessels? I'll just leave it at that. Thank you.

MR. MUSSATTI: Thank you for being brief. One more on the phone lines, if we have them.

THE OPERATOR: No other questions are on the phone lines.

MR. MUSSATTI: Okay. I'm going to go around the room once, does anybody want to speak? If not, I'll -- that's Zhian Li? Is that correct?

MR. LI: Yes, this is Zhian Li from NRC. I just want to have a kind of quick comment on the discussion of margins. I think this is a

great discussion and lends different perspective.

I think if the industry want to pursue that route, they would need to present the analysis to show the margin, so we have a clear understanding where they're coming from. This is not something where, yes, we have margins. Yes, we do have margins, but we do not know. On the lady from the Entergy, already I forgot her name, my apologies.

MR. MUSSATTI: Suzanne.

MR. LI: And Suzanne. So, talk about whether it's the design-basis limit or the actual use, I think that's more in the 72.212 evaluation. There, you can make your argument, is, well, your design allow me to load up to 40-kilowatt days, I'm only loaded for 30-kilowatt days, and then, you have your argument. That's what my comment is.

MR. MUSSATTI: Okay, thank you. I'm going to turn the microphone over to Mike.

MR. LAYTON: Well, thank you, everyone in the room and on the phone for participating in this Reg Con. I found it very informative and very good. I'm not going to keep you much longer.

For all the questions that were asked that were not really addressed here, whether from the floor or on the phone, once the transcript is finished, we will post the transcript link on our web page.

And every year, we go through the transcripts and identify questions and utilize those in trying to develop some Q's and A's that go into our web page. We'll do the same this year.

I do want to point out that any of the questions that were asked by the audience or anyone else having to deal with cost or operating

cost are not within the purview of the NRC. We won't be posting any answers to those.

So, for those of you that have the drive back to the airport, drive safely please. Wherever you go, may you have safe travels. Thank you again for everyone that's been on the phone. And for that, this Reg Con is adjourned. Thank you.

(Applause.)

MR. MUSSATTI: Make sure you grab one of those forms on the way out to give us your response for the meeting.

(Whereupon, the above-entitled matter went off the record at 2:48 p.m.)