NRC 10.31.17

>> Hello again. As promised, we'll be starting the REG CON and what I'd like to do, as you all know, I'm Mike Layton division director for spent fuel management here at NRC. I've met many of you previously and made new friends today but what I'd like to do is turn the program over to Dan who is our facilitator and he'll go over some housekeeping rules and some important safety rules that everybody should be aware of. So, Dan.

>> Thanks, Mike. Welcome nuclear waste aficionados. There won't be a fire drill like there was last week. My name is Daniel Macadi and I've got Chris Brown with me cofacilitator we're part of the NRC corps or corpse depending which president you're referring to. We'll make sure this meeting will end on time since it was promised to end on time since we have a bigger task in front of us and the information that needs to be transferred from one to another has been referred to earlier. And the mission is adapting for change and preparing for the future. Our role, like I said, is to keep the meeting moving, productive and on time. That's going to be especially important, the on time part, because we have to coordinate with the security. And I'll talk about that in a minute but I'm going to start talking a little bit about the housekeeping items we really need to bring up here at the beginning.

For those of you who are not NRC people, if you want to move around out here, on this auditorium floor down here you have full access. You don't need to have an escort to get you over to the restroom or to the fountain or anything like that.

Most of the time people that are from the outside that come in have to go through the top, the first floor, guard station. You take your bag and you put it through the X-ray machine and you take metal off, you go through the metal detector, these sorts of things.

We've been able to get a special badge most of you I think have them. Does anybody not have that special badge for getting down here?

Has anybody not signed in? Good. Most visitors have to go through the upstairs but we've got the special deal going where you can get in through the revolving doors one floor up, it takes a lot of effort I came in and they were doing that, most of you are aware of that what we do.

And that will be available for us at lunchtime when you come back from lunch we'll get the guards back down here and they'll let you in through the back. If you leave the facility for lunchtime and it will also be available tomorrow morning and tomorrow after lunch again.

For times other than that, coffee breaks and those sorts of things, if you want to go up to the cafeteria, we're supposed to escort you no more than five people per NRC escort to the elevators, up the elevators, point you in the right direction and you're on your way.

But it's gotten to the point with the security people that go to the elevator, go up, go to the cafeteria, and you're fully autonomous. You don't have to have a security guard with you. If somebody says anything I'll fall on my sword for them and play mea culpa, but we should be able to do that we've done it before in two or three types of these meetings in the last six months or so. Familiar with that process. You have unrestricted access to the cafeteria and the Starbucks that's right in front of it and right across from it the little gift shop and everything that's right there and right in that general same vicinity there's a little tiny 711 type store that's got potato chips and water and things like that if you need something, aspirin those kind of things.

You'll have that ability. If you need to go someplace else you'll have to have an NRC security person. Bring it all up for one reason. In the case of emergency we all need to be together and what we would like to have you do if we have some sort of emergency we all go out through the revolving doors upstairs, follow the instructions of the security people and everything as far as walking calmly, women and children first, all that sort of stuff and we go out and we'll gather out near the guard station where the cars come in. And what we'll have to do is take a head count. Based on your having signed in here so that we know that if something were to be going actually going on here and it wasn't a false alarm or drill you weren't accidentally left behind. So it's

important for us to make sure you're number one signed in and number two you stay in sort of a little cluster around us when we go out there.

Today's meeting is a Category 3 meeting which means it's open to the public. We've got a webinar going on and we have people listening in by telephone. This is designed to maximize our public participation and we are facilitating it to ensure that the issues and concerns are properly understood by everybody and NRC takes them under consideration effectively. We invite you to provide comments at any time during this process and after the conference. Once we're done with the conference it will be loaded up on video form on the public access website we've got. You'll be able to actually make comments there as well. Isn't that right?

Majority of today's meeting is devoted to your input to the NRC. And us asking feedback questions for clarification purposes. So this is important for us to be able to do our job right that we know what it is that you're asking about so that that's going to be the process of discussions, clarifying questions from us and responses.

When you are -- if you are on the phone, and you're calling in, and asking a question, please speak very clearly. We're going to be transcribing this and we want to make sure we get a clear record of it. So make sure you speak very clearly. If you're in the webinar, please don't use the audio portion of the webinar call in to be able to talk to us on the phone. If you're on the webinar you're using your computers, sound right now, please mute your computer and call 1-888-318-4510. This number is inside the announcement that came out. And when you're asked your passcode will be 4306064. Say that one more time because every time somebody asks me to write down a confirmation something or something like that I don't have a pen that works. 1-888-318-4510 phone in number and when you're asked passcode is 4306064. And I'll turn it over to Chris my cohort and she'll continue with the introduction.

>> Thanks, Dan. So for people in the room, we ask that you mute any device that rings, buzzes or speaks back to you. And also that you minimize any side conversations. Some of you may not be able to mute your phone or to turn it off completely. If that's the case we just

ask that if you do get a call that you go out into the foyer before you answer it to minimize any disruption for folks in the room.

And to ensure like Dan said, to ensure we get a clean transcript, we need to have one speaker at a time. Without any interruptions. And if you do want to speak we ask you use the two microphones that are here in the aisles.

And Dan and I will call on you when it's your turn to speak. If you do need a microphone brought to you, just let us know and we'll bring one over to you. We ask you to speak slowly and clearly into the microphone starting with your name and affiliation.

And this means every time you get up. And I realize that maybe people in the room, you feel like they've seen you before. But for the sake of the transcript, we ask that you identify yourself each time and that you spell your name especially so that we ensure that we have a good record.

And for the record, my name is spelled C-r-i-s. So folks on the phone. You'll be participating through the operator, and we will periodically poll the operator to see if there are any questions.

For those that don't have audio participating via webinar we have Highly Lindsay will be monitoring any questions that come through the webinar and we'll ask Highly if there are questions and we'll go through them.

We'll ask that you are patient with us so we make sure we get the questions or comments addressed for the people in the room as well as for the people on the phone and on the webinar.

So, again, speak clearly and slowly. And spell your name and give us your affiliation. So we'd like to manage this meeting with a little less formality. We don't want to enforce parliamentary rules because we want the exchange of information to occur. So we know that you can ask a question and there might end up being some dialogue back and forth between the asker and the panel. We really, that's great but we really don't want to allow that to go on for an extended period of time. So we want to make sure that everyone gets a chance to speak

over the next two days. We ask that you limit your time on the microphone to three to five minutes. I've got a timer on the phone. I don't want to have to use it but I will if I have to.

Once your time is up, the buzzer will go off and Dan and I will start to muscle in on you and try and shut you down. If there is something that you are not able to get addressed you can certainly follow up with the speakers on breaks and at lunch.

You can also provide comments through the Web page as well. New face to many of you he's had a long career at NRC. Nuclear regulation. And three years later in region 3 outside of the Chicago area where the NRC office is in 1998 Mark joined the senior executive service and let a program to provide the effective regulation, regulatory oversight of over 18 operating reactor facilities in NRC's region 3 office. In 2002, he took over the leadership of the materials program in that region and three years later he became the deputy regional administrator for NRC's region 1 office outside of Philadelphia.

That's where he helped lead the office's oversight of both reactor and materials licensees in the north east. Mark returned to NRC headquarters in 2011 as the deputy director for the Office of Nuclear Security and Incident Response. And I had the pleasure of serving under mark for those years that he was there.

In that important role he provided critical leadership of NRC's oversight of security policy for both nuclear facilities, users of radioactive materials as well as maintained the NRC emergency preparedness and incident response program.

Then in 2003 and it's going to sound like Marc can't keep a job but he moved about the agency and gained a lot of experience in many programs. In 2013, he became the regional administrator in NRC's region office outside of Dallas. As you can tell he's worked in every regional program office except region 2. Region 4 he led the regulatory oversight of 19 operating reactors and licensing and inspection function of over 800 materials licensees. And as many of you are aware, region 4 is one of the largest programs in the regional offices that NRC has.

Marc graduated from the U.S. naval academy with a degree in mechanical engineering. Served on active duty in the U.S. Navy's nuclear submarine program. After leaving active duty joined NRC and continued his military service as a member of the naval reserve. Retired from military service in 2002 -- I'm sorry, 2012, after 30 years of service.

And with that, please welcome Marc Dapas.
[Applause].

>> Thanks for that kind introduction I need to shorten that or my introduction might be longer than planned remarks here. First of all, I do want to welcome all of you to this regulatory conference. It's my first regulatory conference.

So I look forward to hopefully having the opportunity to listen in and participate in some of the sessions and again I'll be hoppy -- happy Halloween. And I realize that some of you are here and results in your foregoing in the opportunity to potentially participate in trick or treating with your children if they're younger or help out handing out candy as I'll have the opportunity to do later today with my fiancee. I do appreciate Cris's comment about we want to abstain or not invoke parliamentary rules. That reminded me last night I had the opportunity to participate in a meeting, annual meeting of the homeowners association with my fiancee. And if I hear another point of order here or getting back to the rules of engagement here, it will be quite frustrating. I think that really stilted the discussion. And I appreciate that the approach to this conference is to encourage open dialogue and meaningful exchange.

As Mike mentioned, this is a forum to discuss and share information regarding regulatory and technical issues involving spent fuel storage, decommissioning and transportation of radioactive material. But it's not just a forum to share information. It also represents an opportunity for the industry, stakeholders and the regulatory staff here to share and provide their perspectives on relevant licensing inspection and regulatory matters. I've had a chance to look at the agenda. I think it's very good and meaningful. And I hope that you get a lot out of it and I would encourage you to engage in discussions on the margins.

When I participated in various conferences I found those on the margin discussions to be particularly valuable as you share experiences in how you've dealt with selected regulatory issues.

The theme as has been acknowledged earlier is focusing on the NRC mission while adapting to change and preparing for the future.

I'd like to provide a little context to that theme. Focusing on the NRC mission. Reasonable assurance of adequate protection. Two subjective terms in that phrase. Reasonable and adequate. And there can be differing views regarding what is necessary to provide for reasonable assurance and what is necessary to provide for adequate protection.

It's adequate protection. Not absolute protection. So again that's subjective. So when you have subjective language associated with your regulatory mission, the best way to proceed, in my view, is to have clearly established procedures and processes that are going to provide for consistency.

We are striving very hard as an agency to improve openness and predictability. You may recall that we engaged -- and this is in the context of adapting to change and preparing for the future, we embarked on Project AIM, which is an attempt to evaluate where we currently are as an agency looking at what does the future look like in terms of the workload, look at various planning assumptions and conduct a rebaselining, looking at what activities do we currently conduct where the scope could be reduced or we could sunset those activities, and we provided proposal to the commission.

The commission endorsed the staff's proposal and that resulted in significant reductions in FTE based on a revisiting of our workload.

While that was meant to be a one-time rebaselining initiative, the idea of evaluating how we can be more effective more efficient and agile is meant to be a continuing approach. We're in the process of shifting the paradigm where we can evaluate on a continuous basis, I'll use the words for those that may remember Bill Cane in the past he was the director of the Office of Nuclear Material Safety and Safeguards, a predecessor and deputy director of operations and one of his statements

placard in his office why are we doing it and why are we doing it this way. We should continue to be evaluating where we can continue, continuous improvement.

If you step back and look at the principles of good relation, couple things I wanted to comment on. What is meant by efficiency? The American taxpayer, the rate paying consumer and licensees are all entitled to the best possible management and administration of regulatory activities.

The highest technical and managerial competence is required and must be a constant agency goal. NRC must establish means to evaluate and continually upgrade its regulatory capabilities regulatory activities should be consistent with the degree of risk reduction they achieve where several effective alternatives are available the option which minimizes the use of resources should be adopted. Regulatory decisions should be made without undue delay. That's what's meant by efficiency in the context of principles of good regulation. So when we look at Project AIM and how can we be more effective, how can we be more efficient, how can we be more agile, we need to be looking at our programs, our processes and look for opportunities to achieve the desired regulatory outcome but do it in a more efficient manner that would minimize the use of resources. So you'll hear me talk a little bit about some of the initiatives we have in place to streamline our licensing review process and to ensure things like requests for additional information are truly focused on those informational gaps that must be addressed in order for the staff to reach a safety conclusion, not because a particular license reviewer is curious about how the licensee might be approaching XYZ. It has to be tied back there's a gap in safety information that is necessary to be filled so that the reviewer can complete their evaluation and be able to defend that conclusion about reasonable assurance for adequate protection. We're continuing to operate in an environment size of government, reducing resources we did not realize the nuclear renaissance we thought was going to play out here and we increased the size of the staff so that as Congress had directed we were not in a position where if a licensee decided to or an entity or a company decided to pursue new construction, we would not be in a position where we're limiting -- where we would have the resources and processes and infrastructure in place to provide for timely reviews of construction or combined

operating license submittals. That nuclear renaissance as you all know did not materialize and there's a variety of reasons for that. Market conditions and the cost of natural gas and renewables, et cetera, all came into play to establish an economic environment where new construction was not considered cost viable by various entities and consortiums. So as a result we needed to right size the agency to ensure that the size of the staff is commensurate with the workload that we anticipate going forward. So we've been embarked on a number of initiatives to reduce the size of the staff while still maintaining primary focus on our regulatory mission and protecting public health and safety. Let's talk a little bit about the current landscape. As I mentioned, it's a competitive energy market. And we expect -- there are 20 plants in decommissioning status right now and a number of other plants that have announced that they will be shutting down permanently before the expiration of their current operating license. So we expect there may be decisioned made in the future by licensees owners of various operating plants to not continue to operate their particular facility and shut down. And then you have the dynamic environment of various states that have weighed in and provided incentives to example would be Fitzpatrick in New York for that plant to continue to operate. But we would expect, as we go forward, that there will be economic business decisions made that may result in closure of additional plants and that translates to more plants entering the decommissioning process. As you know, the decommissioning rule is we are working on that right now. The final regulatory basis is being reviewed by senior management. It's at the office of the Executive Director For Operations level. And then it would go on to the commission. And then we would proceed with rulemaking activities. And there are a number of issues that we're addressing in that rulemaking, what is the role of local and state government stakeholders there. Should the NRC require and approve, if you will, it is required the post shut down decommissioning activities report but should that particular product or document be review and approved by the NRC. So there are a number of various aspects to decommissioning that are being considered as part of a decommissioning rule and public comments which includes industry comments will be fully factored into that rulemaking process. I do believe that the rulemaking process is very open and transparent. In fact, we just established, stood up yesterday was the first day of our Center of Expertise for rulemaking called the Division of Rulemaking resides in NMSS the office which I'm the director I've learned quite a

bit about the rulemaking process and I do believe when it's conducted effectively it's a very open and transparent process and that openness and transparency is consistent with our core values and again the principles of good regulation renewals workload we expect that to increase. A number of independent storage facilities or ISFCs looking to renew a license what is it, John, a term of 30 years or are we looking at 40 years, 40. Thank you. That represents a significant workload for the staff. So we have been positioning ourselves to be able to accommodate that anticipated increased workload. As I mentioned we're continuing efforts to streamline our licensing review process. And that's important, because as a licensee, you need to know what is the cost of the regulator here. What will it cost for a particular license amendment so you can plan for that as you make business decisions and determine what your operating budget is going to be going forward. So we recognize that.

And in terms of the cost of the regulator, one of the initiatives underway right now is to look at our fee process with respect to various classes of licensees. We're looking at what is the organizational structure that we have to provide for oversight that can be inspection oversight and that can be the licensing process. We're looking at fee classes in the context of uranium recovery and fuel facilities and looking at business lines. We have a business line called spent fuel storage and transportation. Mike Layton is the business owner. We have materials users and what is the other one, decommissioning and low level waste. Those are all business license under NMSS's purview and looking at things like should we combine business lines. Should we look at restructuring fee classes. And in an effort to evaluate are there means to reduce the fees that various classes of licensees are paying, with the transition of Wyoming to become an agreement state, we would go from 13 operating inis itu facilities with eight of those 11 transitioning to Wyoming that represents a reduced workload for the NRC. Well, three operating uranium recovery facilities cannot fund the current level of infrastructure that we have maintained. So we're looking at what does that infrastructure need to be going forward. Why do I mention that? I mention that in the context of we are evaluating the organizational alignment that we have to provide for oversight and determining where can we reorganize, what is the workload, what is necessary to conduct various licensing reviews and in that context an initiative I fully

support and am very anxious to see come to fruition and closure is the effort to move things from security of compliance and technical specifications to other documents such that the industry can more fully leverage the 72/48 process which is equivalent to 50/59 for operating reactors. My experience, when I was in the regions, and since I've come to NMSS is those two particular documents the certificate of compliance and technical specifications is overprescriptive that limits the ability to use 7248 as intended it provides a guidance document and we have a commitment internally here to complete review of that and provide an endorsement by the end of the calendar year and I have mentioned that to folks that have participated in the used fuel working group, but that is a high priority for the Division of Spent Fuel Management under Mike Layton and it's important that we reach closure on that. I think we're near completion. There were 12 issues we engaged the industry on I think we're down to one which gets to method of evaluation and we need to make sure we're providing for a reasonable approach to address that. And as some of you know that gets to the issue of, gee, you have a calculation and you change some assumption, well does that constitute a change in the method of evaluation and therefore that would require NRC review and approval.

I don't think that we need to be at that degree of granularity here. So I look forward to us moving forward and providing clear direction on how to proceed in that regard. We are trying to be innovative and encourage innovative approaches to regulatory activities while providing for that regulatory stability and predictability. Another area we're focusing attention on enhancing communication and outreach to stakeholders, federal and tribal partners. The other activity, this is in the context of current landscape, we are very much focused on the review of whole tech's application and acceptance review to determine whether there is sufficient information to proceed with the safety and environmental review. We have requested additional information. And the licensee is providing that in a couple of phases. I believe we received the first one back on the 6th of October with the second response due, what, December 22nd. And then of course I think many of you are familiar with the waste control specialist consolidated interim storage facility application where the licensee asked us to place our review activities on hold pending decision from that licensee whether they're going to move forward as I think many of you know the Department of Justice is engaged with litigation regarding a potential

purchase agreement, WCS by I believe it's energy solutions and antitrust concerns in that regard by the Department of Justice, and I believe that is proceeding. Of course the Department of Energy has indicated some interest in our topical report, addressing the interim facility. We'll see if they move forward with that. Of course, that is all in the context of interim storage with the -- we'll see what Congress decides regarding a permanent solution and a geologic repository. There is, as I'm sure many of you are aware, there is a budget that has been proposed by the administration that would include $30 million for NRC activities to support the licensing proceeding for Yucca Mountain in the adjudicatory process and 120 million for the Department of Energy and the House and Senate are going through their budget deliberations and then depending on budget approval authority and what is allocated to the NRC, we will continue to prepare to support the adjudicatory process. So we will see how all that plays out. And we had to look at planning assumptions three year window to complete the adjudication or four-year window? You may remember from the Nuclear Waste Policy Act the timeline that was established by Congress was three years to complete the licensing process from license submittal and fourth year if necessary, well, of course, when that legislation was enacted it did not envision the hiatus we experienced when funding was not provided by the Obama Administration. So our budget planning scenarios for 2018 and of course 2019 assumed three-year and four-year process to move forward from the date that we would resume adjudicatory activities. I wanted to comment where we are with Yucca Mountain because I know there's a lot of interest in that and a lot of interest in Congress with where we are with our consolidated interim storage facility reviews as well. Let me touch a minute on some recent accomplishments. We issued a regulatory information summary entitled administration of 10 CFR part 72 certificate of compliance corrections and revisions. That was back in September of this year. And that should enhance the process of correcting or revising certificate of compliances associated with part 72. We've issued a new reg 2214 regarding managing the aging processes in storage or maps report and that is out for public comment and we have a public meeting in December. And we hope that that will be a productive engagement and opportunity for folks to provide comments on that document.

And we also have published a new Reg 7198 regarding mechanical fatigue testing of high burnt up fuel for transportation applications.

The test results did demonstrate that high burnup fuel has the ability to maintain its integrity under conditions relevant to transportation. There was a lot of interest in high burnup fuel in that regard. We approved north Anas license amendment request to install instrumentation in the cask. We're working with EPRI and the Department of Energy to demonstrate long-term safety of high spent up fuel and this is the first time we've installed instrumentation inside the cask.

And as I was talking to some of the folks at the used fuel working group last month, it's very important that we get out of that pilot what we need to in terms of the empirical information so that we can move forward on evaluating the viability of high burn up fuel and demonstrate that it can be safely stored in the various cask designs.

Some of the projects that we're currently working on, as I mentioned, NEI 1204 looking for that for possible endorsement relates to guidelines for 7248 implementation and I've already talked about the SIF applications we're reviewing.

Storage and transportation, standard review plan, consolidation efforts. The consolidated storage standard review plan is with our -- I think office of administration there and about to be published. And we expect it to be published for public comment in the next few weeks.

And then the consolidated standard review plan for transportation is expected to be published for public comment in the second quarter of fiscal year 2018.

We have begun to develop 72, 71, 72, right, storage, transportation, storage guidance. We are expecting a healthy discussion tomorrow on ideas for moving forward. That's a 90-minute morning session in Mirage Hami will be leading that discussion. Expect a fullsome dialogue regarding that particular area with 72, 71, 72. I know the trans nuclear NAC and Whole Tech will be providing presentations as part of that session. And then I've mentioned a couple times the used fuel working group and we have the Used Fuel Conference and continuing to

engage in those forums and working -- it's opportunity for regional and state government and tribes to continuing to work with outreach in those areas to communicate the various things that we're doing.

And also want to acknowledge my appreciation for the industry and EPRI working on development of insitu systems, that could navigate the close confines of the environment of the storage canisters for overpacks and so again much appreciate the collaboration regarding moving that initiative forward.

And then the NRC staff has been involved in the ongoing work with the ASEM task group as they continue to develop code case for inspection of dry cask storage canisters and the goal is to have a consensus code case by 2020.

I know that ASME code work, it's a long and disciplined process. But that consensus code case I think will be of particular importance once we reach closure on that, once the committee or task group reaches closure.

Wanted to talk a bit about again requests for additional information. I mentioned the discipline we need to exercise in ensuring that there's an appropriate safety basis for the questions that we are asking. There's also I would offer in the terms of regulatory efficiency and effectiveness, providing high quality applications that where you have leveraged the opportunity to look at the guidance that we provided regarding the content of various submittals, and the standard review plan is accessible such that you see clearly the criteria that staff uses to reach its safety determinations and conclusions.

I offer please take full advantage of preapplication meetings so that there's a shared understanding of expectations and then -- and I offer this to the industry folks that are here today. When I've gone to visit various facilities or participated in different forums, I encourage you to elevate concerns you might have.

If there's a request for additional information that you receive or questions that it appears the staff has and you're not understanding the basis for that or you feel you have sufficiently answered the mail in previous submittals, those concerns need to be elevated so that we

can reach alignment on what is necessary to move forward with the licensing process.

And I do appreciate the cost of the regulator, but I have experienced over my career that when matters do get elevated and the appropriate level of management gets involved it's an opportunity to address matters that staff may not have been fully aware of there, where there are -- are there particular preferences of a license reviewer that are coming into play or are the questions being asked fully relevant to making a safety conclusion here, and there's a level of management review now that we invoke regarding second round of ARIs and requires higher level of management to approve issuance of a letter that has additional RAIs, but I have heard various concerns expressed regarding things like an operating reactor, reviewers don't understand some of the programs we want to leverage like operating experience or corrective action programs. And I know there's been a concerted effort among the staff to ensure that there's a full understanding of that. So we don't leave you with the impression that you have to establish new programs and processes. But it is important that we are consistent in when we are requesting additional information that we're exercising a consistent threshold across different licensees and that that information as I've indicated a number of times is truly necessary to provide a safety conclusion. Reasonable assurance of adequate protection. Not a safety conclusion regarding absolute assurance, but reasonable assurance, and we need to be able to engage in dialogue regarding what is the threshold to be able to make that determination. I've covered some activities we're currently involved in. Some of our accomplishments, the current landscape, what we're dealing with both externally and some of the challenges that we're facing internally.

There was a comment that was made by Cris when she provided some introductory comments. And I'm looking for the quote that I wanted to mention. See if I can find it. I know where it is.

She said there will be no regulatory commitments and I have a commitment to you that is to strive to the best of staff's ability to be open and transparent in the communication of the basis of decisions so you understand that and have the opportunity to weigh in and express your views. If you don't understand that basis or you don't agree with that basis. And there are going to be cases where we end up agreeing

to disagree. But it's important to at least that you understand the respective basis that each involved party or stakeholder has so that we know where there is disagreement versus where is there just a misunderstanding or conceptual error or what have you. So I feel very strongly in ensuring that our regulatory decision-making is as open and transparent as it can be, and that openness is consistent with the principles of good regulation. Under clarity agency position should be readily understood and easily applied. Those positions should reflect coherent logical and practical relation to our various regulations. So principles of good regulation are very important tenets that we try and operate to on a daily basis. Let me stop at this point, because I did want to afford an opportunity to answer any questions. But I will again offer that I hope you find this regulatory conference meaningful, worthwhile investment of your time over the next two days and that you have a productive discussion and that you're very willing to engage and ask questions regarding the subject matter of the various presentations. But let me just open it up if anyone has any questions. On anything that I've said or otherwise. Yes.
>> I'm Don Shaw, I'm from Tan America licensing. Good morning Marc there's nothing on the agenda regarding security which is fine and security can sometimes involve safeguards which can't be discussed publicly, I'm sure we're all aware of that.

But what I want to say, though, is with regards to NRC Comsece we're curious about an up coming NRC security concerns that may impact current or future ISFISIs, I wanted to mention four items of interest.

We wonder will there be changes in regulations that will result in the need to implement changes to currently loaded spent fuel storage systems and are there any dry fuel storage systems designs that are more susceptible to others when it comes to future nuclear security. And third will be up coming security regulations address the dose aspect during used fuel movement from the building to the pad and what is the timeline for development and publishing of guidance on emergency response and accident recovery? Thank you.
>> Thanks, I appreciate your question which consisted of four parts there. I may exercise a lifeline here and addressing a couple of those but my recollection and please weigh in Mike or John if my recollection is not correct. The commission made a decision to defer our rulemaking activities on ISISI related security. I remember when we were

evaluating that when I was a officer design basis threat and what degree can various tactics and procedures be leveraged in the dry cask environment but my understanding we aren't proceeding right now with that rulemaking and if we did engage in rulemaking there has to be a regulatory basis provided that would justify the need for the rulemaking.

I'm going to ask John or Mike here regarding the dose aspects here. I'm not sure on that one but I do know we're not going forward right now with absent any correction here on what I've said here in a minute we're not going forward with any security related rulemaking with IFSII know it's important in your strategies which is assess and respond versus having to interdict with denial of access.
>> You bring key points on the IFSII security. And as Marc said we're not moving forward with rulemaking in the near future for that IFSII security. We are examining, I'm sure you're familiar with the add ver rarery documents but that's been put on hold for a period of time. I know INSER is continuing they have contracts in place evaluating some of the aspects of the rulemaking. Once those are completed, and we begin moving forward with any rulemaking, there will be much more public engagement and engagement with licensees at the sensitive level of those things. So appreciate your comments. They're going to be part of our transcript and we'll take those back to INSER.
>> Thank you Mike and Marc.
>> I do recall just in follow up when I was in INSER there was testing done the industry had an opportunity to observe that testing and that got to what was the effect of uses of various tools and techniques and what was the impact on the cask associated with that. But we do -- and part of that decision not to go forward right now with rulemaking was in the context of Project AIM and rebaselining and providing the commission with recommendations on what rulemaking activities needed to continue versus those that we felt no longer needed to be pursued or those where we felt did not need to be pursued at this time. But it would be -- it is very important that we keep the industry fully informed should we reinitiate any activities in the rulemaking area, and again the commission has a very visible engagement in that process. We have to provide a rulemaking plan and the commission would have to agree with the staff's desire to move forward and then you get into the regulatory basis, regulatory analysis, which you have to demonstrate that there is the need to pursue potential changes to the current

regulatory requirements, because there is some potential safety gap, et cetera.
>> Thanks. I also wanted to add for you folks that aren't as well read in the SECY paper as Don is, currently the NRC doesn't view that there's a gap in security at independent spent fuel storage facilities. Back after 9/11 we did a rather extensive evaluation of security for both the general licensed and specific licensed facilities. And security orders were put in place to assure that there was a even basis of security across all independent spent fuel storage facilities. The office of nuclear industry response is reviewing threat information domestically and oversea and reviewing design basis threat for power reactors and any other threats that may be coming about for waste or materials facilities. And as currently, there is no change in the threat environment that would cause NRC to reevaluate what our security posture is for independent spent fuel storage facilities.
>> I really appreciate that, Mike. So in domestic the detect assess response approach is still considered appropriate versus having to engage in a denial of task and we would change the regulatory requirements we would have to have a clear basis communicated and safety context or security context that would dictate moving forward and security context would lead to safety concerns. Any other questions? I don't know how many of those commission papers I have ready knowledge of.
>> Okay. We're going to take one more question, because according to the back of the envelope calculation we'll be done at seven if we gain 15 minutes every hour.
>> Thanks for that. I appreciate the facilitiers keeping us on track. The reason I was proceeding with questions was I understood there was flexibility in the schedule. I'll take one or two more and adhere to the schedule.
>> Brian Gutheraumn. I was wondering if you could provide any insight on what's going on with respect to inspections as far as how they would complement the other things you're doing differences in frequency or scope or resources, both in headquarters and at the regions?
>> Thanks. The predominant inspection arm of the agency is based out of the regions and as a program office NMSS has to determine with regional input what's the appropriate procedures that dictate, are they the scope of the inspection activities as prescribed by our various procedures. My understanding is similar to licensing reviews, we continue to evaluate the inspection scope appropriate because we

realized that results in resource expenditures. And I think another very important aspect there is sharing inspection findings across the different regions. So there's awareness of how the inspection process is being implemented so we have consistent and repeatable and predictable results from inspection activities. But other than the evaluation on continuous improvement context or self-assessments regarding the inspection program, I'm not aware of a separate targeted initiative in that area. Is there anything John that we're doing that I'm not aware of. We're stepping back in the context of workload looking at do we have the right inspection footprint. So I know we're doing that. But that is all in the vein of a continuous improvement, assessing our learnings from the inspection program versus targeted initiative like removing the level of detail in TSCs and tech specs.
>> As Marc indicated we don't have any plans to increase inspection frequencies or hours. We think we're in a good place with both of those elements of inspection. We do periodically look at what type of samples we take and we'll look at the inspections but that's something we routinely do as in ROP does for reactor inspections and what I would offer is if you look at some of the changes that may be coming down the pike like with 7248, when that session comes up, ask the question about what impact does that change in guidance have on inspection. I think that's going to be a good dialogue for that because that's where I'm referring to that we may take a different look at the types of samples we would do for some of those inspections. I want to make sure we're not just transitioning what we were doing in licensing space and capturing in inspection. It's going to be the guidance that's necessary in a 7248 evaluation and I just thought of and I was remiss in not mentioning this, we have to submit what's called an agency reform plan to the Office of Management and budget and one of the items included in that form plan is more focused effort on risk informing our inspection programs. Right now there's a focus on operating reactors, but the expectation that's broader and that we would also look at the Inspecthion programs we regulate, spent fuel storage in the context of ensuring that our process is informed not expecting more or less, it's a double-edged sword when you bring in risk informing. And it's a promise or IOU when I say there's no current initiatives right now but I would envision us shifting focus from operating reactor inspection reactor oversight process to looking at our inspection programs and processes associated with materials licensees, spent fuel storage and transportation. Can I take one more question and then we'll conclude?

>> I would suggest we ask if there's somebody on the phone that needs to ask a question.
>> Thank you. Does anyone on the phone have a question?
>> I'm not showing any questions from the phone line at this time.
>> Okay. Anything else? Again thank you so much for the time and opportunity to speak with you and answer some questions and again please enjoy the rest of the conference. Thank you.
[Applause].

>> Okay. While John is helping set up session number one, just a little housekeeping while you guys are busy getting set up there. We're going to take whatever slack we can from running over on each one of these sessions out of the lunch hour which is an hour and a half long, and that's quite long when you only have to go upstairs about 40 yards down the hall to be able to get your meal. I hope that's agreeable to everybody in here, but we have bus schedules and car pools and things like that that we're responsible to be on time for. So we want to stick as close to the time as we can. Are you ready?
>> I am ready, Dan, thank you very much. Good morning everyone. It's a pleasure to be here. I'm excited about this session. The session here titled was licensing and certification, fairly generic title. I'm chairing the session but I'm also giving the first talk I'll jump right in start introducing myself. Many of you know me you might have worked with me in various capacities I've been with the NRC for some time. Prior to coming here to the spent fuel licensing branch I worked in the office of new reactors where I headed the licensing branch for the AP1000 design. Very interesting stint. I also worked branch for reactor systems. Containment systems. I've had a number of reactor experiences. Prior to that I actually worked in the office of nuclear security incident response. So I resonated a great deal with much what Marc and Mike Layton were saying with regard to security. Prior to the work at NRC, worked with the Navy. Fairly fair background in that. Interesting times.

If I could I'll jump right in. Logistically folks from my panel what I plan to do is I'd like to go through the talks I've got a couple of very good talks lined up. We do have one change in the lineup. Mark Richter has agreed to step in for Pam Cowen who wasn't able to attend. So I'll go through the talks. I'll give your bios just prior to your

talks, and hopefully we'll save some good time at the end for some good Q&A.

If I could go to the first slide there. The first talk of this session I wanted to start with a safety mission, safety is why we're here. The mission of the NRC is safety security and environmental protection mission. And I didn't want to let that go unremarked. As I looked at the titles of the slides here and the presentations in this first panel, there's lots of talk about efficiency. But I wanted to make sure we started with the safety message. It's only when we have good confidence, reasonable assurance that safety, security environmental protection are being ensured that we can then look to starting to focus on some of the efficiencies. And there is a great deal of efficiency we're trying to work towards. You'll hear a lot about that today.

But I wanted to make sure we stayed on that safety mission and that safety focus. That should be the basis of all the actions that we take. Many of you have seen the mission statement but I wanted to get it up there on the record again. The NRC is a safety organization and we're committed to that. Safety requires constant vigilance. The licensee is always responsible for safety and the NRC has a very important oversight role there.

So I think everybody in the room understands that, but it needed to be said again as we start to talk through a long litany of efficiencies.

Efficiency and safety are not diametrically opposed. They can complement each other. When resources become constrained, that can be a sign where we really need to look and take a hard look at what we're doing to maintain our effectiveness in our safety mission and it really helps sharpen us in terms of our regulatory oversight. So I just wanted to start with that talk.

Next slide, please. Next item, of course, is principles of good regulation. These really provide the foundation of the actions that we should take and the things that we're doing as regulators. There are five of them that you've all seen before and Marc Dapas spoke about a number of them independence openness, efficiency and clarity. And I bolded and underlined a few that are going to resonate through the rest

of my talk. Efficiency and reliability I think those are two themes that I'm going to keep coming back to in my talk.

And then also I want to touch on the clarity one. That's underlined but not bold. They're all important. They're all very valuable and they all work together. But in my talk today, just wanted to focus on a couple of them.

So again with safety as our foundation, we can then move on to look at a number of items. We certainly always want to consider and adopt efficiencies, which maintain the safety posture that we have. But with reduced resources. So that's some of the things we're talking about. As Marc alluded to as you looked at in the program we have a number of activities underway.

Many of them have efficiency enhancements. Maps, update, NEI, the list goes on. Marc saw it, spoke to it. These are all very important, very valuable initiatives that industry and the agency are going through and we need to continue to work those and we need to bring those to closure.

But I think we're going to need more. I think those are all a good step. When I look at the trends and the environment, I'll speak to that in a minute, I think we're going to need to continue to look for additional efficiencies and enhancements in our programs.

Next slide. So let me talk for a second about the resource environment we're in. Marc spoke to it, but I just wanted to reemphasize a number of elements there.

I think Mark spoke at a great level. He's got the whole office to think about. I want to bring it down a little bit to the business line. Marc mentioned that spent fuel storage and transportation business line that Mike Layton is the business line owner. Over the past couple of years many of you have experienced or have heard your project managers or you've heard me or you've heard Mark Lumbard prior to Mike Layton we're trying to right size and bring down expenditures appropriately. I think we've seen that in the past couple of years we'll probably continue to see some slight reductions in resources.

SFSC. That's tough to say. We have to continue that trend. We need to continue to do work to make sure that we can accomplish our mission with fewer resources. And one of the themes that I want to talk about today is timely decision-making and how that plays into that whole issue of working with reduced resources. I wanted to tee that up generically and make sure I captured the environment that we're in.

The workload in the business line has been steady if not slightly increasing, you all know we've got consolidated interim storage applications, there's a steady stream of transportation cases that continue to come through. Steady stream of storage as decommissioning activities have ramped up. I think we've seen uptick in the number of amendments coming through to capture the fuel that's being decommissioned as people move from pools into dry cask storage. So we've seen a very steady stream of work. And what we're going to need to do is work that and continue to face that challenge of trying to do it with fewer resources and trying to be a little bit more efficient while we maintain our effectiveness. So I just wanted to touch on that resource environment. Go to the next slide, please.

So as I reflected on, I love the REG CON, it's an opportunity to think back on the year prior and reflect on where you've been, what you've accomplished. Marc went through some great accomplishments that we've done.

A few of those we still have to make sure we close. There's still a few loose ends to wrap up. But one of the things that I've reflected on that have really challenged us in the division of spent fuel management is timely regulatory decision-making. This is an area that I think the division can improve in. It's an area that I think industry might also reflect and see if they are making timely decisions and moving forward effectively. Certainly I think it's a truism but I'll say it again all external stakeholders, applicants, public, Congress, commission, commission is not an external stakeholder but all our stakeholders should expect timely sound decision-making in a clear and predictable regulatory process, transparency, openness, those are our expectations that you all should hold us to every day. Timely decision-making is important in that predictable mode when we establish schedules, we need to stick to those schedules and that enables you all in the community to do your planning and the consequences of the delays

are significant and they erode the trust and confidence that we need to maintain as the regulator. I'll talk in a minute of a couple of examples that I'm thinking of when I come to that. Every time we delay or we don't make a decision is costing resources both for us and for you. And so this is an area that we really need to focus on going forward. What I've seen here in the past year is that our efforts working with industry to resolve some broad issues rather generically have led to the submission of sites specific licensing actions that in part may overlap some of more generic issues, we'll have amendments underreview and those amendments are becoming pro tracked for various reasons and you'll have site-specific activities that need to come in because they're trying to maintain their site-specific schedules and their planning. So we'll see overlapping applications.

And this is something that is costing us a great deal of resources. One of the things that troubles me the most, you know I'm never shy to expend resources when there is a significant safety benefit.

And I do always appreciate when industry is bringing forward applications that have a strong safety benefit, we need to prioritize those and get those done.

But in these instances that I have in my mind that cause me to come to this, they're really kind of overlapping regulatory actions. Technical reviews are very similar and not the additional resources in that site-specific action is not achieving the same safety benefit that you would expect for the resources expended. So this is an area that I think we need to really focus on. Another example that really comes to mind is reviews that become somewhat protracted for various reasons. Every case is different. Every case is unique. And they all bring certain nuances, both technical or regulatory compliance nuances that need to be addressed. But when the reviews become protracted and you're narrowing down to just a very small set of in the large scheme of things relatively minor issues, we really need to stop and reflect as to whether the continued pursuit of that narrow issue is going to achieve the same safety benefit that the resources are costing us. And so this is an area where we really need to be mindful. If we're getting to that second round of RAIs, we really need to make sure these are clear and really achieve the safety goal and are enabling us to

make that reasonable assurance finding. So that's going to be a key component for us in terms of maintaining our efficiency.

If we're getting to third round RAIs, then we really need to think hard about different strategies to use to come to resolution on those issues. But it's that notion of making a timely regulatory decision is something that we really need to think about and work a little harder towards going forward.

So I wanted to think for a little bit about what are the contributing factors. I had a few cases in my mind and what are we going to do about it as an agency and spent fuel management community what will we do.

And one of the things we've discussed internally that I've reflected on a great deal is that our division instruction for prioritizing work may not be as effective as it could be.

This is a fairly recent division instruction that we've put in place. It's publicly available. So some of you may have looked at it. It's entitled additional strategies and management expectations and it lays out our prioritization scheme when resources become constrained prioritization becomes very important and you need to have an effective scheme in place to manage your work and get your resources in the right place.

As we reflect on this division instruction, we found that that most of the work that's coming in the preponderance of the work is falling really into just two of these categories. We have about seven categories for our prioritization bins and most of the work is falling into two.

And so really that's not providing us a very good discriminator, if everything comes in high there might be a way to think about a different scheme. And that's what with we'll do this year is look back on the prioritization and find a scheme that will help us more clearly differentiate the work and get the resources on the right place.

I've thrown up this -- I've tried to take a twist. Many of you have seen forms in different media about planning, prevents poor performance

or I wanted to put a positive on it and talk about planning promotes proper performance to give it a slightly more positive spin. So I think both NRC and industry I'd like to see a renewed commitment to schedule discipline. I know this is a very important area for us internally. I think externally I've seen a number of areas where I think some enhancements could be made on the part of industry and I'd like us all to recommit to schedule discipline when your schedules slip on submittals either initially or a second submittal that impacts our work. And I know very well that when our schedules slip, it impacts your work.

So that's something that I need to focus and recommit us to high quality submittals are essential. Timely decisions are essential. And I think those two also go hand in hand. High quality submittal makes for easy decision-making. So that's a theme that I think we need to continue to resonate on.

The other item I think we really need to communicate potential resource impacts such as deferring the start of cases, if it comes to that, we really need to communicate early and often as to what those impacts are and make sure everybody can incorporate that into their planning horizons.

Safety focus reviews. We're a safety regulator. We always need to be focused on safety. That should be the primary really the only safety security environmental protection, but that's where we need to stay focused. We're a highly technical organization. But our decisions need to be based on sound science and engineering principles. But with that focus on that reasonable assurance finding that we have to make. Marc spoke already about it's not an absolute assurance it's a reasonable assurance finding so we need to stay focused on that.

I'd also like to reduce, if not eliminate resources on events that are not incredible. I think the maps report does a wonderful job where it talks about some specific environments and specific cases where those environmental conditions don't exist and so then the review on those particular futures are not necessary. So that's a great efficiency where you're not spending time working on nonincredible events. I think that's an area we need to continue to explore. I'll up the pace here a little bit. Thank you for the time reminder.

So I do have a challenge for industry. I've talked a little bit about what we want to do internally within the agency. Certainly I have that challenge for industry. I think I might have mentioned this one at the last REG CON. I'd love to get to a condition of zero requests for supplemental information in our applications.

I know in renewal space they're starting to achieve that and that is tremendous. I think I'd like to see it across the board. Acceptance reviews are attempting efficiency so the reviews themselves go more smoothly. But certainly as we have a decade of experience on applications I think we should be able to achieve a zero RSI status. We need to continue to apply lessons learned. I think the staff has experienced where we're asking the same RAI again and again in a number of different applications. So I'd like to ask industry to reflect on that and see if they can take corrective actions not have us repeat RAIs. Incorporation by reference should be clear and specific. That's a quote right out of the regs but I think there's some additional clarity that could be added to some of the applications, incorporation by reference is a wonderful thing. It eliminates reputation and duplication of effort. But it has to be clear and specific and we need that explanation as to how they're applied to the current case. Adopting best practices. Marc already spoke preapplication meetings are great. And then having those public meetings when you do have technical issues don't continue the round after round of RAIs to try to resolve technical issues let's get a public meeting together and have a face to face.

So I think that's kind of the summary of my talk on our efficiencies. We are going to commit ourselves to timely regulatory decision-making. But we need to maintain our safety focus first and then we do need to start to have a better prioritization for incoming case work and we'll need your help with clear and high quality submittals. That's it for me. If I can, I'll introduce my next speaker. Mark Richter is stepping in for Pam Cowan. Thank mark. Senior project manager decommissioning programs at NEI 30 years of experience in the nuclear industry. Includes 24 years at Consolation a lot of industry experience there. Held various positions at Constellation and the supervisor of fleet engineering programs prior to joining NEI.

He's currently the project manager of NEI's decommissioning task force. I'm sure that keeps him busy the used fuel task force and aging quality issues. I think he's wearing a number of hats. He earned a bachelor's of mechanical engineering and masters in applied science in metallurgy from the University of Delaware, got a doctorate from material science engineering John Hopkins and MBA from University of Baltimore. Thank you and everyone please welcome Mark Richter.
[Applause].

>> Good morning everyone. And John thank you for the introduction. John made mention of the fact that I am wearing a lot of hats these days.

And unfortunately, the one that I wear for decommissioning seems to be the running inside joke. It's like the industry's new area for growth, which is something that we regret. But also something that we take pretty seriously. And we hope that as an industry collectively we can put our minds, thoughts and efforts together to turn that corner and move forward to a better future for our operating plants and future plants.

But a little bit closer to topic for today. In keeping with the theme for efficiency and good regulation in terms of used fuel and related topics Pam Cowan had put together a presentation entitled the imperative of used fuel regulatory efficiency. And for her this is an area that she's very passionate about. And one that she believes is really important for our industry. And she really regrets not being here today and wishes, of course, that she could be.

So she sends her greetings, and again her regrets at not being able to be here. What I'd like to do is hopefully provide a fair representation of what she wanted to deliver in the way of a message and maybe share my own insights along the way as part of that.

So before we go to the next slide, let's hold where we are for a minute and I want to talk about taking a peek into the future. And, of course, peeking into the future is sometimes a little dangerous or a little scary, because unless someone else has better insights, there's only two things I can know with certain going into the future, one is death and the other is taxes and depending on where you are in your

spiritual walk there's only one you can escape in your earthly life and the other probably chases you to heaven.

With that, we'll take a look into the future. Next slide, please and try and get a snapshot of what our nuclear generating future might be.

Now, again, we don't know with certainty what the future looks like, but one thing we can say, we can take what we know and make some projections where we are.

If you take a look at the slide that's presented now, and you look at where we are in the present, in 2017, you can see where we are with our total nuclear generation. But as you well know, there's a number of plants that are at risk. Some have already entered the transitional process of decommissioning, others have announced the intention to do so, whether or not depending on their timeline and specific factors maybe that's a reversible decision if they hadn't made the formal commitment, maybe not. I know the future of some plants are hanging in the balance depending on market factors and other factors that are in play but that's a site and corporate-specific situation for those plants.

So you see in the different color representations here, and I hope this its relatively clear, but here in 2017 we have upwards of 100,000 megawatts of nuclear generation. Although we see that capacity declining with time as a result of plants that are decommissioning those that intend to decommission and some percentage of the current operating plants that for one reason or another elect not to pursue subsequent license renewal. And the one thing I want to emphasize about this in the next few slides that shows different scenarios, it's not so much as the exact values are to be paid attention to, but it's more important, I think, to focus on the relative positioning and the trends where the industry is going in different scenarios.

Next slide, please. Now, this slide represents a little bit less optimistic view than the first slide did relative to what may happen with plants announcing decommissioning. It's sort of the case of the self-fulfilling prophesy or some foreshadowing were plants that have adopted the mindset that, hey, I think we need to shut down for whatever reason may end up actually doing that.

And I wanted to really bring your attention if you look around the year 2025, where the announced plants tend to drop off the radar screen in terms of their production, that national capacity for nuclear generation is about 10 to $12,000. -- 10 to 12,000 megawatts less than the previous more optimistic scenario.

Next slide, please. I think we all know roughly speaking that nuclear generation represents about 20% of total electric production in the United States.

And if we wanted to project into the future given the current projections on our operating fleet retirements early shut downs for decommissioning, and even with a reasonably healthy percentage, maybe 75% pursuing and being granted subsequent license renewal out into the 30s and on we'd have to add about 90 gigawatts of new capacity just to maintain the 20% of overall electric market that the nuclear has at the moment.

And based on the challenges for building large base load capacity nuclear plants in terms of capital investment and whether or not a facility is willing to take that risk on, if you look into the future, I think you're looking at potentially some large base load plants but I think we also have to be thinking in the context of small modular reactors, advanced reactors and some other different configurations that maybe are not even known to us today as we look into the future.

Next slide, please. And -- thank you. If we just wanted to maintain what we have now, in terms of overall capacity and we look at that in the context of growing market demand, even to maintain the position where we are now, in terms of total output, that would reflect a contribution to the total market maybe of 12% down from 20. But to even do that in the face of the requirements and decommissioning whether it be early or on schedule in terms of license expiration, the industry would still have to add 34 gigawatts of new capacity. And for our industry overall it's not just about generation. It's not just about being able to maintain the nation's electric supply there's a number of other factors we have to consider, one of which is our supplier community, our ability to maintain, operate and even build new plants, the suppliers will have a more difficult time staying in

business or staying in business at the level where they can continue to exert leadership in the industry both nationally and internationally. And you see or you can project as our United States nuclear fleet contracts or isn't growing in a healthy manner that you get into this negative spiral where the supplier community sort of diminishes with that. And I think we as a community needs to recognize that as a problem and pay attention to that going forward.

Just to keep in mind as a checkpoint here in this presentation. Our success today really hinges on us being efficient. Again, that's in keeping with the theme of the conference, being efficient. And we know we can do that because that's in our control there are other factors not in our control like cheap natural gas. Somebody woke up one day figured out how to drill sideways after they were five miles underground now we have cheap gas that's under our control how we do in terms of technology, how we manage it that's within our control and also as we look into our future it's not only going to be necessary to maintain the efficiencies we achieve today in the near term but innovation in terms of new technologies, new reactor designs and so forth will be critical to turning the corner on some of these projections for where nuclear will be.

Next slide. So I've painted a picture that may not be exactly rosy. And one of the things that NEI has done along with pretty active engagement and support from the broader industry, one is first recognize that the industries at a pretty critical juncture. We talked about the challenges of cheap natural gas, marketplace imbalances that don't necessarily reflect all of the attributes of nuclear energy and being able to assign the appropriate value that goes along with those attributes, the courts are evaluating different market fixes. We've seen zero emission credits in New York and Illinois and I know Pennsylvania and Ohio are actively involved in consideration of doing some things there to try and I guess rebalance or create greater equity and recognition for nuclear in their marketplaces. So what we have done in response to these challenges is put together what we call a National Nuclear Energy Strategy or NNES. And hopefully all or most of you have heard of this maybe even more than that become a little more familiar with it. But there are really four primary objectives as they relate to nuclear energy preserve sustain innovate and thrive and we really hope to take action in each of these areas as it relates to

nuclear energy to try and turn where we are now into a thriving and growing industry, not just here in the United States but also internationally in terms of technology and leadership and what that does for us in creating a footprint in other countries or regions of the world. I think the United States design reactor is present in another country and they're operating in accordance with the principles and regulations and management approaches that we use I think that in itself becomes sort of an ambassador for the United States and other regards. So it's really important and a broader sense beyond just our industry what the ability to lead internationally does for us next slide, please. So in order to implement the NNES, one of the things we have to do is be successful in achieving the objectives is to create a new sense of urgency or greater sense of urgency than we do now. In order to do that we have to somehow increase the pool of people that support nuclear energy and give them a compelling reason to do so. I think we've begun to see that organically in some areas where some of the environmental groups that maybe decades ago were vehemently opposed to nuclear we find them sort of as unexpected but welcome allies together in the context of nuclear being a clean carbon free energy source as opposed to coal oil or some of the other fossil fuels. So there's a number of other imperatives too that we're going to be focused on as part of our national campaign. And that would include jobs and infrastructure, the current administration is all about jobs, it's all about infrastructure, and we certainly think this industry aligns well with national policies that support jobs and infrastructure. I've already talked briefly about global influence, regulatory efficiency again, if you've heard it once you'll hear it probably a thousand more times in the next two days. Technology leadership again that's going to be important to our success here as well as around the world, air quality climate change and being able to provide clean power are all things that different groups and constituencies can sign up for with some level of enthusiasm. Next slide.

So within the sustain objective and being more specific about the presentation today, the sustain objective is really all about an improved regulatory framework and reducing regulatory burden. And the desired outcome of this objective is to reduce the burden implement durable solutions that will support the entire nuclear value chain, not just the back end. And I'll do that through again the improved

regulatory framework that we're working collaboratively here to achieve.

And as we've heard a number of times already today, we've done a lot of good things already. And with more to come.

Next slide. One of the things that again has been touched on, I'd like to again provide some background here is what we have done in terms of dry cask storage and putting together a forward looking approach. That's something NRC has spoken to quite favorably. We agree.

It's worth mentioning now that the managing aging processes and storage report is out for comment. That's essentially a gold report for dry cask. We support that approach.

NRC and NEI have been working collaboratively and together for a number of years both with NEI's 1403 guidance on format content and implementation for dry cask storage aging management along with NRC's new reg the renewal plan for site-specific licenses and COCs.

We see these as very complementary documents and important pieces of the regulatory framework that we'd like to achieve going forward. One thing that is worth mentioning, though, and it's a very key and important point, for us to establish an enduring framework, maintain these efficiencies, we really need to see the approval of the maps and endorsement of NEI 1403. We need to have those as an industry.

Next slide. Now, in terms of the certificate of compliance and again Marc touched on this, we really believe there's an excessive level of detail in the licenses and the COCs, and the workload that goes along with maintaining that level of information is really diverting NRC and industry resources from potentially more safety significant or emergent important issues maybe that have yet to arise but could tomorrow.

So it's about balancing and being more efficient with our resources. One of the things that we are doing to try and affect and improve more efficient regulatory framework, TanAmericas is undertaking a pilot that the industry and NRC have endorsed.

We're looking for opportunities to reduce content requirements and the information management that's associated with the certificates of compliance.

Next slide. The graded approach that's embodied in the TM pilot, what we're putting forth here, is really going to involve the removal of not insignificant amount of nonsafety-related information. And that's going to be going forward under industry controls.

So, the important thing we want to emphasize here, in order for that to be successful, industry needs a tool so that they can manage the change control of that information, a tool that the NRC has confidence in, in order for us to be successful.

And the NEI 1204 document is one that provides guidance in that area. And again as Mark mentioned earlier, we're seeking the NRC endorsement of that, and hopefully we will hear some more details about where we are and hopefully coming close to closure on endorsement of that tomorrow in Patty Silva's presentation.

Next slide. Again, as I said before it's all about efficiency in order for this industry to be successful, healthy and-driving going forward. We also fully agree and endorse the idea that efficiency and safety are not mutually exclusive. In fact, really when you have efficiency, that enables and frees up resources to support areas that may need additional work or resources to be safe in the future.

So next slide. As I've alluded to earlier, the future success of this industry is really going to be tied to efficiency improvements, not just in fuel, fuel storage or fuel transportation or decommissioning, but really in all aspects of the nuclear value chain from design, construction, operation, the back end, which would include decommissioning and ultimately what we do with the fuel. Thank you very much for your attention.
[Applause].

>> Mark I planned to take questions at the end but if -- okay. So if I could our next speaker is Jose Cuadrado. Mr. Cuadrado is the license manager in the spent fuel branch he's responsible for licensing review for applications for spent fuel licenses, dry cask storage certificates

and for approval of certificates for radioactive material transport. Prior to his role here with SFLB he worked with the division of high level waste repository where he performed reviews on the license application for the composed geologic repository at Yucca Mountain and led implementation of the stakeholder outreach and communications associated with the repository program. Mr. Cuadrado has over 15 years of experience here at the NRC holds a BS degree in chemical engineering from the University of Puerto Rico and MBA from the University of College Park. Please welcome Mr. Cuadrado.
[Applause].

>> All right. I'd like to welcome everybody to this session. I think many of the topics that I'll be covering in my presentation dovetail over many of the statements that John has made. Some of the ones that Mark has also made and I'll try to go over them as quick as possible so we allow plenty of time for questions.

But and also many of these topics I'm going to be covering regarding efficiencies and improvements in the openness of our regulatory activities dovetail over many of the presentations that we'll continue to see from our colleagues over the next few days.

Next slide. Briefly skip over the agenda. I think as I go through them you'll understand where each of these topics will be covered. So go to the next slide.

I want to reemphasize this. I think, first of all, I need to say it was completely inadvertently that I plagiarized Mark's quote on the efficiency principle of good regulation. The agency earlier this year celebrated the 25th anniversary of the principles of good regulation. I was involved in some of those efforts but I think it's very important for us to reemphasize the agency's commitment towards accomplishing the safety and security mission by implementing these principles of deregulation.

I like these two quotes we have there. The first one concerning openness and nuclear regulation, public business and it must be transacted publicly and candidly. The accountability that comes from having our processes and our business conducted openly. Provides a lot of accountability that we need as public servants and regulators. Next

slide, please. The first of the efficiency initiatives that I'm going to discuss is Mark briefly mentioned it has to do with regulatory summary 1725. And this regulatory issue summary discusses the process that we have implemented for doing certificate of -- storage of certificate of compliance revisions and corrections.

The rest was issued in September and licensees and processes of upholding this. The objective was to reduce the amount of amendments we have to do. As you're aware anytime we need to do a correction or revise a certificate of compliance prior to the implementation of the correction or revision process, we had to reissue an amendment which duplicated a lot of the review and the regulatory licensing and technical processes that were not necessary and so by issuing the certificate of -- by issuing this regulatory issue summary we are providing a more predictable and efficient alternative to making these types of changes in the COCs.

Next slide. So the risk as we said discusses the paths. First one is corrections, two parts, certificates of compliance, intended for minor typographical errors in COCs that might happen. And obviously as a result, the Administrative Procedures Act grants NRC the authority to make these kind of corrections to the certificates which are incorporated and finalized by rule in part 72.

And it allows the authority for us to issue those corrections without any, by publishing a rule that doesn't provide any notice or comp.

The second process that there was discussion of a revision process. And this revision process is intended for technical changes to approve COC for amendments. But specifically those that do not affect the design basis or any of the cask structures or component. The reason for this is revisions do supersede the previous approved amendment. We don't want to get into the reason why the revision process is limited we don't want to get into a situation where we're invalidating already loaded or approved casks assigned.

So the revision to the COC by the fact it supersedes the amendment we have to be mindful there's, considerations in this process.

We want to make sure by us superseding a certificate that the current users of that amendment or that certificate are not placed into a situation where any of the assumptions that went into their loading their licensing basis are invalidated.

And these revisions are issued by the same process by which we issue amendments. They're issued by direct final rule, with a notice and common period of those. So the expectation is that by implementing this COC and revision process we will reduce the number of certificate amendments that are necessary. We have already implemented certificate revisions and certificate amendments for many of our licensees. We believe the process has been working appropriately. And we will continue to look at the COC revision and revision process to look for the kind of improvements and efficiencies that are necessary as we gain more experience in the reviews.

Next slide, please. The next topic I wanted to cover has to do with the OIG audit that NRC OIG conducted regarding oversight of storage and transportation COCs. First bullet discusses the title of the OIG report and I've provided a link to where that OIG report can be accessed.

So the OIG over the past couple of months has been reviewing the process that we internally use for approving certificates of compliance not just for storage but also for transportation and the reports which were published about a month and a half ago are two recommendations they provide it's actually four recommendations but they summarize themselves into two main topics. The first recommendation was the OIG F NRC Staff to determine and provide the basis for appropriate term of Part 71 certificate compliance. Currently the NRC issues transportation Part 71 certificate of compliances for five years. The OIG has found that the NRC hasn't properly documented the basis for why the term has to be five years, why can it not be different. So the NRC will be looking into that and formulating a response and the second recommendation is part 72 securities of compliance and it has to do with establishing sufficient controls for the part 7248 process as we discussed earlier, 7248 process which allows NRC certificate holders to make changes to the certificate of compliance as designed as long as those changes meet a certain criteria. The OIG found that we need to provide a review our internal procedures for reviewing the biennial

submissions 7248 report and that we examine those processes to see if they're still applicable still valid. My third bullet discusses the fact that the NRC has reviewed and agrees with the OIG's recommendations and we'll be developing an action plan to address these probably in conjunction with all the other initiatives that we are discussing during these two days as well and I foresee more details about our plans to address this will be forth coming in the future.

That applies to both storage and transportation not only addresses the efficiency part but addresses the openness part has to do with reducing the amount it takes to release publicly available license certification application documents.

The effort has gained more urgency considering the submission of the consolidated storage applications that we started to review and suspend and the one we're currently reviewing which due to the increased visibility and public interest of these applications, we have found that the process by which we received the applications and then between the time, the amount of time that it passes between us receiving it and that information being public, there's significant gap of time that we can certainly make improvements on.

So as a result of that, we're currently looking into improvements to our sensor recover criteria. As many of you may be aware the NRC is required to conduct review of sensitive unclassified nonsafeguard information on all documentation or application documents related to storage or transportation. So we're looking at whether or not these sensitive review criteria are still applicable whether they're still useful or improvements that can be had regarding that process, whether the redactions that we sometimes conduct in these reviews are continuing, continue to be necessary and we're also looking at whether or not if any of these initiatives are adopted to perhaps issue a regulatory issue summary or generic communication of some type discussing what new criteria if any we'll have. On that subject, we continue to focus on emphasizing to industry the importance of a hearing within NRC, acceptance criteria for electronic submissions. We also have looked at other tools that have been used in new reactors licensing, electronic submission tools and packing list that allows licensees to undertake some of the process that normally our document control desk will do for profiling and declaring these documents,

allowing some of that to be conducted prior to the submission, which could help us accelerate that process. And that would be mindful of the reduced environment that we currently have in corporate support activities. A lot of these activities are conducted by our partners in the Office of Information Service.

Last slide that I have regarding openness initiatives, I just wanted to briefly state that whether or not we continue on the push for efficiency, our commitment to openness continues to be the same as we had prior to this environment over whose resources.

We remain committed to public involvement and participation. We provide, already provide many opportunities for members of the public to be cognizant and aware of all the activities that we conduct in licensing and certification for part 72 and Part 71, storage and transportation. The majority of our public meetings and conferences are open to the public. People can attend. People can participate in teleconference or webinars such as the one we're holding today and that will remain the case for the future all of our public documentation we strive to make it available to the public as much as possible except in circumstances where obviously there's security-related information or safeguard information or there's proprietary information. And we also provide opportunities for members of the public to comment on the rulemaking process that we used to approve security of compliance for storage cask systems.

I also wanted to remind everyone of the up coming opportunities we'll likely have as we continue the licensing process for consolidated storage application reviews.

Obviously as an away from reactor license FSC licensing activities continue, there will be, after we -- if we decide to accept any of the applications for the clinical review we'll provide an opportunity for members of the public to request a hearing before the atomic safety licensing board and that is also an opportunity to make concessions so that's significantly different avenue and opportunity to participate in the licensing process that we normally do not have on certificate storage and Part 71 licensing.

And also another, another vehicle by which people can participate is the NEPA process. NRC is required to prepare Environmental Impact Statement process. We'll follow our NEPA process for that and the NEPA process contains significant opportunities throughout its pages, whether it's copy coping, the preparation or the preparation of the environmental impact statement to comment, participate and learn about the environmental review process.

Next slide. So to conclude, the NRC as I said earlier and has been emphasized as many of our presenters continue to discuss storage and safety mission, continue our efforts to efficiency maintain the openness of our activities and the efforts to revise our internal license and administrative procedures will help us achieve those improvements. And I think the continued engagement and discussion between the NRC and industry on future licensing and certification activities, as John so eloquently put earlier in our presentation, will continue to be key for that. We'll put in our two cents. We fully expect our partners and stakeholders to also do so and be able to achieve that success. That completes my presentation. I look forward to any questions you may have.
[Applause].

>> Thank you. I hope we've saved a little bit of time for questions. Cris you're going to help us.
>> We certainly have and we know we have one right here in the front.
>> Just a question for you Mark. I appreciate in the slide where you talked about the sustained objective with respect to nuclear impaired and I fully appreciate that a significant part of that is improved regulatory framework, reduce regulatory burden. But I was a bit surprised to see there's no reference to the role the industry needs to play in ensuring continued high level performance at the various facilities and ensuring that that operational performance is maintained and the role that the industry would play in that as having the primary responsibility for safety.
>> I appreciate that comment, Mark. It's a point well taken. And actually I think it probably should get some recognition. I think maybe within our industry, at least in the community that operates the plants, it's almost -- you know, it's like religion. It's like already burned into your chip there that operating safely is first and foremost because without safe operations you have no future, you have no

industry. But I think to give it some formal and outward recognition in terms of this broader strategy, trying to solicit broad support and advocacy, I think that's a point well taken, I'll carry that back. So thank you.
>> Before we go to the other question in the room I want to ask the operator if there's anybody on the phone that wishes to make a comment or ask a question.
>> Thank you. At this time if there is a comment or a question on the phone line, if you can please press star followed by the number one. I'm showing no comments or questions at this time.
>> Thank you very much. Okay.
>> Plant the three Yankees, my comment has to do with the SFPs. I'm in the middle of looking at the map SRP, which is over 500 pages I believe. We've got another one coming in a couple of weeks I think Mark said and one in the middle of next year.

In my review so far of the maps document, which is needed in the industry, I'm not disputing that fact, there's also a lot of unnecessary prescription in that document that will lead to I predict inefficiencies, RAIs and other things. So the fact of my review is going to try to point out what a lot of these unnecessary prescriptions, hopefully that is something that you can carry forward into your other SRPs and I do understand the complexity of the document. However, I think that you need to look at that particular aspect of these things, understanding that they're not only used by your staff but they're also used by industry to align their applications and we're trying to look at the guidance in that document, create our license renewal application or CC renewal application, and a lot of things don't fit together as well as they should. So that's just the nature of my comment. And --
>> So thank you very much. This is John McKirgan. If I could just get a clarification on your comment. So we have the master report. There's also the consolidated SRP that's going out. So your comment and what you're reviewing now is related to the maps report.
>> Yes.
>> So thank you. We appreciate that feedback. We would welcome you to provide all of those comments back through the comment process, that would be very valuable. And I'm eyeing my colleague Mirage Harimi who has the lead for that activity. He's nodding. We'd very much appreciate that feedback.

It's not our intent to be prescriptive. If you would flag those things we'd appreciate that.
>> Do we have another question? Or a comment in the room.
>> Ren fouler with the NRC. Comments and questions for the panel discussion 7248 details of SFCs overprescriptive tech specs we feel that way as well we look at the tech specs, overly long and adding more amendments getting more complicated. We appreciate the comments of 7248 to be managed that way the other comment or what I wanted to share you hear about discussion with part 50, 59, 52, similar type process. Part 72, 7248 which is similar to 5059, what you don't hear is Part 71. Anybody out there that has ever built a transportation cask understands the plexity to building these things. The thought or discussion for the panel what would your reaction be to somebody proposing rule changes to Part 71 to help implement a change process similar to part 72, and 5059.
>> Let me start I welcome Mark your perspective as well. The thought of 7148 or something some kind of change process makes a lot of sense to me. I think it's something we need to look at. Again, the rulemaking process is a very deliberative one. I think further engagement with stakeholders on what that would look like would be very valuable.

But I do resonate very much with the notion that we need some kind of change control process. Again, I think that's going to be if we're consistent with our principles and we keep it safety focused and we enable industry the flexibility, they have the responsibility for safety, but they do need some flexibility. I've found some amendments in transportation that did not have safety benefit commensurate with the resources we spent doing that. It's a feature I would resonate and certainly it warrants further discussion. Mark, if you have any other thoughts on that.
>> Maybe to reinforce what John said a little bit. As I sit here, I don't know that I can specifically endorse a change process for 71 considering that sort of a silo unto itself. I can say that I know NAC is familiar because you're supporting our recently formed task force for used fuel transportation and one of the things we're going to be looking at very carefully is that 727172 transition issue and what is the most efficient path to navigate through that. So I think if you look at it broadly, if something you're referring to for Part 71 makes

sense in the big scheme of overall more efficient process to be able to move the fuel, then I think we would be supportive of it but we want to make sure it makes sense as part of the bigger grander plan, if you will, for moving the fuel. But certainly it's good input and I think Bob Quinn is out here somewhere that's leading the team that's working on position paper for that. So something to take a look at.
>> I think we have another question or comment here in the room. Next we'll go to the phone.
>> My name is Don Shaw. I'm with Tan America's licensing, my comment is to John and Jose about electronic submittals after many years of resistance on my part we've been taking advantage of it and it is wonderful we appreciate the change in guidance especially the requirement for the file name at length. My comment is we understand that we either are entirely electronic or entirely paper, and some of our documents are so old we often have to go entirely paper. I can't help but think that the document control desk and the staff would be better served by allowing a partial, partial electronic, partial paper or perhaps totally electronic but a part declared not meeting the preflight requirements. I suggest you consider such a thing I think it would be convenient certainly for us and for you as well. Thank you.
>> John, thank you. I appreciate that content. I won't call it a regulatory commitment because we're not making it a regulatory commitment but maybe I'll call it an administrative commitment to look at that a little more closely.
>> Operator, do we have anybody on the phone that chooses to speak.
>> At this time I'm not seeing none during the question-and-answer session it's star followed by 1, should you have a comment or question.
>> Okay. Anybody else in the room have a desire to make a comment or ask a question. We have somebody making their way forward. Jason PeatarFSSM. Senior reviewer. Listening to the presentations a couple areas that stuck out new buzzword we've been listening internally called safety focus. I guess sort of related to reasonable assurance. And one other item of no additional inspections. What's curious about this to me is when I look at this from a technical reviewer point of view, safety focus implies that there are areas where we haven't been focused on safety. It also implies I think to some technical reviewers we'll be doing less in our reviews perhaps with less rigor. If we're going to increase the use of 7248 and perhaps even sounds like introduction to 7148 and we're going to do fewer reviews and the reviews are going to be lighter than they have been in the past, how

does doing fewer inspections actually comport with safety if that's the path we're going to take. One other follow-up on that John if you want to answer it, too. Can you give a couple of examples where we have not had a safety focus as it relates to technical review?
>> So thank you. Thank you Jason I appreciate the comment. And so maybe just a little point of clarity. I think the key for us always has been safety focus. So I hope safety focused is not a new idea for the staff or a new buzzword. I think it has always been the agency's mission and should continue to be so. I think our regulatory program overall needs to maintain that reasonable assurance standard. There is some subjectivity there that we always need to maintain, but I think that safety has always been our priority.

With respect to the nexus to inspection, I think and hopefully there wasn't a misstatement. I mean, we need to maintain our inspection frequencies, commensurate with the activity. We need to make sure that we are maintaining that safety, and we are providing -- sorry, let me say that more clearly. It's for safety and our inspection problems are providing that oversight to ensure they do. I think we're trying to find the right balance of inspection frequencies, sampling the right items so so we make sure we're maintaining that overall safety mission.

There is also a possibility of inspection, it's a sampling, not 100 percent inspection, but the flexibility is on the inspection program to make sure we're identifying the most safety significant elements to inspect so that we're getting the right bang for our safety inspection buck, so to speak. So I don't know that I touched on everything but maybe we can talk off line to get some more on that but let me offer Mark an opportunity if he wants to offer some additional thoughts.
>> Yeah, I have a few thoughts I'd like to share, not just in the context of the topically for this conference, but in general, and from an NEI perspective, it's probably not fully correct to equate number of inspections with safety. Both in terms of NRC inspections or whether or physical inspections in the field at a plant.

I know an awful lot of resources can be invested performing many inspections that add no value in terms of assuring safety. I think what we really need to be thinking of is a broader context of assessing the risk of any given issue, component, or activity and using that

conceptually to apply appropriate resources that address the risks associated with that activity, and by doing that, again, that circles back to the idea of efficient use of resources then more resources are freed up or are made available to invest in areas where we really need to have a safety focus that may be greater than in other area that requires less inspection, for example. I think you have to look at it outside the context of used fuel and look at in the context of all the things that we do in a plant or in the fleet to assure safety.
>> We have one more in the room then we'll check with the operator.
>> I feel compelled to make a comment. Jason I appreciate your taking the opportunity to offer your thoughts regarding inspection. I've had a lot of experience of managing and overseeing inspection programs in a number of areas being an operating reactors. ISIFISIs and we do have in my view looking at the context of good regulation, we need to ensure that our inspection program is appropriately risk informed. Are we getting the -- we invest inspection resources what's the resource investment, is the juice worth the squeeze. Those who work with me I use that a lot. We need to make sure that it's focused on risk activities. Like operating reactors there's a periodic review. What are the findsings coming out of the inspection program are there inspection areas where the industry has demonstrated an outstanding compliance record, is that the best use of our resources to independently verify that the licensee is performing at the appropriate level. Identifying issues commensurate with their importance to safety and taking appropriate corrective action what's the amount of inspection that we need to conduct to verify that the licensee is operating at that level. And so we do need to continue to assess whether we have the appropriate inspection focus so that those inspection resources can be devoted and dedicated to the appropriate areas and again we're supposed to trust but verify and independently assess licensee's performance and to verify they're complying with compliance and I would say there's an opportunity to continually assess whether we're focused on the right things. I wanted to offer that perspective. Thanks.
>> Thank you Mark. Do we have anybody on the phone that wants to speak?
>> At this time I'm showing no questions or comments.
>> Okay. I'm not seeing any other folks in the room that appear to want to ask a question or make a comment. So with that, we're going to

take a 15 minute break. That means we'll reconvene at 11:15. We'll make up time at lunch. So see you in 15. Thank you. [Break] .
>> Our next panel is led by Yoira Diaz-Sanabria. And we're going to -- we'll give folks just a moment to get seated. I'm going to turn the mic over to her and she'll take it from there. All right. Yiora I think you have the floor.
>> I'm the Yoira Diaz-Sanabria here at NSS four distinguished panelist accompanied me will provide an overview of the research work that has been done on validation of thermal models for spent fuel dry cask and the applicable best practices. The material presented will be of interest for most in order to have an efficient session I will ask for everyone to hold your questions at the end as we have been doing on the previous session.

With that being said let me introduce to you the first panelist. John McKirgan is the manager of the used fuel systems group at Oak Ridge National Laboratory where they are involved in a number of activities regarding spent nuclear fuel and high level waste management as well as radioactive materials packaging testing. He's experienced in the development and the use of computational methods for criticality safety, radiation shielding and reactor analysis. With particular expertise in burn up credit, computational validation and spent fuel disposal for Department of Energy owned and commercial spent nuclear fuel and high level waste. John holds a bachelor and masters degrees in nuclear engineering from the University of Florida and has been with Oak Ridge since 2008. Prior to joining Oak Ridge, John worked on the Yucca Mountain project where he held various roles supporting and leading the development of the licensing basis for addressing criticality in the geologic repository. John started his career with tramtone known as Ariva simulating reactor coal operations designing waste packages and performing various spent fuel management activities. Please welcome John Scaglione. Thank you. Today I'll be talking about thermal analysis for spent fuel dry casks. Is there a button?

Next slide, please. So there's a number of modeling and simulation tools that are out there that are used for performing thermal analyses and these are pretty mature have been developed for a long time. A lot of the equations and uncertainties come into how they're being applied and one of the reasons for that is that we've been focused on the design basis approach for a long time only focused on how hot something

can be. So we've been conservatively doing our calculations in the hot direction.

But as we start thinking about longer timeframes and understanding how the temperature changes with time, we want to know a little bit more how is the temperature actually changing with time. So we need to resort back to fundamental mathematics to be able to calculate what is a true value and apply uncertainties in the appropriate direction if you want to estimate the hot or cold direction. Two fundamental models with the thermal analysis. One of them is the comes from the suspend nuclear fuel how hot is the fuel and there's the heat transfer model. The focus on my talk today will be the decayed heat from the spent fuel assemblies and other panelists will be talking about the heat transfer model.

So one of the things we want to make sure that we're thinking about here is that over predicting the temperature is fine for storage applications and what we do when we load a cask, but it isn't okay when we're looking at aging management issues.

So as I mentioned earlier we do want to be able to apply our uncertainties to the correct value that we estimate. Next slide, please. After fuel is in the reactor, it continues to produce decayed heat. Essentially the definition of decayed heat is the recoverable energy released from the decay of radio nukelide and it's driven by isotopics in the fuel and changes with time.

Couple of points I want to make on these two plots that are illustrated here. One on the left is for pressure righted water react fuel and the one on the right is reactor fuel. As you notice PBR is lower output than PWR fuel. You can look at them and see that the change in heat load from the fuel decreases very rapidly in a very short period of time when it's discharged from a reactor.

Sort of starts to plateau out. But the more relevant point I want to have with these plots here is that those are snapshots of the inventory in the pools of fuel across the nation. So when you look at that distribution, what you're going to see is that I have a very few really hot assemblies and I have a lot of medium and cold fuel assemblies. So as you start looking at meeting these thermal loads for the more modern

dry storage systems, you don't have a lot of hot fuel assemblies available to meet these high heat load limits in the casks. Next slide, please. So to give you an understanding of how much margin is in there from the approved design basis load versus what's actually loaded, this graphic here provides a chart that shows on the left-hand side what the COC decayed heat limit is and the bottom shows what the decayed heat was of the fuel we did calculations on at the time of loading. And as you can see, there's considerable margin between what's actually loaded and the COC limit. And another fact to look at is as these COC limits have increased you see they are moving towards the right. So you're leaving a lot of extra margin on the table by for the majority of your fuel you've got a lot of margin. Now, obviously there's a driver for pushing to the higher decayed heats people want to be able to offload fuel in a shorter period of time. But you are sacrificing for the majority of your loads a lot of margin. Part of this is systems have improved over time. They're system dependent on how they remove heat from the fuel and transfer it to the external environment.

So next slide, please. So one of the reasons we have pretty high confidence in our ability to predict decayed heat there have been a number of experimental programs over the years that measured how hot is the fuel in a spent fuel pool. They've used Cal limiters to measure these limits. Done at the han Ford laboratory and a number at the Swedish facility at the centralized storage facility. And they've got a wide variety of assembly types that have been measured. Various enrichments and as you notice hybrid fuel and the cool times have been two to eight years and other experiments have been done to validate shorter time periods and for other fuel assemblies that we couple it with the isotopic validation to understand what the decayed heat could be for fuel that's outside this range of applicability. So fundamentally it is driven by isotopics and we do have a lot of isotopic validation that's out there. Next slide, please.

To illustrate how well we can actually predict decayed heat, we can just chart on the left here so the line represents a perfect comparison between calculated and measured. And the blue dots represent our BWR fuel assemblies and the other dots represent PWR fuel assemblies we're presenting it right on the money when we have detailed information to do the prediction with.

This was used with scale code system. Variety of their tools out there that are used and I'm sure they can do a pretty good job as well, but this here shows that using this code here we get very, very good accuracy. And with the ability, look at the standard deviation there within a couple of watts from the, spreading the data. Next slide. So now one of the challenges here is that we're always looking to do more simplified approaches versus complex approaches and in order to get the high accuracy, it is a little bit more complex, but it's a tradeoff. How complex do you go to make it and how simple do you want it?

So there's a couple of methods out there. Reg guide 354 provides rules on how to calculate decayed heat. There's the ANSI standard and several other sources origin is one of the codes we use and this other software.

And training simplification and the accuracy you see in the reg guide the blue bots and more modernized method that's I guess it's coming out anytime now is in the shown by the red dots.

So what you can see here is by looking at it, improving the amount of information available and refining the techniques, we are able to do better in doing the prediction. This is still focused on a conservative high estimate. That's why everything is above the line, the 0% line. But they are moving in the right direction.

Now one thing to note, though, is that we do have a higher spread in the data at shorter cooling times. So that's something that will need to be -- that needs to be looked at. There's a number of reasons that can cause that. And a lot of it has to do with the operating history of the fuel assembly within the reactor.

Next slide, please. So basically a number of research initiatives underway to look at how do we do better at modeling and predicting temperatures. There's the high burnt spent fuel project a cask that's being loaded at north Anna with high burnt up fuel and it's instrumented with thermal couples. Actually started loading today that's going to provide a lot of useful information.

It's kind of an integral experiment telling you it measures temperatures our models will be compared against that to see how well we can predict it. There's BWR cask simulator effort that's going on. I think Sam is going to talk about that in a little bit and there's some uncertainty analysis between our application models and detailed models.

I know I can do a real good job if I have detailed information but we're looking at how much detailed information do I need to still get reasonable answers.

So there's looking at some key parameters that influence that and try and figure out, work through better methods on how to not have to have all the details but still get a good answer. And ultimately we want to be able to come up with reasonable estimates on the data and apply our uncertainties appropriately. Next slide. So this is a couple of references that are available for you guys to look at if you want to get more detail on this, a lot of this information is discussed in new reg CR 69 and a couple of references here that have a lot of useful information on calculating the decayed heat.

I guess we're taking questions at the end. So off to the next speaker. [Applause].

>> Thank you, John. Our next speaker is Dr. Sam Durbin. Received his Ph.D. in mechanical engineering from the Georgia Institute of Technology in 2005. He's currently a principal member of the technical staff at Sandia National Laboratories with over 10 years of experience as a experimentalist on large-scale projects. Dr. Durbin has participated in several multidisciplinary research efforts, including sirconiam fires and radiation releases. The principal investigator of spent fuel nuclear. And it's an effort to study the performance of dry cask simulators using a singular electrically heated boiling reactor fuel assembly. Welcome Sam.
[Applause].

>> I'd like to thank you Yoira and the folks of spent fuel management for having me here.

Today I'm going to talk to you about the dry cask simulator that we constructed and operated in Albuquerque New Mexico. It's a simplified representation of a dry cask whereby we took as mentioned a BWR fuel assembly placed it in a pressure vessel. The picture you see on the left, that is a cut-away of the apparatus. So in the middle is the BWR fuel assembly. I've got some pictures later on that show it a little more clearly. But we're representing the fuel inside and electrically heating it. So we have a convection pattern that sets up inside the assembly and we also capture the external boundary conditions. So we have an air flow path represented there by the blue arrows, kind of above the and we have those captured in the experiment as well.

We do have another configuration whereby we add a flow path and for that one we're mimicking below ground design. The goal of this testing was to collect validation quality data for CFD validations and to do that, as I said, we had a protocoltypic, prototypic in geometry and assembly. We heavily instrumented it. We thermal coupled and anometers to measure the flow rate and we have these datasets to verify and validate the assumptions used in CFD.

I would be remiss if I didn't mention some past efforts. There have been quite a few. And these are the most relevant ones listed here. But for whatever reason these weren't appropriate for the elevated helium pressures we see in modern designs and also the boundary conditions weren't quite what we have in the fleet right now.

So here's some pictures of the hardware. We have nine by nine BWR. So we have the bottom time plate the upper spacers and water rods, fuel has been replaced by Inko clad electrical heaters and the coil there you see cross-section of internals that's BWR on the center with water rods and we have the channel bots and structure representing the basket as well as the canister.

Mentioned heavily instrumented our assembly, 100 cuplers on the fuel cladding the fuel itself and we have them on the shelves and representing the overpack. This is a cross-section again. You can see the BWR assembly in the middle. Channel bots basket and orange region you see is what we call the down comer return path for the helium that circulates up through the reddish zone there. Up flow through the red and the cooling flow goes down through the orange. You may be saying

to yourself well single assembly how is that relevant to a cask that can have up to I think 87 or 89 in the newest designs. Well, we performed a dimensional analysis to look at the Reynolds number, the modified Rayleigh number and the newsell number if you're not an experienced dynamicist it would mean relevant. What you see there for proto tippic number Reynolds down comer 250 for the two different powers that represent the brackets that we tested we're at 170 and 190 which is pretty darned close. For modified Rayleigh protocoltypic 11 E 611 and DC test we were at 3.1 and 5.9 E to the 11. The powers though I should mention we're using .5 kilowatts and five kilowatts which is a known scaling distortion. We have to apply higher decayed heats than you would see in a cask in order to drive some of these dimensionalist groups up to protocoltypic values. Finallily the knewsell number 200, 230, compared to prototypic of 200. And this is the air flow path shown in green. So everything seen inside the pressure vessel orange and red is helium and green is air flowing around the canister. Reynolds, Rayleigh, Rayleigh modified by the aspect and newsell number, pretty close or bracketing the prototypic value. So this is the above ground configuration. You'll see there's the internal convection pattern is shown where the helium goes up through the assembly comes out the top and goes down the canister wall. And then on the outside you see the air flow coming in through the inlets and going up the side through an anulus or annular region and exiting out the top. The little antenna at the top that's our electrical feed. That's how we're getting the power into the assembly. All this testing was completed in August of 2016. Forgot to mention this work was cosponsored between NRC and DOE prime example of federal agencies working together the datasets that were collected for the above ground configuration are the subject of a proposed round robin. CFD comparison through EPRIA escape program. This is an example of some of the results that we collected on the top there you see peak cladding temperature in Kelvin and bottom air mass flow rate both in kilowatts and these are four different pressures inside of the canister ranging from 0.3 which is more like a vacuum test all the way up to 800 KPA. The general trend is that temperature goes up when you put more power in and so does the air flow rate. If you click this shows you, this is temperature contour maps to illustrate the data density that we have available. So this is really kind of a cherry picking of the data. There's lots more available. I mentioned we had a different configuration which is a below ground cask style so we added another concentric shell. It was added flow path air

now comes into at the top and goes down the bottom and turns and goes out the top again. There's a cut away in the middle. It's still the same with apparatus, just modified. It was completed in April, 14 datasets and we have transient and steady state values available. And again this is peak clouding temperature air mass flow rate. Very similar performance to above ground within 2% for peak and five for mass flow rate. Mass flow rate was trickier because for the above ground we were going into rectangle ducts and below ground it was annular region we had to use several more hot wire anmomteres and we did a test in a building called Sybil that's what you see in the picture. We wanted to test the effect of moderate cross winds on below ground configuration. So you can see that the apparatus is rather unwieldy. We couldn't really take it to a wind tunnel. So we installed a custom made wind machine inside the CIBL building. Air blowers that go into the duct returns the flow and it's got a bunch of flow straightening elements in there to make the flow as uniform as possible.

The cross winds that we were capable of achieving were up to 12 miles per hour, and the coloring book fluid dynamicses that you see there were performed by Dr. Zigh here at the U.S. NRC. This is normalized mass flow rate M dot over NDOT naught that's what you would get if you had no cross winds. So the value of 1 you'll see on the left at the 0 cross wind. So the plot on the at the top shows the normalized mass flow rate for tests conducted at five kilowatts which was the highest power we tested and you'll see three different series, 100, 400, 850 Paschal. Didn't show much dependence on the pressure but you do see the trend that as the cross wind increases the normalized mass flow rate decreases, I think Dr. Zigh has results that extend this. You'll see a trend when you go beyond cross winds we were able to achieve experimentally.

In the bottom, these are tests that were conducted at 800 kilowatts. The trend is different a little different of power resistance net result. The thermal impact for the DCS was rather limited, because we only have a single assembly. We're very much tied to our boundary conditions, but the potential impact to prototypic systems is probably more pronounced. In summary we collected a lot of dataset out to collect data in comparison with CFD and I think we achieved that and we have over 40 unique datasets and we're still trying to dig out from

underneath them. We will be documenting the main results in a new reg CR I believe to be published next year, and Dr. ZIgh I don't want to steal any of his thunder but he's performed some CFD simulations and in my humble opinion they're very favorable and that includes the fuel all the way up to the overpack. With that, thank you.
[Applause].

>> Our next presenter is Dr. Ghani Zigh. He's a senior technical advisor in the at the NRC in the office of research. Ph.D. in mechanical engineering. He's also a registered professional engineer in the state of New York. At the NRC, the doctor has been involved with many activities among them are dry cask obligations PWR and BWR and their fire active analysis. APWR advanced accumulator fire analysis. Ultrasonic flow meters and computational fluid dynamics CFD, best practice guidelines. Prior to the NRC, he worked at Parsons Brinkeroff in Manhattan. And as international consultant using CSV to model the following: Fire and emergency ventilation for tunnels and train stations. Effects on thermal pollution of power plants on oceans and rivers high speed trains aerodynamics and others. He was also visiting adjunct professor at Stevens Institute of Technology at New Jersey where he taught graduate and undergraduate classes in thermodynamics heat transfer dynamics, fluid dynamics and thermal dynamics and fluid mechanics measures and treatments. Please welcome Mr. Zigh.
[Applause].
What I'll be doing in this presentation is pretty much validate the CFD methods that are use for dry cask applications using the data that was collected in dry cask simulator experiments. To start. This is the agenda. First introduction with I will talk about the objective of this work as well as why validation is needed. Then probably the next point I'm just going to skip because just for the lack of time. Quickly I'll talk about the experiment and calculations we did the validation on and then after that I'll be talking about what are the main models, just a few of the models. I mean, we have so many options to choose from but I just chose a few of the options that are important to mention.

And of course these models we picked them from the best practice guidelines we have as a new reg. Then I'll be talking directly which is the most important part the primary validation of the result where

we showed the comparison between CFD predictions and the experimental data and I will do that for the configuration, I picked two cases out of the 14 cases that Sam mentioned. And as you can see the first core benefit is the power given to the fuel rods and the second coordinate which is like say, for example, the first one is two and a half kilowatts power, kilowatt power and four and a half VARs which is the absolute pressure of the helium inside the canister. The same thing for below ground configuration I'll take two cases and show the comparison. Then the last one, which is the crosswind configuration, I have three cases where I will show how the mass flow rate and peak cloud temperature reacted blowing wind on the dry cask. Then I'll summarize.

First is to have evaluation for dry cask, it's got to be interviewed it's for dry cask. I'm not going to perform for dry cask and say this model is good for everything. Every model with its own physics and characteristics needs validation.

Then of course as we know CFD has been used by dry cask to cut on safety margin. Of course because the method is well advanced. It includes all the physics and all aspect of the modeling is there if you want to model it. Depends on your assumptions, of course as we know request for higher heat loads and higher burn up feet continue to be the norm. So as such the margins is going to be reduced. At that time when I'm dealing with delta T. I used to deal with delta T of 30, 40, 50 degrees. I didn't care much about modeling. Of course I cared but I know that changing models is juts going to make a difference between 10, 15 degrees. Now if I go up close to the limit at that time I will have to look at validation and certainty quantification. As well as reeducation. And so far at this point the only thing that NRC is using is the new reg 2152, which is the best practice guidelines to appropriately review the thermal designs from the occupants. And of course this best practices guidelines are gathered from best practices from CFD application from before as well as submit the application and also some validation from limited data that was gathered before as Sam was mentioned before. And we know very well from previous validation studies for dry cask application that we have measure issues with modeling uncertainties. Next slide, please. When I mention uncertainities we have to determine between uncertainty and an error. Of course let me define what is model uncertainty, which are the

differences the enthe real flow and exact solution of the modern equation. And the only way to remedy this problem is validation. Nothing else. So the uncertainty of the potential deficiency that's due lack of [inaudible] and the only way to do is to have validation again. So the error could be user error. It could measure deficiency due to the lack of knowledge. So the validation is not going to resolve this issue. It's the user. Just to give you an example of modeling uncertainties I'm going to talk about the two measured ones we've dealt with. Of course we have many others is turbulence. So turbulence he especially for ventilated casks to monitor the air between overpack. It's a major issue turbulence we don't have a model that could result all the turbulence model every physics has its own model. No one closure model that will set by or turbulence issue.

And correct turbulence model will lead to incorrect temperature for some squared you have like a suite of models, the only thing you can do is just pick when you don't know turbulence model if it's good for your model or not. The next is spores media. Of course the applicants -- which we don't have any problem with that. They don't go and model the fuel rods explicitly. They use forced media instead for quick turnaround time as well as save on CPU time and you do it quickly.

You have to have an equivalent [inaudible] inertial coefficient. And if you put the wrong input, you are going to have wrong P flatting temperatures. So the higher the friction coefficient. The higher the P lining temperature.

If you use lower you're going to end up with peak lining temperature. So after reviewing all the spec validations and in light of all this modeling and uncertainty. We conclude we need another validation and that is exactly where this came to play in both NRC and DOE cosponsored the experiments. Next slide, please. Let's jump this one. Let me move quickly, so Sam talked about the above below ground and as well as cross wind. Next. I spoke quickly about the pores media and turbulence model. What I'm going to do in this slide I'll just be talking about how we chose the turbulence and pores media. Of course in this evaluation we used NC fluent. You could use whatever software you want we used new reg 2152 and 2208 guidelines to set up the models. So anything I'm going to talk about are already 2152 and 2208. We used regime in air channel and low Reynolds capes model turbulence. This is

per best practice guidelines and it was considered in the model both connect energy and as well as dissipation. The helium inside the canister we used laminar. There was no porous because the Reynolds and Raleigh number is very low. And for the pores media, which is just a few region, the channel box around the region we used pours immediately to model that. In that one we used next slide in that one we used of course an equivalent frictional line, initially resistance, and all those resistances were obtained from new reg 7144. We were lucky because new reg 7144 had the flow through of W nine by nine Sam used for dry cask analysis but let's say you have another thing. So what we did also we used analyticnal methods in new reg 7248. If you have 10 by 10 or 17 by you can use the new methods to obtain these resistances also we used porous media to model the honey comb. Sandia used the honey comb to have uniform flow of air before doing the measurement. Before the hot wire measurements. And we used porous materials and we used connectivity from new reg 28 and 2152. And it's important it's measuring, we use the guidelines exactly as in new reg 2152. Next. We have the above ground results here. I chose two cases, two and a half kilowatt, four and a half VARs, which is one case, and the other one is two and a half kilowatts -- one kilowatt 21-bar and you could see the blue and red. The red is for the lower power and the dots are for the experimental. And we have the peak temperature as besides getting the peak line temperature value we also get the trend of the peak landing temperature as function of height, because they have here peak line temperature in the Y axis and height in the X axis. Even though we used porous media we didn't use explicit simulation of the rods we had peak lining correctly and as well as the trend correctly. As you can see when the pressure is higher, you will see that the peak lining temperature move a little bit to up. And of course when I say this comparison is favorable, of course you have to also consider the uncertainty. The uncertainty on the temperature for experiment is seven Celsius and even though it still didn't perform the uncertainty on the greater refinement it's usually 1 to 7%. For 700 degrees it in validation it should be 1400 degrees. We went to channel box, which is the assembly wall. Then we went to the basket wall as well as the pressure vessel wall, which is the canister wall. And you could see the comparison is really favorable considering uncertainty. Next slide, please. We took the next case and the one kilowatt and one VAR, the same thing could be said on the below ground peak line temperature

was predicted very favorably as well as the channel box, temperature profile as well as the basket wall as well as the pressure vessel wall.

Considering, of course, uncertainty in the predictions as well as the measurement. Next one. This one is for the wind conditions. I took three cases. So the first blob is the air mass flow rate to ratio. Ratio of air float condition to air mass rate at still condition. And you could see the black dots black squares as well as black diamonds and the colors are for five kilowatts one VAR and blue and orange and five kilowatt and four and a half and red eight VARs. You could see both the value and trend as a matter of fact with all that chaos that existed in that CIBL or that vessel, I mean, the air mass flow rate as a function of speed, it's predicting favorably. What I did at the bottom peak lining temperature with peak lining temperature at still condition, you will see this one is just for five kilowatts and one VAR, the second plot in the bottom, you will see we have just three experiments here they are black dots. And you can see they are exactly on mark.

So as I mentioned, of course, the high test P velocity that they used is 12 miles an hour and that's where you would see where the experimental data is stopped. Then after that, we finished and then you see. So you go down, there's scientific behavior reaching the minimum air mass flow rate going through the channel or high peak lining temperature, then you go and pick it up and start, if you'll increase the velocity of hair you'll be more helpful than an issue.

Next slide. Okay. For summary, the validation of CFD method for dry cask application is necessary. You don't have a choice. Especially as you are changing the heat. So probably this one is good for this five kilowatt say, for example, the next time if I have 20 kilowatts maybe I have no other physics that I don't know, which I need the experiment for.

But the validation is necessary for any CFD calculations. All the phases of dry cask testing is all completed now. The experimental work will be published by the beginning of next year. I'll say March, April. Preliminary comparison with CFD simulation shows favorable agreement within the experiment seems to be all the cases including peak lining temperature and air mass flow rate values as well as the

flow on the wall. We would be happy if we got the values correct but we got the profile shape and trend. The existencesy of the guideline new reg 2152, that were favorable led to favorable validation. That's all we have at this point and before. Next we'll continue with the validation us because this is preliminary. I just finished a few for each cases and validation of CFD method will be completed by next summer. So the work will be finished by next summer and the lesson learned from this validation will be added to CFD best practice guidelines new reg 2152.

That's it for my presentation.
[Applause].

>> Thank you our last speaker is Jorge Solis responsible for technical guidelines. He has over 15 years of experience performing thermal analysis of spent fuel storage and transportation casks and spent fuel dry storage facilities. More than 20 years of engineering experience which includes experience in nuclear engineering and transient and actual analysis of commercial power plants and review of radioactive materials and transportation spent packages. Dr. Solist received his Ph.D. in nuclear engineering from Penn State University.
>> As you can see on this presentation it's 2152 because it was mentioned several times from the previous presentation. So I'm going to give you an overview of what some other guidance that we have.

Next slide I'll provide the agenda. I'm going to be talking about a brief introduction then jump into the computational dynamics best practices guidelines which is documented in new reg 2152.

Really the report includes other things but I'm going to focus on the checklist for the CFD best practice guidelines, including thorough chapter and summary checklist.

Then I'm going to briefly mention the need for uncertainty quantification and then I'll provide a summary. Next slide, we all know that we conduct, NRC conducts technical reviews in accordance with 10 CFR part 72. And in accordance with the standard review plans both storage and transportation. So as part of the review, a thermal review was performed to ensure that the cask and fuel material temperatures will remain within normal limits within normal and accident conditions.

And we noted that the applications for certificates or specific license have increased the use computational flowed for codes, for instance, as fluent, to demonstrate the adequacy of the design. Next slide. So therefore we saw a need to put these best practices into our new reg report which is actually new reg 2152. So the report provides practical advice for review computational methods used in efforts and for achieving high quality dry cask simulations.

The report includes the definitions and concepts of general errors and uncertainties in CFD and it also includes a comprehensive section providing guidelines on how to deal with these general errors and uncertainties. The reports also gives guidelines to draw the uses potential of the likely sources of uncertainty. When formulating a problem. And to know the sources and understand the methods.

The report as I said provide an entire chapter on checklist for CFD best practices guidelines and summary for checklist for these practices. Also includes a sample application to analyze dry cask thermal response and it's based on VSC 70, which is it's a -- we have some data that were obtained at the Idaho National Laboratory. So the report discusses many of the issues that we dealt with in the dry cask applications and provides the guidelines and based on validations and sensitivity analysis that actually I'm going to use for this study or this validation. The report or the example in the report addresses the modeling uncertainty focusing on the turbulence modeling, for instance, air flow. And the example in our report addresses the application uncertainty to sensitivity starting on the pressure boundary conditions used for ventilated casks like is the case of the VSC 17 cask. Next slide I'm just going to jump into the checklist of what's on the best practice guidelines. And this is as any reviewer when receiving a new application is going to be looking at. And, of course, it's also encouraged for analysts as well. I'm just going to go through the checklist. So as you can see. These are the type of things that actually an analyst is going to be looking at when putting an analysis together. So basically any assumptions made in the geometry to simplify the problem and also need to consider of course mesh quality. When you look at that packages right now for developing measures you can do all of those things. You can look at the type of elements, the properties, and that's going to help you really prepare your mesh for performing the great con ver gensy applications. For input for CMD.

It's impractical to provide it for every one it will be a humongous model. They need to be prepared. And actually there's guidance for that. And all the parameters like under relaxation factors, not because the code offers you some default values. That means that it's going to be okay for the results. Typically those values that default are relatively high. If you want to get, make sure there's full conversion, then you probably need to review those factors to lower values. The order of schemes for accuracy, scheme or type for all equations using the analysis. Placement of the boundary for external flows will be important because the location of the boundaries are going to affect your results.

Of course. A couple of the schemes, you want to have probably a pressure couple solver density base solver, things like that. But both probably should result in similar values for your parameters. Of course, we're looking at thermoproperties for the analysis that are actually functional temperature. And the radiation properties make sure to use an adequate model and, of course, activities, usually would like to see activities that are realistic and better if measured not from textbooks things like that. Probably like a reference like an ASME code. And of course turbulence models used for the case of ventilated casks where you have laminar flow transitional or fully developed flow. So you have to make sure that you select the correct model. And also boundary conditions, especially for the heat flux. You have to make sure that the correlations used for the analysis are adequate for the type of heat flux you have. You have to make sure that those correlations are obtained from similar geometries and they're adequate and this can only be done by sensitivetive analysis, or better, the ambient can be represented in vent ups, that's not an uncertainty anymore.

Of course, to make sure that you have adequate convergence results you have to check on things like mass and heat balance and need to define target variables monitoring, for example, the max plotting heat temperature and total heat flux or heat flow. Or the mass of the rate.

Continuing on the next slide. As I said, you have to look at the residual. So actually they make sense. Either go and get constant if they keep going down there, then that's an indication that you need to do additional analysis. And of course you have to use some engineering

judgment to actually make sure that actually your peak line temperature makes sense or velocity factors make sense for some of the areas. That's something that you need to look at. Usually it's a good idea to perform additional directions to see where the solution is going to go. We have found many, many cases that were given results or analysis and then we perform a future calculation and we see that the results, that the solution hasn't converted yet. And things like wrongness of the world. That's going to affect your turbulence. And important it's actually the pressure boundary conditions that are used for the case of the effluent code there's a code for operating density but you have to modify that and make sure that it's actually reflected by the, in that condition of pressure and temperature.

The next slide touches a little bit on uncertainty quantification, why it's important to include this here? Well, because really lately, we have seen that thermal analysis have been provided by the NRC with actually very small or no margin at all. And they haven't provided modeling and application uncertainty. And so in order for the staff to accept this type of result, there's a need to determine this uncertainty. Because someone may claim that there are additional methods that your results are going to be acceptable but without these quantification it's very hard for the staff to decide the acceptability of the results. And, of course, I mentioned things like modeling uncertainty, like turbulence for the agency to transfer porous media and application and, et cetera, and boundary conditions, those can only be used determining sensitivity analysis.

The next slide provides additional guidelines that we have. And actually we're planning to use those to update 2152, when we issue new reg 2174, it documents the impacts of environmental conditions, particular the ambient elevation and wind and that report concluded that that may general licensee may claim there's a ambient temperature that it's valid for that specific assignment. But for side specific it could be higher and could result in higher temperatures as predicted in AFSR. For some design, we've seen that specifically underground design, low speed growth wind actually affects the results of, it was demonstrated by the dry dry cask simulator environment.

The other report which is of interest is new reg 2808, it was mentioned that it was used to validate fuel assemblies for PWN and PWR. And that

was based on the program that was performed in the National Laboratories and actually that conclusion of that report is that effective model in the parameter models is an acceptable way to represent the homogenous feel of the dry cask analysis.

NRC uses for getting the efficient error is using AMB 20 standard for certification and validation and computational in photo dynamics and heat transfer. After that, that's a way to discuss it.

But actually the standard includes also like a total other useful information like for instance for the total uncertainty determination.

And so it's usually we recommend this report for applicants, especially for results that are very close to the margin but they need to provide [inaudible].
So in summary, the NRC continues to encourage the use of new reg 2152. To address most common identified thermal analysis problems. We've seen applicants starting to use it. He's not very general, but we've seen some successful applications and cases following this guidance it's of benefit not only for the reviewer but also for the application because it actually makes the review simpler. New reg 1724 includes the results for the study of environmental parameters. As I mentioned, and new reg 22.88. That was confirmation of the effective thermal connectivity and of course media models. The report is actually very detailed and provides validation for that and based on the ex-experiments. And it was mentioned NRC with DOE die cast their experiment to help address thermal evaluation issues for someone at this time.

So as Ghani mentioned, this experiment and validation studies are being used to make new reg 2152 in the NSRP accordingly. Thank you very much.
[Applause].

>> Thank you, Yoira and all the panel members who all presented.

During this session we'll take questions right now. Anyone?

>> [Inaudible] NRC. I just wanted to ask Dr. Zigh and Dr. Colis could they clarify the use of best practice guidelines for documentation practices as well.
>> I mean, yeah, of course here we went more generically for the ventilated, the pro turbulence model. As a matter of fact for storage or transportation sorry it's even simpler.
>> Right. I just wanted to make people aware in the audience that --
>> You're right.
>> It's very useful for transportation.
>> Even though he was focused on storage, it's applicable for transportation.
>> Thank you.
>> I'm Ed Price from Duke Energy. And I have a simple question. Here this looks like the right panel to address this issue.

I'm thinking in the old licensing days we used to call it this is the question the milkman in Kansas City might ask so don't laugh at me about it.

But assume can irrespective of the design, assuming that you've got colluded canister filled with backfilled with helium and you do have con vective fuel.

With the impact cracks or whatever, what timeframe based on thermal with would one look for degradation to stop. Would it be years, decades, centuries?
>> What's the consensus there?
>> Degradation of what, of declotting --
>> Cladding or fuel.
>> So just some research underway looking at what temperature that cladding can come to dovetail that is somewhere around 200 degrees C or lower depends on other parameters. But we're looking at probably around 30, 40 years before -- it really comes down to how cool the fuel was before it got put into storage and how long it's been out of the reactor for it. That's going to drive the total heat load.
>> So standard fuel was to burn up like I talked about 30, 40 years and might be getting to see degradation, even under the best circumstances.

>> Depends on what you're defining as degradation. It's really saying it comes less dovetailed doesn't mean it's degrading, a little bit of change in its performance, doesn't mean everything is happening.
>> More susceptible to damage but not damaged.
>> But it might sit there for a century.
>> There's active research going on through DOE to study the issues that you're raising. The high unit up demo, they've removed what they call sister pins and those are going to be the chrome. These are fuel records pulled out of the task specifically for the city. And I think in 10 years they're going to go back inspect in the cask. Ten-year window but no expectation of degradation.
>> That's fine. I'm a simpler nuclear engineer. And sometimes people ask you these and I'd like to be in the ballpark. Certainly looked like the best grouch to ask. And enjoyed it very much.
>> Anybody else in the room that would like to speak? Let's go to the phones while people are building up their courage in the room.
>> We do have a question from Gary Hedrick, your line is open.
>> Thank you. I'm founder of San Clemente green near the nuclear station. We're a group of citizens I'm trying to understand what the threats are and one of the big concerns that has come up and has never been answered very well is how the thin canisters will hold up over time due to the stress corrosion and cracking.
>> I'm encouraged to hear all the testing on fuels and stuff like that. But my question which I hope to get answered within the next day or two is I was in conversation with David Victor, who is the chairman of our community engagement panel and he was telling me about an experiment that an ongoing research project. And it's where they've actually unwelded one of these thin casters and the point is to see what the results are. So we know how the canisters are holding up rather than the fuel is holding up.

And that was a casual conversation. I've been trying to follow up on March 25th, sent me an email saying the unloved cask effort ongoing research effort. I have the summary not the final result which are years down the road.

So Tom PalmisanoVP overseeing decommissioning he confirmed there's an ongoing research project but I've tried for seven months now to try to find out more about that, what's the preliminary results, because we're concerned we're going to run out of time on these canisters that they

may start leaking before we have a remedy at hand. So it's really important for us to understand that. And if you are aware of that study or can get back to me with some technical reports or anything that would ease our minds, I very much appreciate it. Thank you.
>> If you want to have somebody get back to you what you'll need to do is leave your comments with the on the Web page with an address where we can respond back to you.
>> Yeah, are you familiar with any of that, what I mentioned?
>> I'm not the principal investigator. I'm tangential to the project I believe you're speaking of. It's being conducted at Sandia national laboratories by one of my colleagues Charles Bryan.
>> Okay.
>> Is there an open report? Hold on.
>> And that's regarding unwelding thin canister, right.
>> Stress corrosion cracking. The study I think you're referring to, I'm just guessing, but my name is Sam Durbin, the study looked at measuring the tensile stresses in the canister to see if the conditions were right for stress corrosion cracking.
>> This is Sylvia from Sandia national labs, and I agree with Sam that this is probably the study you're thinking of. We did not unweld a canister. We actually had one fabricated just like they are in industry. And then measured the residual stress at different parts of the canister to see where we may have areas of through-wall tensile stress and where we don't.

So where you do have areas on the canister that you need to really look for cracking and what areas of the canister will you really not see much cracking because of the compressive stress within the canister. If you want to -- yeah -- leave your name and contact information and we will get you those, the contact names, but the author's last names are Enos. E-n-o-s and Bryan.
>> I'm speaking of a canister that was in service for a number of years that was being unwelding and I think that would be very revealing, and anyone hears about that that would be great and I will do the research that you suggested. Thank you.
>> Anybody else on the phone.
>> Yes, we have another question. It's Marni Magna your line is open.
>> Thank you. I appreciate all the information. And I want to add to both Gary Hedrick and Ed Price. Sounds like we sit here in San Onofri with casters that are, dry can casters loaded and we don't have a

federal law to move them yet so what we need to understand from you clearly not just research 20 years down the line, we need to understand how we are to be assured that these canisters will be safe for transportation.

We're told they will, but now I hear people -- when I hear you speak, I hear that there are questions that people have. And we need to have very clearly stated to us that these canisters, as soon as there is a place and a federal bill, that they will be able to be moved away from the ocean here in San Onofri. I would like to know who would address that those canisters specifically at San Onofri are able to be moved and what the timeframe is. If we have 20 years, if we get them moved in five years or 10 years or 20 years or 40 years, what are we looking at.
>> Good morning or almost good afternoon now. This is John Wise I'm a materials engineer in the division spent fuel management at the NRC.

First of all, this question is probably a little more relevant to the session immediately after our lunch period but I'm not going to ignore it for now but we can certainly talk about it in more detail than we have this session on the issues regarding the aging of not just canisters but all components right after lunch and eastern time it's 1:45.

But just to kind of touch on this so I don't leave you hanging right now, the assurance we're going to get that stress corrosion and cracking isn't going to challenge the function of these canisters. It's going to be inspections.

And the industry is essentially on the cusp of doing many inspections for stress corrosion cracking of canisters. I say that because when we renew licenses to store canisters on site, we require aging management programs. Essentially what are the holders of those canisters going to do to provide assurance that they are fulfilling their consignment functions.

And what we're looking for are inspections. And you're going to, if you stay tuned for the session this afternoon, you're going to hear a little bit about our specific guidance on what we expect NRC expects of the industry as far as inspecting their canisters.

You're going to hear a little bit of guidance. You're going to have a talk by somebody at EPRI who is going to discuss the advances that the industry has made in developing the techniques, the specific equipment or vehicles to get within those overpacks to see those canisters. And on top of that, you heard a little bit earlier today I think in our introduction, the industry in the form of the society, American society of mechanical engineers, ASME, they're tackling this to develop code rules that holders of canisters will have to follow to inspect canisters to ensure the stress corrosion cracking is not challenging their function.

So what we have now are lots of activities. Very busy time in this area. And things are going to be happening fairly quickly now as far as we have several licensees that are coming up on their deadlines for doing their canister inspections. And as we go forward there's going to be even more. And we're going to learn from each other and go from there.

And so I guess I'd leave it at that for now. We have a whole session right after lunch to get even more detail.
>> Thank you very much.
>> Is there any -- we did have one more question on the floor here.
>> Bob Arnseger senior professional staff from the technical review board. We heard mentioned at least in passing a few times about this cask at the north end heavily instrumented and they're going to start loading pretty soon and one of the purposes of that project was to benchmark thermal code to see what temperatures are actually compared to what the thermal code is predicting. Let's say that that code is spot on for the purposes of conversation. And it's been confirmed to work or validated to work. Now comes along another utility that decides they want to store some BWR fuel with the wrappers in a canister, in a horizontal position, that's hotter. And let's say they have the various input parameters to put into this code.

Is the code going to have to be revalidated to be used for that case, or is the code the way it is going to be okay?
>> Of course, having extra validation, I would never say no to it. So I like validations. But the way we were talking about it, I think what we have is plenty to say that what you guys are using for horizontal

cask is good enough. So you don't need extra validation unless some people came and gave you extra validation data to do the validation.

Because, look, for this dry cask simulator we looked at the entire gamut from lower Reynolds Rayleigh number to higher numbers. So from dimensional response point of view we're covering all the situations.

Even though, of course, you have horizontal. In most cases -- as a matter of fact in horizontal you don't have the problem with pressure. Most of the time they are low pressure inside. But any other thing like bad convection outside, like for ventilated, what you have for the vertical and the horizontal should be the same.

>> Okay. One more question.

>> Mark Delligatti. I'm Table Rock LLC I had a comment for the lady on the telephone. I wanted to make sure that she was aware that tomorrow's session will focus on transportation of casks and to make sure that she is, if she's available, that she listens in tomorrow, we may have some different people on the panels that may be able to speak further to the questions that she has.

>> Thanks, Mark. This is sweeps week we want to make sure we have the biggest audience we can get. Okay. I know that Cris is really an intimidating person. She's really gotten us three minutes of being on schedule. Unless someone has a burning question we should break for lunch and come back promptly at 1:45 for our next session. [Lunch] .