UNITED STATES OF AMERICA

U.S. NUCLEAR REGULATORY COMMISSION

BRIEFING ON REACTOR MATERIALS AGING MANAGEMENT ISSUES

March 1, 2011

9:00 a.m.

TRANSCRIPT OF PROCEEDINGS

Public Meeting

Before the U.S. Nuclear Regulatory Commission:

Gregory B. Jaczko, Chairman

Kristine L. Svinicki, Commissioner

George Apostolakis, Commissioner

William D. Magwood, IV, Commissioner

William C. Ostendorff, Commissioner

APPEARANCES

Panel:

Michael Robinson
Utility Chair, EPRI Materials Action Plan Committee
Nuclear Engineering Manager, Duke Energy

Robin Dyle
Technical Executive, EPRI Materials Action Plan Committee

Mark Flaherty
Manager Nuclear Engineering, Ginna Plant, Constellation Energy

John Kelly
Deputy Assistant Secretary, Nuclear Reactor Technologies
Department of Energy, Office of Nuclear Energy

Bryan Erler
Vice President, Nuclear Codes and Standards
American Society of Mechanical Engineers

NRC Staff:

Martin Virgilio
Deputy Executive Director for Reactor and Preparedness Programs

John Lubinski
Deputy Director, Division of Component Integrity, NRR

Brian Holian
Director, Division of License Renewal, NRR

Michael Case
Director, Division of Engineering, RES

P R O C E E D I N G S

CHAIRMAN JACZKO: Good morning everyone we are meeting today to discuss issues related to materials degradation and aging management for nuclear power plants. With the aging of the nation's nuclear reactors it is critical that licensees and the agency stay on top of these important issues. As the 61 approved license renewal applications today demonstrate the industry has done good work in developing effective aging management programs. The agency and its licensees have, however, very limited experience in seeing how aging management programs actually work after the initial 40 year period of operation. In fact, it was less than two years ago that Oyster Creek became the first nuclear power plant to pass the 40 year operational mark, and only eight units have entered extended operation at this point.

I believe the DOE, the NRC, and licensees have done a good job of identifying and analyzing the issues that we'll be confronting in recent years and I think the Commission looks forward to hearing from the staff as well as, I think, our very diverse group of stakeholders here this morning to talk about the challenges and progress on addressing these aging management issues. So, before we begin, I'd offer my colleagues, any comments you'd like to -- OK. We'll turn it over then, and start with Mike Robinson, who is the utility chair at EPRI's Materials Action Plan Committee, and, with Duke Energy.

MICHAEL ROBINSON: Thank you, Mr. Chairman. I'd like to say, first off, that I appreciate the opportunity to be here today to brief the Commission on our activities, looking at material issues within the industry. As was mentioned, I am with Duke Energy back in Charlotte, North Carolina, and I'm also

the utility chair of the EPRI MAPC, the Action Plan Committee, and I've been in that role for about three to four years at this point. The topic I'm going to talk about today is to talk about the utility experience with the MAPC, and the programs and the initiatives that are part of the MAPC. I'd like to begin by just simply noting the important role that material integrity plays in the safe operation of our plants.

The reliability of plants, the safety, and the operation, really is dependent on the material integrity of the plants. When you look at the materials that are in, in the plant, you'll see they're subjected to some extremely harsh environments, in terms of high stresses, temperatures, exposure to the radiation effects, and things like that. As we've all seen, unexpected failure of these components in the past have been quite problematic. They've created some fairly serious situations in the plant, in terms of exposing people to higher radiation doses, extending outages, and just generally being a real disruption to things around the plant.

We do have some of these unexpected failures. The first slide, please. I'd like to begin by just talking briefly about the EPRI MAPC, just a bit of background for those who may not be familiar with the MAPC. The MAPC is one of nine action plan committees that make up the Nuclear Sector within EPRI, and obviously the Nuclear Sector of EPRI is focused on those nuclear activities for the U.S. fleet of nuclear plants. Other examples of APCs that make up the Nuclear Sector are non-destructive examination, equipment reliability, new plant APC, we look at I&C, as well as a few other different types of areas.

The MAPC is a forum where utilities, both at the technical level and

the executive level, meet and interact with the EPRI staff and some of their various support personnel, looking at strategic issues that are important to the industry. This is a collaborative effort between industry and EPRI, and has proven to be a very successful model that we've used for a number of years. I'd like to mention one additional responsibility the MAPC has taken on. Recently, starting in January of 2010, the MAPC has taken on the overall oversight role for the industry material activities, is now coordinated or done through this particular organization. Prior to that, the industry oversight was done through the NEI organization.

You may recall, I think the last update, there was mention of a self-assessment the industry had done, looking at our NEI 03-08, and how well the utility industry had implemented the NEI 03-08. One of the recommendations coming out of that self-assessment was to look at our oversight organization and see if there was some way to streamline those functions. The result of that was we moved that oversight to the MAPC, and it's now conducted through this organization. In terms of the makeup of the MAPC, you'll note that all U.S. utility members are members of the MAPC. We also have a strong contingent of foreign utilities that are members of the MAPC. We have representatives from France, Japan, Korea, Spain, South Africa, just to mention a few countries that are part of the organization.

That gives us some great insight into foreign operating experience and also allows us to consider that operating experience as we talk about and look at future projects and plans, for things to do here in this country. Next slide, please.

This slide shows the various technical programs that make up the MAPC. I don't plan to go through each of these in any kind of detail, but would just simply like to highlight a few things that I think are of note. First off, each of these technical committees is chaired by a utility person. There's also a support of other executives from the utilities that serve in an advisory and oversight role to each of these technical programs. So there's a strong complement of the utility technical folks as well as executives who are involved in these individual technical programs.

You'll see that within the MAPC, our primary focus is looking at those materials that make up what I call our primary circuit, or the reactor coolant system. We also include both the Boiling Water Reactors as well as the Pressurized Water Reactors within the scope of things that we do within the MAPC. The research that we conduct also applies to both the Bs and the Ps. One new addition to the MAPC is our Welding Repair Technology Center. They came to us, you know, last year, and in part to help us deal with some of the issues we're seeing in the industry.

We've had issues with welding in the past. We wanted to bring our welding technology folks in to help us with some of the welding issues we've seen in the field. We've also had issues welding the 52M of the alloy 690 filler pipe materials. They're great corrosion-resistant materials, but they're also very difficult to weld. So one of the things we're asking our welding folks to help us with is new filler materials that will allow us to be, again, as corrosion-resistant, but also more weldable, or user-friendly, once we get into the field. And also one of the things we're looking at is we're starting to do internal inspections within the

PWR fleet of plants. We're also looking at the ability to weld highly-irradiated stainless steel.

So one of the activities within this group is to help us, along with the National Labs, to look at being able to weld some of these materials. And again, it's to really put a tool in our toolbox to help us deal with some of these potential findings we may have once we start to do these inspections. Next slide, please.

The next slide really shows the expectations for how the utility members are to be engaged with the MAPC. You can see the expectations listed there, and again, these are all documented in the NEI 03-08 document itself, which is the industry materials initiative. You can see there's an expectation for the utilities to be proactive in their approach to evaluating and examining their plants.

So we expect folks to be in their plant looking for things that could be problematic and making sure we're being proactive in terms of how we deal with things we may find in the plants. We're also expecting utilities to commit resources to support all the industry material initiatives, and that support's in terms of both personnel, as well as the dollars to fund some of the research and other activities that are important to us. Next slide, please.

The next slide shows some of the key deliverables that come from our Materials Action Plan Committee. The first item I would like to highlight there is the industry's Materials Strategic Plan. And, again, this is a plan that's required per our NEI 03-08, the guideline, and is based in large part on the results of our Materials Degradation Matrix and our Issue Management Table. Now, Robin, in his talk to follow mine, will talk more about those two particular

documents, but again, our strategic plan takes a lot of its guidance from the results of those two reports.

Our strategic plan is used to identify open issues and gaps. It also allows us to prioritize those gaps with the right prioritization of gaps that allows us to make sure we're applying our research dollars to where we can get the biggest bang for our buck, so we feel like with our strategic plan, our focus on the right set of priorities, we can make sure we're putting our dollars in the right place to make sure we get the maximum benefit from those resource dollars. Another key product coming out of our APC are what I call the Inspection and Evaluation Guidelines. In a lot of cases, these are guidelines that going above and beyond what the current ASME Code or other regulatory requirements may be. I noted several examples there, dissimilar metal butt welds, that was an issue a number of years ago. You may have heard MRP-139 referred to, or MRP-227, which is looking at reactor internal inspections which, we're starting the first one of those in a P, the PWR. Later on this year, we pick up the pace with inspection of the PWR internals next year, and then it really hits a faster pace once we get beyond 2012. Next slide, please.

The next slide talks about industry expectations for how we implement the guidelines. And, quite simply, these guidelines that we issued through the APC are done in collaboration by all the utility members. The expectations for implementation are covered through the NEI 03-08. As we develop these guidelines, we also realize that not all guidelines are created equally. There are some guidelines that are more important than others. And for that reason, we adopted a graded approach for how we implement the guidelines

that did come out of our Action Plan Committees.

The gradation, quite simply, is based on the importance and the impact of that guideline to the industry. You'll see on the slide that we have a mandatory, needed, and good practice gradation for those guidelines. Mandatory is, quite simply, those things that are applied to most of the plants. There's high potential for, either a financial or safety impact to the plants. So those are the ones where there really are few exceptions for not complying with those mandatory guidelines.

The other category is “needed,” which is maybe a step down from mandatory, but in the “needed” we allow folks to offer an alternative to some of those implementation requirements. We also realize there are going to be situations when a utility cannot comply with a particular mandatory or needed requirement, so we built in the provision to allow folks to use a deviation process, if you would. One of the other things that we --

CHAIRMAN JACZKO: I’m going to ask you to, I know you have two more slides, I think, to try to go through those as quickly as possible.

MICHAEL ROBINSON: Yeah. I will.

CHAIRMAN JACZKO: We have a lot of folks to get to, so I don’t want to start up the meeting with the wrong trend, so --

MICHAEL ROBINSON: Thank you. I just want to simply note that the important role we’ve asked INPO to play in terms of making sure the industry is, in fact, implementing the guidelines. Next slide, please. The next slide is really where I’d like to just emphasize that overall, the industry is pleased with how we’ve embraced the expectations of our materials aging management.

Utilities are exhibiting what we call the right behaviors. The processes we put in place are working; our high-priority gaps are being funded, and we have roadmaps for the completion of those particular tasks. We have a stable and predictable funding for this work, you can see that since 2004 we've invested over $350 million in the RCS research and development alone, averaging about $50 million per year for those efforts.

I would also just like to note the positive interactions we're having with the NRC. At this point, I believe the communications, both at the technical and the management level, is probably at an all-time high, so I think we've really come to appreciate what each is about, and we have very strong working relationships with the NRC. In conclusion, I'd like to say that I think the industry has a comprehensive program for managing the effects of material aging and degradation. In a lot of cases, we're going beyond what the code requires, and I think it's important to note that we're going there on our own proactively. We're not being really forced or coerced into going to those levels. As I noted, I think our teamwork is exceptional, we're making progress in closing out gaps in our knowledge, and we're leveraging our lessons learned from the past and applying them to good use as we go forward.

The last point I want to make is, I'm proud of the work we have done over the last several years to really advance the ball, if you would, with our materials aging, but I also believe that the book on material aging is not yet complete. There's still chapters in that book that we have to write, and I think that's going to be in large part determined as we operate these plants longer, subject them to the kind of conditions we have there. I fully expect there will be

things we will see in the future that we haven't really anticipated or addressed at this point. Thank you for your time.

CHAIRMAN JACZKO: Thanks. We'll now turn to Robin Dyle, who is the Technical Executive at the Materials Action Plan Committee.

ROBIN DYLE: Thank you. Good morning. I'll go ahead and get right into the presentation. We'll start with the slide number two. We're here this morning to discuss the Materials Degradation Matrix and issue-management tables. This came about from the Materials Initiative that Mike has mentioned already, NEI 03-08. We had performed an industry self-assessment in 2003 to determine how well we were doing things in the materials arena, and we found there were areas for improvement, and we made the decision to do so. The initiative was written in response to that, and we had a unanimous approval by the CNOs to put the initiative in place, so we have full engagement with the industry. This became the genesis, or beginning, of our materials focus in 2004 when the initiative became effective.

One of the key things that we did was establish strategic oversight with the chief nuclear officers. Instead of being managed at a lower level, we had engagement at the high levels of the U.S. Nuclear Utilities, to ensure we had the resources and the right strategy put in place. As noted here, it also elevated the notion that we needed to be more proactive. Instead of being reactive to materials issues, we needed to find some way to identify what the problems would be, what our vulnerabilities and risks were, and move forward in a proactive fashion to eliminate surprises to the best degree we could. And finally, it brought multiple issue programs, or multiple industry activities, under one

umbrella. Next slide, please.

Mike's already mentioned these programs, and I just note here for completeness or consistency, these are the programs that are addressed by the initiative today. They're the EPRI programs that Mike mentioned, and then the PWR Owners' Group Materials Subcommittee. And with that, I won't spend any more time there, but those are the committees that currently are controlled by the guidelines in the initiative today. Slide number four, please.

To do this work, we needed implementation tools. We needed tools that would effectively manage these multiple groups; we needed to look at the funding for these groups, make sure we weren't missing things, had gaps between the groups, particularly between the Bs and Ps where there might be common materials and synergies that we could build on with our research and understanding of failure mechanisms and things of that nature.

And this took the vision of the initiative and gave it some structure. Mike mentioned that we developed a strategic plan. We had to find some way to take the step back and say, from a high level, what was the right approach, where did we need to go, and again, not be reactive, not function in silos but truly integrate what we're trying to accomplish. So the two tools we came up with to do that are the Materials Degradation Matrix and the Issue Management Tables, and that's what I'll spend time discussing. Next slide, please.

The Materials Degradation Matrix, the first thing that we used this tool for, is we identified all relevant materials within the reactor coolant primary loop, as Mike mentioned. That includes the reactor vessels, the steam generator shell, secondary side of steam generator, and reactor coolant piping. This

includes not only the base materials but also the weld metal, so we've got all of those identified. Then we defined the relevant degradation mechanisms associated with each one of those materials, and when we set out to do this, we said we would take nothing off the table. Anything that could be reasonably postulated as a plausible degradation mechanism had to be considered. We weren't going to allow ourselves to pencil-whip something away or make it go away just because we didn't believe it.

Coming out of that, the goal is to develop a fundamental understanding of what the phenomenon of degradation mechanisms are: how stress corrosion cracking works, not just accepting that it does occur, but how does it work? What causes it? How might we deal with it? In those areas where we didn't have sufficient understanding, we identified what we call "knowledge gaps." Those knowledge gaps are the areas that we use to identify potential additional research.

Mike mentioned welding on irradiated stainless material. That was one of the things we identified that we could not do, so that is a gap that we need going forward, and that's an area where we need to focus research on. We also recognized for PWSCC, we were not doing enough, so we initiated additional laboratory programs. In previous presentations, you've heard this, but in 2004 we collected an additional $12 million to kick-start some of these programs so we could do this work. Next slide, please.

Revision Zero of the Materials Degradation Matrix was finished in 2004. Not long after that, the NRC completed their activity that was documented in NUREG-CR-6923, it's the PMDA is what it's commonly referred to. It was

interesting to note that when the NRC finished their approach, then they started essentially from the bottom up looking at components, where we started in the industry looking at materials and working our way down. We were aligned on what the key issues were that we needed to deal with at that time, so that was good that we had agreed on what the key issues were.

Since that time, we've performed two more revisions to the degradation matrix. Revision 1 looked at operation and life out to 60 years. What additional degradation mechanisms or issue might we need to deal with if the plants were to operate for 60 years? Recently, Rev. 2 was completed and published in August 2010, and that looks at operation out to 80 years. We sat down with a group of experts, we considered the operational experience that we had occurred here in the U.S. and international members we looked at the latest research results that we'd gotten from our multi-year programs, things like the CIR that had been looking at irradiated research, and then using that, we went back through the matrix, identified issues that needed to be addressed, particularly those that would be for 80-year issues. If you look at this table, there'll be a tag in the boxes that say LTO, which means long-term operation issue, so it's specifically identified to address that, and we think we've identified all the issues necessary for 80 years of operation. Next slide, please.

Once we had these degradation matrices that identified what the problems might be and the materials, we had to have some way to assess the relative risk of those, and the priority that we would need to work with. So we used the Issue Management Tables to take the gaps from the degradation matrix and then review it from a safety perspective first, and then operability, and then

financial impact and other things, and breadth of the problem to prioritize where we would do the work, with safety always being the number-one issue.

We prioritized projects for gap closure -- what would it take to make a gap go away, what would it take to get the knowledge base where we need to go -- and in some cases, the gap closure is not so much the knowledge but the things we do in the field. Example, Mike mentioned inspections. Sometimes we reach the point that we understand the mechanism well enough and we know we need to inspect for it. In some cases, we need to develop mitigative tools. For example, in the BWRs we use hydrogen-water chemistry and noble-metal chemical application to retard the growth of stress corrosion cracking.

There's also mechanical mitigation devices that are used, such as mechanical stress improvement, MSIP. We also look at repair-and-replace options. Again, to repair, you need to be able to weld, in some cases with irradiative material. But often there are ways that you can do a preventative repair or replacement to put a new material in, or a new component and avoid some of the problems, so it restarts the life in using better materials, and that comes out of there. We also use the tables to prioritize the research. Where would we go, what's the first place to go, and how would we utilize different laboratories and things of that nature based on those capabilities.

The idea is to develop timely solutions for the plants to implement in advance of the problem being terminal. It doesn't do you any good to get the answer to the question after it's too late to implement it, so that was one of the key things that went into our thinking there. And it allows us to coordinate across reactor types. If there's something that we're learning in the BWRs and we can

share with the PWRs, these practices and these tools give us the chance to look at that and make sure we're properly coordinated. Next slide, please.

The other thing it allows us to do is identify license-renewal needs and options. When we sat down to look at 60 years, we identified those things that might be unique. Well, those are also things the staff might ask questions about related to GALL Rev. 1 or Rev. 2, so it was those kind of anticipatory looks at the materials and the aging management that we needed to look at, that were included in the discussion. We also find that this is a very good tool to sit down with the staff and explain where we're going, why we're going. It gives not only what we think is important, but our basis. We can sit down and show them.

We made these documents publicly available. They're available to anybody, there's nothing in them proprietary, and that further allows us to communicate effectively with everyone involved. Would note at the bottom there that Revision Two of both the BWR and the PWR Issue Management Tables have now been updated based on the 80-year look at the degradation matrix. We went back and revisited the priorities for the work that we were doing for both the Bs and the Ps, and Issue Management Tables have been brought up to date. Next slide, please.

Just quickly, the current focus that comes out of Revision Two of the Issue Management Tables and the degradation matrix. We're looking at the environmental effects on fracture resistance and fatigue life, trying to understand the differences of how these characteristics play out in the reactor and in the coolant loop as opposed to air tests that you would do when you normally test the materials. Stress corrosion cracking of the nickel-based alloys and stainless

steel continues to be a focus. The effect of fluence on stress corrosion cracking, both from a susceptibility and a crack growth rate. Are there synergies there that we need to better understand as we continue to operate the plants longer?

Also looking at the effect of fluence on reactor vessels. If we're going to go an additional 20 years, what other things might we need to be concerned about or monitor as we go forward? Mike mentioned we're starting the reactor internals inspections, and also the alloy 52 welding issues. We're looking at, how can we better improve that or find alternative weld materials? Last slide, please.

So in conclusion, NEI 03-08 gave us the strategic framework to do the work we needed to do for our materials aging, it gives us the use of the Degradation Matrix and the Issue Management Tables gives us the tools to address aging management for current and renewal terms. We can do more proactive research on aging and mitigation options. From it, we identify the appropriate inspection programs to manage the issues. It integrates us across the fleet, again, with the CNO engagement, so at the high levels, it's understood and it's an effective tool for dealing with communication issues with the staff. Thank you.

CHAIRMAN JACZKO: Thank you. We'll now turn to Mark, -- Fla -- ?

MARK FLAHERTY: Flaherty.

COMMISSIONER JACZKO: Flaherty, who is manager of nuclear engineering at Ginna.

MARK FLAHERTY: Okay, actually I'm the corporate engineering

manager within Constellation, just so there's no --

COMMISSIONER JACZKO: OK.

MARK FLAHERTY: My focus or discussion today will be on near-term activities related to reactor-material aging management within CENG. Slide two, please. For some background, CENG currently owns and operates five units and three sites. Nine Mile Point, Unit 1 entered its period of extended operation in August of 2009, and it is the second-oldest BWR in the U.S. Unit 2 will not enter its period of extended operation until 2026.

Ginna entered its period of extended operation in September of 2009, and is the oldest operating PWR in the U.S. And Calvert Cliffs was the first plant in the U.S. to receive its renewed operating license in March of 2000, and its two units will not enter their period of extended operation until 2014 and 2016, so per the earlier discussion of eight units being in the period of extended operation, two of those are within the CENG fleet. Slide three, please. For Nine Mile Point, I'm going to focus this discussion on Unit 1, as Unit 2 will not enter its period of extended operation until 2026, and its next refueling outage is not until 2012.

This spring, for Unit 1, we will be performing a full core offload, and performing the required inspections per BWRVIP program. In addition, CENG has formed an initiative with the Department of Energy and EPRI entitled the Nuclear Plant Life Extension Demonstration Project, and the purpose of this project is an offshoot of the EPRI long-term operations initiative that Robin started, and it's an effort to start looking at some of the issues that need to be addressed or looked at or evaluated as part of going from a 60 to 80-year

operating license. This initiative will focus on two specific areas: containment and reactor internals, and so my discussion will center on the reactor internals portion.

So for this spring, during the outage, we will have representatives from EPRI and the Department of Energy at the site, observing the BWRVIP inspections, and potentially identifying some additional inspections, et cetera, for the 2013 refueling outage. Tied to this is, for Nine Mile Point One, the top guide does have cracking issues that were previously identified, and the Department of Energy may be pursuing taking a boat sample and doing further metallurgical analysis of that cracking. Also, the reactor vessel coupons for Nine Mile Point one are still within the vessel. They were not required to be extracted for the BWR VIP program, so we are having dialogue with the Department of Energy about potentially extracting those and performing additional analysis going forward from 2013. Next slide, please.

So for Ginna, as Mike Robinson indicated, the first PWR performing inspection is consistent with MRP-227, that's actually Ginna Station, and those inspections will also be occurring during the spring RFO. Those inspections are a combination of MRP-227 and the WCAP, and those were previously reviewed and approved by the NRC staff. We are also performing baffle-former bolt replacements. Our baffle-former bolts currently are not inspectable by UT analysis, so we are removing approximately 180 of those bolts and replacing them with a design that will support future UT inspections. And finally, we are also replacing the split-pin replacement and guide card for the reactor upper internals, for further operation.

We also, beneath the reactor vessel, we do have thimble tubes, and we do have an inspection program, and previous inspection did identify some initial wear, so we are proactively going after and replacing all 36 tubes during this outage. Ginna is also part of this pilot program effort with the Department of Energy and EPRI. They will be monitoring our reactor-vessel internal inspections this outage, and also for the baffle-former bolts, the Department of Energy is planning to take possession of several of the bolts that are extracted to do further analysis. And finally, for reactor vessel coupons, several coupons have been extracted for Ginna previously for Charpy specimen testing, and we are working with Westinghouse Department of Energy to potentially transfer some of those to the Department of Energy for further analysis also. Next slide, please.

For Calvert Cliffs, as I indicated earlier, Calvert received their renewed operating license in 2000, but will not be entering the period of extended operation until 2014 and 2016. Therefore, their reactor vessel internal inspections will not be occurring until later on this decade. However, we also have some other material program requirements tied to license renewal for Calvert Cliffs, specifically the Cast Austenitic Stainless Steel or CASS program. This program was approved by the NRC with respect to the renewed operating license. However, since that time, the NRC has issued a GALL and a revision to the GALL, and we are using the current Rev. of the GALL to help develop our CASS program going forward.

And we're doing this for many reasons. One of them, in fact, is that since we are a fleet, we are attempting to standardize, to the extent practical, the

inspection programs among the units, to ensure consistency, but also as part of just standard practice, you know, using operating experience, et cetera, we want to make sure that we are inspecting for all the stuff that's necessary in the event that we do pursue renewed operating license number two for the Calvert units, 60 to 80 years. That concludes my presentation. Thank you.

COMMISSIONER JACZKO: Thank you. We'll now turn to John Kelly, who's the deputy assistant secretary for nuclear reactor technology in the Office of Nuclear Energy at DOE. There you go.

JOHN KELLY: Thank you, Mr. Chairman. I appreciate the opportunity to be here today, to discuss with you the Department of Energy's Light Water Reactor Sustainability Program. I'm a relatively newcomer to DOE, I've only been there since October, and as such this is the first opportunity I've had to brief the Commission, so I'm open to return whenever you desire to brief you on other aspects of the Department's program. Next slide, please.

So currently, there is a lot of interest in looking at ways to reduce carbon emissions, and there's strong support in this effort to look at the current fleet of reactors and extend their life. I think people are understanding that it's probably very difficult to meet the carbon-reduction goals that the President has set if we cannot continue to operate the existing fleet or some large fraction of it for an extended period of time. And this is not unknown; I myself worked back in the 90s when we were trying to get the first 20-year extension, and now we're facing that cliff again as we look forward to the next 40 years. And DOE and EPRI in 2008 conducted a workshop to begin to try to identify what the critical technical issues would be for extending the life of the current fleet. Next slide,

please.

Now within the department over the last year and a half -- next slide, or, there you go -- we had a major strategic effort to develop our R&D roadmap. This roadmap was sent to Congress last April; it has the full endorsement of the administration, and within there are four main objectives for the roadmap. The first has to do with extending the life of the current fleet; the second has to do with enabling new builds; the third has to do with developing sustainable fuel cycles; and the fourth has to do with the concept that as we expand nuclear energy, we need to be cognizant of the proliferation reduce and do whatever we can to reduce proliferation risk. So it's a multifaceted program. Back to the slides.

I'm here today to talk about the first objective, which has to do with extending the life of the current plants, and in that context, we with EPRI have developed a joint strategy that has a number of elements, and some of those you heard of a little while ago, and I'll go into detail about the areas that are within the DOE context in a minute. Our vision is to extend lives well beyond 60 if we can do it safely and economically. Our approach to this problem is to look at expanding the scientific base, using the resources of the U.S. Government to develop that technical understanding to fully justify the economic and safe extension of life. Our effort is coordinated with EPRI and with NRC, and the work with EPRI, with the industry is cost-shared. For our part, we're able to bring in the laboratory and university programs. Please continue about two more slides. Next slide.

So the entire LWR sustainability program actually has five

pathways, and this is the department's energy. The first deals with materials aging and degradation. And again, as I mentioned, this has to do with establishing scientific bases for understanding and predicting long-term environmental degradation of materials. The second aspect has to do with risk-informing safety margin characterization. What we're concerned there about is, as plants age, margins may change, and at the same time we have gained more information about the plants, and so developing a better quantification of the actual margins, taking into account improved knowledge and aging effects, is an important capability to have for decision-makers in the future.

I think we all recognize the importance of advanced instrumentation and control; these are the lifeblood of the plant, and as these systems age and as obsolescence creeps in, we need to look at solutions for the future. Fuels is another area, advanced fuels is another area for development. We are looking at advanced cladding, such as potentially the use of silicon carbide, and other advanced concepts that could get higher burn-up, longer fuel life, reduce the amount of waste per gigawatt electricity produced, et cetera. And finally we're looking at a general class of economic and efficiency improvements, looking at ways of improving power uprates, more efficient operations, and looking at emerging issues such as the current water issue that the new EPA rule may be generating, so this category is trying to address those issues that are emerging as we proceed forward.

Now I wanted to drill a little more into the program related to materials aging and degradation. It's a fairly broad-based program dealing with reactor pressure vessels, concrete, buried piping, cabling, and in addition to

understanding the physical degradation mechanisms, looking at mitigation repair and replacement technologies. As I indicated a couple of slides ago, the program started in FY 10 at 10 million; it's about 26 million this year. And what I've indicated on the slide in bold, which is a little hard to see here, is those areas that we have initiated active efforts. The others are still in the planning stage, so active areas in metals or reactor pressure vessels, internals, et cetera, have to do with really developing the scientific understanding for irradiated systems, stress corrosion cracking, and looking at the high fluence effects on reactor pressure vessel steels.

We've initiated the acquisition of samples and are planning further irradiations, together with using samples that we get from industry as part of this program. Concrete aging, for the long-term operation -- we're looking at the various degradation mechanisms and trying to outline the scientific approach for understanding how our concrete will degrade over time. And in weld-repair technologies, we're looking at ways where we can repair welds in a way that doesn't damage or further exasperate damage within the materials. What we're bringing to the problem here is the ability to irradiate our materials both domestically and abroad. Our hot cells at our National Laboratories, the advanced material science instruments at the laboratories, our modeling and simulation capability, and probably the most important, the researchers both at the laboratories and the universities to bring to bear on the problem. Next slide, please.

It was just mentioned, there are some active programs with industry right now to collect real plant data. I won't go into more detail because Mark has

just talked about the Constellation projects, but these are of great interest to the Department, and we're currently trying to identify samples that we can send to our laboratories at either Oak Ridge or Idaho for further examination. We've become involved with Zion Solutions, who's involved with the Zion decommissioning. They've made an offer out to us to supply material samples from Zion, and we are trying to coordinate the government's interest on their behalf, so it would include both samples that the Department would be interested, as well as the agency and see if we can come up with the funding to secure those samples and then get them to the laboratories for further examination. Again, all of these programs are in cooperation with NRC and EPA, the EPRI, sorry.

So in conclusion, I'd like to reemphasize the point that the continued operation of the existing fleet is in the national interest, and a key strategy for meeting our climate-change and energy-supply goals. I think the federal efforts are essential to stimulate and encourage industrial efforts, as well as to address the longer-term high-risk research that industry is not addressing. Sustained R&D on long-term light water operations is needed to identify issues and develop a technical basis that supports industry efforts to relicense plants for long-term operation, and it is also very important that we continue our cooperation with NRC and to develop the appropriate R&D to support long-time operation and continued licensing activities. Thank you.

COMMISSIONER JACZKO: Thank you. We will now turn to Bryan Erler, who is the vice president for the nuclear codes and standards at ASME.

BRYAN ERLER: Thank you very much, Chairman. I'm going to be

talking about the development of consensus standard in ASME, with regard to both inservice inspection, examination, and repair, but also what learned on there going forward in new plants. If you'll go to the next slide, please. Basically, you know, the inspection, evaluation, and repairs is an important part, but then it's a very important part that the knowledge that is learned in the operating plants get into the code for the design of the new plants going forward right now. Next slide, please.

Just a roadmap, so everybody knows what we're talking about, there's a terminology thing, we all talk about Section XI. Well, Section XI is the section of the Boiler and Pressure Vessel Code for nuclear plants in ASME that deals with inservice inspection, examination, evaluation, and repair and replacement of components. And this includes pressure vessels, pumps, valves, piping, all the major components for reactor systems. Section III is the pressure vessel rules that we have for the design of new reactors. So there's a direct relation. Usually, the sequence is the other way around, we design it for Section III and we inspect it. But because of the subject of today I've dealt with, primarily dealing with the inservice inspection aspects, and then how that has been turned over to the new plant guidelines and regulation that we have. Next slide.

The inservice inspection, Section XI has an operational plan. This plan is a living document which is updated every two years, which outlines the current issues based on the experience of the inservice inspection of all the operating plants we have going forward. We prioritize all the items that we have, the committee makes sure they're dealing with those items, and in an aggressive and quick fashion, evaluating if there's a need for a code or a standard change,

and evaluating if there's a code case that needs to be done.

What I've shown here for you on the following slides will be some of the top ten issues. So, I don't want to go through the details of these top ten issues, but it represents what the committees are looking at, they're making sure that we're moving quickly in incorporating the requirements. So if you look at the next slide, here's three of the issues that we have with regard to -- another terminology issue, code cases. Code cases are those set of rules that really are an alternative to the code, that can be used very quickly without waiting for the next edition of the code. And we have a very good system with the staff about getting code cases out, and then getting them endorsed, and guidelines on implementation of them. So it's a very effective system of keeping the standards up to date with the issues that you find during inspections.

The first one is with regard to optimized overlay, what are the inspection rules to be able to do that. So it's an inspection type of code case. The next is a repair type of code case for non-optimized overlays. So we're working on -- these aren't things that are done, they're things that have to be done in order to support the owners of these operating plants. We also have evaluation techniques. The next two, we look at this, the fatigue crack growth items for austenitic steels in a water environment. Obviously, you find a crack, the issue of evaluating, you need guidelines, standard techniques going forward. If you -- next slide, please.

The stress corrosion cracking growth rate we need for BWR and PWR water environments, so we -- another set of evaluation criteria that we have. And it goes on, and in these ten items -- let's just jump to the next slide

right away -- where we deal with additional inspection items for code cases that we have. So these code cases often are various revisions. We update them, and add to the list. The system that we have really allows you to incorporate those code cases, where appropriate, into the code, as we have the new additions going forward. So it's a living document, this Section XI, that is constantly changing in order to make sure we support the needs and the technology that's required for the operating fleets going forward.

If you look at the next slide, there's some specific areas that I think you really want to -- we want to deal with that are somewhat particularly troubling in terms of exactly how we codify some of these issues. And if you look at last week, you did have a briefing with regard to buried piping. And there's a number of activities that we are initiating with regard to buried piping, both in terms of, you know, exposed buried piping that's in an enclosure, as well as buried within the ground, developing evaluation procedures for degraded buried piping.

A Task Group has been started to review the current code rules and industry activities for piping and providing recommendation for what might be codified. So you can see that we work very closely with EPRI, and with the owners, and owners groups, making sure that what is appropriate to go in the code so we have it available for future application, and the technology that has been learned, applying to specific plants, based on what's been found.

Another area that we've been working closely with is operational leakage. This is -- it's out of the scope of Section XI. Section XI, we do inspections, and we have rules, what you find, how to evaluate, how to repair it. But then, if you find leakage during an operation, that really is up to the operator

to deal with how we should deal with it. And there is -- it gets -- but also, you have all the data about the systems and the plant from the inservice inspection that can help you deal with the results of that operational leakage. So we have several phases of work to provide guidance in the standard, a lot of discussion amongst the owners, what belongs to the standard, what belongs in inspection standard, let's say, and what belongs in operational, just general operational guidelines.

So we have a three-phased approach that's in the process. And it's a key item, it's on the top ten list of things we're dealing with very quickly to make sure we support the owners, but also the NRC with regard to that. So, many of these things, you've got to understand, don't necessarily belong in a code, but we have to decide and be on top of it to see what does belong, and the right guidelines are provided and the right implementation are present. So, if you switch to the next slide, I want to talk about -- this is on Section III now, this is -- new reactors, one of the things that we've obviously talked about, a lot of material issues, a lot of welding issues, things we've learned, what are good details, bad details.

And therefore, in Section III of our code, we have -- we're incorporating all of these lessons learned through the last 42 years of operating plant. You know, which materials we should exclude from various components that we have. Upfront design for access the inservice inspection. One of the challenges of inservice inspection, of course, is making sure you can get at various components to do the inspection that's required. Minimizing weld repair. We've learned a lot of times that, you know, we have a very rigorous code,

ASME, and when you stamp it, it's supposed to be perfect. And therefore, you end up sometimes repairing it to make it so-called perfect, and the repair, in the long-term life, could be worse than leaving it as-is.

So guidelines on that is required, and going into the new code that we have. Various surface conditions that we need to deal with and evaluate to make sure a repair is needed or not needed. There are things that we're incorporating, and we have a group that's a joint group between Section III and Section XI that's constantly monitoring what's being learned at the inspections and folded in to action items that go to the Section III Executive Strategy and Management Committee, and correspondingly go forward into the code where it's found to be appropriate.

One of the things that has really been very critical for ASME has been the communication. If you look at the next slide, we have had significant increases in the level of communication with all of its stakeholders. And by stakeholders, that's everybody here at the table here, plus the staff, plus the labs, so that we're obviously making sure -- prioritizing what needs to be done in the codes and standards going forward. So this -- it's not the committees, our board, I'm chairman of the board, oversees all the committees. It's not the committees that are sitting there writing their own standard.

You've got to get input from everybody, and there have been regular meetings we have now with the staff. We have, every six months, we have set up Section III and XI of a management-level meeting with the staff to go over key items, buried piping, operational leakage, some of these material issues. We don't solve them, we just make sure we understand what each of us

are doing going forward. Very valuable, these stakeholders meetings and regular management meetings.

Coordination with EPRI on a regular basis, that's obvious many owners that are on our committees and on the board, there's many EPRI members that are participating in stakeholders meetings. And we have an increase in participation from across the industry. So, prioritization and communication has improved over the last, well actually, I would say about the last five years, significantly, looking forward to what needs to be done. One of the -- next slide, please.

The value of consensus standards is very clear that in order to develop the requirements, we need to get input from the stakeholders, not just from a particular academic group or a particular country. We have participants from around the world, and experts from everything from operating, to designers, to fabricators, and regulators, that are participating in the work we do. And they all have a vote.

Consensus is hard to do. Especially on technical issues, you know, it's not exact science that we have, but you -- and you have strong opinions. And I think -- but it's very valuable, I think we end up with a stronger standard, and capable of going forward for the industry. We have limits of influence, by having a consensus, you don't have the influence of one group, going forward. Plus, you get the global participation.

I'd like to just summarize by saying that the ASME is proactive in developing a standard and advancing examination and evaluation methods to find material degradation before any serious problem. We've developed regular

communication with all stakeholders involved with material issues, and ASME updates the nuclear construction standards based on operating experience, making sure that new plants don't have the same problems that we learned are existing in the operating plants. With that, I thank you for the time, and I appreciate it.

CHAIRMAN JACZKO: Thank you. We'll now begin our questions and comments with Commissioner Apostolakis.

COMMISSIONER APOSTOLAKIS: Thank you, Mr. Chairman. Thank you all on all these very interesting presentations. I have a question, or maybe two, for Mr. Dyle. You mentioned the Materials Degradation Matrix and how you prioritize the issues, and so on. That reminded me of a matrix that EPRI developed for inservice inspection, where the mechanisms, degradation mechanisms, were on one axis, and then you had the risk impact, or the potential failure of that particular piece of piping, CDF and so on. So, since you are trying to prioritize issues, I'm wondering why you are not using some metric similar to what your organization developed for ISI to do this.

ROBIN DYLE: When we go through the process using the Issue Management Tables to assess what comes out of the Degradation Matrix and look at safety, one of the things we do consider are the risk parameters. And that information that came from those other studies, from development of risk-based inspection technologies, and things of that nature. So we did not ignore that, we built that into what we were doing, so we have --

COMMISSIONER APOSTOLAKIS: But in a qualitative way, or --

ROBIN DYLE: In a fashion. We didn't do a specific PRA.

COMMISSIONER APOSTOLAKIS: No, you don't do the PRA, you are using somebody's PRA.

ROBIN DYLE: Right. But we, you know, we learned from those. For example, the BWRs had performed PRA analyses of the reactor internals in the mid '90s, so that we took from those insights what were the high-priority safety issues so they could help us with the ranking there. So we have used those tools.

COMMISSIONER APOSTOLAKIS: So that is an input. Dr. Kelly mentioned that one of the themes of the sustainability program is to quantify the safety margins. And you said that you're doing this because materials degradation erodes the safety modules. And I wonder why that's relevant only to beyond sixty. Why isn't it relevant to what we're doing now? Why aren't we trying to quantify margins now, and see what the real impact of erosion of performance is?

ROBIN DYLE: In the Materials Degradation Matrix, the first version of it, Rev. Zero in 2004, looked at only 40 years. So we were looking at the issues and how they would affect margin, how they would affect operability and safety at that point in time. Based on that information, we developed inspection and flaw-evaluation guidelines through the BWRs and PWRs in response to that. We recognized that we were not doing all those things that we ought to do. One of the ways I like to characterize our effort is if we are proactive enough, and inspect the right things at the right frequency, to find a problem, then safety never becomes an issue, and we maintain that margin that we --

COMMISSIONER APOSTOLAKIS: I guess my question is, if DOE,

and EPRI, I assume, because it's a collaborative effort, decide that one of the five themes or pathways of beyond 60 effort should be risk-informed safety margin characterization, it seems to me that would apply also to beyond 40. Now, you're not doing it, obviously, but maybe it's something that you may want to consider.

JOHN KELLY: I think that's certainly true. Although there are certain rules now that we believe we can get to 60 adequately without further analysis. So I think there's a mix, but this current effort we have to develop these advanced simulation capability centered at Oak Ridge, called our hub, our energy and innovation hub, is really focused on issues with the current plants, with fuel failures, et cetera, trying to get, even for beyond 60 years, trying to get at some of the issues that are inhibiting operations.

COMMISSIONER APOSTOLAKIS: Well, you know, I'm not offering this as a criticism; we're trying to be constructive. I happened to read an ACRS letter from September 28 of 2009, where the committee complained that some applicants for license renewal were using generic data to supplement the two years' worth of operating and maintenance data they had regarding material issues. And the committee complained, they said that each licensee should submit at least five years' worth of plant-specific data. I'm wondering, is there an effort now by all licensees to actually collect plant-specific data regarding materials issues, at least for five years, going back for five years, or are we still dealing with generic data in some cases? Is there such a thing as a generic database, I assume there is, but --

MIKE ROBINSON: There is -- there are databases that we've developed, you know, through EPRI and elsewhere, as we've, you know, had

some of these different inspection transients, where we've found issues, for example, with like head cracking, for example, and -- or penetration issues. And we were looking for inspection results, what were others seeing, so as we had more inspections, those inspection results were all fed into a database to where we're able to track and see what the results were of those various inspections.

I used the head penetration issue as an example. We also have other databases that look at other inspection results for similar-type things. Back to individual utility, we have the obligation to maintain records of our Section XI Inservice Inspection Program, so we have inspection records that go back, probably to day one, that show what we inspected, what those results were, and how those particular results were dispositioned, or looked at.

COMMISSIONER APOSTOLAKIS: But these are individual records. My question is, does anybody go back and look, and try to draw some lessons and use them? I know that the records exist. My question is what do you do with them?

ROBIN DYLE: We have done that in several cases. For example, the BWRs, when they do their reactor internals, examinations, they provide that information to EPRI every six months, so we collect all the information from those examinations and are able to use that. The MRP for the PWRs does a similar activity, where, when the inspections are done, the utilities are obligated through this initiative that we talked about to provide those inspection results back to EPRI so they can be compiled and understood.

COMMISSIONER APOSTOLAKIS: Dr. Kelly, you mentioned that the cooperation with the NRC must continue. What kind of cooperation is that?

How involved are we?

JOHN KELLY: Let's see. Just last week, we had a joint workshop with DOE, EPRI, and NRC to discuss the whole plethora of issues associated with each of our programs. So that was an important meeting where we each have our research agendas and we look to harmonize those, and make sure that there are no important gaps, et cetera. There's regular staff meetings at the lower level to make sure there's progress, and then, currently, for instance, in the Zion activity, we've requested from NRC a list of samples that they may desire from that, and then we are in the process of negotiating, based on budget, et cetera, what can actually be accomplished, so --

COMMISSIONER APOSTOLAKIS: But it's more of a--

JOHN KELLY: It's fairly high level, but it gets down to details of ordering samples, et cetera, so it's --

COMMISSIONER APOSTOLAKIS: Thank you.

JOHN KELLY: I think it's very broad-based.

COMMISSIONER APOSTOLAKIS: Thank you, Mr. Chairman.

CHAIRMAN JACZKO: Commissioner Magwood.

COMMISSIONER MAGWOOD: Thank you, Chairman. Good morning, and welcome to all of you, particularly John, it's good to see you. John and I, of course, have interacted for many years when he was at Sandia. And I note that you are new to the Federal Service, but let's just say that if I had known that you had the ability to get the President to mention your program so prominently in the State of the Union address, I'd have brought you to Washington ten years ago.

[laughter]

JOHN KELLY: Too late – I guess I have to be the speechwriter.

[laughter]

COMMISSIONER MAGWOOD: Let me start with the industry guests, I'll sort of focus on Mr. Dyle, but please, others of you, comment. One thing I do worry about, I appreciate the sort of the breadth of the EPRI program, it's very encouraging to hear that the industry's undertaking an effort of that scale, it's something that's I think is -- that used to be lacking, I think, in the industry's research programs, so it's very, very encouraging to see that happening now. One thing I do worry about, however, is what is the, I guess I'll say the availability of samples, coupons, other specific materials at specific plants that will enable you to take the research that you're doing now and apply it to support 80 years of operation? Do the materials exist, do the coupons exist, do the samples exist? And if the samples don't exist, do we have the technology to take the samples?

ROBIN DYLE: In some cases, the material does not exist, in other cases, they do. We have an integrated surveillance program, for example, on the BWRs, that looks at the reactor vessels. And what we've done is identify those key capsules that need to be tested. We required the owners to keep the other capsules in place in the event that material proves useful. As Mr. Kelly mentioned, we're looking at collecting samples from Zion and trying to figure out what materials there might be available.

We are working to try to get materials from the Zorita plant, that we might use to see how inservice effects have been managed. We also look for

those materials where they've been archived. In some cases, we found archived materials that matches what's in a plant, so we can look at what the material is without service and with service. But that is difficult, that's something we're constantly striving to do. We've also tried to develop techniques where we can use, for example, proton irradiation to mimic neutron irradiation and see if that helps us gain insights without having to wait the long time it would take to do the neutron irradiation.

COMMISSIONER MAGWOOD: And again, I think that information helps you build your scientific basis, but it doesn't give you specific information about specific plants. And I wonder how, if we do eventually see applications for an extended 80-year operation, will there be enough information to support the analysis?

ROBIN DYLE: I'm optimistic that it will. One of the things we try to do within the Primary Assistance Corrosion Research Committee is understand, on a fundamental level, why the materials behave the way they do. So if we can understand the effects of different material constituents, the effect of irradiation and other things from a first principles basis, and develop those predictive tools and models, then those give us the insights to help try to predict what would happen with the existing material, should we not have samples available.

COMMISSIONER MAGWOOD: Mr. Robinson?

MICHAEL ROBINSON: Yes, I'd just like to add on to Robin's comments. Robin talked about the BWRs, so within the, you know, the PWRs, and again, looking at the 80-year beyond life, and again, your question is very good, because we do need to have the samples there to allow us to form the

bases for making the decision to go those extra years. We're doing the inventory now to see what material samples we may, in fact, be missing. We're also identifying the situations where there may be samples that have been taken out of the reactor and is currently sitting in a spent fuel pool. But that serves to close a gap in terms of where we do need some insight. So there is discussion going on now about identifying those samples in spent fuel pools, so we can in fact, take out a spent fuel pools and put back into the reactor, so that we can irradiate those samples to maybe fill in a blank that we're missing in terms of having actual data.

MARK FLAHERTY: Yes, as I indicated earlier, Nine Mile 1 still has its reactor vessel coupons available, and I believe Ginna also has one remaining, but part of the effort with the Department of Energy was to look at the coupons for Ginna that had been previously extracted, and to maybe do further analysis or irradiation of those at an accelerated rate to get more insight. So I think that, to the discussion points, there's been a lot of interaction between, you know, EPRI, DOE, and the industry, to make sure that we have all the information that we really need to go forward.

COMMISSIONER MAGWOOD: Thank you. John, just a quick question for you. You mentioned in your presentation that part of your research portfolio is built around some issues which are high-risk, long-term research that are sort of beyond the industry's scope. Could you be a little more specific, what -- which areas do you think fall in that category in this umbrella?

JOHN KELLY: It's kind of difficult to give a general characterization. But the way I think about it is that there are some with --

categorized as high important issues where the lack of a scientific understanding is really holding us back from addressing that issue. So in those areas where we can get the data, the information, to understand at the first principle level how microstructures evolve, et cetera, with the hope of, with simulation, putting that together to address that bigger issue. That's how I would categorize the general trend in that area.

COMMISSIONER MAGWOOD: So it's not so much, technology this way, it's technology that way. It's technology drilling down --

JOHN KELLY: It's really the bottom, it's really get the bottoms up, and piece it together with the capabilities we have now. Both the science instruments that can make the measurements sometimes *in situ* now, as well as the ability to do the simulation.

COMMISSIONER MAGWOOD: Does your program also include the development of new materials for reactor applications?

JOHN KELLY: Not in this particular program here, but we have a new initiative that has not yet been authorized, beginning in FY 2011, hopefully, to look at the development of new materials. And we can talk about that more, but it'd basically be a principle investigator initiated type of activity to look at new materials with probably broad applications to different reactor technologies. So really, more futuristic, blue sky type of work.

COMMISSIONER MAGWOOD: Thank you. Mr. Chairman, I have a question for ASME I'd like to ask. Just one quick one for you, Mr. Erler. I appreciate your discussion about the process ASME goes through to develop the codes and the code cases. I do get the feeling, however, that that process is

moving forward rather aggressively in some areas. And I wonder if our agency, in your view, is keeping up with the changes. Do you feel that the codes, the changes in the codes are being reflected on our side, and that licensees are able to reference the changed codes very easily, or are there some communication issues.

BRYAN ERLER: I would say, generally speaking, I think there is a very good coordination. But there are specific areas where you have bumps in the road sometimes on things, especially when you're moving ahead with new technology. You know, one of the issues that we're dealing with is polyethylene pipe. And in getting rules for that. And we want to move fast because the industry likes to get a code case out and get it approved, and meanwhile, there are some regulatory issues that we have to deal with to have it available for use, both in new plants as well as for replacement in existing plants.

As an example, I would say that we need to work closely at a very high level, make sure we're moving fast enough. There are other areas where we are really in lock-step, and very close. And I think the management meetings have helped facilitate that in a number of areas. So I think, from an ASME perspective, I think we're very satisfied on the interaction that we have with the staff on each of the various issues and code cases that we have going through. You have one or two that -- and now we have a basis to be able to correct those one or two, or at least bring it up to the right level.

COMMISSIONER MAGWOOD: Excellent. I appreciate hearing that. Thank you, Mr. Chairman.

CHAIRMAN JACZKO: Commissioner Ostendorff?

COMMISSIONER OSTENDORFF: Thank you, Mr. Chairman. I also thank you all for being here today, it has been very interesting. Mr. Flaherty, I really appreciate your identifying what Constellation is looking at for your older units as you go into different maintenance phases, I think that's very helpful for us to have that situation awareness. It's going to be related to a comment I'll make to Dr. Kelly, I appreciated your mentioning the Zion decom in which you're looking for, as far as trying to capture some lessons learned from that, I know that typically industry and the Department of Energy and NRC looks at nondestructive testing, and here's an opportunity where we have a decommissioning plant to, perhaps, do it at a different level.

I'll just make two comments there. Twenty-five years ago, give or take a couple years, naval reactors took a decommissioning ballistic missile submarine that was never going to be returned to service, and simulated a large steam-line rupture accident. And that test, a controlled test, really was pivotal in informing naval reactors and the submarine force on how to operate a submarine under those conditions. And so I mention that as one data point that there might be some opportunities, Dr. Kelly, with naval reactors, to look at their methodologies, as to how they've dealt with different issues. Four of the six submarines I've served on have been decommissioned. But those are -- none of those lives exceeded 30 years, and I know that the neutron embrittlement issues on the reactor vessel, et cetera, were -- so there may be some opportunity to talk to Admiral Donald's folks on that that might be insightful.

I want to go to Mr. Dyle and Mr. Robinson here, just for a minute. And I appreciate your comment on materials history is still being written. And I

can remember, again, creatures of our own experience, but in 1978, as the main propulsion system on a submarine, I had responsibility for training the machinery division, and two of my guys had to be nuclear weld qualified. And so the welding -- I'm going to focus on welding here for a minute, but also get back to a comment Mr. Erler made on this area. I saw where there were intense manual welding techniques used in the ’70s, even for new construction submarines.

The ’80s, there was some computer-assisted help in getting the rig set up, but it was still a manual operation. And then today, in the last 10 or 15 years, maybe even longer, the extensive use of robotics for welding, and we've seen that, and other Commissioners have seen that when they visit facilities and travel overseas. I'm just curious, if you use welding for that expertise area, do you think that the United States and the nuclear industry in our country is able to capture fully the best practices from experiences overseas in welding? Do we really, in your assessment, in your expertise, do we have state of the art welding in this country, for nuclear applications?

ROBIN DYLE: One of the things that Mike mentioned that we've got the Welding and Repair Technology Center underneath the Materials Action Plan Committee, one of the ideas was to have them be proactive and look at those issues. Similar to the Degradation Matrix Issue Management Tables, the Welding Group has now put together a very large document on welding best practices. They've worked with international members, they've worked with NSSS vendors, they're working with research labs to understand all these welding capabilities from underwater laser welding and things of that nature. And they're compiling all of those as best practices so that we would know what to do

and what not to do. And they're also trying to look proactively at additional filler metals that would be more effective, easier to meld, produce less defects, and be able to be implemented in the field more readily.

MICHAEL ROBINSON: I certainly agree with Robin's comments. And I think your question was really asking are we really taking advantage of foreign experience as we look at developing capability here within this country, and I would say we are. I mentioned earlier, the involvement we have with some of the foreign utilities and others, within our new Action Plan Committee. We do have access to information, things that are happening in France, Japan, Korea, and some of the other places, that allows us to bring those types of insights back here, and to take advantage of those.

We talked about the welding of highly irradiated stainless steels, for example. And that is a joint effort between us, us being EPRI and the industry, and the Department of Energy, in particular the folks at Oak Ridge, looking into how we can develop some of these capabilities. So I feel very good about how we're reaching out to others in the world to bring those best skills and talent and knowledge, to put to bear here in this country.

COMMISSIONER OSTENDORFF: Thank you. Mr. Erler, I'm going to ask you a quick question here. I was listening to your commentary on the quandary of what belongs in the standard or code, on one hand, and what might just be part of good engineering practice on the other. And, having had some experience at DOE working with concrete cracks in nuclear facilities, and with MOX fuel fabrication facility construction, but also some aging DOE facilities that had cracks, concrete is something that got my attention. And I'm just curious, I'm

going to focus my question -- one question here very specifically. Recognizing that you and your organization are working very proactively on the code development, is there any help that you need from the NRC that you are not currently receiving in those efforts as they apply to codes that might apply to new reactor plant construction?

BRYAN ERLER: Well, I don't think so. I mean, I think we get a lot of good help from the NRC, sometimes you might say too much help. The issue that we need to have is if you want to pass along the rules into something that we control as an industry, it's a real advantage. Does it belong in a code or a standard, or is it a guideline? We have the capability in all of our standards to classify them as what they are. A standard, you know, is something that is a consistent way of doing a design, fabrication, manufacturing, or inspection that you have. A code is a legal adoption of that standard. And, of course, guidelines help provide consistency but don't have to be followed. And there are certain things that certainly do belong in guidelines.

And I think that there could be debate with regard to that, and that always can be changed by adoption by the NRC with regard to making a guideline required. We do have debate with the NRC often, our -- we have appendices in all of our codes and standards, mandatory and non-mandatory. And there are times when you would like non-mandatory be mandatory, then there's other times -- and we do listen to that, and we do change as necessary, but it's with the guideline of the rest of the industry, within the consensus of the group that says, "Yes, that is mandatory, it applies to everybody." And so, I would say that we have -- one of the real strengths that we do have is we have

very strong staff support on the committee level, and the board level, and on the management interaction. And so, that helps us kind of walk that tightrope a bit.

COMMISSIONER OSTENDORFF: Thank you. Thank you, Mr. Chairman.

CHAIRMAN JACZKO: Commissioner Svinicki.

COMMISSIONER SVINICKI: I also want to thank all of you for being here today. As I prepared for this meeting, I was struck by the tremendous body of work that has gone on, and is going on between the industry, the research community, and the DOE National Laboratories, and also the standard-setting bodies. I think, taken as a whole, it's really an impressive effort, and I think also impressive is the amount of integration that goes on, which, I think, really is a benefit, in terms of maximizing the resource that's being put into this work.

I had a data point from my staff that the last time the Commission had a briefing on this was in April 2008. I'd been serving on the Commission, if the date is right, exactly 30 days at that point. So something that I've noticed over the three years that I've been on this Commission is that, I don't want to make it sound melodramatic, but I think, I would say that the areas where we have had maybe safety learnings or emergent issues that have been of interest, and some of those were briefed about today, dissimilar metal welds and things like that. I think that where we have had safety, maybe, you know, things of some safety significance that have emerged, they've been in the materials area, and so I think that that, you know, speaks to the fact that we are certainly adding to our body of knowledge in this area.

But we do have, as the Chairman started off the meeting by saying, you know, we have an aging fleet here. So this is an issue, I think, of really vital importance. So as I've listened to all of you, you are a group of experts, again, representing different areas, I thought of a question that you won't like, but I'm going to ask it anyway. If I were to, I guess, force you to identify an area of all the different types of materials and research and things we're looking at, phenomenology that we're looking at, degradation mechanisms that we've talked about, where would you identify that you think has some probability of being our next item of technical surprise that will occur for the operating fleet? And I knew you'd all be so eager to jump in and answer this.

MICHAEL ROBINSON: I will --

COMMISSIONER SVINICKI: And I'm not saying that you're indicating that you're aware of any problem there. But just maybe it would be reflective of where's our state of knowledge less than other areas?

MICHAEL ROBINSON: Yeah, I'll take the, you know, a first shot. But, I think about the kind of thing that keeps me awake at night, and I realize that we've talked a lot about where the BWR fleet of plants are, and their operating experience the last 15 to 20 years, really looking at more of the internals, and dealing with a lot of issues there. I realize that the PWR fleet, and you heard Mark talk about their experiences coming up later this spring, at their Ginna plant, to me, there's a huge set of unknowns of what we're going to find once we go into these PWR reactors and start looking at some of these reactor internal components that have never been looked at before since they've been put into operation. So I don't know that we're going to find anything, but if I think

that's an area that's fertile for finding things, I think that's going to be an opportunity for us to find things that we probably haven't -- may not be anticipating at this point.

COMMISSIONER SVINICKI: And I want to hear from others, but you've raised a really interesting point. Another element of surprise for us might be, we knew about the phenomenology but somehow our inspection system was not encompassing it. So that's another aspect, and Mr. Flaherty, maybe you'd have some perspective on that as well. So it can be the materials knowledge and phenomenology, or I guess it could just be our method or awareness in terms of inspection protocols.

MARK FLAHERTY: Yeah, and that's why, for this year's outage, we were actively engaged with industry experts to help us to, you know, as part of the inspection, also to start looking at what other things should we be looking at going forward. The whole reason we got into the initiative with DOE and EPRI was we need the information now to start evaluating what things we need to do to set the unit up for, you know, additional operation 60 to 80. So that really facets into is there stuff that may come up that, you know, we, the industry, whatever, is not currently aware of that's a new insight that would help -- that we want to start addressing now. So that's why these initiatives are really kicking off now early in our extended period of operation for the units.

COMMISSIONER SVINICKI: Did anyone else want to weigh in about the issue of the next technical surprise?

ROBIN DYLE: I guess the -- we asked ourselves that question when we tried to update the Degradation Matrix the last time. And the question

is are there items that we're in the bottom of the bathtub on? And that, in 60 or 80 years, you might hit the back end of that bathtub curve. And if those were to occur, where might they be? Again, it's an intellectual exercise where you're trying to do that, but the question becomes then, if I can postulate that it occurs, should I be inspecting now so I find it early in life? And those are the questions we're asking. I think I agree with Mike, the next challenge is going to be reactor internals, simply because we have not looked. And until we go look, we're not going to understand the extent of how the materials have behaved. We think we have an idea, but we won't know until we prove it.

COMMISSIONER SVINICKI: And just one other question that I had for the group was, given all that you are doing and the significant investment that industry has made, as the federal regulator, NRC has a very modest amount of research resources that we can apply against these issues which I have just mentioned. Of course, they are potential safety significance, so we need to be heavily involved. But, would any of you like to offer your view of what is the most effective use of NRC's modest amount of research and resources that we have to put into this area? Of course, we always talk about confirmatory, we should be out doing confirmatory research, but is there anything you'd add to that?

ROBIN DYLE: Well, we have meetings periodically with the Research staff. We have one planned in March to look at things we're dealing with. And to me, it's either the confirmatory research or areas where we're not currently looking that we've identified as potential problems where we just need data generated. It would be great for the staff to be able to use those monies to go do the laboratory work and generate the data. It makes it available for the

public, it makes it available for all to use, and it helps fill those knowledge gaps. I think being able to work with the staff on things like that would be very good, because it helps us more quickly bring some issues to close, or determine the extent of what the problem might be in the future. I think that might be beneficial.

COMMISSIONER SVINICKI: Thank you. Thank you, Mr. Chairman.

BRYAN ERLER: I'd like to address that too a bit because the issue with regard to research, you know, we're -- we talk a lot about light water reactors, it was a subject of all of our dealing with materials here. But the fact that research can be very beneficial is the next generation. We've done a lot of work from DOE with regard to materials, but gas cooled reactors, liquid metal reactors, they're moving forward with Idaho, there's real material research that needs to be done to get the right materials into the reactor.

And I would put a high priority on supporting that area, so that we have the materials available when we get asked the question about new materials. You know, are there new materials that should be going into the standard, or going into the design? We need research to verify that new material and the behavior of that material. And that is, I think, a critical step for the next generation of reactors.

CHAIRMAN JACZKO: Turning to a slightly different approach to this, some of the issues that we've seen with some of the plants recently have more to do, I would say, with construction defects. Issues that occurred, probably a good example is the Beaver Valley containment liner corrosion, it turned out, I think, the root cause was some material left over during

construction. And this, perhaps, gets to, I think, a question that Commissioner Svinicki raised as well, is this idea of our ability to do inspections and the extent of our knowledge base based on what we think now are the problems.

And so therefore we inspect certain things, and we kind of operate in a certain sphere of -- we inspect things, we find things in the areas we inspect, but maybe outside of that there may be other issues. To what extent are we, or are all of you, looking at issues of potential construction errors or defects that could manifest themselves later, in operations? You know, as an example, when we do some of these irradiation effects testing, do we put in construction flaws, or defects, and see how those may propagate, rather than take material that wouldn't have something like that?

MICHAEL ROBINSON: I'll make a comment and allow the others to. But I mentioned earlier that the MRP guidance 139. And you talk about construction defects, and construction methods, and those kind of things. And, if you recall, the issue that got us to do the dissimilar metal weld inspection several years back, was the discovery back in the 2000 timeframe of a leak through a hot-leg weld at one of our plants. As the research was done to understand why that situation occurred, what was pointed out is there were a number of repairs that were done during the original fabrication. There was actually a, you know, the actual welding sequence itself was a contributor to that issue.

We then, I think, saw the importance of understanding weld repairs, and making welds, and that was one of the drivers for looking at our inspection frequencies for these dissimilar metal welds, whether you're talking about pressurized, or reactor coolant, your loop or whatnot, and saw the industry go to

a shorter inspection interval for those welds because of things that we knew could have been, and probably did happen, during original plant construction. So that's an example of where we -- we have taken operating experience, we have looked back at construction effects and tried to build that into our current inspection plans today.

ROBIN DYLE: One of the things that Bryan mentioned is that in new construction they're looking at the effect of weld repairs, and to go along with what Mike's identified, that has been a key player. Because when you, you might have lack of fusion at a narrow point in a weld, and you do a deep repair localized, you create an unfavorable stressed rate at that location, and we have seen that feed in to stress corrosion cracking.

I'll be honest, I'm not aware of any situation where we, for example, built a sample that might have lack of fusion embedded in a weld, and then done research on that. But we have taken different types of cracked samples that we assume we have a defect at the surface, and then, through irradiation and testing, we tried to understand the effects of cold work and irradiation from that standpoint to predict how it might behave. But as far as taking actual manufacturing defect that's embedded, I'm not aware of one, but I'm going to go look, since you've asked the question.

CHAIRMAN JACZKO: Okay. Well thanks, I appreciate that. I think so much of the challenge with these issues is that it is, to some degree, trying to figure out what the unknowns are. So certainly I think that will be an interesting -- I would be interested in the results that you find from that. As a follow-up then, I'm wondering, Bryan, you talked a little bit about how we're incorporating some

of the work that -- some of what we're learning from the materials side and the inspection side, how we're factoring that into the design piece. Are we doing similar things on construction codes? I guess I'm not sure that those would necessarily fall under the ASME codes, but does that process happen as well, that as we identify something that has a root cause in construction, or that we update construction codes and standards to ensure that those methodologies are reduced, or --

BRYAN ERLER: Yeah, let me address that. With respect to ASME, obviously, Section III, Division Two is a concrete for the containment. For both post-tension and pre-stressed concrete containment, and reinforced concrete containment. We do have a lessons learned as part of that committee. Most of the issues, you look back, a lot of the plants that were built in the ’70s, we're all familiar with it, had concrete placing issues and some welding issues. And there's lessons learned that have gone in, where it's appropriate, to are there code changes that are necessary. A lot of the stuff we're finding is it's not code changes that need to be done, its implementation, the rigor of the implementation. But there are some changes that need to be done, in, perhaps, more the oversight of that type of construction.

There is work that's being done by outside organizations. Right now, going on is a meeting with, it's called NESCC. It's a group, it's, Nuclear Energy Standards Coordinating Collaborative. It's very hard to say. But it's an effort of all SDOs, and DOE was a part of bringing it together, and all the SDOs are there and dealing with these kinds of issues: lessons learned, and how do we change a standard, or implementation of a standard, to help prevent that in the

future plan set? Again, it's a group of SDOs that have a group of activities, so it's taking some time. But there is an effort going on that has ACI, AISC, AWS, ASME, ANS, IEEE, you name a letter and it's participating, and it's very effective, very effective. And NRC is very active in being part of that too, from the standards side of it, and your research part of it, too. I know Mike has been very active and maybe addressing that. But I think that's the more focused place of where we're looking at trying to take the knowledge of construction practice in the past, and improve it in the future.

CHAIRMAN JACZKO: If I could just, very briefly, ask one last question, and this is maybe more of -- but we haven't done a lot of philosophizing in this meeting, and -- but perhaps this is a philosophical question. Do you see the ultimate challenges for these facilities as being technical or financial? And then, like Commissioner Svinicki, this may be one that nobody wants to touch. But --

MICHAEL ROBINSON: We, and again, we've spent quite a bit of conversation about the LTO, and there was a survey done of all the executives back with U.S. utilities several years ago. And it was asking the question of, well, what's your view of long-term operational -- what are the kind of things that would really make those a show-stopper to you? And there were a lot of things like, events could happen at the plant, you know, material failures, those type of things. Financial really wasn't a significant driver in terms of that decision. I think as long as there's a strong technical basis, and that was really the challenge that the industry offered back to EPRI is we -- right now we don't think there is a showstopper or an Achilles heel, but we're asking you -- we're expecting you to

do the research to help us understand if there is an Achilles heel out there, which would be more the technical type of issue. But outside of something like that, I don't think financial -- I think the financial will take care of itself.

CHAIRMAN JACZKO: Yeah, and I guess, switching engines. perhaps I should have been clearer, I meant more financial in terms of, ultimately does it just become too expensive to replace parts and components that -- will we get to that point before we really have technical issues that drive us to shut down?

MICHAEL ROBINSON: And again, I think it's really a timing issue. I think the sooner we're able to see a clear pathway towards long-term operation, it gives us the greater ability to make that financial decision today, to allow us to really recoup those costs over a longer period of time. So I think that really works in our favor when we're able to see that we can make those decisions because we can operate. Now there's a framework that allows us to go there.

CHAIRMAN JACZKO: Well thank you, I appreciate that. And I appreciate all of your comments and your participation, and the collaboration in this area. It's certainly an area where I think lots of different equities are involved, and different roles and responsibilities, but it's good to see everyone working together. Thank you. We'll take just a quick five-minute break, and come back with the staff.

[break]

CHAIRMAN JACZKO: Now we'll turn to the staff, and I would note that -- and I was an offender, as well, probably -- we all took a little bit longer with our questions, but -- so maybe you all could make up some of that time, and I

just want to make sure we have time for the Commissioners to ask lots of questions. So, Marty, I turn it over to you.

MARTIN VIRGILIO: All right, thank you. Good morning, Chairman and Commissioners. It's been a couple of years since we've had the opportunity to brief you on this topic; as a matter of fact, it goes back to 2008. At that time, our focus was primarily on reactor material aging issues directed for the operating fleet. This time, we're going to take a broader view. Mr. Chairman, as you noted in your opening remarks, we have eight facilities now operating in a license renewal term, so today we'll put more emphasis, or an appropriate degree of emphasis, on material aging issues for license renewals.

Although our three speakers have very distinct roles and responsibilities, they're all closely coupled and work well together. I'll start with, on my far right, John Lubinksi, who is our director of our Division of Component Integrity in our Office of Nuclear Reactor Regulation. John's focus is -- and the division's focus is primarily on reactor material aging issues for the operating fleet, but he's always got an eye forward, because the work that he does will be linked to license renewal.

And that brings me to Brian Holian on my immediate right, who's got the responsibility for the Division of License Renewal in our Office of Nuclear Reactor Regulation. And Brian's focus includes reactor material aging issues for the license renewal period. Undergirding all of those activities is our Office of Research, and with us today is Mike Case, who's our division director for the Division of Engineering in our Office of Research, and he supports us across the entire spectrum of operation. So with that, let me turn it over to the staff. John.

JOHN LUBINSKI: Thank you. Good morning. This morning I will discuss a few materials degradation mechanisms that have been observed during the first 40 years of plant operations. I will then discuss NRC's interactions with the industry and our current focus areas. On slide four, we list five areas where materials degradation has been observed in service, been extensively evaluated, and are being successfully managed under an established NRC regulatory framework. Neutron irradiation can embrittle the steel reactor vessel, making it less tough and less capable of withstanding, for example, the effects of pressurized thermal shock in PWRs.

Radiation embrittlement has been understood since the early '60s, and NRC established regulatory requirements to monitor and manage the phenomena of pressurized thermal shock in the '80s. Based on extensive research performed by both the industry and NRC, NRC published 10 CFR 50.61a, Alternative Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events, which ensures the fracture toughness of PWRs is being managed based on state of the art science and without imposition of unnecessary conservatism. This rule became effective in January 2010.

An issue with reactor vessel head penetrations is that exposing nickel-based alloys in a high-stress condition to high-temperature water can lead to cracking by primary water stress corrosion cracking. The most notable incident occurred at Davis-Besse, found in the spring of 2002. NRC and the industry responded generically to this issue using multiple processes. In 2003, NRC issued an order requiring plants to perform visual and nondestructive examinations. NRC participated on ASME Code committees, which developed a

code case which was based on the inspection requirements in the order, and in September 2008 as part of its regular updates of 10 CFR 50.55a, NRC required all licensees to implement the ASME Code case.

In the spring of 2010, Davis-Besse identified leakage in vessel head penetrations. The head was a replacement head but was made of the same materials as the original vessel head, so we did expect they might experience some cracking. However, this degradation was discovered before the effecting structural integrity, due to the inspection practices implemented by the current regulations. Primary water stress corrosion cracking of dissimilar metal butt welds has occurred at several plants, and is another example of the use of multiple processes to address potential safety issues.

Licensees inspected these welds in accordance with an industry initiative. NRC performed inspections of licensees' implementation of this initiative and participated in the development of an ASME code case which adopted the essential inspection requirements of the initiative, and in May 2010, NRC proposed to endorse and require licensee implementation of the code case, with additional requirements in its proposed 10 CFR 50.55a. In the mid '90s, the BWR vessel and internals project developed guidance on the management of aging degradation in vessel internal components, including mitigation inspection and repair.

The NRC has reviewed and approved many of these technical reports, and BWR licensees have committed to implement some of these as part of their license renewal commitments. Utilities have been successful in ensuring steam generator tube integrity through replacing steam generators with less

susceptible materials and improvements in tube-inspection programs. A key part of this program is performance-based technical specifications which are incorporated into the licenses for all plants. Overall, plant-specific inspection programs, and the associated NRC oversight, have been effective in ensuring safe steam generator operation. As you can see from these examples, NRC's actions, including interactions with the industry, has resulted in timely industry response and durable regulatory requirements.

Overall, NRC continues positive interactions with the industry. NRC reviews the more significant materials initiatives developed under the NEI 03-08 program. Some initiatives eventually become NRC requirements, either through the inclusion of the ASME Code and subsequent incorporation into our regulations, or through a licensee commitment to these as part of either a license amendment request or a license application such as for license renewal. Starting with the development of the BWR vessel and internals project and continuing with the development of NEI 03-08 and the PWR Materials Reliability Program, there's been very good communications on materials issues between the industry and NRC.

Starting in 2009, industry and NRC initiated annual executive meetings. These discussions include exchanges of technical information and understanding a potential alignment on priorities of addressing materials issues. NRC staff participates in the consensus process for writing ASME Code requirements and development of code cases. NRC then endorses the ASME Code via its updates of 10 CFR 50.55a, some of these with additional regulatory requirements. NRC and ASME executives routinely meet to discuss their

activities and prioritization of work, similar to the meetings I discussed with the materials executives.

Slide six includes a list of current NRC focus areas. In addition to the inspections of nickel alloy materials I discussed earlier, industry continues to develop strategies for repair mitigation. NRC is supporting consensus efforts on ASME Code activities to support review of these repair mitigation methods, and is reviewing licensees' re-analysis of leak before break for repair mitigation methods that impact applicable piping. In addition, NRC and industry are performing research activities in support of extremely low probability of rupture methods, to develop a probabilistic, analytical framework to evaluate stress corrosion cracking mitigation and its effect on the probability of piping rupture.

ASME Code Section III requires radiography examination for acceptance of welds. Radiography requires vacating portions or all of containment, which creates radiation safety challenges for plant personnel. This could be avoided if ultrasonic testing was permitted in lieu of radiography. Before NRC could approve licensees to use ultrasonic testing, it needs to determine that whether ultrasonic testing and radiographic testing is interchangeable for the purposes of ensuring structural integrity. Mike Case will talk more later about research that's being done in this area.

High-density polyethylene piping, as was noted earlier, is being considered as an alternate for buried steel piping because it does not corrode or foul like steel piping. As part of its review of applications to use polyethylene piping in buried piping systems, NRC determined it needed additional information regarding two aspects. One is the integrity of the fuse joints, and the other is the

long-term material performance. As part of its approval of two applications for the use of polyethylene piping, NRC imposed conditions to address both of these issues. NRC is continuing to participate in ASME Code activities that would support the use of polyethylene piping in buried piping systems to ensure that these concerns are adequately addressed. PWR reactor vessel internal components are expected to experience age-related degradation as they are operated into their extended periods of operation.

To address this, the PWR Materials Reliability Program developed an initiative and submitted it as a topical report for NRC review and approval. The report contains a discussion of the technical basis for the development of an aging management program for PWR vessel internal components. The staff is currently reviewing the report and intends to issue a safety evaluation at the end of this month. PWR licensees are expected to use the guidelines in the report, as approved and/or conditioned by the staff's SE, for developing plant-specific aging management programs as part of their renewed licenses.

The staff continues to interact with industry on issues that are related to both current plant operations and operation during the extended period. These include buried piping, spent fuel pool, neutron absorber degradation, and containment liner corrosion. Brian Holian and Mike Case will discuss these further in their talks this morning. In conclusion, the NRC has established and is implementing regulatory processes to address materials aging degradation issues. NRC continues to have positive interaction with the industry on materials degradation issues, and NRC and industry are proactively addressing potential materials issues. I would now like to turn to Brian Holian for

the second area of our presentation.

BRIAN HOLIAN: Well, thank you John, and good morning, Chairman and Commissioners. I'll use two slides to touch on program status of license renewal, and then present some technical issues with pictures, and that license renewal has been working, along with our sister divisions in NRR, and then I'll comment on recent update guidance, in particular the GALL, and close with a quick look to the future.

One takeaway I hope you take is that there is quite a bit of cooperation and interrelationship between the NRR technical divisions, License Renewal, which has its own electrical-mechanical structural engineers, and Research, and I hope you take that away today. Along that line, I'd like to recognize behind me, seated, Dr. Allen Hiser. He's a senior level advisor in license renewal; he's been with us a couple years now. He came from John's division, the Division of Component Integrity, a couple years ago as a branch chief. He interfaces well with the senior level advisors both in the technical divisions, Research, and New Reactors. Next slide.

This slide is a bar graph presentation, really just to show you the license renewal workload over the last several years and the future years. I purposely left off Y-axis descriptors there, they're FTE, a combination FTE and contract money, but it does show you that over these current two years, we're in the peak of our work. We do both safety and environmental reviews -- that covers both of that casework. As an aside, license renewal does the environmental work for all of NRR, so power outbreaks, Molly-99, other issues are covered out of license renewal. So it does highlight those first two bar

graphs are the peak of license renewal work over the 10-year history so far. We've peaked up over the last three years, and you'll see a slight decline over the next several years and a continuing decline as you go out to 2016 and 17. Next slide, please.

This is just a quick summary of the 104 plants, so there are 62 licenses renewed, Chairman, that other one was just yesterday, to 62, Kewaunee plant -- we do have 20 under review in various stages. That includes five in adjudicatory aspects. We do send out a regulatory issue summary every few years for licensees to schedule their reviews, when are they coming in. That's worked pretty well; they've spaced their reviews pretty well. We do have 20 that are scheduled with two that are not scheduled on that bar chart before, but we expect to get their applications in.

We'll fit them into that bar chart and workload as that comes on. I do highlight that eight of those plants, as has been already mentioned, are in their extended period, and I like to keep highlighting that because in reality, the license renewal commitments are starting in their extended period, and the real measure of the success of license renewal will be how well those aging management programs work in that period. Next slide.

The bulk of my presentation is a series of topics that represent some of the technical issues that we found, both in Part 50 space and Part 54 space, during license renewal. In line with the materials theme, I'll focus on materials issues. We do continue to have issues with scoping-type issues, where a lot of our requests for additional information -- are you getting the right things into your license renewal program that should be applied -- so ACRS

identifies that with many of their independent reviews of our applications, that we continue to ask those questions and see surprises sometimes on whether they're scoping things in. Commissioner Apostolakis, you asked earlier about an operating experience issue that was out of the ACRS review, and if I remember it right, it was an issue with operating experience for their new programs, the ones they haven't put in place yet, and they were using an EPRI database for generic operating experience.

That's part of our review; we do verify that they use at least five years of operating experience for their ongoing plant-specific programs, and in that particular case, ACRS identified that at a subcommittee, the Region and headquarters went back out and audited that they did have plant-specific operating experience for that particular plant and applied it, and there were no surprises there. On the slide on metal fatigue, I want to highlight this as a first technical issue -- I don't have a picture to go with that -- but you know, it is a key issue. You've asked what some key issues are; metal fatigue is clearly one.

We ask questions: has the applicant conservatively forecast heat-up and cool-down cycles for the rest of the period? Are the stress calculations bounding? I would like to highlight at this time that we do perform on-site audits as part of our reviews of the applications, so we still go out with our technical reviewers from headquarters to do independent audits, and in particular, metal fatigue -- it was a couple of years ago that on one of those audits, the staff questioned a simplified assumption that they saw in the background material for the application, where they used one stress input instead of six stress inputs, that there should have been in the calculation. Staff questioned whether that was

conservative, that resulted in the applicants, there were a couple applicants, revising their analyses to prove that they were still conservative. And how do we correlate that to Part 50 space?

What we do, on many of our issues, send out generic correspondence so that applications -- future applications and plants that have already come through will address it through the Corrective Action Program, and that was done in that case. The final thing on metal fatigue I'd like to highlight is that in license renewal space, it is the time that we spend a lot of emphasis on the environmental impacts, the fatigue. It was an old generic safety issue that particularly looked at environmental impacts and said, "We look okay for the first 40 years, but in particular we want license renewal doing a more in-depth review of the environmental effects fatigue," so we accomplished that in our reviews. Next slide.

Many materials issues have to do with, really, just the long-term effect of water getting to where it's not supposed to be and staying there for a while. And the first example that I have is a BWR drywell, outer wall corrosion. I know this one's very familiar to the Commission; the issue was water had run down into the sand bed region. I'll go to the next slide with the picture. These are schematics that we've used at ACRS. They're a little detailed here, but on the left-hand side you do see the light bulb-shaped drywell, and water had run down into that sand bed region. It's hard to see, but it's right at the lower left-hand corner of the schematic.

The resolution, the issue was obviously the water sat there over years, and it either had gotten through the coating, or areas where it wasn't

coated appropriately, and caused corrosion. On the right-hand side, you see a schematic looking up from the bottom of the drywell with actual mills that were done from measurements, ultrasonic measurements there. The area was recoated on this particular application; the applicant came back to ACRS a couple times at least, and they did some 3-D finite element analysis of the whole drywell, so a very well-studied drywell. And we sought commitments through the license renewal for periodic ultrasonic inspections through the period of extended operation. We also issued generic correspondence on that issue. Next slide.

Branching to another -- well, that was a picture of the actual pictures. I'm sorry, I should have forwarded that. On the left was the before, and the sand bed has been excavated out there so that they could enter, and on the right was after recoating, you still see a dimple from many of the numerous pits, but that's recoated some spots where we did ultrasonics. Next slide, please.

Torus pitting -- staying with the BWR theme a little bit, a reminder that torus is that circumferential pressure suppression chamber surrounding the inverted light bulb, and what we've seen, not so much a safety issue here, but an ongoing issue for concern as we look forward.

The Regions were following, obviously, from refueling outage to refueling outage, the repairs made to toruses. When it came under the license renewal spotlight, you know, you realize that over the years, they were fixing thousands of pits in the torus, and so were they really getting to the root cause of it, which is eventually either a recoating or some plants didn't even have an initial coating on the torus. So we're able to get commitments from them to recoat at an appropriate period if that's appropriate for them, and these two plants in

particular over the last year have decided to do that, either right before the PEO or the first refueling outage inside the PEO. Next slide.

And that's a quick picture of some of the torus pitting areas. You see some previous ones that had been patched, and you see an inspector kind of inside the torus there, during an outage, taking measurements prior to a recoating of the individual spots. Next slide.

I'll branch over into containment liner issues. The issue in general is corrosion, both internal and external. I'm going to highlight four pictures that show the aging effects of water, wood, moisture, and really what we'd call a construction artifact. Chairman, I know you mentioned some construction issues, and we'll show one.

This first slide is a schematic of a PWR licensee, and really, I want to show you the Detail A there, it's at the concrete base mat, and it's where the steel liner plate comes down inside containment. And at that spot, all plants have a moisture barrier there. What we've seen on numerous plants, at least four to five over the last five years, has been some degradation in that moisture barrier, almost like a caulking-type material that over time and water has gone down there. Plants are doing a good job of looking at this now, putting borescopes down to see the extent of the degradation and fixing that, so they seem to have a good handle on this issue now. Next slide.

This is one that, Chairman, that you alluded to at a plant where as you see, a progression of pictures, what was first identified as an internal blister in the liner, as you put the screwdriver up into it, went through the liner. So that was the first indication that you had. The second picture to the right there shows

a deeper penetration right through wall on the liner and into the concrete space behind. This particular issue was due to a piece of wood left from post-construction, and the issue there is good visuals on the internal of inspection, but then the licensee did make commitments for a UT examinations to try to see the extent of the condition over the next few refueling outages. Next picture.

This is a more current plant. As a matter of fact, this one's still in-house, and in containment liner -- this particular plant had, in the basement of the containment, really up as high as 20 to 30 feet, a liner insulation that covered the lower aspect of containment. They did come in, even before their application, they were pulling the liner plates off, and looking behind just to see what they had, and found some extensive degradation just due to moisture that has come down from maybe service water leaked piping, running down alongside the containment wall. Once again, the individual issues are fixed by licensees and they go into an enhanced monitoring program.

And the final slide is also an in-house application, still. This is a plant dealing with some external concrete issues, currently now in an outage, but also internally what you see, there are containment liner bulges. So you actually see the lines and the bulges; they've been around since, some of them, at the construction period. They're in between the kind of liner stiffener plates, as they call it, and there's a gap there. The licensee is doing a better job now as they come in with the highlight towards a license renewal aging management program, putting in place a measurement technique to make sure those bulges aren't growing and that the gap isn't increasing between that and the concrete behind it.

Next issue I just want to highlight briefly, and I know the Commission was briefed on groundwater last week, I believe, is underground in buried piping. The issue there is corrosion, as you know, and really operating experience, in particular the last three years, we've seen -- highlighted a number of issues with buried piping. I want to just show you a couple pictures and highlight some of the issues here. The first picture shows a plant with a pipe in scope of license renewal, coming through the turbine building concrete wall. And you see some leakage of the water right there; this was a picture taken within the first day of identification of the leak. So this is, quote, categorized as underground piping, but still within the scope of that industry initiative that you were briefed on last week. The next picture.

This is a success story, really. And I don't know if it was the Groundwater Initiative that caused it, I claim to think it was them coming in for license renewal application, and seeing what we were doing in GALL Rev. 2 was improving the number of inspections that we would require them in the extended period, or part of the extended period. This was a safety-related pipe that was dug up, was not leaking, however it had coating issues and had corrosion issues, and they were able to replace this as part of their schedul, and find an issue before the leak. So I know at the Groundwater meeting you asked, are your monitoring issues leading you to actions. In this case, and with the license renewal rule, I think it did, or we view, I think it did.

You know, about ten slides from now I'm going to come back to buried piping and give you a highlight of a GALL issue. So we'll cover a little bit more on buried piping with that program, and you'll see a slide on how we've

updated that GALL. The next slide is, inside the spent fuel pool, neutron absorber blistering. Many plants have a thin sheet of neutron absorbing material in the spent fuel racks. We've -- there's many different designs out there, we've covered some of them in the GALL. Recently -- I'll won't say recently, several years ago, degradation was noted. The next picture shows a coupon of a neutron absorber that was pulled from the spent fuel pool, and you clearly see the bubbling there. And then the issue is that bubbling may be caused by moisture that was in there when the substance was made, maybe some hydrogen formation there that caused that blistering, and the issue is, is criticality analyses still conservative?

So once again, this is an issue, good issue, that once again crosses part 50 space and part 54 space. We put out an Information Notice on this, and the Region responded very stringently. The first plant that identified this out in Region III, and made sure that their spent fuel pools were still within their operating assumptions. We take it a step farther and make sure they have commitments in there, for routine periodic examinations going into the extended period.

The next issue is electrical cables. You know, once again, Commissioners, you're asked about issues, and I think that might be an issue in the future. And electrical cables is clearly one of them. It would be, probably, an economic issue to replace them all, I hear overseas they're looking towards just replacing cable, by monitoring the aging of them. I don't know how true that is.

But in our license renewal story base, it was a license renewal auditor or an inspector who first went out, maybe four or five years ago, and said,

"Could you open up that manhole? It doesn't look like it's been open in a while." And found it full of water. And asked the question, "okay, are those cables qualified for underwater submergence?" And the utility said, "We think so." We'd like to think that. But, in reality, they weren't qualified for submergence, complete submergence, and so the Regions have done a very good job of following through on other plants, including with license renewal reviews. we've sent out industry Information Notices on this, there has been enforcement on this for cases where it hasn't been fixed in time.

So, besides just the normal heat and wear and tear of cable installation, now you have the added aging effect of wet-dry, wet-dry, and what does that do to the aging issues. And so we have Research helping us with this a little bit as you go into life beyond sixty, and so it's also an item that we are making sure we have strong commitments on. Next slide.

Now that's a picture of a good manhole, you know, there was one picture I had where actually, to get to a manhole, you had to dig up three inches of asphalt out in the parking lot to get to it, it hadn't been looked at in twenty years. So, license renewal is causing them to look where they haven't looked before. Next slide.

Concrete issues. Obviously, concrete issues I would say is another issue that really holds some unknown for us as we go. There's been the neutron issues with it, the heat issues with it, that they don't think heat will do too much issues with it. I'm going to show you a picture in a little bit here, of water issues, that was a, kind of showed some extra degradation that was a known issue, but it was due to extensive water that had been against the wall for quite a bit of time.

We see things from cracks, spalling, water getting to rebar, and this alkali-silica reaction I'm going to show in a minute, let's go to the next slide.

This is the picture I wanted to highlight. This is a current open item in a review that's ongoing now. And you do see here that the applicant was ahead of this, the Region was aware of these types of cracks in a wall, this is in an electrical enclosure building. On the outside of the reactor building, there is water on the outside of that wall, where groundwater, intrusion water had stayed at a high level, obviously. And they believe the water is actually reacting some with that concrete silicate, and causing that minor cracking and some gel to form. You see there, they are taking core bores, so by the time we got the license renewal, they had taken twelve core bores to check the extent of that, and also doing some strength measurements of the concrete, they were actually seeing some loss of strength in the concrete. So it's a good item, they were ahead of it, and were able to formalize that with license renewal commitments.

That's the next picture I have. I show a lot of bad pictures, so it's not all bad. And I just thought I'd show a picture, ACRS often asks us, how is the material condition of the plants overall. Regional inspectors come to our ACRS meetings, and they give their reports on it. I just picked one, that's not a spill of water on the floor, I think that's the light that's shining off a well-polished floor. But you see good concrete base mats on safety-related pumps, there. This is an older plant, I believe it's one, it's almost into the extended period, so I just wanted to highlight that, I'd be remiss if I didn't say that there's a lot of good, obviously, out there. And we were just showing you some rough pictures before that. Next slide.

I'm going to branch over into license renewal guidance issues. We recently issued Revision 2 to the GALL. The GALL is Generic Aging Lessons Learned. We didn't have the GALL when the first plants were renewed. It was something after the first four or five plants, and it was really an efficiency issue. Again, we put out there in guidance space, what are the kind of reviews that we, NRC, would find acceptable. Applicants can come in with different ideas, and that we would have to review. But this could, if they could apply a certain percentage of consistency with the GALL that would ease our reviews.

It is a living document, we have updated it on about the five-year time frames. This review, I just wanted to give you a highlight, over ninety staff participated in it, from a lot of the technical divisions: Research, we had contractors, we had public workshops, we had a formal comment period. The GALL itself is really internationally recognized now, as a document. Vienna, over in the IAEA there, they're working on an international GALL right now, with several nations wanting to utilize that type of guidance.

We did highlight on this slide, we did receive some kind of process feedback of frustration from some of the industry as we went through the GALL process. In general, they were very engaged with us. The process feedback I received, and I think a little bit at the Commission, and at Marty's level, was that late in our review process, we had numerous requests for information to these plants that were going through, as we felt it was important to bring them up to, kind of, their current operating experience, for all the in-house applications. So I consider it a little blip in the RAI, but it caused some frustration for some of those plants as, “Well, what's the next thing you're going to ask me about?”

A lesson learned for me, maybe, is, you know, you do these five years updates, we do have an interim staff guidance process that we use, and maybe we held off on some of those that we were doing as we were heading into the last two years, part of the GALL update, and saved them all for that. And I think we can be better at that in the future, and issue those from now until the next GALL update, and rope them in. The next slide shows you an example of a GALL page. And this is not an exact page out of the GALL, it's more detailed and finer print, but it does highlight, back to buried piping now, and this, I think, shows a big gain from GALL Rev. 1 to GALL Rev. 2. In GALL Rev. 1, you had a requirement for digging up one buried pipe. And it could be any system that they chose. What you'll see here is an expanded GALL that will highlight -- I just highlighted three: steel, copper, and aluminum. But they are now required to dig up one of each material, or a certain number of each material.

And it's based on the material, the risk significance, it's based on the type of fluid in the piping. And you see a column there for preventive action. We do try to credit them for, if you are sure you have good back-fill material, if you have cathodic protection that is working well and has been well-maintained, that's been proven, well-proven in industry standards to prevent leakage. So, we can credit them with less inspections, if that's the case. Next slide. You know, I wanted to pause here, really, and, on this slide, highlight the Regional input that license renewal gets.

You know, you have the inspectors out there, the same inspectors who do maintenance rule inspections, they do the corrective action inspections, and then you have a set of them in their division, Reactor Safety, who highlight

themselves and train themselves in Part 54 in the aging management in the GALL. And it's working very well, they go out and inspect and look at issues during our review, so they feed off of our audit, our audit feeds off of their inspections, our safety evaluation expands on things.

It's not uncommon to have a license renewal applicant supplement their application with either things that weren't in scope, or tweaks to their aging management programs, based on a Regional inspection. So I wanted to highlight that. They also go back. The Regional inspectors go back. And this is even getting more important to me and them, especially, as they get into these inspections for the plants, right prior to going into the PEO. And they have an option to even extend that, the first year, into the PEO extended period, the period of extended operation. And they are finding issues from those types of inspections. You know, we'll probably have to put out an Information Notice with the type of issues, the industry's pretty well self-learning. When we have an ACRS meeting, it's not uncommon for twenty, all the applicants that are in-house, come to learn from the ACRS meetings.

We have quarterly public meetings with the industry, and you routinely get twenty to twenty-five licensees there, to catch up on the latest issues, or what's coming down the pike. One example of an inspection issue was at the Dresden plant out of Region III. And they really did very well. One, they check, are you fulfilling the commitments as written in the safety evaluation. But also, what are you finding, and what are you doing with them? And Region III highlighted one issue, where they would do a one-time inspection.

The utility did that, they found degradation in a vent piping ducting,

they said, “Okay, we'll look at the other plant”-- it was a dual unit site. They didn't expand it to other ventilation piping, and that, and they didn't incorporate it into an aging management program. They kind of just credited a one-time inspection, and maybe they scheduled one for the future. But the Region said, “Hey, this is the type of issue we're looking for.” You find something on a one-time inspection, it's a new aging mechanism, you put it into aging management. So the industry's learning out there, and our Regional inspectors are helping them along.

ACRS, I highlighted them earlier. Very good independent reviews. They do an independent review of the application, and they also do a good independent review of the staff review. So we learn well from the ACRS questioning. And they often have dual or repeat subcommittee meetings on technical issues. They have had us back on drywall and containment issues for a second subcommittee before we go to the final safety evaluation and a final full subcommittee at the ACRS.

Next slide -- looking to the future. In our preparation for potential subsequent renewals, I like to feel like we are in NRR space. I'm trying to put my Research folks out there first on the potential second subsequent renewals. We're trying to continue to highlight and ensure for good safety evaluations for the current fleet here, still, and that's been our focus. We are participating some with Research and some with some of the industry forms, and we'll pick up with that a little bit, we're budgeted a little bit over the next couple years to start looking at applications, and how will they differ. But I wanted to highlight on this that, you know, we are -- we don't have a time frame for a second subsequent renewal. I've heard the industry press at the conference last week, they're

looking at the 2016 time frame, but nothing has been scheduled with us yet.

In preparation for it, though, we have asked Research to help us. And in particular four items: hold recurrent workshops, like we've done last week, expand on the materials degradation assessment to verify current assumptions, and are there any new items we should have for kind of a base for an aging management program that might differ for sixty to eighty. We also asked Research, and they are just going to be starting that, to kind of assess the aging management programs now, and I'll go back to the Regional inspection. They're looking at the current SER commitments. It'll be -- the time is now to start looking at, okay, have you also been learning from GALL Rev. 1 and GALL Rev. 2? I don't have a great hook to them to make sure that their operating experience program is keeping up with improvements that we made in the GALL, for those plants that were licensed before us.

So we do have -- we're working our RIS right now, Regulatory Information Summary, that will put out the highlights of GALL Rev. 2 and licensees will have to put that in their corrective action program. And we will go out and look and inspect how well they're doing on that in the future, on some of those inspections. And finally, the last item for Research was to continue to work with international partnerships and domestic partnerships to help us, and make sure all of our money goes wisely, to the right areas.

Next slide, finally, in summary. I'd just really like to highlight for the Commission that, you know, we do believe that license renewal is focused on ensuring aging issues are identified. You know, the pictures I showed you, we keep them highlighted on our wall on the eleventh floor in One White Flint there.

We have them there, we have them in the Region. It's reminders to us of the type of issues to look for, and also reminders to get the strong commitments in the safety evaluation to insure for robust programs by licensees. You know, we have a blank sheet up there, also, what is the next aging management picture we want to try and get ahead of, and when we're out on our audits as a reminder for that.

License renewal is a good mix of, I wanted to remind you, in our view, of a technical review and inspections, so I think I highlighted that, and I highlighted that with some of the ACRS issues. We do have a mind, not only to the future, but coordinating with our Part 50 brothers, and the other four technical divisions to make sure that we issue generic correspondence and address things in Part 50 space and Part 54 space. And then, finally, we are looking to the future, towards the second quote, “subsequent renewals.” And with that, I'll turn it over to Research for a little more information on that.

MICHAEL CASE: Thanks, Brian. Good morning, everyone. I'm here today to discuss the NRC's Material Research Program, focusing on activities related to extended periods of operation. But before discussing extended reactor operations specifically, I'd like to mention that the highest priority for the Office of Nuclear Regulatory Research is to provide technical support to the program offices for the oversight of current licensees. Much of our present materials research is conducted to address issues in operating reactors for the Office of Nuclear Reactor Regulation. We also support the Office of New Reactors, most notably in the area of advanced reactors, and the Office of Nuclear Material Safety and Safeguards, most recently on technical issues

associated with spent fuel storage.

In my presentation today, I will briefly highlight some of the current material research areas, because nearly all our work that supports current issues at operating reactors is relevant to long-term operations as well. Furthermore, I will describe to you some of the targeted research activities to systematically and effectively identify unique material degradation issues that may arise during the extended operating period, but may not have been observed in plants to date. Next slide, please.

The NRC's Material Research Program provides our partners in the program offices the technical advice, tools, and basis to support them in identifying and resolving potential safety issues, making regulatory decisions, issuing regulations, and developing regulatory guidance. We invest approximately twelve million dollars per year in our research program that is almost completely user-need driven. A user-need is a specific written assistance request from the Program Office to provide research support for a particular safety, regulatory, or technical problem. The Materials Research Program currently involves about a dozen user needs covering over fifty specific tasks. When appropriate, we coordinate our activities internationally, or with industry, to ensure that the most effective and efficient use of resources.

Some of our more important areas of ongoing research are listed on the slide. Our products are typically technical evaluation reports for the program offices, NUREG series documents, or the documents that establish the technical basis for changes to our regulations. For example, our work in the reactor pressure vessel integrity area became the technical basis for 10 CFR

50.61a, the alternate pressurized thermal shock requirements. Our work in non-destructive examination influences the development of the ASME code, and ASME code cases that are eventually incorporated by reference into our regulations. Since you've heard from John and Brian about many of the issues in these ongoing areas, I just wanted to pick one project to illustrate some of the innovative work that is being done in this area.

The Extremely Low Probability of Rupture, or xLPR project, responds to an NRR request for assistance in updating the current leak before break evaluation procedures detailed in the staff Standard Review Plan. These evaluations are currently conducted using a conservative deterministic approach to ensure that the likelihood of reactor coolant system piping rupture is extremely low. The goal of xLPR is to use best estimate models that properly account for uncertainties to quantitatively evaluate the effect of active degradation mechanisms, in-service inspection protocols, and associated mitigation activities, to provide a more direct assessment of compliance with the probabilistic acceptance criteria in General Design Criteria 4.

This tool will be sufficiently adaptable to permit analysis of a variety of in-service conditions, and accommodate evolving and improving knowledge, as well as additional degradation modes. Important stakeholders, such as the Electric Power Research Institute, the international community, and the Advisory Committee for Reactor Safeguards, are appropriately involved in its development. Several National Labs are also under contract to support this project. The xLPR pilot study was completed on schedule late last year. A briefing to ACRS on this pilot study is currently scheduled for September of this

year, and version two of the xLPR modular code tool is expected in 2013. Next slide, please.

One of the principle attributes of a vibrant materials program from a safety perspective is to never become complacent in addressing potential safety issues posed by material challenges. In collaboration with NRR, our research projects have provided key information to help them assess the scope and depth of potential safety issues associated with these challenges. Some of these projects include our investigation of containment liner degradation, which has specifically identified conditions necessary for the initiation of corrosion at the interface between the liner and the concrete. Our work will help NRR recognize that similar conditions could occur at other plants and ascertain if there are specific vulnerabilities associated with particular containment designs.

NRR will also use the findings to determine if an update in review guidance documents, such as the Generic Aging Lessons Learned Report, is warranted. With respect to high density polyethylene piping, we're conducting confirmatory research for both NRR and the Office of New Reactors to assess the service life, design, fabrication, and inspection requirements for the generic use of HDPE piping. Our information and insights is helping to build a robust technical position in ASME's consideration of the revised code case concerning HPDE, as well as supporting NRO in their consideration of a topical report concerning the application of this piping.

Once again, I think a short example will help illustrate the close collaboration between Research and the licensing offices and the high safety ethic by which we consider these material degradation challenges. A particular

emerging issue that drew attention in the past year involved the degradation -- involved the cracking of the replacement head at Davis Besse. Following degradation of the head in 2002, the licensee replaced the degraded head with an identical head from a cancelled plant until a new head fabricated from more corrosion-resistant material could be attained.

During the scheduled refueling outage in the spring of 2010, the licensee noticed flawed indications on a number of control rod drive mechanism penetrations, as well as evidence of boric acid leakage. The Region III inspection staff, supported by NRR, led the agency evaluation of the licensee's corrective actions. In support of their efforts, the Office of Research provided expedited technical support to NRR and Region III staff by conducting confirmatory analysis of the licensee's non-destructive examination findings and performing several component integrity calculations. More importantly for us, we were able to provide this support with our own in-house staff, thus lessening our reliance on contractors and improving our responsiveness.

Finally, at the request of NRR, we were in the process of confirming some of the underlying assumptions in our regulatory decisions by conducting crack growth rate tests on actual samples from the degraded Davis Besse reactor head material. We have just completed decontamination and machining of those samples, and we expect the testing results to be completed by the end of March. Next slide, please.

While the research programs described to this point have primarily been initiated in response to material degradation issues identified in current operating plants, the consideration of extended reactor operations may

necessitate a broader scope of activities, in particular, the effects of long term exposure of reactor materials to high temperature, pressure, chemically corrosive conditions, and radiation fields must be evaluated. These conditions may increase the susceptibility of materials to the type of degradation already observed in the operating reactors. In such case, the scope of our research programs already in place may need to be expanded to consider the condition of extended surface. For instance, the project investigating irradiation embrittlement of reactor internals may need to evaluate doses over 80 years of operation rather than 40 to 60 years.

Because there's a lack of operating experience with power reactors in service beyond 60 years, there's a possibility that new degradation issues will arise that have not yet been observed in the reactor fleet. To ensure continued safe operation, we must methodically identify and evaluate such potential degradation phenomena. As will be discussed in subsequent slides, efforts are underway to identify these issues and to assess the impact for greater than 60 years. Next slide, please.

Okay. Working in collaboration with the Division of License Renewal, our first area of focus was to begin the systematic identification of potential material degradation issues for extended operation. First, we assessed the integration of the results of the proactive material degradation, or PMDA, into the Generic Aging Lessons Learned, or the GALL report. The materials degradation – the PMDA was conducted between 2004 and 2006 using an eight member expert panel. For each component, the panelists first ranked the potential degradation issues, such as stress corrosion cracking, or fatigue, first

by the degree of susceptibility, and second by the level of knowledge associated with the degradation mechanism. The results of the PMDA are documented in the NUREG-CR-6923.

Under a 2010 NRR user need, the Research staff has identified a discreet subset of material degradation issues that were not addressed in the GALL report. The staff is currently working on the disposition of these remaining few issues. In order to assess potential issues for extended operations, the staff has recently initiated an expanded materials degradation assessment using a process similar to the PMDA but looking at a broader range of material aging issues. Specifically the expanded material degradation assessment will explore systems and components beyond the pressure boundary -- beyond the primary pressure boundary, such as concrete structures and electrical components. Further, in anticipation of extended reactor operations, the expanded material degradation assessment will reassess primary pressure boundary components for up to 80 years of service life. The expanded material degradation assessment final report is expected by the end of 2011.

Because the oldest plants have recently entered the renewed operating period, there is limited operating experience information specifically related to components in material degradation within the period of extended operation. Licensees with renewed licenses have committed to aging management programs either consistent with GALL or with other plant-specific aging management programs. Since there are no license requirements for submittal of the results to the NRC, the staff cannot easily gather results of inspection or monitoring that licensees have performed in support of license

renewal. We are commencing an activity this year, perhaps in collaboration with industry, or through site audits, to gather this type of information. Operating experience information will be important to inform our regulatory decisions on the appropriateness of existing monitoring and inspection requirements and potential areas for additional research concerning periods of long term operation. Next slide, please.

One objective of our work on issues for extended operations is to conduct them in the most efficient and effective manner that we can. As you have heard previously, the industry and the Department of Energy have active research programs to consider feasibility of operation beyond 60 years. Likewise, countries around the world are facing the challenges of aging reactor fleets. The mutual need to address material degradation issues associated with long term operations provides the impetus for collaborative research, thereby allowing NRC to leverage limited resources and to benefit from the sharing of valuable knowledge with domestic and international partners.

To this end, the staff has entered into a Memorandum of Understanding with the Department of Energy and the Electric Power Research Institute to collaborate on various activities, such as the expanded material degradation assessment, mentioned earlier, and a recent workshop concerning U.S. nuclear power plant life extension research and development held last week in Washington, D.C. The workshop brought together many stakeholders from NRC, DOE, industry, and the public to discuss regulatory and technical issues associated with long term operations. Internationally, the staff is working towards the establishment of the International Forum for Reactor Aging Management, or

IFRAM, to bring together interested parties from around the world to collaborate on important research activities. The kickoff meeting for the international forum is planned for August of this year.

In addition, the staff plans to support a senior-level workshop on long term operations sponsored by the Nuclear Energy Agency in June of this year. And finally, the NRC and the Department of Energy have agreed to co-host an IAEA, International Atomic Energy Agency, symposium on plant life management in 2012. The staff intends to develop for NRR an annual summary of international collaborative research results highlighting any newly identified technical issues that should be considered in the license renewal process. One of our most effective means to develop testing data to better understand the aging issues for the period of extended operation is to use real plant materials that have been exposed to radiation in environmental conditions of plant operation; therefore, one of our important activities in the coming years will be the recovery of selective materials and components from decommissioned nuclear power plants.

The materials will provide invaluable insights for material aging effects that are difficult to replicate under simulated laboratory conditions. For instance, it takes many years of test reactor irradiation to simulate the fluences that are expected for a reactor pressure vessel and internals beyond 60 years of operation. The Office of Research is working with the industry and the Department of Energy to harvest the materials from the Zorita plant in Spain, and the Zion plant domestically. Materials of particular interest include reactor pressure vessel and vessel internals, as well as cables and concrete. Next slide,

please.

In its expanded material degradation assessment, the staff is developing detailed focus areas for potential research on issues associated with long-term operations. The areas listed on the slide are generally thought to be important areas for extended operating period. As mentioned earlier, long-term irradiation may lead to embrittlement of the reactor pressure vessel, and internal components. Embrittlement may in fact be a life-limiting factor for these components. With respect to the reactor pressure vessel, our current research is culminating in a series of technical basis documents to revise our regulatory infrastructure. The technical basis to support changes in our regulations concerning reactor vessel material issues, such as radiation embrittlement and surveillance capsule testing, have been transmitted to NRR, along with an updated Regulatory Guide on radiation embrittlement.

A third technical basis document, on fracture toughness requirements, is planned for submittal to NRR by April. All these products support rulemaking changes that are expected to be in place by 2013. However, additional data modeling are needed to assess and possibly develop additional regulatory guidance concerning embrittlement beyond 60 years of operation. With regard to reactor vessel internals, the austenitic stainless steels that comprise the majority of the internal components are irradiated during reactor operations. Radiation can change their microstructure and increase their susceptibility to cracking. Our current research is supporting NRR's regulatory decisions related to reactor internals such as the safety evaluation on EPRI's topical report on developing the inspection program for PWR reactor internals.

Ongoing research is investigating various aspects of radiation-induced degradation, including the threshold dose above which radiation affects material properties, and the adequacy of crack growth rate data. Electrical cables are critical to providing the powering for operating safety-related equipment, and transmitting signals among controllers used to perform safety operations. Some cables are exposed to moisture, high temperature, and radiation fields, conditions that have contributed to the failure of some cables in operating reactors. A small group of cables are expected to remain operational during and following a design-basis accident. Research is ongoing to evaluate long-term cable performance, and to assess monitoring techniques which attempt to detect unacceptable levels of cable degradation.

For extended periods of reactor operations, the combined effects of prolonged exposure of concrete to elevated temperature and radiation facilitate chemical interactions that may compromise concrete integrity. In support of advanced reactor activities, the staff has recently completed a NUREG Report that examines the effects of high temperatures, and began to explore the effects of radiation fluence on concrete performance. While this work was done in support of advanced reactors, some findings may be applicable to the current fleet, and can help us understand potential issues for long-term operation. Future work is planned to assess monitoring techniques for concrete structures, as part of Research's long-term research plan. Last slide, please.

Thank you for the opportunity to brief you on the aspects of our Materials Research Program. I hope you gained an appreciation of how the program is focused on directly supporting operating reactor issues, and how this

research is starting to inform our considerations of issues associated with extended operations. And finally, how we are beginning to systematically and effectively evaluate potential challenges that are unique to extended operations. And with that I'll turn it back to Marty.

MARTIN VIRGILIO: Thank you, Mike. That concludes the staff's presentation.

CHAIRMAN JACZKO: Thank you. Commissioner Apostolakis.

COMMISSIONER APOSTOLAKIS: Thank you, Mr. Chairman. I don't have any questions or comments, other than to say, this was one of the best presentations I've witnessed in this room. Thank you.

CHAIRMAN JACZKO: Commissioner Magwood.

COMMISSIONER MAGWOOD: Thank you. Good to see all of you this morning. It was an excellent presentation, thank you for all the detail and the pictures; it was great to have pictures instead of just bullets for a change. Not that bullets are bad, OK, all right.

[laughter]

Geez. Just a quick one for you, Brian, on Slide 21, you showed these bumps in the liner, if you could bring up Slide 21 quickly, but just quickly. what do we think the cause of those are?

BRIAN HOLIAN: You know, it's, I call it -- we call it a construction artifact. This one is still under review right now, so it still is an open item in our draft Safety Evaluation Report. And, you know, some data shows up to 28 bulges, they call them bulges, and they've identified them, the Region has been tracking them, they identified them early on. They also have identified some that

they hadn't seen before, or maybe hadn't just noticed before, later on in life, in '96, '97. So some were identified early, and then some later on. You know, so, I mentioned it between the liner stiffeners.

We think that the gaps are, you know, you'll see some of the longer ones right here, this picture shows some of the long ones that run down. Some of them are just twelve inches by 12 inches that, you know, have bumped out some. ACRS asked some good questions about it, you know, at our subcommittee, this is one plant; we're having a second subcommittee review on, not mainly for this issue. Technically, they think, OK, as long as you measure them and, you know, you can do some ultrasonics there, they have done some ultrasonics already, to make sure that the liner is maintaining its thickness. So, other than original construction and some give on the panels as they were formed, that's the best I've heard so far. But I know it's not a great answer. And we haven't seen it on many other plants, here, that's another separate issue.

COMMISSONER MAGWOOD: Interesting.

BRIAN HOLIAN: Yeah, that's one issue we, we talk about it, just to add on, you know. Research is looking at, you know, how much can moisture get through the concrete, to attack from the backside of the liner? So, you know, this is an issue, you have wood in one case, there was a question raised even on a sub-atmospheric containment, would that draw moisture in. We had a stakeholder address that to us when we were taking one plant through. Sort of the same issue here, can anything from the concrete pull some moisture in that area. So that's, that's the concern. But as for original cause, they've called it a construction artifact in that particular design.

COMMISSIONER MAGWOOD: Thank you. Both you and Michael also mentioned electrical cables prominently in your presentations, and what I haven't quite heard from, at this point, and I look forward to seeing what you've thought about this, is, when you, how do we inspect these cables? I mean, how do we assure that they are in reasonable condition? Because I don't think that there's a lot of non-destructive examination done on cables. So is it all visual inspection? What, what do we do to make sure that they're in good shape?

BRIAN HOLIAN: You know, ACRS has been pushing us on that also, and Research has been helping us some. Industry-wide, not just --

CHAIRMAN JACZKO: -- the Commission.

BRIAN HOLIAN: [laughs] Yeah, that's right. I get it twice, or we get it twice. The testing, including naval testing, we get some answers from that. How predictive can cable testing be, is really the issue out there. And I know, just recently, a draft Reg Guiide was put out by Research on Essential Elements of an Electrical Cable Condition Monitoring Program. And, you know, beefing it up with the, what can be the best test we do?

We do testing, you know, they do visual inspections, and, but how predictive can that be? Now, the good side of the story is, in 2007, you had that generic letter go out requesting information on cable failures. And there haven't been that many induced up to this point. And so, that's the good news. But are we getting ahead of it, are we staying ahead of it, I think that's an open question for us.

JOHN LUBINSKI: Brian Holian's talked about it from a license renewal standpoint. Matt McConnell of our staff is here, and I think he has some

additional insights from an operating standpoint.

MATTHEW MCCONNELL: Good morning, my name is Matthew McConnell. I'm a senior electrical engineer with NRR. Brian hit on everything pretty well. We have issued guidance, I have asked for questions and information on Generic Letter 2007-01. We are working with the industry currently on trying to develop effective programs for condition monitoring of cables, especially if we find conditions that we don't expect. But, you know, the mega-ring and high pod testing, different electrical characteristic tests, they can be performed to understand what the condition of the cables are, and hopefully they give an indication of what the health of the cable is, as well. So, in NRR's space, we are inspecting these cables, and we do have expectations for condition monitoring of cables at nuclear power plants to understand where the cables are, and what the condition of those cables are?

COMMISSIONER MAGWOOD: Has there been any thought about micro samples taken from cables, it's something I know that was talked about, maybe 10 years ago. Is that --

MATTHEW MCCONNELL: The sampling is something that I'm aware of in the U.S. nuclear industry that is not a common practice. I understand they do it internationally quite often, where they actually install samples, and actually can pull those from the plant and perform testing on those. That’s something that we are considering and I think, we’ve been talking with the industry, as something going forward -- what we can do as a proactive approach with the new reactor designs. I think that’s something that obviously needs some consideration and something we learned from our international counterparts.

COMMISSIONER MAGWOOD: Thank you. Obviously a bright individual.

CHAIRMAN JACZKO: Because he has a Steelers' lanyard?

COMMISSIONER MAGWOOD: Absolutely.

[laughter]

Well, my time is up I'll pass it off to Mr. Chairman, thank you.

CHAIRMAN JACZKO: Commissioner Ostendorff?

COMMISSIONER OSTENDORFF: Thank you Mr. Chairman. I add my accommodation to that of Commissioner Apostolakis on the quality and usefulness of today's briefings. John, I'm going to ask you a question real quick. On your slide six on current focus areas recognizing that NRC and industry EPRI, DOE all have resources, but they're finite and there's not a blank check approach that can be taken. Do you feel like there is an adequate interchange that you and your team has to coordinate particular interest areas from the NRC perspective with industry research efforts to get to some of these issues?

JOHN LUBINSKI: I would say the short answer is yes and if I were to look at the prioritization on slide six, the first one on the primary water stress corrosion cracking is something that we have a lot of experience with, but there's still the unknowns as we move forward, especially with the new materials. No material is going to be totally non-susceptible to this. It's just how long will it take before something like this may occur, and I think we've put a lot of focus in this area.

If you look at some of the other bullets on the slide, the prioritization such as on the high density polyethylene piping, that's a high priority for the

industry. And we're really pushing the industry to put effort in that area of their research because it's a benefit to them of using that piping, whereas it's not something that we look at as an immediate safety issue. That's a change they're making to the plant. And finally I'd say the periodic meetings that we have that have referenced with both ASME and the industry -- one of the goals of that is to make sure that from a prioritization standpoint we're looking at the right issues. And I think the results of those meetings have been, while we may have disagreed on some of the technical issues, the prioritization of the work we have had a common prioritization.

COMMISSIONER OSTENDORFF: Thank you. Brian, both you and Mike, referenced the containment liner degradation issues in your presentations. I was wondering if you could just briefly talk about how do you feed back into NRO containment liner issues as it affects their review of new reactor license applications?

BRIAN HOLIAN: Well, you know, we do it through our generic correspondence program. You know, we have pretty good technical meetings with NRO, their management comes over, actually, to our meetings a couple times a month to check in on technical issues we're doing. So, we do it one; just by sharing information in meetings, but secondly just through the generic correspondence program primarily, we expect them to be picking up. So, I'd have to check myself on how well they're picking up from our generic correspondence, I know it's part of their process, but that's the primary way we do.

On that question though, I wanted to highlight one other thing from

new reactors to demonstrate it from the other way. I mentioned the metal fatigue audit and I just wanted to -- I didn't mention it in my presentation -- but we just completed, Dr. Hiser with a member from Research, and it spawned itself from new reactors. So it spawned itself from them in a paper work application looking at a PWR vendors stress calculation and raising questions over how well that could be applied in the field. And they asked us if we'd seen it and we had it being used in some current applications so just a month ago we went out and audited it. So that at least demonstrates some interface there and I would expect the same that they're looking our documents and putting them into their processes over at New Reactors.

MICHAEL CASE: Just to add on to that. From a Research perspective when we do studies on containment liner degradation or anything, even though it may be initiated by user need from NRR, we take the product and before we issue it we share it with both offices. So, they'll have a period of about 60 days to review it. Then for containment degradation we also understood that a lot of them were construction defects, so we sort of went the extra mile on that one and engaged the other division of construction inspection to make sure they were aware of those issues too.

COMMISSIONER OSTENDORFF: OK, Mike I'm going to stay with you here for the next question. It deals with accelerated life testing and how the Office of Research looks at that and certainly trying to look at higher neutron influence or accelerated temperatures or more aggressive chemistry conditions as they impact -- trying to do the fast forward on the DVD player to see where are you 20, 30, 40 years out. Can you talk about any concerns you have and the

ability to conduct that accelerated life test, and what role modeling, and simulation, supercomputing plays in that kind of an effort?

MICHAEL CASE: OK. It is a concern because it's very expensive and very time consuming, and so you have to plan ahead on it. So we have a lot of activity in the reactor internals area and that's why we're interested in ex-plant materials. Also very expensive, and you have to coordinate to sort of get in there at the right time to get the materials. We really haven't thought that much about advanced simulation for that type of activity. You know, we are aware of the DOE activity and we're following that pathway but we really haven't looked at that specifically to see if it could help us. But it is an area of concern for us because of the length of time and the expense.

COMMISSIONER OSTENDORFF: NNSA in particular has done a lot of work in the aging of plutonium and I encourage you all -- and it's been done in the context of supercomputing models that you may want to touch base with them. Thank you, thank you Mr. Chairman.

CHAIRMAN JACZKO: Commissioner Svinicki?

COMMISSIONER SVINICKI: Well, I appreciated the photographs as well, and I worry though if we're too enthusiastic we'll get a lot of photographs in the future but it's funny my colleagues have such intellectual questions based on looking at the photos and I -- listening to the exchange between Commissioner Magwood and Brian about -- when they called up the slide with the containment liner I found myself thinking, and I was listening to what you guys were saying, but I found myself thinking, "Who knew that containment liners were so much like people that after age 40 you might get additional bulges

emerging."

[laughter]

So, that was my really -- but you know sometimes a picture is worth a thousand words, and sometimes it causes you to take your thoughts in a different direction but -- so now to recover from having shown myself as the most uncouth person on this side of the table.

CHAIRMAN JACZKO: You showed yourself as the funniest person on this side of the table that was --

[laughter]

COMMISSIONER SVINICKI: Brian, you talked about -- and if I've got my numbers right. OK, 62 renewed licenses, eight are in the period of extended operation and we heard from Mr. Flaherty that he's got two in his fleet of five. What I draw from that, though, the license renewal is a very mature program but we're very early in our learning about what might come out of the conditions that we've put on -- any way we've conditioned a renewed license or aging management programs and you know those often have unique commitments depending on the unit and the licensee so, you know, I was thinking as you talked about we're on a notional five year cycle for updating the Generic Aging Lessons Learned.

And I began to think, and I'd like your reaction, do you think that the GALL Rev. 3 or Rev. 4, you know if we stay on this same kind of frequency, might have really different knowledge in it than we know right now, meaning that as we get out there and see, you know, how predictive were we in conditioning the renewed licenses. How expertly have we put the right thing into aging

management programs? Is that something you're thinking about as you look to the future and that maybe a five year revision on the GALL is not going to be frequent enough if we get a flood of information that comes in and some of this, John, is you know the Regions and others outdoing those inspections. And I would see a need in the early part of our learning of having larger numbers of units in their period of extended operation, I think there's a potential that we'll be getting a lot of information really quickly.

That it might be better, as you talked about, some of the frustration that applicants in the pipeline now felt just with GALL Rev. 2. Because they felt, and you said, well we thought the benefit was to bring them a little more current right now, and so basically they could get RAIs now or they could just address these issues later if they didn't get the RAIs right now. But I would see people that are coming in for renewal over kind of your bar chart showed that trailing off, but those people might really be subject to this flood of new information coming in. Can you tell me what you're thinking about that?

BRIAN HOLIHAN: Yes, thank you Commissioner. I'm glad that we get to expand on that subject in particular. There wasn't as many changes from GALL Rev. 0 to GALL Rev. 1 so they saw there were significantly more from GALL Rev. 1 to GALL Rev. 2. So I think it surprised the industry some and as I mentioned, we probably could've used that interim staff guidance a little better and why wait for the GALL update a year or two from now, why spend my time on an ISG that would be out there and then I simply roll into the GALL. We just kind of saved them and concentrated our effort on the GALL, and it's a public process so it's very similar to the ISG.

You're getting stakeholder input on that so I think some of the frustration from the applicants that were there -- the schedules weren't impacted all that much. I think they knew we were doing the right thing making sure that their in-house requirements were up to snuff. And I'm also a little bit, I'll say hollow, to their frustration a little bit because I am looking at it maybe another way. If there was another way where I could guarantee they would do the operating experience and on their own update to GALL Rev. 2, GALL Rev. 3. It's out there; they'll do it through their operating experience programs so I do believe they'll do it. I had many years in the Region and we have Regional inspections that will verify that. But I bring that up because two answers, one; the ISG process I think we can use and if I use that well maybe I can stay on a five year. It's a lot of work going into that GALL update, it's a humungous document.

So the ISG process, I believe, is one way we can handle it and just start issuing them three a year or so as we get that new operating experience. So hopefully you'll see that. The second piece, on can I be smarter on -- maybe the rule, or a different license condition that might help my Regional folks with that, "Hey you do have a tie to operating experience." You heard the industry applicant for Calvert say they're already looking at GALL Rev. 2. I don't know if -- and they're doing the right thing, but do I have an enforcement tie to that? I think the best way I have now is getting at it through inspections. And so when I look at the rule for -- the license renewal rule if I was to improve one area as I looked at it now, it might be to put like a maintenance rule assessment in it where they have to do their own assessment of their aging management programs. So that's something our staff is looking at as we engage in discussions with them.

JOHN LUBINSKI: If I could add to that as well. When we talk about a processing issue, so over 60 renewed licenses right now GALL 2 wouldn't apply. They've already been through the licensing process, have their renewed license so whether or not we have a GALL 3, a GALL 4 coming out at an accelerated rate, from a licensing standpoint that would not apply to them unless we did what Brian said. But we do have processes in place from the standpoint of our inspection, we treat the 62 licenses that have been issued, the eight that are already in extended term as operating reactors. They're subject to the inspection program; they're subject to our operating experience programs. When we get issues in under the operating experience program from one plant we evaluate that through technical review groups to determine how it should be implemented.

When I think of some of the issues -- a good slide may be slide 39, if they put slide 39 up -- liner corrosion as an example we look at that in license renewal as a process that's been in place. How to address it moving forward? But, again, it's an operating experience that we have to adopt into what we're doing for the current licensees and that would apply to those that have already been through license renewal. Neutron absorbers is another example which is why I put this slide up, where we have established processes. We're right now looking at user needs with Research to get additional technical information to understand the significance of these events. There is no immediate safety issue, but how do we take that information and decide what do we do with the plants that already have renewed licenses.

COMMISSIONER SVINICKI: And I'll just close by saying I think

that this particular topic is really going to become increasingly important because it cast into my mind such a strong shadow to any consideration of life beyond 60. If we cannot have fulsome processes to deal with this whether they've been renewed or they're coming in for renewal. If we can't take what we learn from those now entering the period of extended operations and apply that to our processes and our inspections I don't know long term about how much confidence folks are going to have in the 60 to 80 year period, so I'll close with that. Thank you.

CHAIRMAN JACZKO: Thank you. Turning to just a slightly different topic, I think Mike you talked -- or many of you talked about getting components from Zion and other plants that may be in decommissioning. Are there any challenges right now to us acquiring some of those. We heard a little bit from the first panel about efforts to do that. I thought I would ask you all if there are things you're trying to get; you can't. So what are the hurdles?

MICHAEL CASE: Well, I don't want to whine but the challenge is cost. These are enormously expensive to do, and so we don't want to miss opportunities. So, Zion, sort of, you know, they change their decommissioning approach so all of a sudden they're in the decommissioning cycle. So it's hard to find the resources to do some of that in a quick way. And quite frankly the decommissioning company is interested in making money, so they don't want to wait around for us to harvest materials. And so it's a coordination activity and it's a cost thing, that's the real challenge of the ex-plant materials.

CHAIRMAN JACZKO: Right now how would you say we're doing on a scale of one to five, five being good?

MICHAEL CASE: We're much better prepared for Zorita, because we saw that coming down the road, although, you know, we don't have a lot of resources to go after everything that we want. Zion, we need to put together a package to do that. You know, we're actually going out at the end of this month to look at some of the material at Zion. So we're already starting down the Zion road, but the hard part is the resources.

CHAIRMAN JACZKO: Certainly as you go forward, if you could keep the Commission informed of the efforts and challenges in that area. I think it's certainly an important one and these opportunities are rare. I remember the -- couple years ago -- we had the issue with St. Lucie, not with St. Lucie but it was, I don't remember --

JOHN LUBINSKI: St. Lucie pressurizer wells.

CHAIRMAN JACZKO: Pressurizer wells, and we did get that sample; turned out it was a non-issue, but it was certainly a good opportunity for us to really learn, and I think as Commissioner Ostendorff said earlier not just on doing nondestructive testing but taking an actually component and doing testing on it and opening it up and really seeing what was going on inside. So it was a very useful exercise, I hope we don't miss these opportunities as they come by. I appreciate the challenge of resources, that's a real challenge, but certainly if we can make sure we're doing all the planning we need and anything we can do to help with that I'd certainly be willing to support.

Well, I didn't really have any other questions. I appreciate, as others have said, the presentation from the staff, and from our previous stakeholders. This is, as Commissioner Svinicki said, an important area for a lot

of different reasons and we heard discussions on existing plants, on licensed renewed plants, on new plants and all of these things come together to some extent with the materials programs, and so it's good to see that there is sharing of information across all of those and that there is a proactive look at the challenges and the issues that we'll have in front of us. Thank you very much, I don't know if anybody had any other comments. Thank you very much, we're done.

[Whereupon, the proceedings were concluded]