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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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581ST MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

OPEN SESSION

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THURSDAY, MARCH 10, 2011

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ROCKVILLE, MARYLAND

The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Said Abdel-Khalik, Chairman, presiding.

COMMITTEE MEMBERS:

SAID ABDEL-KHALIK, Chairman

J. SAM ARMIJO, Vice Chairman

SANJOY BANERJEE, Member

DENNIS C. BLEY, Member

MICHAEL L. CORRADINI, Member

DANA A. POWERS, Member

HAROLD B. RAY, Member

JOY REMPE, Member

MICHAEL T. RYAN, Member

COMMITTEE MEMBERS (CONT.)

WILLIAM J. SHACK, Member

JOHN D. SIEBER, Member

NRC STAFF PRESENT:

TERRY A. BELTZ, NRR/DORL

PAUL CLIFFORD, NRR

STEPHANIE COFFIN, NRO/ARP

RICHARD CONATSER, NRR, Division of Inspection and Regional Support

ROBERT HARDIES, NRR/DCI

ALLEN G. HOWE, NRR/DORL

WILLIAM JESSUP, NRR/DE

THOMAS KEVERN, NRO, Advanced Reactors Branch 1

LOUISE LUND, NRR

MICHAEL E. MAYFIELD, NRO/ARP

SAMUEL MIRANDA, NRR/DSS

BENJAMIN PARKS, NRR/DSS/SRXB

WILLIAM RECKLEY, NRO, Advanced Reactors Branch 1

LEONARD WARD, NRR/DSS/SNPB

MAITRI BANERJEE, Designated Federal Official for Risk Insights Portion of Meeting

ZEYNA ABDULLAHI, Designated Federal Official for Power Uprates Portion of Meeting

NRC STAFF PRESENT: (CONT.)

DEREK WIDMAYER, Designated Federal Official for Groundwater Protection Task Force Portion of Meeting

ALSO PRESENT:

RAY DREMEL, Maracor

KEN GARNER, Westinghouse

STEVE HALE, NextEra Energy

HARV HANNEMAN, NextEra Energy

ANIL JULKA, NextEra Energy

JAY KABADI, NextEra Energy

LARRY MEYER, NextEra Energy

MIKE MILLEN, NextEra Energy

KIM ROMANKO, Westinghouse

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P R O C E E D I N G S

8:29 a.m.

CHAIRMAN ABDEL-KHALIK: The meeting will now come to order. This is the first day of the 581st meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting, the Committee will consider the following: 1) Commission Paper on the Use of Risk Insights to Enhance the Safety Focus of Small Modular Reactor Reviews; 2) Future ACRS Activities/Report of the Planning and Procedures Subcommittee; 3) Reconciliation of ACRS Comments and Recommendations; 4) Point Beach, Units 1 and 2 Extended Power Uprate Application; 5) Status of Groundwater Protection Task Force Efforts; and 6) Preparation of ACRS Reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Ms. Maitri Banerjee is the Designated Federal Official for the initial portion of the meeting.

Portions of the session dealing with the Point Beach Units 1 and 2 extended power uprate application may be closed to protect information designated as proprietary by NextEra Energy Point

Beach.

We have received no written comments or requests for time to make oral statements from members of the public regarding today's session.

There will be a phone bridge line. To preclude interruption of the meeting, the phone will be placed in a listen-only mode during the presentations and Committee discussions.

A transcript of portions of the meeting is being kept and it is requested that the speakers use one of the microphones, identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

At this point, we will go to the first item on the agenda, Commission Paper on the Use of Risk Insights to Enhance the Safety Focus of Small Modular Reactor Reviews.

Dr. Bley will lead us through that discussion. Dennis?

MEMBER BLEY: Thank you. I'm Dennis Bley, Chairman of the Future Plant Design Subcommittee. In a staff requirements memorandum last year, the Commission directed the staff to integrate risk insights and develop risk-informed licensing review plans for each of the small modular reactor designs, the SMRs.

SRM also required the staff to billet on the SRM Next Generation Nuclear Plant Review Insights, an early technology neutral framework in NUREG-1860 and develop a new risk-informed licensing framework for the longer term.

We had a Subcommittee meeting on February 9th and with the staff and industry who briefed us on the development of this process and of the SECY paper that outlined how staff planned to integrate risk insights in their review. And just for the Committee, the title staff has up here might be a little misleading. It's more the tighter focus. And next April 5th, we're going to have a Subcommittee on the entire advanced reactor research program.

This is the first of a series of SECY reports staff sending to the Commission on these issues dealing with policy and licensing of these reactors and we look forward to further interactions on the other ones as well.

At this time, I'd like to turn the floor over to Mike Mayfield.

MR. MAYFIELD: Thank you and good morning. I'm not going to try and steal any of Bill or Tom's thunder, but I did want to introduce you to my deputy, Stephanie Coffin. When we first started coming to talk to the Committee about the small modular reactors and the advance reactor program, there were about five of us and we weren't quite sure we were going to be real. And I know that I have now reached real status because I have a deputy.

(Laughter.)

So we're ready to go and I just wanted to take a moment to introduce Stephanie. And with that, I'll turn it over to Bill to get on with the presentation.

MR. RECKLEY: Thank you, Mike. Before we get to the response to the staff requirements memorandum on SMR reviews, I'd like to take just a few minutes to go over some of the other issues. And then at the end of the meeting, as we did with the Subcommittee, use this as a vehicle to initiate discussions on future interactions in regards to designs and issues.

So to start with, what is within the scope of the Advanced Reactor Program in the Office of New Reactors? And basically, it's anything that is in the arena of a small reactor or anything that uses anything other than light water as its coolant. So the major focus of the program right now are the small pressurized water reactors or integral pressurized water reactors. The primary pre-application activities right now are focused on the B&W mPower design and the NuScale design. There are a couple more recent entry, the Westinghouse SMR and some early indications that Holtec and perhaps other companies will be entering that arena.

So we are in the pre-application discussions with those designers. The other activity in the small pressurized water reactor arena is that Tennessee Valley Authority has initiated studies and plans for the location of an mPower-based facility of multiple modules at the Clinch River site near Oak Ridge National Laboratory.

The other activity within the Advanced Reactor Program that takes up the bulk of the remaining time from new organization is the Next Generation Nuclear Plant. That's a high-temperature gas reactor concept that was initiated through the Energy Policy Act of 2005. So our primary interactions on that project is with Idaho National Laboratory. And we are reviewing a series of White Papers on licensing approaches and concepts and matters like high-temperature material qualification, fuel qualification, and some of the predictable things that one could foresee for a new technology. Actually, much of the research program you'll be hearing about on April 5th is related to NGNP because that up to now has been focused on advance reactor research at the NRC.

We do a little bit of pre-application work --

MEMBER BANERJEE: Can I just ask a question?

MR. RECKLEY: Yes.

MEMBER BANERJEE: Do these water reactors use 3600 RPM turbines or 1800 RPM?

MR. RECKLEY: I don't -- I think the NuScale with the lower pressure might be using a smaller one, but to be honest, I don't know.

MEMBER BANERJEE: Just because with the smaller size, you might be able -- the blade sizes would be --

MR. RECKLEY: I'll be honest. I don't know. My primary focus is on the NGNP side.

MEMBER BANERJEE: These are saturated steam turbines --

MEMBER CORRADINI: They're all saturated steam, but I don't think they've gone to that detail yet, Sanjoy, in picking their turbine equipment.

MEMBER BANERJEE: That makes a big difference, of course, to the cost.

MEMBER CORRADINI: Oh, yes, but from a safety standpoint, I don't think --

MR. RECKLEY: So lastly, within the scope of our activities are a little bit of work to try to keep abreast of what's going on with other technologies, primarily the sodium-cooled fast reactor.

MEMBER CORRADINI: So can I ask about that, since just to be clear because we had in preparation for a meeting, our Chairman had a side meeting. Is that just a watch and see? There's no real activity within the staff on the fast reactors?

MR. RECKLEY: I'd characterize it as watch, yes.

MEMBER BANERJEE: So there is no BOP, Mike, design?

MEMBER CORRADINI: Nothing specified.

MR. RECKLEY: The other activity that the Advanced Reactor Program is looking are to resolve several policy and key technical issues. I'll just go through these relatively quickly. Some of them may be of interest and others not.

This slide is basically just licensing

process kind of things, the use of prototypes and how we would accommodate that under 10 CFR 50.43. What the license would look like for multi-module facilities and whether we could use the provisions in Part 52 for manufacturing licenses, whether that would be a good fit for the licensing and deployment of SMRs.

There are a number of issues that we more traditionally talk to the ACRS about and the design requirement arena. These include the use of PRA to define licensing basis events and otherwise use it in the licensing process. Source term and dose consequence analysis, key component designs, and now based on the codification of 10 CFR 51.50, the requirement for aircraft impact assessments.

There is also a number of operational issues that we foresee and the industry foresees and that we're trying to address. These operator staffing, industrial facilities that may use process heat. That's primarily NGNP concern. Security, off-site emergency preparedness, and again, post-9/11 requirement, the loss of large area due to fires or explosions.

Likewise, the last set that we identified are a number of financial issues: NRC annual fees, what would the liability and property insurance requirements be for the SMRs and how would we handle decommissioning funding?

I'm going to talk just about a couple of these that we thought would be the more likely ones the ACRS might have interest in and also ones that are on the horizon in terms of some staff activity and interactions with the Commission.

The first is control room staffing. We believe, as we talked about during the Subcommittee meeting that we can take a fairly traditional approach to how we assess what the staffing would be in terms of using tasking analysis and what would the operators be required to respond to and running through those exercises, how many people does it take to do the needed task? Related issues to that, very key, is the plant design, the control room layout, and so forth; which events they would be required to simultaneously respond to, the development of simulation in order to provide to the confidence.

And a peripheral issue is the overall plant staffing. There's licensed operators, but then there's also emergency response, fire brigade, maintenance. And so there's a broader focus on staffing beyond just the requirements for licensed operators.

MEMBER RAY: Bill, is there a presumption of passive safety throughout all of this? Or is that an open question?

MR. RECKLEY: The designs that we're seeing incorporate passive safety systems as much or more so than let's say AP1000 in the US APWR. So yes, they do -- everyone is moving in that direction.

MEMBER RAY: I perceive that, but I just wondered if that was a premise of all of this or if that was just how it seems to be working out, because, you know, if somebody came along with something -- you're talking about operator action, but if something came along that required an active system or component or some action to maintain it's safe, would that then put it outside the scope of what we're talking about here?

MR. RECKLEY: I don't think it would put it outside the scope, but as you did the assessment for that design, you might say this similar plant that used passive features and had other inherent features that gave you more time or made operator actions less -- made the overall response less sensitive, could survive the tasking analysis and need fewer operators, while this one chose for whatever reason more active systems and therefore may require.

MEMBER RAY: I'm not going to assume that it isn't required that it be passive, it just would affect all the things you're talking about.

MR. RECKLEY: That's right.

MEMBER RAY: If it was not.

MEMBER CORRADINI: Just, since we were at the same meeting you were at yesterday, I think where Harold is going is kind of the reverse of what when I first started here. Professor Apostolakis noted that just because it's passive, doesn't mean the failure is zero. So to the extent of these new systems employ passive safety or passive-relate new systems, there's going to have to be some sort of estimate as to failure rates.

MR. RECKLEY: Right, and we think it's consistent with the Advance Reactor Policy Statement. They're moving in that direction and so forth, but some of this would be up to the designers to choose.

MEMBER REMPE: Since we've interrupted you, I'd like to go back to this use of probabilistic risk assessment to select licensing basis events. Some of these plants that are talking about siting in very remote locations that might have very harsh climates and maybe because I live in a cold location and we see excessive failures due to cold temperatures, how do you do this when you might have to requantify for extremely cold climate versus other climates that exist and will that not affect? It's almost a requantification on failure rates of the PRA.

Have you thought about how that could effect --

MR. RECKLEY: Only to a limited degree. Really, it would be up to the vendor to set design parameters that would include temperatures and temperature cycles and so forth and for us to review them. But I'll just assume, although we didn't get into very much discussion with Toshiba that when they were planning for remote locations in Alaska that they had given things that kind of thought. Most of these facilities do get buried, so you do get some protection from some extremes.

MEMBER CORRADINI: But I guess I'm curious because -- so take it to two extremes. One extreme would be the NGNP next to industrial site, population, feedback from the industrial process, location relative to emergency planning. The other extreme is way out in the boonies somewhere where you can't get at it easily if something goes wrong.

I assume both extremes we're talking

essentially a siting analysis with some sort of a standard design that would come in and then the siting analysis if it's outside the envelope would have to then address it.

MR. RECKLEY: So unless the framework would -- we plan right now that we'll be providing to the Commission a framework which basically would lay out that we believe we can handle this through tasking analysis and so forth without getting into the details in the third quarter of this fiscal year.

Security. We're currently talking to the vendors about doing security assessments to see how they may incorporate design into the design, the security requirements. If we deem one to be necessary, we would expect that paper to go up in Fiscal '12.

Emergency planning. There's a paper being prepared that we expect to go to the Commission within several weeks, probably in April and that paper will be explaining to the Commission that we're going to go out and engage stakeholders on possible alternatives. And among those alternatives would be a graded approach to emergency planning zones and other emergency preparedness requirements based on the relationship of off-site dose consequence analysis to the protective action guidelines. So at this stage, we'll just be going out to get initial feedback from stakeholders on that concept.

Related issues. Obviously the source and how you do the off-site dose consequence analysis. Dr. Corradini mentioned close proximity to either industrial facilities or in the case of the integral PWRs, if they're being used to supplant old fossil stations. You still may be putting them in at sites where it's a little different than our traditional.

Following the Subcommittee meeting, in the interest that was expressed in that, we've been talking with the ACRS staff and we will be talking about that particular paper and the options that we're going to be including in the paper or the alternatives at the ACRS full Committee meeting, I think currently scheduled for April 7th.

MEMBER POWERS: Let me ask you a question about the line on your slide that says mechanistic source term. Most of these designs are relatively novel. There hasn't been a lot of experience with them. How does one generate a mechanistic source term for these reactors?

MR. RECKLEY: Well, the term has been most often used with us with NGNP and it's traditionally been the term used for the gas-cooled reactors and the studies that they have under way do try to evaluate the migration of the fission products from the kernel through the various barriers.

How it may be applied to the smaller light water reactors, we're still in discussions with vendors. So we don't know exactly how they're planning at this point to do their off-site consequence analysis.

MEMBER POWERS: Well, the Department of Energy seems to be investing a substantial amount of money in in-pile testing and in a variety of other things. Lots of universities seem to be investigating their source term. Are you expecting things like NuScale and others to have a similar investment in experimental characterization of fission product migration under design basis maxing conditions?

MR. RECKLEY: There will be studies. I'm not -- we're still in the pre-application phase. Now all of the PWRs that we're talking to at this point are using traditional fuel. The primary difference is just to mention shorter.

MEMBER CORRADINI: But it's essentially UO2 fuel, shorter fuel length.

MR. RECKLEY: With zircalloy cladding.

Basically the same.

MEMBER POWERS: Very seldom is the source term limited or controlled by the fuel. It's usually the configuration of the flow pattern through the reactor coolant system to great outdoors which, of course, bears no resemblance to existing reactors.

What I'm trying to get a feeling for is we have a relatively rich computer culture nowadays where people do lots and lots of calculations and relatively few experiments. But surely there must be points in any new reactor consideration where one would have to provide some sort of experimental validation of the calculations particularly for the source term. That's the most obvious one.

And have you or will you give some thought to where and at what point a computer code, no matter how good its pedigree, how much it's been used on other kinds of reactors has to be validated by experiment?

MR. RECKLEY: Yes.

(Laughter.)

MEMBER CORRADINI: Dana is politely asking the question that comes to my mind which is -- it goes back to Joy's PRA. I'm fully aware that one can do a PRA on these machines, but given the fact that I've got different containment systems. I've got different placement, different geometries, there's going to have to be some sort of integral testing.

MR. RECKLEY: Right. And just part of the review and part of the interactions with this Committee will be to take whatever the vendors propose and to see what kind of verification and validation was needed which is just a little premature, I think, to go into too much detail because we don't know how they are going to approach this in terms of taking very conservative approaches because they can afford to do so or whether they're going to try to get fairly sophisticated in order to address some of these other issues like emergency planning, in which case they may be doing more sophisticated analysis. And we, in turn, would have to have discussions on how those analyses were verified or how they were benchmarked against experimental facilities.

MEMBER RAY: At this meeting that Mike referred to for my colleagues' information, the point was made by people in the discussion that this mechanistic source term wouldn't be limited just to small modular reactors. As a policy matter, you could envision it applying to AP-1000, for example. And that could have quite a change that is larger in its footprint than just SMR. So we've got to keep that in mind that we're not -- on something like that, we're not able to just say well, this is just for SMR and nobody else.

MR. RECKLEY: And on source term, when the Commission -- and I forget the papers and the dates, but when the Commission directed the staff on the appropriate use of mechanistic source term, it did set conditions and one of those conditions was that you had the confidence that the model was accurately predicting the release of the material through the various barriers. So --

MEMBER CORRADINI: But I think since we're all talking about the same meeting where we were seeing each other there is -- that is what I heard from Dave Lieber seemed like a reasonable approach which is to try to develop a set of principles and then use a new analysis different than what he -- I can't remember, I wrote down the NUREGs, but essentially in analysis 25, 35 years ago, in terms of what was assumed to be the source term and what was assumed to be the severe accident progression that gave you the -- that led to essentially the 10-mile limit.

MR. RECKLEY: Lastly --

MEMBER BROWN: Before you go on, I wanted to backtrack for a second to the security aspect that just occurred to me. If you thought about remote areas where these things were libel to be at least thought to be applied with fewer operators and obviously to keep costs down, there's probably going to be a desire for some off or more remote data. I don't want to call it sharing, but information flow as well as possibly even some remote control functions that you may want to be able to take in in emergency-type situation, which raises the issue of not just physical security, but the issue of cyber security as well.

Has that been thrown in to the -- it didn't seem that way from the paper. It seemed --

MR. RECKLEY: It's not included in our discussions. Now if you look down the road and talk to various designers, various people who foresee future, you will sometimes hear discussions of things like remote operation even. We're not having discussions on anything like that with the current crop including the iPWRs and NGNP.

MEMBER BROWN: I don't want to use the word isolated but relatively, there would be a box around them relative to the -- the same as we have today, relative to our perspective on access.

MR. RECKLEY: The ones we're talking to right now and can foresee in the immediate future, yes.

MEMBER BROWN: Okay.

MR. RECKLEY: This just summarizes and I won't go through it because we've talked about it, the progress on some of those issues, and we'll come back to this at the end about future interactions and which of these ACRS may want to pursue.

MR. KEVERN: That was the introductory material, and you see the scope of issues and topics we're dealing with. Now this is just one specific and it's the primary topic of the presentation as Dr. Bley mentioned earlier, so use of risk insights to enhance the safety focus of small modular reactors.

And this is documented in staff's SECY paper 11-0024. It's in response to the SRM of the same name. Dr. Bley mentioned, issued back in August of last year.

We had a -- I guess I would call it from my point of view, a lively presentation and interaction with the ACRS back in the Subcommittee meeting last month.

And so today's session presentation is

going to be an update of that presentation as well as because of the time limitation and most of you were here for that Subcommittee presentation, somewhat of a summary. So I'm going to highlight changes and where we are on moving forward on this policy issue.

At this point in time the SECY has been issued, the 18th of February. It's with the Commission for their consideration. And I note we got some publicity, good news or bad news, in the Commissioners Plenary yesterday when Dr. Apostolakis, Commissioner Apostolakis, gave us some probably five minutes' worth of his discussion in the Plenary Session.

So the Commission is reviewing it. I point out that the SECY itself covers the multiple topics, the enclosure, our draft revision to NUREG-0800, the introduction as an enclosure to that document. I emphasize it is a draft. And real briefly, we talked at length in the Subcommittee meeting. The NUREG-0800, Standard Review Plan, as you all know, is an interesting document. It lacks internal consistency from page 0 to page N. The introduction is where the generic guidance to the staff or how to do a review is located.

The following 19 chapters and the 250 plus or minus sections all deal with specific topics, specific SSCs, specific programs, but the overall guidance as to how the staff should do a review is in the introduction. So that's why we're proposing to revise the introduction to the SRP to address the specific way we are going to address or we intend to address the Commission's direction for changing the review, improving the review, making it more efficient, making it more risk informed for iPWRs.

The staff requirements memorandum was, in essence, a three-part series of actions to the staff. The first was to develop a specific review framework, more risk informed, more efficient for the review of iPWRs.

Secondly, to develop design specific review plans for each of the iPWRs coming in in the near term, and the near term being over the next several years. And then the long-term item, NUREG-1860 was issued by the staff for consideration a few years ago. That was a technology-neutral review framework, not only review framework, but also potentially for applicants so. What the staff is directed to do in the SRM is to consider a long-term approach for a new regulatory structure based on something moving in the direction of technology-neutral approach. And that's one of the tasks and we're going to cover each of those three action items in the presentation today.

MEMBER RAY: I didn't know whether you were going to change the slides yet or not.

MR. KEVERN: Not yet. Before I move on to the next slide, this is just an update to the last bullet there. We had some discussion on two topics that two of the members brought up and I wanted to provide a more succinct response to both of those. The questions ended up in lengthy discussion.

Initially, first Dr. Corradini brought up the question of lessons learned from the review of the large light waters over the last several years.

I cannot address that generically, but for iPWR reviews, when we get to the design-specific review action item in the SRM, that's where we are going to address that specifically for the parts of the Standard Review Plan that we are going to either create new section for specific SSCs in the iPWRs or where we're going to do some modification to the existing SRP section. That is part of what we've tasked our contractors and we're reporting through our technical staff to do to include lessons learned. And I use the example again of passive features and written those issues that it was an interesting challenge for the staff and ACRS and the large light water reviews. So specifically for iPWRs we're addressing that, so that's a limited, from our perspective, response to your question.

MEMBER CORRADINI: I heard what you said. Can I say it back to you so I've got it right? So you're saying that in the non-Chapter 1 sections, the rest of the sections, as appropriate, they'll be reviewed and the integral PWR designs will be considered as to how the review sections were modified?

MR. KEVERN: Yes.

MEMBER CORRADINI: And as you do that, you'll reflect back on what your design centers are observing from what they learned in doing AP-1000 ESBWR, etcetera.

MR. KEVERN: Yes.

MEMBER CORRADINI: So the two will be combined.

MR. KEVERN: Yes, and I use the specific example, like I mentioned before, in Chapter 8 of the Standard Review Plan that addresses electrical power. So for the example of how we deal with 8.4 station blackout procedures or how we deal with the necessity of having connections and safety reviews of the off-site grid connection, that was a lengthy process for large light waters.

We tend to incorporate the lessons learned we had from that to make the review for iPWR much more -- in the Standard Review Plan section for those parts of Chapter 8, be more succinct and clear as far as what the staff's expectations are and relaying that to the applicant. So it is a less confusing and less complex type of review.

MEMBER CORRADINI: But the applicant should also be aware that if something is substantially different, let's use the turbine example. If there's something about a change in the power conversion system, the change may require more analysis. It may require experiment. It may require something. So it's not going to be just basically speedy, more efficient. It will be appropriately reviewed so that if something is different and something has to be better analyzed, the applicant will have to do that and will be aware of it going in.

MR. KEVERN: Correct. And that is the primary focus of the design-specific parts of the Standard Review Plan that I'll get to when we get to those slides, but what I wanted to specifically address is the past tense lessons learned.

MEMBER BLEY: Tom, before you get there, as I remember from the Subcommittee, you envision this design-specific modification of the SRP to be maybe an Interim Staff Guidance or something along those lines. The mechanism maybe you haven't decided on yet. Is that right?

MR. KEVERN: Let me --

MEMBER BLEY: You can wait until you get to the others, that's fine.

MR. KEVERN: Okay. The other question or issue that was brought up was by Dr. Stetkar regarding the risk significance determination process and if I could -- I hope I am not mischaracterizing it, but it was a question about currently the varied approaches and in the absence of consistency and quality, specifically for, again for iPWRs. We're moving in the direction of resolving -- not resolving, but addressing those questions. We had a staff -- we had an audit of the PRA at NuScale facilities last week, technical staff, project managers and contractors there.

We have on-going public regulatory workshops. We started back last summer and the one scheduled for April is going to have a several hour presentation by the staff, hopefully some lively interactions with the attendees on risk insights and the process. So we, as I mentioned earlier, we cannot mandate that, but we are moving to exchange our views with industry and hopefully move to an alignment in that area.

MEMBER STETKAR: I guess one of the -- I was going to wait until a later slide, but since you brought it up, we might as well discuss it now.

The genesis of that question is the variability that we've seen in the design certification, things that are called PRAs. I'll call them that rather than call them PRA, and what indeed is the scope of those PRAs?

And the guidance in the draft introduction to the Standard Review Plan as part of the SECY makes reference to interim staff guidance as acceptable methods to determine risk significance.

And the thing that's referred to is Interim Staff Guidance ISG-018, and that guidance, in particular, allows the use of things like fire-induced vulnerability evaluations, seismic margin analyses, things that are not quantitative risk assessment, things that cannot provide quantitative measures of risk significance.

Given that, and given the potential nature of many of these, if not all of these designs, reliance on passive features, the lack of guidance to quantify what may be the most important contributors to risk and measure the importance of SSCs relative to those contributors, seems to be a bit lacking.

So I was curious whether, and we don't want to go off into what you found in the audits, but it would be very interesting whether that audit discovered whether or not that particular vendor was indeed quantifying the risk from seismic events, external floods, high winds, tornados, the types of issues that may substantially affect the plant risk profile, may substantially affect emergency planning, and may substantially affect the relative importance of those SSCs in your ranking scheme.

That's the genesis of that question. I hear you're saying you're going forward and yet what's being published still relies on things that allow a non-comprehensive, if you will, assessment of risk and assessment of that importance.

MR. KEVERN: I'm not disagreeing. That's why I wanted to -- we have not resolved it, but we're moving in the direction of addressing the issue and of course, I'm not prepared to talk about that today.

That's another subject, but we get to the end of the presentation.

Bill will talk about some of the options for interaction between the staff and ACRS in the future and it sounds like that's one of the topics that would be quite interesting to have some engagement with in a Subcommittee meeting.

So moving on, I want to point out, I'm still on this one slide, that the direction that the staff got was somewhat limited in scope. It was to address the review process and I know back in our Subcommittee, I did not emphasize that enough and we had a few questions on why we were not addressing a broader range of actions, whatever.

The way the staff interpreted the SRM was that it was a review process. So this was somewhat unilateral on the staff's part and when we get to future slides, I'll point out that we've shared that with industry, but we've also shared with them that we can only go so far in a unilateral manner and that we need their support as far as some upgrading or more robustness, if you will, in their applications.

MEMBER CORRADINI: So can I -- so yesterday, since you referred to Commissioner Apostolakis' talk, now that he's the head of the task force, how is your office or somebody in the office communicating with that task force relative to what I, at least, what I heard was the goals and scope?

MR. KEVERN: Can I defer that to a later slide?

MEMBER CORRADINI: Sure.

MR. KEVERN: Moving on to the second slide, not quite --

MEMBER RAY: Can I ask you to -- you've touched on it. It's on this slide here, so let me just say you're right that the focus is on reviews as opposed to requirements. And that the EDO's response, in particular, echoes that back and talks about reviews and getting things for different levels of review.

But as you go forward now, as a long-term licensee, I really am concerned about requirements, not what the staff does in its review. You can review things a little bit, but that doesn't mean that I don't have to meet whatever the requirements are. And therefore the more important thing in my mind is to gradiate the requirements based on risk, not have differing levels of review based on the risk which is what you addressed.

And so as you go along, try and keep that in mind and tell me why I should care about the review process, given that it's important in the beginning. But later on, what's really important is what are the requirements that exist for these different categories of SSCs that have been in the way that you've done?

MR. KEVERN: I guess I'll make one partial response to that that we've had a number of interactions with industry starting with public meetings back last summer, specifically addressing actually before that, better than a year ago, and one of the concerns -- I guess I would not call it a theme. But a concern we heard from industry is that the length of the review, the schedule, the calendar time as well as the level of effort that the staff would apply that question the economic feasibility I guess I would say if they had to go through for each of the iPWRs, a five-year plus review like we've done for AP-1000 ESBWR and the cost associated, the thought was a company like NuScale would be sorely pressed financially to support a five-year review with the resultant staff costs.

Now whether that's relevant or not, I don't know, but what we -- what the staff's position in response to the Commission direction was that without compromising safety what can we do to have a more efficient review process and also, of course, the aspect of incorporate risk insights to the extent we can. So that's what we were trying to address here.

MEMBER RAY: I can see that, but it troubles me because obviously, the vendors want to get through the review process quickly. I understand that. They're the ones who are talking about the need to streamline a review. But the people, the licensees and the Agency, per 60 years, have to worry about did we get the requirements right? And that's what I'm puzzled by because like I say, once I get the plant and I hold the license and I'm operating it and I've got an inspector in my site, we don't really care that you reviewed things in Bin No. 2 more quickly than you would have normally. What we care about is what are the requirements and can I meet them and are they appropriate?

MR. KEVERN: I will respond to that by saying going back to Bill's presentation, that we're attempting to do all of these in parallel, so this is just one leg of all of these. And whether it's one of the more important or less important, I wouldn't qualify that, but take the staffing issue or the security issue, we're trying to address all of those that are applicable to iPWRs in parallel.

MEMBER CORRADINI: You're kinder. I figured you were going to tell them I'm just following the SRM. I'm just doing my job.

MR. KEVERN: Trying not to do that. Leading on to the second slide, living within what I said on the first slide, we've got two elements of this review approach.

Two bullets on the slide here. More risk-informed and we're doing that in a graded manner. So if we pass over the discussion about how we got to safety determination and risk significance determination, we have a four-bin or a four-level process where SSC is determined to be safety-related and risk-significant. The receipt of the most detailed level review and then we trail off to something less so for non-risk significant and non-safety.

And to support that risk-informed process, we have got a more integrated manner in which we are going to address the program requirements in parallel, rather than in series with the review of the technical issues with those respective SSCs.

MEMBER BROWN: Does that imply -- I'm just looking at the first sentence. It says "Both safety-related and risk-significant would have detailed reviews." That implies that safety-related, but of lesser -- a decision, a judgment would be made that we would do less of a review or evaluation, even though it's safety-related?

MR. KEVERN: Yes.

MEMBER BROWN: I'm just trying to separate the bins between safety-related.

MR. KEVERN: I have a slide, a diagram, later in a later slide and that will not answer all of the questions, but that's the mechanism by which we're using it for discussion anyway.

The second half of the slide on status quo, this is just reiterating more of what we said earlier on the first slide that we believe that the Commission directed us to live within current regulations and current Commission policy, so in some respects the options we had were somewhat limited.

And then as we went forward with the Commission paper, we chose to make no change to the safety determination process and no change to the risk-significance determination process, recognizing there are some short comings as Dr. Stetkar has pointed out now as well as back in the Subcommittee meeting. That continues to be a challenged work in progress, but for this review process, we did not tackle that. We taught that as a different subject that we can address.

MEMBER SHACK: For the class of reactors we're talking about which are largely passive, I don't know that Bin 3 is going to be all that large. I mean one of the advantages of the passive reactors, they got rid of a lot of safety components. I mean this is not South Texas we're talking about here.

MR. KEVERN: I'll defer that to the diagram when we get there. I'll point out what we think is -- because we have made some progress interacting with vendors and done a first cut on safety class as well as risk determination and what kind of populations we can expect in those four bins.

MEMBER SHACK: Part of your lessons learned here is this is going to look like RTNSS.

MR. KEVERN: Right, right. And that's a key. And we specifically want to address a more efficient way of reviewing a status review of RTNSS systems because that was a critical path item for AP-1000 ESBWR review.

Okay, so briefly talking about the review framework. Starting out with the integrated approach that leads us into allowing for a risk-informed pick up one of the 250-odd SRP sections, specifically addressing an SSC. You observed that there are two types of acceptance criteria. One are design-related criteria that is enforcing some type of a design relative perhaps the general design criteria. Another is performance-oriented criteria and here we're talking about things like the capability of systems to perform at varying operating conditions. How available is it under various upset conditions or loss of electrical power, for example, the reliability of that system and how well it can be maintained, ISI/IST issues, for example.

So the program requirements that we've identified give performance-oriented characteristics is one way to describe that. So we look at the six different programs that we've identified there. And tech specs have been around for a long time. That hasn't changed too much. But the next -- and the four programs, availability controls, the start-up test program, reliability assurance program, and ITAAC very specifically have matured, I'd say a couple orders of magnitude since we initially got the large light water designs.

And of course, RTNSS was a concept that existed back in the '90s with Part 52 and when we started doing the AP-600 review. But it didn't really evolve until we got into AP-1000 review and even then, when we went to the ESBWR review, why that's where what I would say is the current situation where it's comparable at tech specs. If you pull out the availability control manual and Chapter 19 of the ESBWR design control document, for folks that have limited experience, you look at that and it's really -- you're hard pressed to differentiate between the content of that and the content of the technical specifications.

So clearly there are strong requirements for the system. The start-up test program has evolved. It's not fully definitive yet, but it certainly has evolved in ITAAC. Of course, again, was a concept, but now it's a reality.

So in short, on the integrated perspective, we want to enforce a way that the staff can review the technical criteria, the design criteria, acceptance criteria, as well as these other programmatic aspects, all in parallel and recognizing that that should be a more efficient review process.

And this is just a correlation, kind of an eye candy slide there, if you will, trying the way we see it, correlating the attributes or the characteristics of acceptance criteria of the different programs on this.

And so this is a textual statement of what I hope I just said that we observed that we have yet -- acceptance criteria that have performance-oriented elements to them. Those correlate with the performance-oriented statements in the program requirements on the previous page and we can draw that correlation, use that correlation to either expand upon or support the review, the technical review by the staff or the safety-related and risk-significant in the first bin or we could actually use these program requirements in lieu of a detailed technical review that the staff may do for some of the non-safety or less risk-significant SSCs.

And the simplistic example is there in brackets where we use the combination of the RTNSS availability controls and the maintenance rule to address reliability, availability and maintainability of an SSC.

Risk-informed aspect is something that is more commonly expected, I guess I would say, using a graded review approach.

MEMBER RAY: Excuse me, what you just said, for example, use of available controls in lieu of an ETL design review --

MR. KEVERN: Not in lieu of a detailed design review. The premise -- if you look at the acceptance criteria, a typical SSC, for an SSC in one section of the Standard Review Plan, it's a mixed bag of two types of criteria. One is related to the design. Does this SSC meet the functional requirements expected for this system? Does it perform consistent or is it expected to perform consistent under varied and actual phenomena or accident conditions?

Most likely, and I'd say almost guaranteed, but most likely, the staff's review of whether the applicant's information is adequate or not to meet that acceptance criteria is going to require some type of detailed calculation, perhaps a computer code, but what we're calling in the SECY paper a technical analysis.

For other criteria and I'll get to an example later, if the criteria, acceptance criteria identifies that the system has to have a minimum flow or minimum pressure, for example, under varied operating conditions, that is what we call a performance-oriented criteria and that can be satisfied by some combination of perhaps a start-up test program or availability control where the start-up test would be designed to measure the pressure or the flow rate within a system under varied operating conditions.

MEMBER RAY: Well, I don't want to take any -- your time is important here. I'm trying to discern what it is we're not going to look at because it isn't highly risk significant and safety related.

MR. KEVERN: We're going to look at everything. But when we get to the point of how the staff does its review at the reviewer's discretion, if this acceptance criteria is something that is measuring or evaluating the performance of that particular SSC, is there one of these program requirements that can satisfy that criteria or in lieu of that, do I need to some type of calculation? Do I have to use some type of a computer code? Do I have to do some type of independent technical review?

MEMBER RAY: That seems to be something that nobody can argue with. The concern would be that you're assuming performance in a domain that isn't assured by the performance program that you're talking about and you're not doing anything to verify, as you say, computer analysis or whatever, that it will, in fact, perform under those conditions, design conditions.

MR. KEVERN: But if a specific start-up test, for example, were to measure that, that is something that will occur.

MEMBER RAY: Of course.

MR. KEVERN: And if it is not satisfied why then, it is up to the applicant to correct it, until it is satisfied.

MEMBER RAY: I'm just -- never mind. I'm taking too much time. Go ahead.

MR. KEVERN: Rather than talk about text, we'll go right to the diagram and address questions on this. This is the diagram that illustrates the process that we're going through, that I've been talking about. It's essentially a two by two matrix. The SSC to be reviewed is either safety related or non-safety related. And it is either risk significant or non-risk significant.

Go through the decision diamonds and that ends up with what we've concluded are four review types or four review bins, if you will. The A1 and the nomenclature here is there's nothing specific or nothing special about it, you just happened to label it as such. The far left corner block is safety related and risk significant and that's where we envision the most detailed review. For comparison purposes that would be analogous to what the staff currently does and their independent review and analysis of systems.

In fact, in this case, we are proposing to take those program requirements, identify them as part of the review and this would actually augment so the review would actually be a step up, if you will, a more robust review than what is currently done, because it's integrating those specific program requirements for the reviewer to look at, not to do in lieu of, but do actually use as a -- to augment a technical review.

And then as you proceed across in the other three bins, why we have the graded approach implemented, ending up over in the B2 bin where the least detailed review. When we look at these, please keep in mind we're talking about what the applicant has provided in their application in the FSAR. So to answer your question that came earlier on quantifying this, the B2 systems, in some cases the B2 systems have close to zero and perhaps even zero impact on reactor safety. So in cases past, if you look at the different SRP sections, for example, you see the potable water and sanitary system there. Well, for most designs you're hard pressed to come up with some type of an action sequence where those systems can adversely impact reactor safety. But as part of the application and therefore because of the way we're organized as part of status review, what we're proposing, like it's currently done, but is not well documented, that there be a minimal review for that type of system.

There are not too many -- I can't quantify it, but there are fewer B2s than any of the other three blocks. The B2 where we're not safety related, but we are risk significant, that's primarily populated. If we were to go back and look at AP 1000 ESBWR, we think it's going to be likewise for the iPWRs. Those are the RTNSS systems. And so this is an area where the staff believes we can get the most improvement and efficiency. We've lived through the process of not knowing what RTNSS is or how it ought to be applied.

We've gone through two large light water design certifications now, and it was a struggle for the staff, as well as ACRS, to address some of these requirements and we think we got there. So now let's take advantage of that.

And the Availability Control Manual is the one I wanted to highlight as the best example. It's very robust. And if we use the ESBWR example, and so rather than doing some review of where there's an absence of specific criteria, it's kind of a vague highly-reliable type of criteria. Well, that's not very definitive and you end up with a dozen reviewers, you get a dozen opinions of what highly reliable means. So what we've proposed here is that what is rather than just saying what highly reliable is in trying to do some type of a quantitative analysis or review of something that is subjective criteria, say we've got an Availability Control Manual. It's very specific. Here's what that system has to do and how it has to perform, etcetera. And that's part of the design or part of the commitment on the part of the licensee. Let's take advantage of that. And it's performance oriented.

So we get to a point and perhaps it's being demonstrated by a start-up test. If the start-up test fails, why the license or the certification rather is not complete until that is satisfied. So we're not deleting or overlooking or any other negative term on the acceptance criteria. What we're doing is satisfying it by an alternate means.

MEMBER CORRADINI: So, give me an example that's an A2?

MR. KEVERN: I'm sorry, an A2.

MEMBER CORRADINI: I think I know the answer. I just want to make sure I understand. But what's an A2 example?

MR. KEVERN: I'm --

MEMBER CORRADINI: John, what's an A2 example?

MEMBER STETKAR: Standard light water reactor current generation plant, probably accumulators.

MEMBER RAY: Battery charger.

MEMBER CORRADINI: Are there --

MEMBER STETKAR: Not necessarily the battery chargers.

MEMBER CORRADINI: Where I'm going is, does anything populate A2 in the iPWRs?

MR. KEVERN: We've started the review, initial review and interaction with mPower and NuScale and initially we couldn't find anything.

But most recently, our contractors have given me a couple of suggestions that I've forgotten. One could be in the A2 category. But it is a very limited number.

MEMBER CORRADINI: So here's where I'm going. I think I know why you're doing this, but just since three is better than four, why not essentially make it a point of whatever is in A2, send it to B2 because it shouldn't be a safety related --

MEMBER STETKAR: They've scoped down safety related so much --

MEMBER CORRADINI: What's that?

MEMBER STETKAR: They've scoped down the definition of what they call safety related so finely that it's probably difficult to find something in A2.

MEMBER BLEY: That's a good thing.

MEMBER STETKAR: That's right, that's a good thing. But if it's there, somebody made a decision that it should be.

MEMBER CORRADINI: So what you're telling me then is there is very little in A2 and so from the standpoint of a review, I'm thinking about this. I mean I don't appreciate -- I understand what Harold is saying so I'm not totally over on his side on this, but I do appreciate the fact that this -- you're developing a revised process. So my thought is if there's nothing in A2 or there's so little in A2, either it belongs in A1 or it belongs in B2 and get rid of it so that the reviewer has a much cleaner picture about how to address this in a working smarter mode.

MR. KEVERN: Let me try to provide a tactful response to that on behalf of the staff. We went through numerous iterations of developing this approach and one of the iterations was just to have the A1 and B1 because that is where qualitatively 90 percent or so of -- maybe 95 percent of all the SSCs where a hypothetical design would end up.

To make a long story short, in order to get consensus we end up with --

MEMBER CORRADINI: I've got it.

MR. KEVERN: A complete setting. So we have the complete framework. All four bins. They all relate to existing terminology of safety related or not and risk significant or not. And for a particular design, we may find nothing in A1 -- I'm sorry, nothing in A2, excuse me. Nothing in A2 and no systems in B2 because the applicant has refined its approach for an FSAR to provide fewer systems they had before.

MEMBER CORRADINI: Thank you. That helps.

MR. KEVERN: But from an efficiency point of view, I want to focus on B1 because of the majority of the systems are in the RTNSS category that's where we expect to get the most improvement and efficiency because it really is a lesson learned from ESBWR reviews.

MEMBER BLEY: Tom, I was just looking through the rest of your slides. There's a lot of detail in them. I think some of that we've probably already covered.

MR. KEVERN: Yes, sir.

MEMBER BLEY: You're going to need to take advantage of that, I think.

MR. KEVERN: Okay, I will take an opportunity to bypass -- speed right over the example I was going to have. Let me focus a little bit on the Design-Specific Review Plan. That's the second action.

MEMBER BROWN: Can I ask one question before you go on? You used the word efficiency a couple of times. And I guess I'm sitting here thinking efficiency of review. And it just gives me the flavor that I've lost that maybe we're losing track of what we think of is the safety aspects of what we're doing in the review? Because we're going to do it more efficiency, we're going to start down a little slipper slope? I'm not trying to be pejorative.

MR. MAYFIELD: Dr. Brown, that's why I'm here.

(Laughter.)

We're not bypassing safety. The Commission asked us to look at is there a better way of doing the reviews so that we're not having staff do hours and hours of review on something that just doesn't matter. Is there a better way was the question. We think we found one.

The Commission has been very clear that we are not bypassing safety. And the staff, I think, has been very mindful of that in going forward. We have gotten a lot of pushback from some of our colleagues in the Technical Division about just what are you doing? And why are you doing it? So we've got a lot of folks that are at least as skeptical as your question was starting to suggest.

(Laughter.)

The question posed by the Commission was a good one. We've tried to take a good-faith run at answering them. But at the end of the day our job is assure safety, not to just necessarily do it faster. And that's where we're going to stay. Okay?

MEMBER BROWN: Let me use Dr. Corradini's response, as I understand what you're saying.

(Laughter.)

MEMBER CORRADINI: I think the

forcefulness of Mr. Mayfield gives me some assurance.

MEMBER BROWN: He was being very forceful and I guess part of my concern in here from listening to this is here I've got the reviews and now if I'm going to do it here, do I step back and start looking at -- to use Harold's term, requirements? We've got a set of general design requirements. We've got a set of specs and other things that are listed in the rules and some, they're very subjective. There's arguments on those and you've just -- the ability of when do we go back and look at those requirements that are important as he pointed out That's what people have to build on.

MEMBER CORRADINI: I guess my only thought is what I hear him saying is the vendors ought to come in with wide open eyes that because they're doing it smarter, certain things may take longer because those things are new and they better be aware of that and not expect efficient means faster, necessarily.

MEMBER BROWN: I would particularly expect this in terms of these new small modular integrated power reactors. We don't have any experience with them so we really don't have the lessons to draw on to enhance these reviews if that's what you determine, knowing are we really going in the right direction?

Did we make the right judgments? I'll stop right there. I've taken enough time on this.

MR. KEVERN: Let me use that discussion as a segue into the next slide here. The second action we were directed to take is a Design-Specific Review Plan. What does that mean? Well, first we're going to implement the framework I just talked about for each of these iPWR reviews. But there's going to be a unique plan for each of the iPWR designs and it really is -- the types of documents are two parts. One is a Standard Review Plan that's tailored to the design. And that hits the discussion we were just having head on.

So we look at -- we've got contractors, our national lab folks, as well as the technical staff, are looking at each of the SRP sections for each of the -- let's pick NuScale, for example, for each of the designs. Now for each of those SRP sections, one of four things is going to happen. Either it's still applicable as written and this may be for one of the support systems in the electrical grid or diesel generator, for example. Maybe retained as it is, or the system may not exist. NuScale, for example, for be reactor coolant pump rotors or something related to that which would be -- so it's deleted and would be appropriately noted.

Others are going to be modified and we've got a couple of examples. We met with some folks that were drafting these earlier in the week and doing a rather extensive modification to the SRP. The system is approximately the same. It may not be the same name, but it serves similar functions when identical functions.

So it's a rather extensive effort to go through and determine which GDCs are or are not applicable, maybe some new ones, maybe some are being deleted; looking at the risk significance of it, incorporating as we can and as applicable to that system the lessons learned from light water reviews.

And others are going to be brand new and this is going to be the case, yes, we're going to apply or this is what the staff is proposing to apply the review plan we just talked about. For some of these new systems though they may be rather mundane as far as being innovative systems. Others may be so new and novel.

I again pick on NuScale with national circulation, that it may require even for an efficient review, it may be the critical path item for the review, because it requires extensive testing by the vendor, extensive review, computer modeling by the staff and so on.

So we tried to get a more efficient review, but that doesn't mean it's going to be short. It is going to depend on the design and this is where we hit that head on as far as Design-Specific Review Plan. And then following along from that Standard Review Plan modification is a Safety Evaluation Report. So in parallel with that we're looking at how we're going to update the existing sections of the Standard Review Plan and looking at how the Safety Evaluation Report would correlate with that.

Again, an efficiency aspect, rather than going through and doing all the Standard Review Plan changes and then thinking about how we're going to document this for a recommendation to the Commission on Design Cert. or COL issuance, why then we're doing the up front activities while it's fresh in our mind that we're revising the Standard Review Plan.

And then as another aspect of efficiency is to expand the number of interactions we're having with the applicants, or potential applicants, in this pre-application space. So the first bullet is topic reports. We're going to review those just like we've always done in the pre-application space. But we're doing more extensive audits. The one I just used as an example at the PRA audit at NuScale last week.

And moving on into even doing some preliminary determination of the safety significance and risk significance of some of the SSCs. As the designers move along and they're doing an iterative process to looking at their initial version of the PRA and making some design changes for whatever reasons, while we're keeping abreast of that and we're doing these initial drafts of the update of the Standard Review Plan based on information we have. So the whole effort here again under the guise of efficiency is to be more prepared for the applications we expect to get.

And then the application process, post-application, similar to what we've had before, but we're looking at how we can perhaps shorten some time there without compromising the activities that have to be done.

MEMBER STETKAR: Tom, we discussed in the -- I think we did in Subcommittee meeting that this notion of pre-application definition of the SSC and review, as has been done in audits of the PRA. Whether or not that's an actual, useful, efficient process, only from the perspective that I'm going to call it inertia tends to set in. An when people do a preliminary analysis and they make some preliminary conclusions based on that preliminary analysis, there's extreme reticence to back off or to supplement those preliminary conclusions.

And we've seen some of that in the evolution of the current light water reactors. The design has evolved and people have asked questions about the PRA. There's been sort of reluctance to say well, we categorized it that way before for the following reasons and we don't feel that it's worthwhile to reexamine that part of the analysis. Have you thought much about that? I know we had some discussion and I thought in the Subcommittee you were saying well, you'll make your final determination based on your post-application PRA and categorization.

MR. KEVERN: And that's what I've got there in the third bullet under post-application, but yes, it is an issue. We did talk about that a little bit in the Subcommittee and I don't have an answer that would be comprehensive.

MEMBER STETKAR: It's more of a sensitivity.

MR. KEVERN: Yes.

MEMBER STETKAR: It's a discipline

sensitivity.

MR. KEVERN: I believe we're aware of it and the way we're addressing it is by doing the audits, by having a number of different people involved from different technical aspects, looking at the --

MEMBER STETKAR: I'm actually thinking in terms of efficiency. Because if you do an audit of a particular part of a PRA, check off all the boxes and say well, we looked at that, there's a tendency not to go back and look at it again, even though it might have changed or perhaps it should have changed, but didn't. So in terms of the efficiency of the overall process, there's that danger, rather than doing a one-time audit of what the applicant would bring to you as saying this is our best effort. It puts the onus on the applicant to try to develop completeness and consistency, but indeed that's what they ought to be doing. Anyway --

MR. KEVERN: That is an item we need to be aware of, yes, sir.

And as I mentioned, as we were going through, this is the approach for doing the framework as well as doing the Design-Specific Review Plan. We are intending to do it unilaterally, but as we've been talking to industry and potential applicants for the last nine months now, that to really gain some momentum here and improvement why it needs to be supported by the applicants incorporating some of the information we talked about as a higher quality, more robust applications in addressing the program requirements that we've talked about in the framework, as well as supporting the pre-application activities, we were just talking about.

The third item, and I go through this very quickly, is in the long-term activity that was tasked by the Commission to develop something approaching a technology neutral regulatory structure. We're doing this in a multi-step process that we propose, a multi-step process, gaining insights from the iPWR reviews, getting insights from the high temperature gas reviews, primarily the NGNP pre-application activities, as well as the limited and maybe it will be more extensive, but currently the limited interactions we're having in the liquid metal reactor and sodium --

MEMBER CORRADINI: Can you go back a slide?

MR. KEVERN: Yes, sir.

MEMBER CORRADINI: I'm trying to

understand what this means.

MR. KEVERN: Okay.

MEMBER CORRADINI: Does this mean that the staff is separately from DOE, and let's just pick the NGNP, is engaged in trying to determine what are appropriate licensing basis events? Does this mean that the staff is listening to the DOE as they do -- or watching and listening to the DOE as they're doing their analysis and then making notes and ready to comment if and when something pops with a real design and a real set of things besides white papers?

And what's the phasing of the iPWR versus this?

Because when the licensing strategy document from the NRC went up, it had to be, I can't remember exactly, it had to be coincident or coordinated with DOE back to Congress. The report was, if I remember correctly, was that this -- we would use the NGNP as, shall I say, a stalking horse for this what I'll call option 2 prime B, this middle road about doing technology neutral framework.

But what's happening with NGNP? Will the iPWRs take that role? Because when I look at these slides it kind of looks very theoretical. But the way I remember it is, we're going to take something and work through the system with that something and we'll learn from using that approach.

And so if it's not NGNP, will it be the iPWRs?

MR. KEVERN: It's going to take a couple of minutes to answer that question. That's rather comprehensive.

(Laughter.)

MEMBER BLEY: Go ahead. It's an important one.

MR. KEVERN: Yes, to all of the above, in part. So just taking it sequentially, iPWR applications are expected near term. So in parallel we're doing the review that we just talked about for one or more iPWR reviews. We'll take one of those and do a parallel study of applying the -- not all of 1860, but the principles because the staff still has to determine exactly what those technology-neutral principles might be to quantify those. Do a parallel study of that application and see how the review results would end up, if we use a quote unquote technology- neutral approach for review of that iPWR application.

That's going to happen in the near term. We anticipate in the 2013 time frame based on current schedule.

MEMBER CORRADINI: So what I heard you just say is mPower is the stalking horse that you're going to --

MR. KEVERN: mPower or NuScale would be, yes, whenever the first application is.

MEMBER CORRADINI: Right.

MR. KEVERN: As we're currently doing with NGNP, we currently are doing pre-application activities, reviewing White Papers as you mentioned. We do have interactions with the ANS Subcommittee on the current draft of 51.2. We are doing public meetings. We're working with the DOE and the prime national lab, Idaho National Lab that is the proposed vendor for or the coordinator these activities. That's been on-going for a while and continue to be, and yes, it is based on the Licensing Strategy Report.

That was what started -- it was the premise for starting this and whether DOE and Idaho National Lab continue in that vein or do a slight variation, that's not our call. That's up to them to do.

So we're reviewing all of those in parallel. And if an application actually does materialize, then we do similar to what we were doing with the iPWR. Take whatever the final application licensing process that they choose to do for their submittal and compare that with the same principles we had for the iPWR parallel review and see what kind of -- and there the guesstimate is for the time frame. Now whether that's true or not, that's subject to change.

MEMBER CORRADINI: Thanks.

MR. KEVERN: And for completeness, at the present time, we've got limited information only on two, PRISM and 4S. And so there's not a lot of information we can gather there, but there the staff is involved in participation in the ANS 54.1 standard which is analogous to 53.1 is for the design of a sodium coolant fast reactor. See what kind of insights we can get from that. We probably can't do a parallel review or whatever because they don't expect an application in the near term.

So the result would be down in the 2014, 2015 time frame. We compile the insights we get. They would be rather extensive for iPWRs and still somewhat in doubt for NGNP and maybe pretty slim for liquid NO reactors, but the thought was we need to do something within the next four to five year time frame as far as a recommendation to the Commission, staff thinking that that was about the amount of time we had to work on this.

Now what's come since then is what you mentioned earlier and what Dr. Apostolakis mentioned, Commissioner Apostolakis mentioned in his Plenary yesterday. We had a task force from the Chairman where he's the head of the task force that's been chartered to look into the regulatory approach, new regulatory structure. And exactly how that will interface with or whether we'll have our proposed activities subsumed or whether that whole part of our SECY will just be obviated and passed on, I don't know.

Mr. Reckley is a member of that task force, so if we -- I guess I would say in a side meeting after the meeting here, if you wish to pursue that, I volunteer. Bill will volunteer.

(Laughter.).

MEMBER BLEY: Tom, one quick one from me. I was waiting to see if it cleared up, but it didn't. A few slides ago you talked about the specific, Design-Specific Review Plans and I know it's a horse race here. You've got to learn a fair amount about a design to be able to put together --

MR. KEVERN: Yes.

MEMBER BLEY: -- that Design-Specific Review Plan. How far in advance of the first anticipated application do you think you will have that Design-Specific Review Plan for that application? Or will it be? I know that's the intent. Otherwise, it's going to get pretty confused.

MR. KEVERN: It will be an iterative process. We have just the concept now. Within the next several months we'll have a more definitive way of doing what a Design-Specific Review Plan is going to be. We have initial drafts of SRP sections for both mPower and NuScale that have been created by our National Lab folks. As recently as this past Monday, we had a working session with all the senior folks at the lab that were working on this to come to agreement on what the format and structure of each of those sections will be. They've already for the last year, they've been tasked with interacting with the potential vendors and they've got an initial cut, good news or bad news, from Dr. Stetkar's position, an initial cut of what is safety related and what is risk significant for each of the SSCs for those two designs.

They accompanied our staff out at NuScale, for example. And so they've got a table that consists

-- rather, I'm sorry, it is composed of each of the SSCs for those designs and what the safety significance, risk significance might be, as well as now they're using at the start getting into drafting the initial SRP sections.

So the intent is to have this as a working plan that will assist us as well as assist the vendor. And so at some time prior to the actual application coming in, it will be complete as far as we can get it. We're all familiar with the six-month criteria. That is a goal we would have, but it's a little bit of a misnomer in that since this is an iterative process, we're starting it now, well before the application is expected. That six months gets a little fuzzy. So we could use that as a milestone, but actually will have something along before that six-month time frame.

MEMBER CORRADINI: Can I just inquire about one thing? So you said the labs -- so I assume their staff is intimately involved in doing this. You're not leaving it just to the labs, not that we don't trust the labs.

Who is the team that is doing this?

MR. KEVERN: The initial cut is being -- the initial effort is being started by the -- as far as this Design-Specific Review Plan is by our National

Lab contractors and that initial --

MEMBER CORRADINI: Do you know the team?

MR. KEVERN: A combination of Oak Ridge National Lab, Brookhaven National Lab, Pacific Northwest National Lab, and Sandia.

MEMBER CORRADINI: And there's staff on that team also, not just the lab people?

MR. KEVERN: Right. And our technical staff. Those are the contractors and then the technical staff. It's each of the perspective branches within NRO.

MEMBER CORRADINI: Thank you.

MEMBER BLEY: And then you have something also, Bill, right?

MR. RECKLEY: I just wanted to finish up with some discussions we were having at the Subcommittee meeting and then continue. I think we've actually made some progress already in scheduling the May 7th presentation on emergency planning. But what we'll need to do is to continue on that path and work with ACRS staff and work through the staff to see what you want to talk about.

Some things that were previously mentioned that we need, I think, to start working into Subcommittee and Full Committee schedules, plant design familiarizations, I think this was done early on for some of the applications that we just went through. We would foresee that you would appreciate something like that so we could coordinate with the vendors to come and give overall kind of starting point presentations.

Then as we get into more detail, this kind of goes along with what Tom was saying. These aren't ordered in any particular way. We're going to be developing review plans for each of these designs. So that will be which of the safety features are most different. We would anticipate that the Committee, as well as the staff, will want to focus as early as we can on those. And this is this iterative feature that I would not foresee that on a Design-Specific Review Plan, again, taking something that's a little more different like the NuScale containment concept and bringing you necessarily a final product and say here is the total thing.

I would expect that on a feature that's as different as that is from what we're accustomed to, that it would get laid out in a series of meetings. When the vendor comes in and talks about the design, maybe subsequent discussions on safety features, and how we are going to do our review going back to Dr.

Powers. What are we going to do and how are we going to validate our models, what did they do to validate their models, would all be part of those discussions. And it's a short time frame. So we'll have to see how much of this we can get done.

But the goal is to do as much of that in the pre-application period as we can, such that they know to put in their applications. We know what to expect. The confirmations and final reviews are done after the application comes in, but we minimize how much of this we have to work out during the review process.

Again, going back to some of Tom's examples of spending many, many hours talking about whether its RTNSS or not, if we can resolve as much of that ahead of time as we can, it makes sense that it's safety related. It makes sense that it's RTNSS or it makes sense that it's all the way over into that other category.

MEMBER ARMIJO: Along those lines, one of the things that interests me is the issue of multi-module control and operation, particularly when two or more are envisioned to feed one turbine generator. And it seems that several of these systems could be hooked up that way. I would certainly like to understand what the staff is thinking on how they would review those kinds of issues.

MR. RECKLEY: Exactly, and that would be in a review plan which again looks in format like the Standard Review Plan, but the expectation is that we will be interacting with the ACRS on those review plans and guidance designed specifically just like we do on the Standard Review Plan. And the Committee may very well say they are similar enough that we don't need to look at 200 of the 250 sections.

MEMBER BLEY: And you have a SECY scheduled on this issue.

MR. RECKLEY: On which?

MEMBER BLEY: One of your reports due to the Commission is on multi-module?

MR. RECKLEY: Yes.

MEMBER BLEY: That's coming up fairly --

MR. RECKLEY: That's only on the licensing structure.

MEMBER BLEY: Just on the licensing structure.

MR. RECKLEY: Not on all the --

MEMBER CORRADINI: Not on operations.

MR. RECKLEY: It's a sub-issue within a whole bunch of other issues including the staffing, emergency planning and other things.

So in any case, I guess I just want to close then with we'll start interacting with ACRS staff in terms of subcommittees and so forth. In the longer term, you may face decisions on whether to form new subcommittees on designs like you did in the past or not. Again, that's all up to you. But as we start to lay out the schedules and talk with the staff, all of those things will be on the table so that you're not taken by surprise like was evident at the Subcommittee meeting that these papers are going up and you weren't aware.

MEMBER BLEY: Thank you very much. I'd like to thank the staff for a great presentation.

MEMBER POWERS: I'd like to ask a couple of questions. I'm sure you're right, that you're going to present this stuff to us over a spread of time. But sooner or later, you're going to come and say okay, we've looked at this. And our strategy involves a substantial amount of justification, subjective justification. You have things like graded approaches which are extraordinarily attractive, but sooner or later, a judgment gets applied on this is safe or not safe and things like that.

It's going to be bolstered by

calculations. And so I'm wondering at what point I should raise my objections about the calculations being unsupported by experimental data.

MEMBER CORRADINI: This would be a good time.

MEMBER POWERS: If I raise the objection at the final package, I'm quite sure you will present me a blizzard of justifications, most of which will hinge upon the fact that the computer code was somehow approved in the past for use in this application. So should I object when the computer code appears, that it lacks experimental validation for a design that I have yet to see? Or can I wait until you apply it to a design for which it was never qualified?

MR. RECKLEY: That is somewhat hypothetical because we don't have a calculation yet.

MEMBER POWERS: Well, come on. You know this is exactly what's going to happen.

MR. RECKLEY: But my advice is to raise it as early as you can identify it because what we want to avoid in all of these cases is finding ourselves what we had anticipated to be the end of the road and finding that there's now a whole lot of hurdles to do that. A vendor, for example, had not done tests. It's more likely the vendors would be doing most of these as opposed to the NRC staff, but that a vendor did not do a test, then reach again what we thought was supposed to be the end of the road to find out now they've got to go back and redo tests. And we've had some examples of that. And in those examples, AP600, for example, additional tests may have been done. There weren't expectations that AP600 was going to be built immediately. And so in the end everyone --

MEMBER POWERS: Let me give you a specific example --

MR. RECKLEY: -- knew about it, but in this case we're going to have schedules. And so anything that gets derailed late in the game is a bad thing. So I would say raise your concerns --

MEMBER POWERS: Let me give you an example --

MR. RECKLEY: -- as early as you can.

MR. MAYFIELD: Dr. Powers, if I could. Most of the vendors have test programs set up may be the way to get an early look at your concern. So invite them to come in and discuss with the Committee their test apparatus, their test plans, what they're really going to do and how they propose to validate the codes. And let the Committee get an early look at that. I have no interest in this coming up late in the game.

MEMBER POWERS: It's going to. You know it is.

MR. MAYFIELD: But if they do a good job upfront, then it won't.

MEMBER POWERS: It will come up, almost inevitably. I'll give you an example. It's some place where I happen to know that's going on. We have for your NGNP, you're going to ask for variously worded mechanistic source term or an appropriate source term. So you're doing a lot of experiments on release of radionuclides. It's fairly elaborate, undoubtedly heroically expensive because it's in pile testing and things like that of isothermal experiments. When in fact, we know the radionuclides will be the least in thermal gradients and the gradients in a gas reactor are just enormous gradients because the temperature drops accrue over very small distances. So a couple of thousand Centigrade per centimeter are just common thermal gradients, but these are isothermal tests.

And they're going to have a computer code to analyze those tests, based on Fickian diffusion with a diagonal diffusion matrix, which we know is not appropriate. And we're going to -- that's just going to be an incredible block for saying okay, now this is a qualified computer code for analysis of the source code.

MEMBER BLEY: I'd like to thank Mike for his suggestion. We'll certainly try to follow that up.

MEMBER CORRADINI: But I think, Dana, at least get these on the table early.

MEMBER BLEY: The only thing I was going to say is I think Dana's point is well taken. I think when Dave Petty -- I don't think Dave Petty forgot, because I'm pretty sure you said this to Dave straight up, what was it, a year ago, whenever we had this review of the AGR. But I think that's a fair question. It's going to eventually have to be answered in some fashion by either additional testing or by some sort of auxiliary testing after they do the irradiations. Otherwise, you'll keep on raising it and you'll have a problem once you get to the end.

MEMBER POWERS: Well, I mean when we get to the end, we'll be met with a blizzard of - because it has been approved for use and you can't object to it and things like that.

MEMBER CORRADINI: They'll probably be the first ones to stand up and say no.

MEMBER BLEY: Any more?

MEMBER POWERS: Again, the fundamental problem is I do not see the staff moving to have a crisp definition of where they require, shall we say integral, validation of computer codes. I see us moving more and more toward computer codes that no human being can understand. They're monster codes, unbelievable codes, that if you bring them in for an oral discussion in front of an ACRS Subcommittee, the Subcommittee would have to meet for six months to go through them.

I have no idea how this is going to progress and it's going to get -- it's going to be endemic to the small reactors because quite frankly they don't have enough amortization to do experiments. And experiments under things like reactivity insertion experiments and things like that just aren't going to get done. I don't know at what point you can accept that and at what point we can rely on the computational vehicle.

And I mean even in so simple an area as computational fluid dynamics where they're only solving four or five equations, seem to be heroic challenges in understanding the computer codes. When you get into chemical processes where there are hundreds and hundreds of equations that you can't even write out correctly, I think it's more a war of attrition. At what point -- I just get tired of asking the question and not getting an answer.

MEMBER BANERJEE: There is no substitute for experiments.

MEMBER POWERS: There is and they're pushing it very hard. We have a Secretary of Energy that seems to be persuaded that all things can be solved by just big enough of a computer code.

MEMBER BANERJEE: That's a separate story.

(Laughter.)

MEMBER BANERJEE: I agree with Dana that we do need a solid experimental base before we apply.

CHAIRMAN ABDEL-KHALIK: I think the proposal on the table for us to look at these best programs is the right thing to do. The Subcommittee should pursue that.

MEMBER BANERJEE: At this time, we're scheduled to take a break. So we will reconvene at 25 after.

(Whereupon, at 10:10 a.m., the meeting was recessed, to reconvene at 12:59 p.m.)

A F T E R N O O N   S E S S I O N

12:59 p.m.

CHAIRMAN ABDEL-KHALIK: We're back in session.

At this time we will move to Item 5 on the agenda, Point Beach Units 1 and 2 Extended Power Uprate application.

And Dr. Banerjee will lead us through that discussion. Sanjoy?

MEMBER BANERJEE: Thank you very much. We had a Subcommittee meeting of the Power Uprates Subcommittee on February 23rd and 24th and discussed Point Beach extended power uprate. This is an uprate of about 17 percent to about 1800 megawatts thermal.

Units 1 and 2 were licensed back in 1975, no, is it '75? Before that. 1972, sorry. Well, Mike lives nearby, so he knows these things.

In any case, they are two-loop Westinghouse PWRs and the original license power was 1518 megawatts thermal. They had roughly a 1.4 percent measurement uncertainty recapture uprate. And now they're going up by about 260 megawatts thermal.

So there have been pretty large modifications to the plant, particularly on the secondary side, many of which have been pretty positive with regard to safety.

So during the Subcommittee meeting, there was certain areas which probably got the most attention and one of these was boron precipitation. The second was flow-induced vibrations of the secondary due to increase flow in the secondary side, especially on the steam generator internals. Power Ascension testing of the plants or not doing extensive testing, particularly because there were several major changes on the secondary side.

And then there was some discussion also of things like anticipated transients, sort of overpressures that might result and whether we were according to code and so on.

In any case, I'm sure the staff, who seem to have done a very thorough job here, will go over these matters which the applicant has required. So I'm going to turn it over to Allen, I guess, to take it forward. And thank you very much.

MR. HOWE: Thank you and good afternoon. I'm Allen Howe. I'm the Deputy Director of the Division of Operating Reactor Licensing in the Office of Nuclear Reactor Regulation.

I do appreciate the opportunity to brief the ACRS this afternoon on the Point Beach extended power uprate application. As was mentioned, last month we did brief the ACRS Subcommittee on power uprates on this topic on February 24th and 25th.

Just a little background on this. In April of 2009 is when the application was submitted for the extended power uprate at Point Beach. I won't go over the numbers again for you since you've heard them, but it is a 17 percent power uprate.

The staff is prepared to present an overview of the results of our thorough safety and technical review of the licensee's application. We also plan to address selected areas that were highlighted during the Subcommittee briefings. And Terry Beltz will cover those topics in a little bit more detail.

During the course of our review, staff had frequent communications and interactions with the licensee. We held conference calls. We did audits. We had public meetings. And we also issued multiple rounds of requests for additional information. And those requests for additional information span multiple technical areas.

We believe that the open dialogue that we had contributed positively to the overall review.

Overall, I am pleased with the

thoroughness of the staff's review. There were a diverse set of technical issues and the staff interacted extensively with the licensee over the course of this review. And at this point, let me turn it over to Terry Beltz who will introduce the discussions.

MR. BELTZ: Thank you, Allen. Good afternoon. My name is Terry Beltz. I am the Senior Project Manager at NRR, assigned to the Point Beach Nuclear Plant. I'd like to take this opportunity to thank the ACRS members for your effort in reviewing the proposed EPU application in such a short period of time.

I also want to express my thanks to the NRC staff for conducting a thorough review of a very complex application and also for providing support to these meetings.

This afternoon, you'll hear presentations from NextEra and the NRC staff. The objective is to provide additional follow-up information relating to the details of the Point Beach EPU application. The information presented today provides sufficient information to assure the ACRS members that the proposed EPU is acceptable and to confirm the NRC staff's reasonable assurance and determination that the health and safety of the public are not endangered by the proposed EPU.

This slide provides the agenda and the principal topics for discussion today. The topics were determined from those focus areas provided by the ACRS members at the conclusion of the Subcommittee meeting on February 25th.

I'll provide a brief overview of the EPU and the application. NextEra will then go ahead and provide a presentation on the modifications and effects related to safety, risk, and the impact on operations. They'll have a discussion on the reduction in plant risk.

The NRC staff will then provide a safety analysis overview and there will be a focus on the LOCA boron precipitation. And the NRC staff will also give a presentation on the high-energy line break methodology.

The licensee will then go ahead and give presentations on the effects of increased steam generator flow velocity. They'll give human factors and operator response time presentation and the final presentation will be on power extension testing.

I'll briefly go over the EPU application, give some background. As was mentioned, the application was submitted on April 7, 2009. The application includes the licensing report which was Attachment 5. It also included an auxiliary feedwater modification within the EPU application. There was a high-energy line break methodology and there was an RPS/ESFAS setpoint methodology.

There were a total of 12 supplements to the application.

In addition to the EPU, there are currently three other amendments that are under NRC review. Two of them I talked about were the auxiliary feedwater modification and the RPS/ESFAS setpoint methodology application. There is also an alternate source term application that are under review.

These amendments support Point Beach EPU and require approval and implementation prior to the final implementation of the EPU for the respective units.

Unless there are any questions, I'd like to turn the presentation over now to Mr. Steve Hale. Steve is the licensing manager for the Point Beach EPU and AST amendments.

(Pause.)

MR. MEYER: Good afternoon. My name is Larry Meyer, NextEra. And I'm the site vice president for Point Beach. I'm the NextEra senior executive in charge of the plant. It's our privilege just to take a few minutes to provide a brief overview of the project.

Jay, next slide, please.

So this project is much about people as it is about hardware and this is actually a sign. This sign is about the size of a billboard. When you drive on our site, every morning, this is the sign that you pass and those are plant employees. More generation for our next generation.

Uprate at the plant coincides with hiring a new generation of workers and increasing power, increasing the amount of green power for the local community, as well as the next generation of plant equipment.

Next slide.

This uprate package is a very big package. It makes the plant better in a number of ways. It makes the plant safer. This package resolves a number of important legacy issues that have existed at the station for many years. It makes the plant more tolerant of secondary component failures and is more reliable, creates a more reliable plant.

This package involves a lot of

improvements from changes to the top works of our steam generators to reduce moisture carryover, a brand new unitized motor-driven auxiliary feedwater system for both units, new control room ventilation, emergency ventilation system. We've got new feedwater heaters, new feedwater pumps, new condensate pumps, new control systems on the secondary plant for heater drain and a real big package that makes the plant better in just a number of ways.

These changes result in an improved plant risk profile which Jay will talk about briefly in a few minutes, primarily through equipment improvements that eliminate the need for manual operator actions, as well as equipment improvements. Both of these, elimination of operator actions and equipment improvements, drive our core damage frequency and our large early release factor below existing plant levels, resulting in a safer plant.

Many important legacy issues resolved. The plant is a 40-year-old plant. And as a result there was some design issues really right back from basic initial design, a lot of to do with the electrical distribution system. For example, just one of them is our 480-volt electrical distribution system is at the limit of its loading from just a basic electrical capacity perspective. Has been that way for many years.

As a result -- and when you consider that our instrument air compressors, our charging pumps, and our battery chargers as well as the existing motor-driven auxiliary feedwater motors are all powered from 480 volts, we need to proceduralize in the control room and restrict the operators from putting certain combinations of equipment on certain 480-volt buses at any one time. We call that a long-standing operator workaround. In fact, that is the longest standing operator workaround at the plant. And that's by putting the new auxiliary feedwater motors on 4160 volts. We permanently have removed that restriction on the operators resolving a long-standing issue.

We have the wonderful benefit at the plant of having a two-unit simulator. So it's a two-unit station and unlike most plants in the country, are simulator models, both units. And so we've already installed all the modifications on one of the units in the simulator and have trained the operators on what the new plant looks like.

And as predicted and to our pleasure, the new plant is more tolerant of certain typical equipment failures that one might see on the secondary plant such as the loss of the feedwater, loss of the condensate pump, the failure to close or open of a heater drain valve, the failure of a feedwater pump recert valve.

The current plant is fairly resilient and tolerant of these, however, the upgraded plant will even provide the operators with more time to respond. More reliable because of the new equipment that's being installed which is very symbiotic with license renewal. In fact, Unit 1, just last October, entered its period of extended license operation.

And I'll show you a few photographs of the equipment. But another point I wanted to emphasize is that right from the beginning, there's been strong integration of site personnel with this project. It's not been one of these deals where sort of site is letting a project work on site and do something, the less we know, the better kind of thing. We've had many of our SROs and people involved from Day 1 reviewing the designs and getting the procedures ready to go. In fact, we have up to ten plant SROs assigned full-time to the project.

Much of the work that we've done, that hasn't required the approval, so to speak, that's been done online and has been done safely and event-free with over two million person hours worked without an injury as indicated here.

MEMBER STETKAR: You mentioned you are already in your period of extended operation on one of the units.

MR. MEYER: Yes.

MEMBER STETKAR: Have you re-performed all of your scoping and screening analyses for extended power operation to account for the uprates, the modifications to the plant?

MR. MEYER: Yes, sir.

MEMBER STETKAR: Folded all new AMPs and folded equipment into the existing AMPs and so forth?

MR. MEYER: Yes, we have.

MEMBER STETKAR: Okay, thank you.

MR. MEYER: And there's been some changes in inspection frequencies and things of that nature as a result.

MEMBER STETKAR: That's been fully integrated?

MR. MEYER: It has been. Yes, sir.

MEMBER STETKAR: Thank you.

MR. MEYER: So this is a picture of our new feedwater heaters. These have been installed on both units. They're beautiful.

(Laughter.)

MEMBER CORRADINI: As feedwater heaters go.

(Laughter.)

MR. MEYER: It's amazing what this can do for the plant though when you get an area look like this and you show everybody and say now this is what the plant needs to look like.

MEMBER CORRADINI: Historically, Point Beach has been a very tidy plant, even in the days of what you called extended manual operation. Glen Reed made it so, come hell or high water.

MR. MEYER: Right.

MEMBER SIEBER: Are all your feedwater heaters horizontal?

MR. MEYER: They are, yes.

MEMBER SIEBER: That's an old design.

MR. MEYER: So we've replaced a number of the feedwater heaters already. Unit 2 has a main transformer. This is the alpha, bravo, and charlie phases. The original transformers are 40 years old. They needed replacing anyway. We replaced them with uprated transformers. These transformers will be able to handle the uprated electrical generation capacity.

MEMBER SIEBER: And you have a separate device for each phase?

MR. MEYER: Yes, we do. In fact, this is the breaker for one of the phases. This would be the alpha phase breaker.

Jay, you can go to that slide right there.

We've also installed generator output breaker which is shown here. The plant never had generator output breakers before. The output breaker was in the switchyard. This actually improves the electrical safety margins for the plant.

This equipment is installed. This is one of the new motor-driven auxiliary feedwater pumps. It's tight-tight. We expect to do uncoupled runs on it for testing in the next week or two.

MEMBER CORRADINI: These are steam-driven only?

MR. MEYER: These are motor driven.

MEMBER CORRADINI: Right, but previously.

MR. MEYER: We still are retaining our steam-driven one.

MEMBER CORRADINI: This is in addition?

MR. MEYER: That's correct, yes.

MEMBER SIEBER: And you still retained the motor-driven ones, too?

MR. MEYER: We are retaining our old motor-driven ones as well.

MEMBER SIEBER: These come on first.

MR. MEYER: That's correct, yes, that's correct. And I'm also replacing the steam-driven ones with brand new Dresser-Rand Terry Turbines in the next two years.

MEMBER SIEBER: And that's important for fire protection. Because now you have separation.

MR. MEYER: Much better, yes.

MEMBER SIEBER: He has an exemption, I take it for the --

MR. MEYER: Discretionary enforcement, I believe, yes.

MEMBER STETKAR: Where are the new motor-driven pumps located?

MR. MEYER: They're located in the auxiliary building. And the existing ones are located in the turbine building. And this is a new main feedwater pump being started. The installation on this starts around -- within the next week.

I just wanted to show you a little bit about the plant and some of the photographs as far as by way of overview goes.

If there are no questions, we'll turn it back over to Steve.

MR. HALE: Hi, my name is Steve Hale. I'm with NextEra. As Terry Beltz indicated, I've been the project manager for the EPU and EST license amendment requests.

What I thought I'd focus on today in the modifications in the interest of time -- We went into a lot of detail on all the modifications during the subcommittee. But what I thought we'd do is focus on the mods that provided the most significant safety improvements as Larry has summarized. Jay, next slide.

As Larry mentioned, we are installing two new motor-driven AFW pumps. From the changes we also implemented, the system was a shared system originally. We had a turbine-driven pump for each unit. But the motor-driven pumps were shared. And as a result when you start looking at reliability, you start looking at availability it was not a highly reliable system.

So as part of our overall interest in improving the safety margin at the plant, we installed two new motor-driven auxiliary feedwater pumps and they will be unitized. So now you have a closer to a standard AFW system design with a motor-driven and a turbine-driven for each unit.

Another what I consider to be a very positive feature which we've used in some of our other plants in our fleet is we're retaining the existing motor-driven pumps. And those pumps will basically take on all the normal operating duties that currently the safety-related pumps had to do. So in essence you're taking on all that normal operating load off of the safety-related pumps and doing it with the now standby pumps. And so things like start-up, shutdowns and things like that can be accommodated by the existing pumps.

MEMBER SIEBER: I have a question.

MR. HALE: Yes.

MEMBER SIEBER: Typically a plant will have a steam-driven pump and two motor-driven pumps. The motor-driven pumps are from different diesels.

MR. HALE: Yes.

MEMBER SIEBER: Now you're taking credit for one steam-driven pump and one motor-driven pump from one diesel. So you still need the other two to satisfy the independence criteria.

MR. HALE: No. Let me explain what we did there. What we did is for one unit.

MEMBER SIEBER: Okay.

MR. HALE: The motor-driven pump is associated completely with one train.

MEMBER SIEBER: Right.

MR. HALE: The turbine-driven pump is completely associated with a differenture. Okay. Now grant it. On the turbine side it's all DC primarily, but we did go and look at the motor-driven and any DC related services are on its own associated with the motor-driven pump.

So essentially the motor-driven pump, for example, on one unit will be A train motor-driven, B train turbine-driven. And then the other unit will be A train turbine-driven and B train motor-driven. So they are totally electrically separated.

MEMBER SIEBER: And you can't cross connect the fluid side.

MR. HALE: Can't cross connect. No.

And then as Larry mentioned also which taking on an improved modification like this we also wanted to focus on eliminating a number of the operator actions that currently have to take place, so of these outside of the control room.

Where the safety-related source of water for aux feedwater for Point Beach is service water which is basically Lake Michigan, once your condensate storage tank you use the supply out of that, you transfer to service water. That is currently a manual action. That will now be an automatic action.

Also operators had to be stationed. The mini recirc valves on the AFW system are air operated. And as a result once the air supplies would be diminished we had to station, actually physically station, operators at the valves to actually operate those valves manually. That has been eliminated with the new design.

And then, of course, if you have a shared system and you have an event on one unit and not on the other unit, you had to do some positioning of valves in order to align the existing motor-driven pumps. That has gone away. So, as a whole, we've actually through the implementation of this EPU eliminated operator actions.

MEMBER BLEY: What's the quality of the lake water especially chloride content?

MR. HALE: It's essentially a freshwater lake.

MEMBER BLEY: So you're okay if the water doesn't generate.

MR. HALE: Yes.

MEMBER BLEY: You don't think it --

MR. HALE: It's not something you want to do certainly, but it is the safety-related source. Typically your source is from the condensate storage tank which is DI water (deionized).

MEMBER STETKAR: You're not great. The lake is still the lake what it was 30 years ago. You're not great putting that water in the steam generator.

MEMBER BLEY: A little different place than usual.

MR. HALE: It provides --

MEMBER BLEY: -- water a little different matter.

MR. HALE: Yes.

MEMBER SIEBER: Now you didn't need to do any of this to satisfy the minimum requirements with your licensing basis for the EPU.

MR. HALE: That is correct. The AFW is --

MEMBER SIEBER: So we could characterize it as a safety improvement as opposed to required to get the higher output.

MR. HALE: Yes, that is correct.

MEMBER BLEY: I'm just curious. How hard did you look at the possibility of the automated system accidentally putting lake water on the generator?

MR. HALE: That is a good point. It is a -- We spent a lot of time with OE looking at other plants. We're not the only plant in the country with this design feature.

MEMBER BLEY: I know.

MR. HALE: And it does pose some challenges for it because you want it to work and you want from a single failure standpoint all that to happen. But at the same time you don't want it to inadvertently go off. And we spent time and actually have provisions in the controls to ensure that we protect ourselves from inadvertent actuation without failing the single failure assumptions.

MEMBER SIEBER: Sooner or later I'll ask you how did your PRA results change.

MR. HALE: Okay. Yes, that's really part of my next slides.

MEMBER SIEBER: I'll wait until you get to the end of the change.

MR. HALE: Yes.

CHAIRMAN ADBEL-KHALIK: What is the capacity of the new pump?

MR. HALE: The new pumps are 275 GPM minimum flow capacity. They can actually go -- But that's the minimum required flow requirement.

MEMBER BLEY: One pump is sufficient.

MR. HALE: One pump. One pump is sufficient.

CHAIRMAN ADBEL-KHALIK: Barely sufficient after 30 minutes.

MR. HALE: I'm not sure what --

CHAIRMAN ADBEL-KHALIK: Two hundred and seventy-five?

MR. HALE: Yes.

CHAIRMAN ADBEL-KHALIK: One pump?

MR. HALE: Yes.

CHAIRMAN ADBEL-KHALIK: Eighteen hundred megawatts thermal?

MR. HALE: Yes.

CHAIRMAN ADBEL-KHALIK: At 30 minutes two percent?

MR. HALE: Oh yes.

CHAIRMAN ADBEL-KHALIK: Three hundred and sixty megawatts?

MR. HALE: Oh yes. That's plenty. Yes, sir. I can speak from experience.

MEMBER SIEBER: If plant trips it's just decay heat removal.

MR. HALE: Yes. It's just decay heat

removal.

CHAIRMAN ADBEL-KHALIK: I fully understand what it is based on. Okay.

MR. HALE: Yes. Very comparable to other units.

CHAIRMAN ADBEL-KHALIK: All right.

MR. HALE: Okay? We thought we'd include this flow diagram. It was something that we came back a little later during the subcommittee meeting to show the modifications, piping and pumps. This is for a single unit. And you can see the ties from the condensate storage tank through the new motor-driven pump and the supplies to the two steam generators. Next slide, Jay.

MEMBER BLEY: Could you go back to that one?

MR. HALE: Yes.

MEMBER BLEY: I can't read that and I haven't gotten mine open yet. You said there's no cross connect to the other train. What's that line going up there after the pump with an arrow on it? Where does that go?

MR. HALE: Which one is that?

MEMBER BLEY: Where does that go?

MR. HALE: I'm not sure which one you're

talking about.

MEMBER BLEY: From the output of the pump.

MR. HALE: Yes. The vertical?

MEMBER BLEY: The first up-branch you have with the closed valve on it.

MEMBER STETKAR: The thing that says "To Unit 2."

MR. HALE: Yes.

MEMBER BLEY: So it does cross connect to the other unit.

MR. HALE: Yes, but not by -- I mean not by automatic design or anything like that.

MEMBER BLEY: But it doesn't cross connect --

MEMBER SIEBER: The pipe is there.

MEMBER BLEY: -- by pipe to the other steam generator.

MR. HALE: No. You can see that --

MEMBER BLEY: It can help out the other units.

MR. HALE: -- the turbine-driven pump supplies both steam generators and the motor-driven pump supplies both steam generators and they're train specific.

MEMBER BLEY: Okay.

MR. HALE: But, no, there is a manual tie, but that's normally closed. The system is unitized. You know, certainly from PRA space if you wanted to align flow from another unit you could. It's kind of a defense-in-depth type of approach.

MEMBER SIEBER: Attribute.

MR. HALE: Yes.

Some of the other safety improvements that we've made, we are installing fast acting main feedwater isolation valves. These valves actually result in a decrease in peak containment pressure for main steam line break after implementation of the EPU.

We are implementing loss of voltage time delay relay setting changes to improve the plant response to grid stability, you know, things that may happen on the grid.

We have implemented, and this was going back to as Larry had mentioned legacy issues, a rigorous uncertainty based analysis for all of our RPS and ESFAS set points. These are not only the ones that were changed by EPU, but also all the other ones not changed by EPU. So we end up with a much better analysis based set point program with both of our RPS and ESFAS.

And as Larry pointed out we installed main generator output breakers.

MEMBER STETKAR: Steve, as part of the electrical upgrades, I know you increased the time delays under voltage time delays. Did you go back and look at relay coordination, protection relay coordination?

MR. HALE: Oh yes. That's one of your major things that you have to look at.

MEMBER STETKAR: Okay.

MR. HALE: And it's got to be looked at --

MEMBER STETKAR: You did that all the way down to low voltage stuff.

MR. HALE: Yes. You have to.

MEMBER STETKAR: Okay.

MEMBER BLEY: Your point is well taken. You have to do that on an integrated basis.

MEMBER STETKAR: Yes. Okay.

MR. HALE: And you've got to go all the way through and kind of from an external perspective and look at all aspects. You can't just modify the little pieces.

MEMBER STETKAR: Good. Thank you.

MR. HALE: Yes. Next slide, Jay. And we did implement a series of modifications specifically related and had direct impacts on our plant risk profile. We mentioned some of them were the AFW where we've eliminated some of the manual actions associated with that.

But a couple of other things that we did is that we installed or are installing a air compression which is self-cooled. What this does is it eliminates a tie to service water and it provides us some fairly significant benefits in PRA space.

In addition to that, the actual condensate and feedwater pumps are not cooled by service water any longer and, as a result of that, are not as susceptible to maybe some of the transients that you might see.

MEMBER CORRADINI: So are they component cooling? What's the cooling then in the condensate?

MR. HALE: It's the actual pump fluid I believe.

MEMBER CORRADINI: Okay. So it's --

MR. HALE: Right. Right.

MEMBER BLEY: So that air compressor ties into the instrument air system?

MR. HALE: Yes. Right. What we found there is if you have to rely you have a tie between power and service water that tended to increase our probability both in CDF and LERF. I'll get into that in a minute.

MEMBER BLEY: And it's oil free.

MEMBER SIEBER: Do your air compressors, the new ones, have a radiator or is it fin cylinders?

MR. HALE: It's -- Boy, that's a good question. Harv, do you know what the --

MR. HANNEMAN: Harv Hanneman from NextEra Energy Point Beach. Yes, the new air compressors are air cooled. So they have cooling fins in the cylinders for cooling.

MR. HALE: Yes, cooler fins. Okay.

And then also we essentially provided additional guidance to the operators. We had a feature in the design of the plant that gives us an alternate to our RCS depressurization. The pressurizer auxiliary spray, you can actually get it to open with a DP of approximately 250 psi. And as a result of that it gives us some flexibility with regards to RCS depressurization which is also a contributor in PRA space.

MEMBER STETKAR: Is that -- So what was that? I didn't get it.

MR. HALE: You have different means. You can open pores to depressurize. Your normal sprays come off your RCPs. So those aren't available with loss of offsite power.

What we found is the auxiliary spray which comes off the charging pumps, the valve will actually open once you get about a 250 psi DP across it.

MEMBER STETKAR: Just by itself?

MR. HALE: Just by itself.

MEMBER STETKAR: Oh.

MR. HALE: Okay. And you know --

MEMBER STETKAR: You kidding?

MR. HALE: No.

MEMBER CORRADINI: I don't think he is. He doesn't look like he's kidding.

MEMBER STETKAR: No.

MR. HALE: You don't have to have motive power to open the valve. In other words, right now it's an air operated valve to open. Okay. So with the spraying once you get about 250 psi you don't need air to open the valve.

MEMBER SIEBER: It opens the valve.

MR. HALE: You would open the valve, but you don't need air to open the valve.

MEMBER STETKAR: I understand. Okay. Yes, interesting. Go on.

MR. HALE: But anyway, the point being is it provides some flexibility in allowing us to have depressurization capability that we didn't recognize that we had immediately and it's highlighted in the procedures. And that also gives us some benefit in PRA space.

MEMBER SIEBER: That's not a physical change, is it?

MR. HALE: No, it's not a physical change, but it does --

MEMBER CORRADINI: But did you do a test? How did you determine that?

MR. HALE: What?

MEMBER CORRADINI: Did you do some sort of in situ test or did you have a --

MR. HALE: No, we actually replaced the valve some time in the past.

MEMBER CORRADINI: Oh.

MR. HALE: We just didn't recognize that from a procedural standpoint we could actually also credit that. That's why we clarified this.

MEMBER BLEY: I guess it's the pump though that's coming up under --

MR. HALE: Right. It's a positive displacement pump.

MEMBER BLEY: Something's got to give.

MR. HALE: Yes.

MEMBER BLEY: Now are you not concerned that you might get some damage from blowing that valve open from underneath?

MR. HALE: No. It's just you don't need the air to assist it open.

MEMBER BLEY: It's designed to work that way?

MR. HALE: Yes.

MEMBER CORRADINI: But I thought Jack said something on the side. But since you have a positive displacement pump and you're going to have just a small change in liquid volume, would it go bub, bub, bub?

MR. HALE: No. You just don't -- You've got to realize this is just a regular valve to open. You don't need air to assist it to open.

MEMBER CORRADINI: Right. I know. But I thought Jack's --

MEMBER SIEBER: Positive displacement pumps put out pulses.

MR. HALE: I know very well. I've done testing on three units.

MR. MEYER: I guess the question, Steve, is how do we know.

MR. HALE: The valves are tested in the

shop. They confirm that.

MEMBER CORRADINI: Okay. With a positive displacement pump pressure signature.

MR. HALE: Yes.

MEMBER CORRADINI: Okay.

MEMBER SIEBER: There you go.

MR. HALE: But you've got to realize you have features also on positive displacement pumps to limit damper pulsations, pulsation dampers and things of that sort.

MEMBER STETKAR: Is that auxiliary spray line normally isolated with an --

MR. HALE: Yes, it is.

MEMBER STETKAR: It would have to be, wouldn't it?

MR. HALE: Your normal means of sprays are from your RCPs.

MEMBER STETKAR: Sure.

MR. HALE: So it's a line that comes off of your charging header.

CHAIRMAN ADBEL-KHALIK: Back to the 270 gallons per minutes capacity of the aux feedwater pumps.

MR. HALE: Sure.

CHAIRMAN ADBEL-KHALIK: This is based on

being able to remove decay heat after 30 minutes.

MR. HALE: That is true. Yes.

CHAIRMAN ADBEL-KHALIK: So it's supposed to remove 36 megawatts at what pressure?

MR. HALE: At whatever steam pressure is at. You know, we're designed to deliver the required flow at the safety valve lifts that point. Yes.

CHAIRMAN ADBEL-KHALIK: At the safety valve.

MEMBER SIEBER: It may be a little short for the first minute or so. The level will come down. But decay heat drops off pretty rapidly right after.

MR. HALE: And your criteria or your immediate criteria, the hardest criteria to meet, is to prevent pressurizer overfill.

MEMBER SIEBER: Right.

MR. HALE: Okay. And RCS overpressure for some of the events. But those are your limiting events for AFW that establishes that minimum flow rate.

CHAIRMAN ADBEL-KHALIK: But that heat removal capability of 36 megawatts is based on an aux feedwater inlet temperature to the steam generators of what? Room temperature?

MR. HALE: Yes, pretty much. Room

temperature.

MEMBER SIEBER: It comes out of the condensate storage tank.

MR. HALE: Yes, the condensate storage tank. You know, your safety related source, of course, is Lake Michigan.

MEMBER SIEBER: Right.

MR. HALE: But from my safety -- I mean from a assumption standpoint you would go with whatever the highest anticipated temperature would be.

MEMBER SIEBER: You have an upper limit on that temperature.

MR. HALE: Right. What's that, Harv? One hundred degrees on CST temperature of 100?

MR. HANNEMAN: Harv Hanneman, NextEra Energy Point Beach. Yes, the CST is limited to 100 degrees Fahrenheit maximum temperature.

MR. HALE: Right. That's what you would --

MR. HANNEMAN: I would also add as far as the capability of the pump at 275 gallons per minute that's the input to our design basis accident analysis and the limiting accident is loss of normal feedwater.

CHAIRMAN ADBEL-KHALIK: Right.

MR. HANNEMAN: And so we've shown that

that's sufficient to handle that accident and prevent pressurizer overfilling.

CHAIRMAN ADBEL-KHALIK: But in that analysis you're relying on the water inventory in the steam generators.

MR. HALE: That's true.

MEMBER SIEBER: True. To start output.

MR. HALE: That's really one of the benefits of recirculation, steam generators, you know is you have some --

MEMBER SIEBER: Volume.

MR. HALE: -- capacitance I guess you could call it.

CHAIRMAN ADBEL-KHALIK: Okay.

MR. HALE: Any other questions on the modifications?

(No verbal response.)

All right. Thank you. With that I'll turn it over to Jay. He and I will trade places.

MEMBER BANERJEE: Jay, maybe you can just discuss briefly the change in the delta T. Just set the stage.

MR. KABADI: Okay. Yes. I'm Jay Kabadi. I'm a nuclear fuels manager for Point Beach.

As you heard, we are operating from 1540 megawatt ton which is the current power level to 1800. So this will be achieved right from the nuclear fuel all the way to the secondary side. We'll be putting more fuel, fresh fuel that we recycle, that will increase our load about eight to 12 assemblies based on the cycle length of every cycle and that will help produce more energy in the core.

Delta T across the core will increase because our RCPs are the same. So the flow going into the core is same. So Delta T will increase. And our T av is increasing to 577 from the current level of about 574. And since we are maintaining T av not exactly going up proportional to the power level or T core our inlet temperature will go down for full power. So Delta T across the core will go up and essentially the T hard going into the steam generators will be harder and will be transferred across the steam generators. And that power on the secondary side, there are a lot of changes done to take that power and convert into the --

MEMBER ARMIJO: Will your peak power levels LHRs stay the same?

MR. KABADI: Our tech spec FQ will remain the same.

MEMBER ARMIJO: Yes, the fuel.

MR. KABADI: So LHR will go up because the average power will go up.

MEMBER BANERJEE: You have a table on that. Right?

MEMBER ARMIJO: You have a number there from --

MR. KABADI: The FQ is over 2.6. So average power is -- I don't have exact number, but it's about 6.7, something in that order, the average power of the core.

MEMBER ARMIJO: Average kilowatts per foot.

MR. KABADI: Yes. Average kilowatts per foot is in that range.

MEMBER ARMIJO: What about the peak?

MR. KABADI: The FQ is 2.6. So 2.6 times --

MEMBER ARMIJO: Is it 13.4? 14.4?

MR. KABADI: No, it's more than that. It's more than that. It's about -- I think it's about roughly 17 maybe. I don't have a calculator here.

MEMBER BANERJEE: Could you do this because I think these are relevant questions? We could get a little table showing some of the fuel parameters and just summarize it for Dr. Armijo.

MR. KABADI: Okay.

MEMBER BANERJEE: Unless you have the number. You can give it to him right now.

MR. KABADI: I mean so I have the numbers in terms of -- Like I said our enrichments will vary from four to 4.95.

MEMBER BANERJEE: Going up in enrichment. Right?

MR. KABADI: Our license enrichment remains the same. We are currently licensed for 5.0.

MEMBER BANERJEE: Right.

MR. KABADI: And we are currently using enrichments in the same range. Now the number of feed assemblies will go up.

MEMBER STETKAR: Right.

MR. KABADI: And like I said right now we are using on the average of about 36. That will go up to about 48. Therefore we are expecting a raise in the cycle anywhere from 44 to 48 number of assemblies.

MEMBER BANERJEE: Enrichment goes up slightly and, of course, the number of assemblies will go up.

MR. KABADI: Right. The number of feed assemblies will go up.

MEMBER ARMIJO: And you're flattening the power in the core.

MR. KABADI: Right. We are reducing the --

MEMBER ARMIJO: And getting more energy out of the core.

MR. KABADI: Yes, we are reducing the peaking factor which is F delta H to from 1.77 to 1.68. We are maintaining as I said FQ same, but our average power in the core will go up. So our peak linear heat rate will go up.

MEMBER ARMIJO: Your peak linear peak from roughly --

MR. KABADI: Heat rate because we are maintaining FQ.

MEMBER ARMIJO: -- roughly from what to what?

MR. KABADI: It's exactly by the ratio of the power which is about 17 percent because we are keeping the FQ which is the peak kilowatts per foot to the average power the same. So that remains 2.6. So our increase in the average power will go up by 17 percent. So peak linear heat rate kilowatt per foot will go up by the same amount.

MEMBER SIEBER: You should end up with a flatter power distribution.

MR. KABADI: Yes. The power distribution --

MEMBER ARMIJO: Higher.

MR. KABADI: -- will be flatter. As I said, we have F delta H which is the hot ***1:43:36 of going down from 1.77 to 1.68.

MEMBER SIEBER: If you would have increased the enrichment which you probably can't because ***1:43:50 and kept the number of feed assemblies the same --

MR. KABADI: Yes, I think -- Yes, we did a lot of sensitivities on that and they did satisfy all the requirements of both accident analyses as well as fuel performance and all aspects of the operation.

MEMBER SIEBER: So you end up with approximately the same discharge burn-up.

MR. KABADI: Yes. The discharge burn-up will remain -- we'll be discharging actually more ***1:44:18 assemblies that we did not have to do in the past.

MEMBER SIEBER: A little bit more.

MR. KABADI: But the ***1:44:19 assemblies will run to about the same burn-up.

MEMBER ARMIJO: And you're compensating for some of this gas pressure --

MR. KABADI: Right. By reducing --

MEMBER ARMIJO: Angular pellets, more angular pellets.

MR. KABADI: Yes, increasing the angular actual blanket length from six inch to eight inch.

MEMBER ARMIJO: Right.

MR. KABADI: And we are also reducing the IFBA loading from 1.5 to 1.25. So all that, we did a lot of studies on that and maintains that there is pressure to a reasonable level.

MEMBER SIEBER: Now you've done that by reducing the pellet stack height. Right? Because the assemblies --

MR. KABADI: Pellet total actual length remains the same. Just the actual blanket length goes up.

MEMBER ARMIJO: Put in more for gas space.

MR. KABADI: Right. Exactly. That's the reason of increasing that.

MEMBER ARMIJO: Okay. Thank you.

MR. KABADI: Yes. Okay.

MEMBER BANERJEE: Do you need any more information because I know that you couldn't attend the meeting?

MEMBER ARMIJO: No. Yes, I missed that

and I was sorry to do that. But this is a little different from what I've seen the past in BWRs where actual peak LHERs stayed exactly the same and they just spread it out. In this case, you are increasing it by two or three kilowatts per foot.

MR. KABADI: Yes, we are maintaining that FQ ratio the same. We actually designed much lower, but all the analysis are done to that higher value.

MEMBER ARMIJO: And was this similar to what was done in Ginna? I know you reference it once and a while in your documentation that you kind of model what's been done with a prior EPU of this magnitude.

MR. KABADI: Right.

MEMBER ARMIJO: Did they have -- Did they do the same sort of thing?

MR. KABADI: Yes. They actually reduced the F delta H to 1.72 or something. They did not go all the way to 1.68. They actually remained a little higher than us.

MEMBER ARMIJO: Okay.

MEMBER BANERJEE: Ginna also had to change the fuel type.

MR. KABADI: Yes.

MEMBER BANERJEE: Whereas they are staying with the same. Or they're already there.

MR. KABADI: Ginna actually implemented the same fuel as what we have right now.

MEMBER BANERJEE: Okay. And their linear heat rating is comparable, isn't it?

MR. KABADI: Yes. That's the same as us.

CHAIRMAN ADBEL-KHALIK: Now FQ remain roughly the same, 2.7. What's PBAR?

MR. KABADI: That's the average across the whole core.

CHAIRMAN ADBEL-KHALIK: Right. But what's the ratio between heat bundled power and average bundled power?

MR. KABADI: Yes. That remains in the range of about 1.4, 1.8. It changes to run the cycle but in the range of 1.4 or 1.5. That's what our PBAR numbers are in the range of 1.5. That's the peak assembly --

CHAIRMAN ADBEL-KHALIK: Now Point Beach has never had problems in the past with axial offset anomaly.

MR. KABADI: That is correct. We did not have a problem and as a part of this uprate we did a lot of studies in the field performance looking at the other aspects of actual anomaly.

CHAIRMAN ADBEL-KHALIK: Right.

MR. KABADI: We did actually have Westinghouse do a lot of field performance studies all the way to level three and level four of the EPRI guidelines and we have verified that our level of ***1:47:45 disposition and boron disposition were well below the risk level.

CHAIRMAN ADBEL-KHALIK: You were originally classified as the --

MR. KABADI: Low risk, yes.

CHAIRMAN ADBEL-KHALIK: Yes. So where are you on that risk scale?

MR. KABADI: Yes, still below. We did a study all the way up to three cycles right now and in three cycles we still remain low. We will continue to follow with our actual site with our actual designs where we fall. Our levels right now --we've had studies done -- still remain in the low level, low risk level with the operated designs.

Now when we do our actual cycle designs and recycle as a part of -- Like, for example, right now we have design cycle 32 which is the core right now. We have an outage and once if this is approved it will be our first operate cycle. We have done specific with that also and the risk has been very far below.

CHAIRMAN ADBEL-KHALIK: So even though you increase power, you still consider low duty core.

MR. KABADI: That's correct. There from the EPRI level three/level four considerations. We were very low before. That has gone up slightly but still below what is called the thing which switches you from low risk to medium risk.

MR. HALE: I think what you find also is that for the two loopers the temperatures are typically lower --

CHAIRMAN ADBEL-KHALIK: Yes, I understand.

MR. HALE: -- than what you see with four loop plants and stuff.

MR. KABADI: Right. Four loops.

CHAIRMAN ADBEL-KHALIK: I understand.

MR. KABADI: Yes. And as I said we'll as part of the recycle continue following these just to make sure that if there is anything going on you want to get that up front. So we do project. Right now, we have a project that puts recycles in future to see how the trend will be and right now the levels look good. But as I said following cycle/recycle.

CHAIRMAN ADBEL-KHALIK: Okay.

MR. KABADI: Okay. So I think I'm going

to the safety analyses. I'd like to just -- Yes, quickly on that just to see what the overall approach for safety analyses we use and what changes we did.

One thing we did is we are using new methods for our accident analysis. Those are previously approved by NRC. We are reducing as I mentioned before the F delta H. We have moving from the axial offset control strategy which is a RAOC to CAOC which is a relaxed axial offset to a consent. And that gives significant benefit in the axial offset in terms of axial analysis. And Steve and Larry talked before about the AFW system that has been a factor for in these analyses.

One of the approaches in the analyses what we tried to do is we are trying to make sure that the assumptions used in the analyses remain bounding cycle by cycle. So physics parameters we tried to set it up to allow for any cycle-by-cycle variation. So every cycle we don't go below the limits of these analyses. And that's a typical approach which we are currently using and it's still the approved method which called ***1:50:44 reload safety analyses checklist that we follow and verify every cycle that we don't go beyond.

As far as the plant operating parameters, we have covered the range of what is expected operating parameters are and analyses are done to account for all the uncertainties. These are directly into the analyses or the analyses do nominal values and then the uncertainties are applied when we do the DNBR calculations which is the approved methodology called Revised Thermal Design Procedure, RTDP method for DNBR.

One of the things as far as the DNBR we are -- the thing I want to highlight here is the way the analyses is done is as you can see the limits are checked against the Safety Analysis Limit. The way the methodology particularly with Westinghouse we do is we define the safety analysis limit which already has some margin built compared to the regulatory and the design limits.

So as long as we meet the safety analysis limit we are assured to have margin compared to the real DNBR limit. So in many of these analyses results we see that the safety analysis limit and the actual values are very close. But that assures us that there is very sufficient margin compared to the real DNBR limit which is the approved correlation limit for that particular correlation.

And we have been using different correlations based on the conditions. So the majority of the analyses are done with WRB-1 correlation which is used for the majority of the analyses. And in places where low pressure and other conditions don't permit WRB-1 correlation we are using W-3 correlation. So there are some changes in the correlation limits that is coming because of different correlations.

And this slide I'm just going to highlight some of the key events in some of the categories. In the decrease in flow category, we have main events of loss of flow and a locked rotor. Both of those meet the acceptance criteria.

For locked rotor, our Rods-in-DNB criteria for those is 30 percent and we are getting 25 percent fuel failure for that. And this is where we used the new real methodology from Westinghouse which is the 3-D neutronics method.

For the overheating --

CHAIRMAN ADBEL-KHALIK: Which code was used for the loss of feedwater ATWS?

MR. KABADI: Well, it's the --

CHAIRMAN ADBEL-KHALIK: The loss of feedwater ATWS, what code was used to analyze?

MR. KABADI: That ATWS must have been done at RETRAN. I have to verify that. But that might be done with RETRAN. But I need to verify that.

Westinghouse.

MR. HANNEMAN: Harv Hanneman, NextEra Energy Point Beach. The ATWS analysis was redone on a plant-specific basis using the Westinghouse LOFTRAN code.

MR. KABADI: LOFTRAN.

CHAIRMAN ADBEL-KHALIK: So you're using the old LOFTRAN code.

MR. KABADI: But for ATWS.

MR. HANNEMAN: Just for the ATWS analysis.

MR. KABADI: Just for the ATWS. And all the other transient analyses we have shifted to RETRAN.

CHAIRMAN ADBEL-KHALIK: Well, given the fact that the result for your loss of feedwater ATWS is so close to the limit, have you checked that against a more modern code than LOFTRAN?

MR. HANNEMAN: Again, there's a generic ATWS analysis that was done by Westinghouse. I've believe it's documented in a WCAP and so they have generic analysis for two-loop, three-loop, four-loop plants. We had previously used just the generic two-loop analysis. But for the EPU we did a plant-specific analysis and we wanted to be consistent with the methodology and codes that were used in this previous generic analysis. That's why we stuck with the LOFTRAN code.

CHAIRMAN ADBEL-KHALIK: But are you sure that LOFTRAN is conservative especially for a loss of feedwater ATWS?

MR. HANNEMAN: It was used by Westinghouse for the generic analysis which was submitted and reviewed by the NRC.

CHAIRMAN ADBEL-KHALIK: Thirty years ago.

MR. HANNEMAN: I'm not sure of the date of that.

MR. KABADI: Yes, but that's still all right. We have not changed the methodology for that as Harv mentioned really that for operate and the only thing what is conservative in that is the -- limits used are compared to our plant-specific numbers.

CHAIRMAN ADBEL-KHALIK: Has the staff done any independent calculation especially when the result is so close to the limit?

MR. PARKS: This is Ben Parks, Reactor Systems Branch. We didn't do confirmatory calculations on the ATWS analyses. However, to speak more to the questions that you're asking to the Licensee, Westinghouse's replacement tool is RETRAN. RETRAN and LOFTRAN are benchmarked together with code-to-code comparisons and have excellent agreement. The basis for approval --

CHAIRMAN ADBEL-KHALIK: Are you sure for loss of feedwater ATWS that these two codes --

MR. PARKS: Specifically for loss of feedwater ATWS, no.

CHAIRMAN ADBEL-KHALIK: Okay.

MR. PARKS: But again overall the codes were compared and the basis for our approval of RETRAN was that it compared excellently with LOFTRAN which is benchmarked against actual plant --

MEMBER CORRADINI: So let me make sure I understand what you just said. So what you're saying is that RETRAN is good because LOFTRAN is good.

MEMBER SIEBER: Right.

MR. PARKS: That was our basis for, part of our basis for, approving RETRAN.

MEMBER CORRADINI: Okay. That's fine. I just wanted to make sure I heard it. That's all.

CHAIRMAN ADBEL-KHALIK: My understanding is that these two codes predict different results for the loss of feedwater ATWS.

MR. PARKS: Well, again I --

CHAIRMAN ADBEL-KHALIK: And if I were to believe one I would believe a more modern code.

MEMBER CORRADINI: A RETRAN more modern code. Is RETRAN considered more modern?

CHAIRMAN ADBEL-KHALIK: Than LOFTRAN.

MEMBER CORRADINI: I don't know. They're both pretty old.

CHAIRMAN ADBEL-KHALIK: Yes. But it's old and very old.

(Off the record discussion.)

MR. GARNER: Ken Garner, Westinghouse. RETRAN has not been approved for use analyzing ATWS in the generic or in the ATWS submittal.

CHAIRMAN ADBEL-KHALIK: But I don't think that was the question.

MR. GARNER: Okay.

MEMBER BANERJEE: Does that mean you have not exercised RETRAN?

MEMBER CORRADINI: I guess I have to step in. I want to make sure I understand because I'm confused about all this regulatory stuff. What I think he just said was that if they tried to use RETRAN it's not approved. They would have to go through an approval process for RETRAN.

MEMBER BANERJEE: Right. But Said's question was how do they compare.

CHAIRMAN ADBEL-KHALIK: Well, I mean

whether the staff has done any independent calculations using a more modern code.

MEMBER CORRADINI: That's different.

CHAIRMAN ADBEL-KHALIK: Given the fact that this is a very old code and there are a lot of assumptions in LOFTRAN and also considering the closeness of the predicted peak pressure to the limit.

MR. HALE: Well, I think one thing it's important to point out that certainly we use bounding parameters in the analysis to start with. So there's margin there. And also the limit, the value of 3215 psia also has margin built into that as well. So it's not as if there's not margin in the limits I guess is the only point I would make.

CHAIRMAN ADBEL-KHALIK: How much margin is there in the 3215?

MR. HALE: I can't speak to exact margins, but I know from a code perspective you know you're probably looking at maybe one-third -- 50 percent from overpressure evaluation.

CHAIRMAN ADBEL-KHALIK: Seriously you can't be saying that this number has a 50 percent margin in it.

MR. HALE: I'm just saying there's margin in the numbers. I can't speak to the exact numbers.

CHAIRMAN ADBEL-KHALIK: Okay.

MR. HALE: But that is not yield I guess is the point I'm making.

MR. KABADI: Yes. We have the MTC value used in these analyses which was done with 3175 as margin compared to our actual MTCs for the cycle on that.

MEMBER CORRADINI: I'm concerned.

MEMBER ARMIJO: I have similar questions about the overcooling event where your LHR, the limit and the criteria and the results of the analysis for all practical purposes are the same.

MR. KABADI: Yes. Right. I think there is margin on both of those, for example, when the calculated number used very conservative assumptions in terms of the trip setpoints used for this thing. And the centerline melt used for defining the limit is also conservatively set here.

MEMBER ARMIJO: So is a 22 -- Is a critical set on the basis of fuel melt?

MR. KABADI: Yes.

MEMBER ARMIJO: Only on fuel melt?

MR. KABADI: Yes.

MEMBER ARMIJO: Or is there clad strain parameter involved in that?

MR. KABADI: No, it's just based on the fuel melt.

MEMBER ARMIJO: Strictly on fuel melt.

MR. KABADI: Right. And that is a conservative criteria set up and the parameters used in these analyses are bounding cycle-by-cycle. We will pass all of them.

MEMBER BANERJEE: I guess the overall question coming out of this and eventually I'm sure the staff will address it is that some of these numbers come pretty close to the limits. Okay. And the explanations are that they use bounding parameters and so on to set --

MEMBER ARMIJO: It's okay to go right up to the line.

MEMBER SIEBER: Because there's more beyond that.

MEMBER BANERJEE: Well, let's ask the staff that question when it comes up in the safety analysis.

PARTICIPANT: It's typical design basis.

CHAIRMAN ADBEL-KHALIK: My concern is that the results are code-dependent.

MEMBER BANERJEE: They are.

CHAIRMAN ADBEL-KHALIK: And if you get so close to the limit it sort of calls for an independent verification.

MR. KABADI: And some of these numbers are not atypical also compared to other -- Like for the loss of load, their numbers are a little higher than what we see here. Instead of 2741.9 they are a little higher. And again these analyses are done with the safety valves and all the valves opening at their highest tolerance and all which is very, very conservative. And then those tolerances itself account for 50 to 70 psi difference instead of if you just assumed that on the average all the while we assume their nominal setpoints. That would be a tremendous benefit. So all these are bias, all the safety valves opening which is a big impact on these loss of load type analyses. Those are done very conservatively.

MEMBER BANERJEE: None of these are with nominal values. Right?

MR. KABADI: That's correct. These are all taken to all the extremes of both the operation at the same time the setpoints and lifting of the rods. All that's set to the extremes and with those the numbers are matched to cycle. But for every other ***2:02:16 these are all bounding for this one. Next slide.

MR. HALE: Next slide.

MEMBER BANERJEE: There were some calculations you did with nominal.

MR. KABADI: And those ones I think are just briefly mentioned. Some calculations which are the nominal, the uncertainties, are accounted for when the DNBR calculation is done. That's the Westinghouse revised procedure where is what you do is many times you run the transient the nominal and then the uncertainties are statistically combined when in the DNBR calculation. So the overall --

MEMBER BANERJEE: What did you use nominal for?

MR. KABADI: Like all the RTDP calculations. For example, this is one of rod withdrawal, loss of flow, of lock rotor. You use nominal in your transients and then the uncertainties are applied when you calculate the DNBR. And those are really like in the submittal. Those are mentioned as being used with the RTDP approach and that's where the revised thermal design procedure which is approved by the NRC that allows the uncertainties to be combined statistically in defining the final limit rather than applied and right up front deterministically. Next one.

MR. HALE: Next one.

MR. KABADI: Yes.

MR. HALE: Okay.

MR. KABADI: Okay. ASTRUM large break LOCA analysis was approved in the last year prior to the EPU and this just presents the results of that analysis. It covers the EPU conditions. The peak cladding is 1975.

MEMBER BANERJEE: The first one pre-EPU is not an ASTRUM calculation.

MR. KABADI: That is correct. And one of the things on this slide I want to point out is I think that in the discussion last week at the subcommittee meeting a point came that what is the 50th percentile PCT just to see how the 95-95 compares to that. This one shows that for the limiting PCT which was reported in 1975 the 50th percentile actually is very below that. That shows how -- the 95-95. That was one of the discussions last week in the subcommittee. So just put in the slide. The 50th percentile is about 600 degrees or so lower.

MEMBER BANERJEE: If you're worrying why the pre-EPU value is higher it's a different methodology.

MR. KABADI: Right. For pre-EPU it was not ASTRUM.

MEMBER BANERJEE: It's all best estimate for uncertainty.

MR. KABADI: And that was some of the sensitivities on those that were provided as a part of the approval of these to the staff. Next one.

CHAIRMAN ADBEL-KHALIK: This 2.57 percent oxidation includes the pre-event oxidation as well or this is just associated with the event itself.

MR. KABADI: This reported one, I have to double-check but it looks like this is just calculated for the event this 2.57.

MEMBER BANERJEE: Do you see the benefit of best estimate plus uncertainties? It allows you to do the EPU.

CHAIRMAN ADBEL-KHALIK: But what is the estimated pre-event oxidation level?

MR. KABADI: I do not know whether that was --

MEMBER ARMIJO: I think you're supposed to include that. I think the staff issued some guidance a few years ago that you really should include the pre-event oxidation.

MEMBER CORRADINI: The reporting of it,

Sam?

MEMBER ARMIJO: What?

MEMBER CORRADINI: When you report it.

MEMBER BROWN: Yes, the comparison. But this is a zero load. So it's going to be low.

MR. KABADI: Right. That what we're checking is being okay. What I don't remember is if the 2.57 is there. But the margin with the 2.57 that allows enough that even with the pre-EPU it meets the -- I mean the pre-accident oxidation it meets the requirement of 70 percent.

MEMBER ARMIJO: With the current regulations.

MR. KABADI: That's correct. Yes, that has been looked at. The only thing I don't remember is if that number is with that or without that. But in either case such a minor compared to the margin we have. So that's not a concern for this.

MEMBER BROWN: But it is zero load. Right?

MR. KABADI: Yes. We have zero load cladding for this and -- when these numbers come close to meeting the limits that's where I think that becomes a concern. But that was checked as being okay.

MEMBER BANERJEE: When you say long-term cooling here clearly you don't mean long-term cooling with any debris effects. Right?

MR. KABADI: These are long-term cooling for 5046 and that's where the boron precipitation and all that is coming in.

MEMBER BANERJEE: Right. That's what I said.

MR. KABADI: Yes. Next slide.

Yes, this is a small break LOCA. The small break LOCA some of the changes which affect this analysis that was done for EPU is all the power is increasing. We have reduced the F delta H from 1.8 to 1.68. And then the actual offset because we went from the RAOC methodology to the CAOC. That reduced the actual offset significantly. And then the --

CHAIRMAN ADBEL-KHALIK: Can we go back to the previous slide please?

MR. KABADI: Okay.

CHAIRMAN ADBEL-KHALIK: There is a what I consider a sizeable difference between the predicted peak clad temperature per units 1 and 2. What is the difference between units 1 and 2?

MR. KABADI: Yes. I think part of it is a steam generator difference and the other part is just the methodology, how those parameters are sampled. Between that 95/95, even a few points fall in there based on how the sampling is done. That's a part of the ASTRUM.

MEMBER CORRADINI: So I'm sorry. The first thing was what?

MR. KABADI: Steam generator differences. There are --

MEMBER CORRADINI: So replacement. What was replaced from the original component?

MR. KABADI: Yes.

MEMBER CORRADINI: Okay. And I don't understand the methodology difference. Two different people did it at two different times or two different --

MR. KABADI: It's a sampling.

MEMBER SHACK: It's a sampling.

MEMBER BANERJEE: So you can get completely different -- not completely -- but you will get different results.

MEMBER SIEBER: You can get any number you want.

MEMBER CORRADINI: So then let me ask the next question.

MEMBER SHACK: For the convergence.

MEMBER CORRADINI: This is what? This is like a Monte Carlo sampling.

MEMBER SHACK: Yes.

MEMBER SIEBER: Yes.

MEMBER SHACK: Fifty-nine samples.

MEMBER BANERJEE: Fifty-nine samples.

MEMBER CORRADINI: So nobody did 60 or 65 to see if they started conversion.

MEMBER SHACK: No. All you're looking for is it's at least this. So you get a value that's guaranteed to give you a bound on your 95/95. But you don't try to go and find out what it really is. You can run more cases.

MEMBER BANERJEE: Yes, you could run more cases. You could do 99/99. But you don't need to by this methodology.

MR. KABADI: That's right. This is just done using the way the methodology was approved and that's how these numbers came out.

CHAIRMAN ADBEL-KHALIK: And what is the difference between the steam generators? Just the fraction of tubes that are plugged or what?

MR. KABADI: No. The design is different. The one is delta 47 and one is 44 F generator. We have two different generators. That's like volumes are different.

MEMBER CORRADINI: Right.

MR. KABADI: And so the tube lengths are different. So there are some differences in that. That at least contributes to this much difference. That might have contributed some of the difference, not all.

MEMBER BLEY: So there are different dryout times to them. Do you have different procedures for one unit than the other for going to --

MEMBER CORRADINI: Not because of this.

MR. KABADI: Procedures and all will drive the operators to take actions based on the levels and those will be the same.

MEMBER BLEY: Just based on levels, not range.

MR. KABADI: Right.

(Off the record discussion.)

MEMBER BANERJEE: But you could even -- I mean if you did this once, 59 runs, do it again.

MEMBER SHACK: You're going to get a different number.

MEMBER SIEBER: Right.

MEMBER BANERJEE: You're not going to get it exactly the same.

MEMBER SIEBER: But you'll eventually get one.

MEMBER CORRADINI: Ah, the wonders of uncertainty.

MEMBER BANERJEE: We spent a lot of doing this stuff.

MEMBER CORRADINI: That's why you're so happy with it.

(Laughter.)

Those that haven't --

MEMBER SIEBER: The same answer twice.

MEMBER CORRADINI: -- get nervous.

MEMBER SHACK: Speak to Dr. Wallis.

MR. KABADI: Yes. I think this slide points out what the steam generator types are for the two units, 4040F vs. delta 47. And these are for the small break. Again as I said based on these changes done the impact was very little of the EPU. The numbers came out some difference but not significantly different.

MEMBER BANERJEE: And the staff did some confirmatory calculations or you would some for Ginna. Right? Did you do any for this? You're nodding. Did you do any confirmatory calculations for this specific plant?

DR. WARD: This is Len Ward, NRC staff. I used since the Ginna plant RELAP5 calculations bounded Point Beach, the temperatures were so low I had a PCT of a three inch break of around 1300 degrees. I mean the capacity of the high pressure safety injection system pumps are very high and very little core uncovery.

This plan has a very high capacity ECC system compared to the power level. This power volume. Point Beach as does Ginna.

MEMBER BANERJEE: As does Ginna.

DR. WARD: So there was no need to repeat anything. And that was at 17 kilowatts per foot and I think Point Beach is at 16.

MEMBER CORRADINI: But I thought the peak was 17.5.

(Off the record comments.)

MEMBER BANERJEE: That's the large break LOCA. This is the --

MEMBER CORRADINI: 17.67.

CHAIRMAN ADBEL-KHALIK: What is the shutoff head of the high pressure safety injection pump?

DR. WARD: Around 1200 pounds.

MR. KABADI: Shutoff head?

CHAIRMAN ADBEL-KHALIK: Right.

MR. KABADI: Harv, we have those.

MR. HANNEMAN: Harv Hanneman, NextEra Point Beach. It's around 1400 psi.

CHAIRMAN ADBEL-KHALIK: So this is considered a low pressure plant.

MR. HANNEMAN: Well, it's an intermediate head.

MR. KABADI: That's correct.

MR. HANNEMAN: Safety injection system. We have charging pumps, but we do not credit the charging pumps for emergency core cooling.

MEMBER SIEBER: Right. That's -- to capacity.

MEMBER BANERJEE: Okay.

MR. HALE: Any other questions?

MEMBER BANERJEE: Let's move on. Good. We're almost on schedule.

MR. HALE: Okay. Jay and I are going to switch places again.

In the interest of time we did not get into a lot of detail. We spent a lot of time in the subcommittee going over the PRA modeling and that sort of thing. But I thought we would focus on here is really talk about what the changes were and how they impacted the results.

We've already spoke to the various plant modifications, the ones that really had an impact on PRA or the ones that we had listed there, the AFW changes. And we spoke to some of the others.

One that I would want to mention and Larry kind of touched on in feedwater and condensate, the plant has a much better capacity to ride through certain transients like loss of feed pump, loss of a condensate pump, as a result of the changes we made. And, of course, they can contribute to the initiating event frequency.

But if we go to the next slide I think these really point out. If you look at our -- This is on CDF, core damage frequency. You can see that pre-EPU condition. And if you just look at the EPU by itself what the CDF would be and then with the mods that we've summarize and the changes we're making it's a positive story.

And we can show an actual decrease in CDF with implementation of the EPU along with the other mods that we're doing. And you can see a similar comparison with large early release frequency. So I think from an overall standpoint, from a PRA standpoint, this highlights and emphasizes the benefits of the safety mods that we're making with the site.

MEMBER BLEY: Can I ask you two questions? I apologize for not being at the subcommittee meeting. But I was out of the country. I couldn't be there.

But reading what detail I could find in the application especially about both the PRA and the human reliability analysis was they both ran to a place where they describe the impact of the changes in an engineering sense very nicely. And then the PRA one, the systems related things, get to the end and say, "And now we have no experience with this new design. So we used expert judgment and raised the failure frequency 20 percent."

And there's a big gap. How do you come up with that? I didn't see any justification of that. And maybe it's somewhere. But I didn't see it in the report.

And there appeared to be no acknowledgment or consideration of the uncertainty in these things you were judging. The HRA was in a way similar in that after it laid out the impact of the changes in a functional sense comes to the end and says, "And we threw this different time into the HRA calculator in ASEP/CBDM or whichever you use method."

My knowledge is those are two different methods and neither of them has in a way that's obvious to me a great discriminator on time. And, boom, out came the answer and again no consideration of uncertainty. Can you address those related issues?

MR. HALE: Yes. Let me -- I have the fellow that did all of our PRA work.

Go ahead, Ray.

MR. DREMEL: Ray Dremel from Maracor. And I'll address first the increase in initiating event frequency for turbine trips and loss of main feedwater. There's no reason to expect that this plant change would have any long-term increase on initiating event frequency. But we wanted to see what the effect would be if that increase did go, if there was an increase in plant trip frequency.

So we used the 20 percent. Just it seemed like a reasonable increase. But if you look further I think in the analysis we did a sensitivity. And the overall results weren't really sensitive to a change in the initiating event frequency per se.

MEMBER BLEY: While you're on the systems, there was one where you put in some new valves and you acknowledge there could be a common cause effect there. And then again it was a 22 percent number was assumed. And a common cause effect could kick failure rate way up. And I don't have a clue about why you picked what you did.

MR. DREMEL: I'm not sure. We didn't pick -- I'm not sure what you're talking with that valve. There were no fast acting feedwater isolation valves put in and we used the existing date we had for similar valves in the plant.

MEMBER BLEY: And I think those were the ones. And you acknowledged there could be, since it was a new design, a common cause effect. I mean it's true in an expert judgment number of like 22 percent increase in the failure rate which in no way to me links back to that possibility of common cause.

MR. DREMEL: I don't --

MEMBER BLEY: That's what it said. Take a look.

MR. DREMEL: I have to look at that. I'm not sure.

MEMBER BLEY: Okay. And on the HRA?

MR. DREMEL: On the HRA the time available to perform the actions was based on thermal hydraulic analyses performed for both pre and post-EPU.

MEMBER BLEY: Got that.

MR. DREMEL: And the time available went

down. We stuck with the same methods that were used for the pre-EPU values as for the post-EPU values so we could get a valid comparison between the two conditions.

For the cause-based decision tree methodology that's typically used where there is adequate time to perform an event such as feed-and-bleed cooling where it's not really all that time critical. They have to get certain actions done within a few minutes.

That was the methodology that was used in the pre-EPU baseline value. We stuck with that for the post value. Time is indirectly considered in that method through dependency of failures on the multiple steps that are modeled. So when time goes down the dependent failure of a second step over the first step goes up. And that's why the HRA human error probabilities went up.

MEMBER BLEY: What about uncertainty in those results? I mean that's pretty -- I mean it's a -- You come up with real precise differences.

MR. DREMEL: Sure.

MEMBER BLEY: And it just seems over confident to me. Let's put it that way.

MR. DREMEL: Right. What we saw was we

did see some big increases in human error probabilities.

MEMBER BLEY: A few enormous ones, yes.

MR. DREMEL: But we did not want to change methods or change assumptions from pre to post value. As we saw these big increases we looked -- We could have gone back and changed the conservative assumptions using the base values and applied that to the conservative assumptions used in the post-EPU values.

But NextEra decided a better approach would be rather than try to play with the numbers they made modifications to eliminate the need for some of these operator actions or greatly reduce the need for some of these operator actions. So rather than try to play games with the numbers and see how sensitive the numbers were the modifications effectively eliminate the need for a lot of these operator actions.

MEMBER BLEY: And I sure can't argue with that. I think that's a great idea.

MEMBER STETKAR: Yes. It just brings into question the center bar is there. I don't have a lot of confidence on what they might be at all. They could be a lot higher. They might be lower. The deltas between the pre-EPU and the center bars that are post-EPU certainly don't have very good resolution on the changes in human error rates as a function of a plant just because the way the methodology is applied. It's sort of a discrete judgment-based methodology.

There are other methodologies that people argue about that have more continuous relationships. But that would have required that they go back and redo all of the initial analyses using those methodologies which would have changed the pre-EPU numbers also. So in this sense you can have some confidence I guess pre-EPU vs. post-EPU with mods because most of the benefit you're getting is from the justified hardware changes.

MR. HALE: And I think that the message that we wanted to present to the committee was that we have invested in modifications that are unrelated to the EPU that have resulted in positive results in both CDF and LERF.

MEMBER STETKAR: Despite the fact that you are increasing power.

MR. HALE: Right. Exactly. And that's really the message that we wanted to say.

MEMBER BANERJEE: So that's why I've let this discussion go on a little longer otherwise.

MEMBER STETKAR: And that despite that fact is --

PARTICIPANT: Good discussion.

MEMBER BANERJEE: Because I thought it was an important point.

MEMBER CORRADINI: Even though the risk is going up. Right?

MEMBER SIEBER: Right.

MEMBER BANERJEE: Are there anything -- Are you going to go now onto the increased effects because the agenda I have in front of me says the NRC was going to come in?

MR. HALE: We felt this was a good spot for them to speak to the boron precipitation discussion.

MEMBER BANERJEE: Right.

MR. HALE: So we're going to turn it over to them and then we'll come back.

MEMBER BANERJEE: Okay. Great.

MR. HALE: And close it out. Okay? Okay. Thank you.

MEMBER BANERJEE: We're slightly behind schedule, not slightly, but with the Chairman's indulgence this will run a little bit longer.

So, Len, we've actually used up your time.

(Laughter.)

DR. WARD: I could try and catch up.

MEMBER BANERJEE: Okay. We won't cut into too much of your time.

DR. WARD: Maybe I can try to make up some time.

MEMBER BANERJEE: Right.

DR. WARD: So if I skip too fast just stop. My name is Len Ward. I'm with the Nuclear Performance and Code Review Branch. And what I'm going to talk about is what I looked at and that was the post look of boric acid precipitation. This is the other aspect of long-term cooling.

To demonstrate long-term cooling, one of the things you have to do is you have to demonstrate that during recirculation that you're putting in more water than you're boiling to keep the core covered and to keep the temperatures at near saturation for the remainder of the event. Then you also have to show that you can prevent the boric acid from precipitating. You're putting in borated water. It's boiling. Steams disengaging. The boric acid is building up.

And before I get to the results, what does the boric acid concentration look as a function of time, I thought maybe we would go over just some of the characteristics of this plant because it's very important to the scheme and how they control boric acid. Point Beach is as you know a two-loop plant. It's got roughly 700 pound accumulators.

But it has a low pressure, upper plenum injection system that delivers flow to the upper plenum of the reactor vessel and with a shutoff head of around 134 pounds. So when you reduce pressure below that, you will get flow in from the low pressure injection pump. And it also has a standard, high pressure safety injection pump dumping into the coldlegs.

Now one of the key characteristics of this plant is that when the RWST drains, the refueling water storage tank drains, they turn off the high pressure safety injection pump. So you're just pumping with a low pressure injection into the upper plenum.

And what that does from a precipitation standpoint when you look at it, it makes the hotleg break worse. Clearly if the coldleg was broken and you're injecting from the hotleg, I'm at a continuous path through the core up the downcomer. And any boron, boron is not going to build up. It's going to get swept out particularly at the runout flow of around 1407. You're putting in over 250 pounds per second. So it's really putting in a lot of flow.

So the RWST drains in 20 minutes. And so after that you start the recirculation mode. And after 20 minutes you're going to start building up boric acid.

Clearly for large breaks you need to reinitiate the high pressure safety injection pump so that now I can develop a head on the cold side, a high head, and have flow from the cold side to the hot side and remove the build-up of boric acid during the event. And you need to do that before you reach the precipitation limit.

And just briefly before I show you the calculation and discuss that, the key assumptions in this analysis are as required by 10 CFR 5046 Appendix K you have to use the '71 ANS Decay Heat Standard increased by 20 percent. So basically this plant we're assuming it's pumping out 20 percent more power. So that's a pretty conservative -- I mean that's a healthy assumption.

The mixing volume is kind of dependent. It will grow with time. You start off with basically an empty vessel and then fill it up. Because it's a hotleg break and it's not a coldleg break there's no steam binding. In a coldleg break you have to build up enough pressure in the upper plenum to drive the steam around the loop. And so that's going to offset the fluid levels between the downcomer and the inner vessel. And so it's going to grow slowly.

For this plant it grows very fast. And some of the RAIs that I asked the Licensee, the Cobra Track Analysis showed that within about 300 seconds you've filled up the vessel and you have flow much in excess of the boiloff going out the break somewhere in the order of 300 pounds per second.

So it fills up fairly rapidly. I'm putting in roughly 60 pounds per second from a high pressure pump and 250 from a low pressure pump. And that's a lot of water going into a plant of this size.

MEMBER BANERJEE: The upper head, how much is going in there?

DR. WARD: Two hundred and fifty pounds per second. And just the RWST and the SIT concentrations, the source is 3200 ppm. It's about a little over. You divide that by 1749 and get weight percent of about 1.8 percent.

Now I did an audit calculation. I have a simple model of boric acid build-up and I calculated four hours and 25 minutes to reach the precipitation limit. And the Licensee was about four hours and 50 minutes. And it's fairly close. If you could put that next figure up.

MEMBER BANERJEE: What's the precipitation limit?

DR. WARD: It's 29. The precipitation limit here is 29 percent. And that corresponds to a containment pressure of 1407. The containment pressure in some of the calculations that they have done it's more like 20 pounds, 20-21 pounds, which means temperature would be higher. Limit would be just on temperature alone more like 32 percent. But they don't take credit for that.

And there are chemical additives in the sump and that will drive the precipitation limit even farther. That will push it up close to 40, somewhere in excess of 36 percent. So that's not taking care for it.

But anyway let me show what's going on here. If this is the concentration in the vessel, that's the core. Part of the upper plenum below the bottom of the hotleg and only half of the lower plenum. You'll see here. My calculation are the circles and the squares are the Licensee.

Now what I do is I don't take credit for the lower plenum at time zero.

MEMBER STETKAR: Just as long as you're going to stand at the board just make sure you speak pretty loudly so that the microphone picks you up.

DR. WARD: I'm sorry. Yes. Okay.

MEMBER STETKAR: Otherwise the transcription has a problem.

DR. WARD: Can everybody hear me?

MEMBER STETKAR: Really project or sit down and use the cursor on the mouse.

MEMBER SIEBER: She has to hear you.

DR. WARD: Okay. Is this okay? Okay.

In the Westinghouse methodology, they assumed that the lower plenum and the core and the upper plenum is all mixing from time zero. And that's a wrong assumption.

The correct assumption is you've got to wait until the boric acid density builds up in the core. It's getting heavier. Once the density in the core exceeds the density of the fluid in the lower plenum, then it will start to convect. It will flow downward.

So the reason why I want to do this is because sometimes in some plants if for low pressure conditions atmospheric sometimes this initial spike will shoot up near the precipitation limits. So you want to make sure that doesn't happen. And clearly it didn't happen here for this plant. So it turns out it doesn't matter because once you start to deliver and mix some of the boric acid into the lower plenum then you return to the curve. And as you can see the staff calculation basically confirms the Licensee calculation.

Now probably the main difference is I used the bottom peak axial power shape. And what that does -- They've got a top peak. It's probably the source of the difference and maybe some physics might drift the velocity correlation that predicts a void. That's probably a little different, too.

But with a bottom peak I'm going to have more vapor residing in the core relative to a top peak because most of the power would be near the top. Most of the steam would be at the top. If I have a bottom peak I'll have more vapor inventory in the core and that means there's less liquid. That means I'll probably build up a little faster.

So when you're looking at core uncovery for a small break a top peak is obviously more limiting because if you uncover the top of the core you won't expose the hottest spot. But for boric acid for mixing I want to minimize the amount of liquid there. So I look at the bottom peak.

So if we go back to the original slide. So clearly with the precipitation time of four hours and 50 minutes you want to initiate hot side high pressure safety injection in the cold side to flush it out before the precipitation occurs. Now originally the Licensee proposed four hours and 20 minutes relative to their four hour and 50 minutes which means it takes ten minutes to do the alignment. They would achieve a flushing initiation of sweeping it out at around four and a half hours. So that's a 20 minute margin.

I didn't feel that was enough margin. I mean you need -- All other plants we have at least maintained an hour's worth of margin when you initiate simultaneous injection or a scheme to control the boric acid relative to the precip time. So what the Licensee did is they modified the requirement to three hours and 20 minutes. That gives an hour and 20 minutes roughly. It's over an hour. So that's going to give -- That should provide at least minimum, sufficient amount of margin to accommodate, say, an operator error or maybe they're slow to getting, a little slower to getting, around to switching on this system.

CHAIRMAN ADBEL-KHALIK: What is the reason for terminating the high head safety injection in the first place?

DR. WARD: I think it's an NPSH problem. It can't run all the pumps at the same time.

MR. HANNEMAN: Yes. Harv Hanneman, NextEra Energy Point Beach.

MEMBER BANERJEE: It's a piggyback.

DR. WARD: So they piggyback the --

MR. HANNEMAN: Yes. We operate in the recirculation mode for emergency core cooling. We operate in a piggyback mode with only the low head safety injection pumps taking suction from the containment sump. And the discharge of the RHR pumps not only go into the upper plenum, but they go to the suction of either the containment spray pumps or the safety injection pumps.

But because of net positive suction head requirements the maximum flow rate we allow in the low head SI pumps is around 2200 gallons per minute. And we can't operate in piggyback with both the SI pump and the containment spray pump at the same time.

We need to run the containment spray pump on recirc for at least two hours for our alternative source term radiological analysis. So we run spray first and then once we secure that we immediately shift over to the piggyback with the SI pump to get the coldleg injection. And that addresses the boron precipitation concerns.

MEMBER BANERJEE: There is -- Len, I need to ask you a question because in the subcommittee meeting this didn't really get completely closed. The issue is how much of the lower plenum gets mixed in. And there was certain arguments made that half the -- And this is sort of a standard assumption based on experiments where you have things injected into the coldleg and it goes through and comes out the hotleg.

Now what happens in this case is you're injecting on top. And whatever we think of the coldleg, you know, the injection experiments there are as to whether half the lower plenum mixes, this is sort of a different scenario because water is having to run down the periphery, mixed into the lower plenum and then run up the middle. And you're injecting on top. And the mechanism there compared to the experimental database that exists at least to the extent that we investigated it seems to be a little different.

Now to compensate for that though they essentially don't take credit for any water going sort of -- any of the boron going out; whereas, of course, the injecting there a lot of the water going through the core or whatever will get carried out. Right?

DR. WARD: Yes.

MEMBER BANERJEE: So there was a compensating mechanism which may actually give you lower concentrations even if you don't take mixing of the lower plenum into account. So the situation is they might be okay, but not necessarily because the lower plenum is getting mixed in but because some of the boron is being carried out. There's a different mechanism.

So, anyway, I need to address that issue to you because it arose during our --

DR. WARD: The BACCHUS test that's a scaled vessel, 1/81 scale, showed that you get mixing in the lower plenum. Once the boric acid builds up, it starts to dump. And the test shows that.

And if you look at the lower plenum at the region just below the core, the concentration then jumps up to roughly the core and then at the bottom of the lower plenum where there are measurements it decreases linearly downwards. So it's mixing. But it's not 100 percent in the entire lower plenum.

If you look at the difference in concentration between the top and bottom of the lower plenum it's within 10,000 ppm of the core which is at 40. So it's a little more than half. But because that data and then there's some VEER Finnish data that showed you get mixing down to the crossover point of the lower plenum.

MEMBER BANERJEE: Did that have a downcomer?

DR. WARD: I want to limit that to a half. Pardon me?

MEMBER BANERJEE: Did that have a downcomer?

DR. WARD: You know, that's what I --

MEMBER BANERJEE: That's the issue I think.

DR. WARD: That's what I had -- I also had some issues with that. It's like a U-tube. It's not a vessel. It was a U-tube pipe. And so they scaled it up -- They made the volume larger to look at mixing and they did get mixing as -- The rewet was a smaller version of that and didn't have much at all. But it was a very thin U-tube.

There were oscillations that caused the

mixing and that's not what we'd expect here. So vendors up until this data became available were using 100 percent lower plenum. And I said, "No, I think we're going to limit it to 50 percent."

And now there's an owners' group effort to look at boric acid precipitation testing and modeling and review of all of their methodology and come up with a new model. And part of that is justify the mixing volume and particularly they're going to focus on what's appropriate for the lower plenum, when and how much.

MEMBER BANERJEE: How many upper head injection plants are there?

DR. WARD: Six upper plenum.

MEMBER CORRADINI: Ginna, Point Beach, Kewaunee.

DR. WARD: Ginna, Point Beach 1 and 2.

MEMBER CORRADINI: Kewaunee, Prairie Island. Right?

DR. WARD: Yes.

MEMBER CORRADINI: Four sites. Six.

DR. WARD: And Connecticut Yankee used to be a UPI plant. Obviously it's not running anymore.

CHAIRMAN ADBEL-KHALIK: Is there any indication in the emergency operating procedures other than time for the operator to do that switch?

DR. WARD: That's the way it's -- Yes, that's a time. And the CE EOPs at X hours initiate hot and cold side injection. So it's a time.

CHAIRMAN ADBEL-KHALIK: So if somehow you have an event where the operators somehow enter the FRGs rather than the EOPs how would you do that?

DR. WARD: Say that again.

CHAIRMAN ADBEL-KHALIK: If you enter the functional restoration guidelines.

DR. WARD: Well, they're not going to --

CHAIRMAN ADBEL-KHALIK: I mean are you forcing them to sort of essentially be an event-based procedure rather than a symptom-based procedure?

DR. WARD: Well, in the CE methods, it's event-based and if you have a LOCA there --

CHAIRMAN ADBEL-KHALIK: This is the thing is that -- Now --

DR. WARD: The EOP will have -- I haven't looked at it and maybe Steve can confirm this there should be a time in EOP that if you have a LOCA you will --

CHAIRMAN ADBEL-KHALIK: I can believe that you'd have time.

DR. WARD: You'd have to do this within

three and a half hours.

CHAIRMAN ADBEL-KHALIK: In E-1. But how about if you enter the FRGs? How would you do that?

MR. MILLEN: Mike Millen, NextEra Energy. I'm the Operations Lead. Our EOPs are set up that you enter if you have a LOCA, a large break LOCA. It takes you through the steps. And there's specific time guidance that says before this time you need to switch sump recirculation from containment spray to safety injection.

CHAIRMAN ADBEL-KHALIK: Yes, but that's sort of on that E-1 side. But what if you enter the FRG side?

MR. MILLEN: The diagnostic steps in the Westinghouse EOPs one of the first things you diagnose is a large break LOCA and you go there. You don't go to the beyond-design-basis event.

MEMBER SIEBER: Right.

MR. MILLEN: I guess I don't really understand how to answer the question.

CHAIRMAN ADBEL-KHALIK: I mean you're sort of implying that during an event like that nothing else would ever happen that would cause the operators to enter the functional restoration guidelines if they somehow lose track of where they are.

MR. MILLEN: In the Westinghouse ERGs if you have a large break LOCA you suspend the functional -- You do not implement functional restoration guidelines until you complete the certain steps to establish some recirculation. And then you're allowed to implement the functional restoration guidelines.

CHAIRMAN ADBEL-KHALIK: So the only indication in all of these cases the operator has to keep track of time.

MR. MILLEN: That is correct. I'll discuss that a little later when I discuss the operator actions.

MEMBER BANERJEE: Could we revisit this on the human factors part because we are running really late now?

CHAIRMAN ADBEL-KHALIK: Okay.

MEMBER SIEBER: I would say that Westinghouse plants under the Westinghouse Owners Group are event-based; whereas, General Electric plants are symptom-based.

MEMBER CORRADINI: What plants are symptom-based, Jack? I'm sorry.

MEMBER SIEBER: GE.

MEMBER BANERJEE: Conclude. Are you done?

DR. WARD: Okay. Well, I just wanted to

mention other thing. One of the other concerns was there's a high concentrated boric acid storage tank in 12 weight percent. And if that's discharging, it needs to be terminated. So they agreed to put in the immediate actions to terminate flow from that should it be discharging. And that's one of the immediate --

MEMBER STETKAR: I wanted to ask -- I'm sorry, Sanjoy.

MEMBER BANERJEE: Go ahead.

DR. WARD: So that was the other.

MEMBER STETKAR: This gets back to this human performance. So the Licensee agreed to terminate flow from a boric acid storage tank. On Point Beach, what is the boric acid storage tank's supply? Where would you be getting flow from the boric acid storage tank? I'm not going to presume that I know the plant.

MR. MILLEN: This is Mike Millen, Operations NextEra. Only use of the boric acid storage tanks is our normal charging for a load ramp at charging pump flow rates through our boric acid transfer pumps.

MEMBER STETKAR: Will you get transfer of the charging suction to the boric acid storage tank if you have low level in a VCT?

MR. MILLEN: No. We transfer the -- On low level in the VCT it transfers to the RWST, refueling water storage tank.

MEMBER STETKAR: Okay.

MR. MILLEN: So the boric acid storage tank any boration would be at a relatively small rate based on the limitations of our normal boric acid transfer pumps that supply the suction and the charging pump.

MEMBER STETKAR: Is there an assumed time when the operator has to -- If you were borating when this thing happens and you were aligned up that way --

DR. WARD: Twenty minutes.

MEMBER STETKAR: Twenty minutes.

DR. WARD: Because in the first 20 minutes you're flushing. You're not building up any boric acid. So if they turn it off within that there's no effect at all. And if it does -- Should in the unlikely event that it would discharge your precipitation would move up to less than two hours.

So to end that issue immediately just make sure that there's no injection from that tank for whatever reason. And like the Licensee says very small probability. But if there's a chance then you need to deal with it and make sure that it's dealt with and that it is. And they did that.

MEMBER BANERJEE: Okay. Len, I'm really going to have to --

DR. WARD: Okay.

MEMBER BANERJEE: -- not terminate the boric acid but terminate you talking about it.

DR. WARD: Terminate. Okay. Anyway, based on the staff calculations what they did and what they agreed to do we found it from that criteria 5 from 10 CFR 50.46 for assuring long-term cooling they did that. And we found it acceptable.

MEMBER BANERJEE: Without any debris, of course.

DR. WARD: Yes, without any debris. Yes. Well, that comes later.

MEMBER BANERJEE: That comes later. Okay. So thank you. Thank you very much.

And now, William, are you going to have a little talk on the high energy line break? I would appreciate it if you could keep it relatively short.

MR. JESSUP: I'll be succinct.

MEMBER BANERJEE: I know that all these things are very interesting.

MR. JESSUP: I've only got a couple slides.

MEMBER BANERJEE: Okay. Go for it.

MR. JESSUP: Good afternoon. My name is Billy Jessup. I'm from the Mechanical/Civil Engineering Branch in NRR. And like I said I'm going to be real succinct. I'm going to present the information relative to the staff's review of the high energy line break reconstitution which was performed in concert with the EPU implementation.

As NextEra indicated in their subcommittee presentation a couple of weeks ago, an effort was undertaken to update and improve the high energy line break analyses at Point Beach concurrent with EPU.

The NRC staff's review focused on what they were changing in their methodology and this included the reassessment of piping systems which are designated as high energy, the updated criteria used to postulate pipe breaks and the use of a new code to Point Beach to evaluate compartment, pressure and temperature response to high energy line breaks.

The current licensing basis requirements at Point Beach relative to high energy lines are based on the Giambusso criteria which were issued in 1972. And the acceptance criteria is based on compliance with Point Beach GTC-40 which requires engineered safety features to be protected against dynamic effects and missiles resulting from potential plant equipment failures.

The NRC staff's review of the reassessment of piping designated to high energy was based on the current licensing basis criteria which is used to classify high energy lines. And based on the pressure and temperature criteria used to classify these lines, it was determined that eight systems satisfy the criteria for being designated as high energy lines as part of this HELB reconstitution effort.

The criteria proposed by the Licensee to postulate pipe breaks or the updated criteria are based on the stress equations in the ASME Boiler and Pressure Vessel Code Section III.

The NRC staff noted in its review that the Licensee has a formal code reconciliation of the pertinent equations from ASME to the Code of Construction. And based on the use of the new stress equations, new pipe breaks were required to be postulated as part of EPU implementation.

And following that the environmental assessment, the assessment of the environmental effects resulting from high energy line breaks as part of the HELB reconstitution efforts, the License requested to use the GOTHIC Code to determine the pressure and temperature response in compartments due to high energy line break. And the staff did some independent sampling and reviews and found the analysis results acceptable and also noted that GOTHIC has been accepted in a number of other nuclear plants.

And, in summary, the staff's review covered these three primary areas. The staff found the Licensee's identification of the high energy lines acceptable and dynamic effects protection was also deemed acceptable. The postulation methodology criteria which uses the stress equations of ASME was also found to be acceptable by the NRC staff. And the NRC staff found the Licensee's mass and energy releases due to HELB's and the corresponding compartment pressure and temperature responses acceptable.

And as I said the NRC staff did some independent evaluation of the use of GOTHIC also. And this was noted in the staff review.

MEMBER BANERJEE: Okay. Any questions?

(No verbal response.)

Thank you. That was -- You saved us five minutes. Great.

MR. JESSUP: That's what I'm here for.

MEMBER BANERJEE: Now we go back to Steve

Hale to talk about the effects of -- And I think that's all we are going to get from the staff. Right?

MEMBER SIEBER: That's it.

MEMBER BANERJEE: Okay. So let's go with Steve then and if he needs to have questions for the staff we'll go back and do that.

Steve, your shot. So we're going to talk about the increased steam generator flow velocity now, the effects of that.

MR. HALE: Yes. We had quite a bit of -- Again, I'm Steve Hale from NextEra. We had quite a bit of discussion at the subcommittee on velocities in the steam generators as a result of operating at EPU conditions and really what has been the OE. Where do we sit with regards to operational experience?

We actually have the fellow we talked to on the phone here today.

MEMBER BANERJEE: Okay. Great.

MR. HALE: Kim Romanko from Westinghouse and we also issued a letter. I don't know if you've had a chance to see the letter, but we did docket some additional correspondence to try and respond to the answers or I mean the questions.

In the LAR, we identified what's the acceptance criteria and I apologize but our buddies at

Circle RW considers the results proprietary.

MEMBER BANERJEE: Do you want to close the meeting or something?

MR. HALE: No, the information is in the LAR if you want to see that information. I mean I can give you what the numbers. I think the key is that we did meet all of the acceptance criteria with regards to what they analyzed with margin.

But I think what's more important is if you look at the next slide the --

CHAIRMAN ADBEL-KHALIK: The second acceptance criterion with regard to the amplitude of tube vibration 1/2 the gap that assumes that the neighboring tubes will vibrate in phase.

MR. HALE: Actually that they are --

CHAIRMAN ADBEL-KHALIK: I mean if they're -- Okay. So the assumption is that they'll vibrate out of phase.

MR. HALE: Right.

CHAIRMAN ADBEL-KHALIK: So that they just barely touch.

MR. HALE: That's right. The acceptance criteria is a half and that's where the half comes from.

MEMBER SIEBER: Right.

CHAIRMAN ADBEL-KHALIK: Okay.

MR. HALE: Okay.

MEMBER CORRADINI: So can you -- I'm sorry. Can you say that again please?

MR. HALE: When you look at -- The area of concern certainly is in the upper portion of the model.

MEMBER CORRADINI: They bang against each other.

MR. HALE: Yes.

MEMBER CORRADINI: Okay. That's what I --

MR. HALE: Okay. So if you say one-half then you say they won't touch each other as a result of vibration.

MEMBER CORRADINI: Thank you. I just wanted to make sure.

MR. HALE: But you go to the next slide, this is -- we've expanded it somewhat to try and give you a feel for where will Point Beach end up at EPU conditions relative to other steam generators that are actually operating. And you'll see there we talked about velocities. And then we talked about volumetric flow rate. And then we started talking density and I think the parameter of interest was pV^2. And this is in the upper two bundle region.

But you'll see Unit 2, again we mentioned differences in the steam generator design is actually within a number of the steam generators out there. And Point Beach is certainly on the upper end of the operating experience but not by much.

But I think the real positive story with Westinghouse and these steam generators is they've had no history of any kind of AVB wear with these design steam generators which is I think in and of itself quite phenomenal.

MEMBER SIEBER: This model.

MR. HALE: Yes.

MEMBER BANERJEE: Well, it's the 44F that we were concerned about. Yes.

MR. HALE: Westinghouse steam generators in general I think have shown good performance.

MEMBER SIEBER: Yes.

MR. HALE: So that hopefully provides some perspective as to this is where Point Beach will be after the EPU relative to actual values that plants are experiencing today.

And then finally to summarize Westinghouse has had hundreds of reactor operating years and they've had with the Westinghouse design no indication of tube vibration problems with steam generators like

Point Beach.

We do perform steam generator tube inspections. In fact we will be performing an inspection on unit two after one cycle of operation at EPU conditions.

And we do and are able to inspect in the U-bend regions and it is part of our overall inspection program. And then although by the analysis that we summarized in the LAR we don't anticipate any problems, we will be doing inspections to confirm and get early indication if there are problems with the --

CHAIRMAN ADBEL-KHALIK: Now how well will the recirculation ratio change at 100 percent power at power uprate conditions?

MR. HALE: Kim, can you speak to that?

MR. ROMANKO: Kim Romanko, Westinghouse. The recirculation ratio, it depends on which parameters we're looking at. We look at both the zero percent plugging limits. We look at the 10 percent plugging limits.

CHAIRMAN ADBEL-KHALIK: Where the plants are right now whatever that is.

MR. HALE: Zero percent. We're essentially zero.

CHAIRMAN ADBEL-KHALIK: How does it change when you go into the power uprate condition.

MEMBER CORRADINI: I don't think it would change.

MR. ROMANKO: I know the moisture carryover increases and I believe it goes up. But I would have to go back and confirm that. With the recirculation ratio, it's amount of water taken out. But the other conditions are you have feedwater temperature change and you have a steam temperature change.

CHAIRMAN ADBEL-KHALIK: That's why I'm asking what the recirculation ratio is.

MR. ROMANKO: And these need to be -- Yes. I can't give you an exact number on the recirculation ratio. But it depends on the range of parameters that we're looking at and how they change.

CHAIRMAN ADBEL-KHALIK: At full power conditions.

MR. ROMANKO: That I cannot answer right now.

MR. HALE: And I think if you look I guess you would get some relation to that in the -- And the velocity in the downcomer region would include not only your feedwater, but plus the recirculation flow.

MR. ROMANKO: In the downcomer region the velocity for an uprate typically decreases. If you look at these pV^2 terms going into the tube sheet generally a ratio of what we expect in the uprate compared to where they're currently operating, that ratio is typically less than one.

MEMBER CORRADINI: Can you repeat that please? I'm sorry.

MR. ROMANKO: The pV^2 looking at that energy going into the bottom right above the tube sheet. So we're coming down the downcomer into the tube bundle.

MEMBER CORRADINI: Right.

MR. ROMANKO: If you look at the ratio at the EPU conditions compared to the operating conditions they're at now, those numbers are less than one.

MEMBER CORRADINI: Right.

MR. ROMANKO: So if you're looking for loose parts or things going on above the tube sheet conditions are actually better at the EPU conditions. It's only when you get up to the U-bend region where that number now increases.

MR. HALE: And that's really what we were trying to accommodate in the pV^2 in the U-bend region here along with the velocities that we've indicated in the U-bend region and just trying to stack up where Point Beach will be relative where other plants are operating right now.

MR. ROMANKO: And for those two plants that are close to it it's within three percent.

MEMBER CORRADINI: Is that another way of saying that the generator was not operating its optimal heat transfer performance prior to the uprate? Or I'm trying to understand. What you're telling me is after the uprate it behaves like Kewaunee, Indian Point, and Turkey Point which tells me the generator was oversized when you installed it. That's what I take away.

MR. ROMANKO: That's a look at the -- For example, the energy that's going into the U-bend region, we use that as a means of ratioing up the FIV numbers. And the reason is those are the parameters that will change and are used in calculating those parameters to begin with.

So I'm not saying it's not operating at peak efficiency. I'm saying because of this increase you'll get an increased effect as a result for FIV.

MEMBER CORRADINI: Okay. Fine.

MR. HALE: And I would like to point out, too, Kewaunee is currently operating where Point Beach will be.

MEMBER CORRADINI: That's what I thought.

MR. HALE: So when you do look at Kewaunee --

MEMBER BANERJEE: Within 25 megawatts.

MR. HALE: Yes, it's going to be very close.

MEMBER BANERJEE: Have you noticed that the density is lower?

MEMBER CORRADINI: Right. That's why he made the point of the pV^2 I assume.

MR. HALE: Yes.

MEMBER BANERJEE: The velocity is high, but the density is low. Okay.

(Off the record comments.)

MR. HALE: Any more questions on that topic?

CHAIRMAN ADBEL-KHALIK: I mean with a lower density that means the recirculation ratio is a lot higher than it is at Kewaunee, isn't it?

MR. HALE: I can't speak to the recirculation ratio. I'm not sure if we covered that in the LAR.

MR. ROMANKO: I don't know that we did.

MR. HALE: But what we tried to do was

address the primary area of concern which was the U-bend region which was where everyone was --

MEMBER BANERJEE: Yes. I think you've addressed the concern we had in the subcommittee. Right? Now also you showed us the velocities near the tube sheet.

MR. HALE: Yes. That's -- If you see here the velocity downcomer tube entrance which is right in here.

MEMBER BANERJEE: I mean you've got both those numbers. Okay.

MR. HALE: All right.

MEMBER BANERJEE: Thank you. Let's move onto the next one.

MR. HALE: Okay. And I'll turn this over to Mike Millen.

MR. MILLEN: Good afternoon, I'm Mike Millen. I'm the Operations Lead for the Point Beach Uprate Project. I'm a licensed Senior Reactor Operator at the plant. I'll discuss briefly some impact on human factors and then I'll discuss impact of EPU on operator actions.

We have had significant operations involvement in the uprate project as Larry mentioned. A lot of that was input into the modifications, approval of the mods, the procedures, the testing areas. In the area of human factors, we did follow existing design guidelines for optimization of human factors for the new controls.

I would like to point out the significant improvement in human factors that was the installation of the new motor-driven aux feed pump controls. We put the new controls on our secondary plant control board near the steam generator level indicators. That's also where the turbine-driven aux feed pump controls are for that unit.

You may have heard. We used to have shared or we still have them. But our 480 aux feed pumps that were shared between the two units, these controls were located on a separate shared equipment control board with no steam generator level indicators for either unit on it. So it required the operators to coordinate the control. That's a significant improvement for us.

In addition in human factors, we did consider plant equipment locations for ease of access and maintenance. That's things like vents, drains and valves.

Another item in the area of human factors is we did have procedure changes to our emergency operating procedure set. Primarily the changes were due to again the addition of the new aux feed pumps, addition of our main feed isolation valve controls and use of the containment spray on sump recirculation as you hear earlier.

Overall there's no significant change in strategy or the operator actions. I'll discuss a couple of those effects on operator actions in the next couple slides.

Larry also mentioned that --

CHAIRMAN ADBEL-KHALIK: Now from the EOP perspective, what does it mean that the old aux feedwater pumps are on standby?

MR. MILLEN: The old aux feedwater pumps are still going to be functional. They're still capable of being manually loaded onto diesel-backed buses. What we did was we removed the autostart features from those pumps and if they did happen to be running and we got a valid actuation signal we installed the autostrip feature so they would strip off.

Operators do have the ability to override that signal. We have a manual switch installed in the control room that's a manual override and that would allow us to go to that same control panel that we have now and operate the pumps and the valves if all the other aux feed pumps went away.

We do have that proceduralized in our emergency operating procedure set. It's credited in the PRA and we will be testing those pumps. We're not just going to -- They'll primarily be used for start up and shut down for the plant. But because we are crediting them we do intend to test them and stroke the valves. They just won't be a tech spec required test.

As Larry mentioned, our simulator, we did have the ability to upgrade and modify our unit 2 simulator with all the plant all both the controls and the computer model with all the pump data. And we were able to validate our emergency operating procedures and run a bunch of transients in the simulator. Next slide.

As far as operator actions go, we did not create any new actions outside the control room for power uprate. And we were able to eliminate some of the outside the control room actions. We eliminated the need for local action to reset our control room emergency filter fan circuit breakers. Existing plant they strip on a loss of offsite power and operators have to go and reset the breaker at the motor control center.

As part of our modifications where those now will be autoloaded on the emergency diesel generators. So it eliminates that operator action. We also -- I think you heard Steve discuss. We eliminated the need for local actions to gag our aux feedwater minimum recirculation valves. If we had a loss of instrument error in the current air, the bottles on them ran out of air. Right now, as part of our modifications, we installed a 24-hour backup air supply for the recirculation valves on all of our aux feed pumps, the turbine-driven and the new motor-driven pumps.

We also eliminated post accident sampling system (PASS) requirement. And that was due to the implementation of a revised core damage assessment methodology.

I also wanted to mention that any other actions outside the control room that we have in our procedures are not affected by EPU. So overall outside the control room it's a benefit. Next slide, Steve.

As far as actions in the control room, some actions have changed. Not considered to be a significant burden for us. Again we have validated all of these in a simulator.

As far as we had a lot of discussion in the subcommittee about steam generator tube ruptures and margin overfill. Those operator actions and response times all remain unchanged due to the EPU.

In a large break LOCA response, we did create two new operator actions and these are -- The first was establish containment spray on sump recirculation. What that is is once we've established sump recirculation our containment spray pumps will continue to take suction from the refueling water storage tank until we reach a certain level. And we have to secure those containment spray pumps from an injection mode.

And then as Steve described earlier we have steps -- this is all done from the control room -- where we then realign the suction of the containment spray pump to the discharge of the RHR pump which is on containment sump recirculation. And then we start the spray pump on recirculation.

The second operator action that is there's 20 minute time from the time we stop them from injecting from the RWST to again shut the valve from the RWST, realign it to the suction of the RHR pump and restart the pump.

The second new action is primarily to address the boron precipitation action that you heard of. After we are on containment spray on some sump recirculation for a two hour time period, we have a direct action step in the EOP which says immediately after that two hours is done we stop the containment spray pump and realign the suction of the safety injection pump to the discharge of RHR pump and restart the safety injection pump to establish cold leg injection.

And that we can perform that action within 10 minutes from the time we run out -- The two hours is up. We secure the spray pump. As I say, it's a fairly simply action. You secure the spray pump. You open up the suction valve for the SI pump from the RHR pump and restart the safety injection pump.

The other control room action that was affected was we did remove the action for the operators to manually transfer the suction of the aux feedwater pumps to service water. As far as once our condensate storage tank level decreased to a certain point we had them take manual action to transfer that over to service water. That has been automated as part of our auxiliary feedwater modification.

MEMBER BLEY: I'm a little curious as to

what criteria you used to decide which of these you were going to automate and which ones you were going to leave manual action.

MR. MILLEN: Well, the aux feedwater one was a very -- from a PRA perspective, it was a very risk-significant action to accomplish. So we did elect to automate that. The other ones there will be variations from the times based on --

MEMBER BLEY: You didn't have a good criteria for automating.

MR. MILLEN: That's correct.

MEMBER BLEY: Okay.

MR. MILLEN: That's a short answer.

MEMBER STETKAR: Mike, I asked this in the subcommittee meeting and I've lost my notes. Would you remind me what the difference in the time is from normal steam generator level to the level at which the operators are instructed to initiate feed-and-bleed cooling pre-EPU versus post-EPU.

MR. MILLEN: The level is the same when we are directed to initiate.

MEMBER BLEY: Right. But there's going to be a difference in time to get to that level.

MR. MILLEN: That's correct. And I don't know if Ray had -- They did a map run for PRA with that. It is a shorter time, but --

MEMBER BLEY: And I recall the difference was quite substantial, but I don't have my notes here. So I was curious what it was.

MR. DREMEL: The PRA analyses for implementing feed-and-bleed were based on a loss of main feedwater event and pre-EPU these had 56 minutes from the initial loss of main feedwater until they would get to the level when you would implement feed-and-bleed. Post-EPU that was 35 minutes for a loss of feedwater event. Obviously it would be longer for a normal trip.

MEMBER BLEY: Thank you.

CHAIRMAN ADBEL-KHALIK: This is a total loss of feedwater event. This is where you get down to 10 percent wide range.

MR. MILLEN: Yes, that's correct.

MEMBER RAY: Is there any time in which NPSH is an issue for the pumps to take suction in containment?

MR. MILLEN: Excuse me. Any time?

MEMBER RAY: NPSH is an issue for pumps to take suction in containment. Do they have to watch it? Do they have to terminate spray? What?

MR. MILLEN: Yes, we have -- In our EOP

set, we have parameters we monitor. We have designed the modifications to limit that flow so the operators are not -- We're not relying on operator action to stay well within the calculated NPSH. But they also are directed to monitor pump performance. And we have other specific EOP we're directed to go to if we have indications of a sump blockage basically. So we have another EOP where --

MEMBER RAY: Okay. Absent some blockage though, you don't calculate any cavitation of the pump due to insufficient NPSH.

MR. MILLEN: Right. That's correct.

MEMBER BANERJEE: To start a recirculation you still have even at 212 you have a margin. Right?

MR. MILLEN: Yes. Significantly more RWST level comes into the sump after we initially establish sump recirculation.

MEMBER BANERJEE: So even if they are down to one atmosphere and you assume 212 degrees you've got margin if I remember that.

MR. MILLEN: Yes.

MEMBER BANERJEE: Without the sump blockage.

MR. MILLEN: That's correct.

If there are no further questions, I'll

move onto power ascension testing. I'll be presenting just discussing the overview of our approach and then the testing that we intend to perform.

Our testing approach will ensure our plant systems and equipment are operating within design limits without large transient testing. We do have a significant amount of post modification testing that we will be doing throughout our start-up sequence.

We'll be performing individual component testing to ensure our pumps and valves and equipment meeting our design requirements and what are expected and predicted performance is. We'll be calibrating and testing the control systems. We'll be doing valve tuning at various power plateaus during power ascension.

We'll be monitoring the performance to ensure all of our systems and integrated response is as we expect. We'll be monitoring our pump flows and valves positions. We'll be doing feed pump swaps, condensate pump swaps, full feed train swaps as during the power ascension testing to ensure all of our equipment is performing as designed.

We will be performing some limited transient testing, turbine overspeed trip tests, govern stop valve, turbine govern stop valve testing.

And on our steam generators and feedwater heaters, we will be doing level deviation tests where we'll take the control systems to manual and put a level deviation and return the systems to auto and monitor for proper response of the control systems. And we designed our testing approach to be consistent with the current operating philosophy to minimize our real challenges to the operators and operating plan. Next slide.

The testing will be done in a controlled and deliberate manner. We do have an overall power ascension test procedure. What this does is coordinate the power ascension. It calls out different hold points where we'll be doing specific testing evolutions and data acquisition, both system monitoring plans and vibration monitoring.

We will be increasing power in a very slow and deliberate manner. As I mentioned, we'll be stopping at pre-determined power levels for both steady state data gathering and then formal parameter evaluation.

We'll be evaluating that data against pre-established acceptance criteria. And if either an unexpected plant condition occurs or we see ourselves approaching one of the acceptance criteria, the testing and power ascension will be stopped and we'll be reducing power either to the last acceptable operating configuration or depending on the nature of the issue as directed by our plant response procedures.

For the data evaluation and against acceptance criteria parameter gathering, we developed a test review board. And they will review and approve of all the test results at the power plateaus.

The test review board in the power ascension testing is headed up by a start-up test director. It's senior operations department individuals that are assigned to that role. They'll be chairing the test review board. So for all those before we move on at any of our hold points during power ascension, the start-up test director, shift manager, test review board approval is required.

In addition, senior management approval is required. This is the plant general manager and our plant operations review committee at selected power plateaus. Essentially this is from at our approximately 85 percent power point which was our old 100 percent power level. And then at that power level we'll be stopping at every three percent until we get to the new 100 percent power level. And we'll have that level of approval and review of the results as well as the operations review.

MEMBER BANERJEE: Is your 100 percent power level 1800 megawatts thermal or is 1806? I'm sort of -- I've seen numbers.

MR. MILLEN: The six is the RCP. 1806 is NSSS power.

MEMBER BANERJEE: Okay.

MR. MILLEN: So that includes RCPs.

MEMBER BANERJEE: That includes the RCPs.

MR. MILLEN: That's correct.

Anticipated duration of the power ascension is 21 days. A little more than half of that is from breaker closure up to 85 percent. And then a little less than that I think at nine days is from 85 percent to the new 100 percent power level. So there's a significant amount of time built in there for both data gathering, parameter evaluation, reviews and approvals.

MEMBER BANERJEE: So now when we went through this in sort of depth in the subcommittee meeting. There was an issue that was brought up with regard to the large transient tests by one of the participants. It was related to the fact that you changed out quite a lot of the feedwater trains and all this. And whether some form of testing for turbine trip or something like that of some magnitude was needed.

You heard the question and we didn't resolve it at that time. We just left it sort of hanging. We heard from the staff as well and the fact that you'd use LOFTRAN.

But Ginna which had done let's say less extensive recent mods that you did some form of large transient tests. So could you just for the Committee's benefit give your views briefly as to why you shouldn't do such a test?

MR. MILLEN: Well, one of the differences Ginna did more modifications to their control systems. They put in a new digital feedwater control system.

We did not change our condensator steam pumps at all as part of the modifications. Our feedwater control system is the same except that we've installed a digital positioner on the main feed reg valve.

As far as we did put new digital controls and positioners on our feedwater heater, drain and dumps and heater drain tanks, but those are essentially as you saw in Larry's picture we have our four and five feedwater heaters replaced on both units already with these digital controls and positioners, two cycles on unit 1 and one cycle on unit 2. And unfortunate we have plant transients and plant trips on both units while those were installed. And we had for those controls satisfactory performance.

And we believe that while we're replacing the individual components the integrated systems are not changing in any significant form. So we're doing these individual component level tests. We are tuning valves to ensure the proper -- You know, they're performing as we have predicted with our initial valve tuning data. We're testing the components, as I mentioned, feed pump performance testing at different power levels, swapping feed trains, and swapping pumps.

And with that, I guess that's really the basis. We don't -- that and the fact that we did do the LOFTRAN predictions which was based on actual plant data as well as benchmarking the comparisons with Ginna, the sister plant, demonstrated adequate performance as well. So I think when you look at all the extensive detail testing we're doing on a component level the fact that we're not revising in significant fashion any of our major control systems and then combining that with the LOFTRAN modeling that has been done and benchmarked against industry experience, I think that is the basis for our conclusion that significant testing was not required.

MEMBER BANERJEE: Is that satisfactory to the Committee because this was an issue that came up?

MEMBER BLEY: Yes.

MEMBER BANERJEE: There was a second issue which because I don't think it only affects you, it has to do with the -- Were there any instances where there were any issues with the net positive suction head of the pumps? We know that when you switch it to the recirculation flow you have adequate at the positive suction head. Because even if you have atmospheric pressure you have 212.

But during the transient, of course, you have higher temperatures. But, of course, you have containment pressure. Otherwise you couldn't get those higher temperatures because it's at saturation essentially. Right?

MR. MILLEN: Right.

MEMBER BANERJEE: Okay. Are there any issues that arise? I just want to put this to bed because there are concerns here and there about it. Are there any issues at all with net positive suction head any time during these transients?

MR. HALE: You mean from a containment sump perspective?

MEMBER BANERJEE: Yes.

MR. HALE: No.

MEMBER BANERJEE: Or any of those containment spray pumps or whatever?

MR. HALE: No.

MEMBER BANERJEE: All right.

MR. HALE: And I think speaking on the secondary side we've actually improved things fairly significantly. I know feed pump suction pressure has improved. We can ride through transients better than we did before.

MR. MILLEN: One other item that helps address NPSH issue is that long-term we won't have to rely on the operators to balance flow when we would go on piggyback operation. We've included an automatic throttle position on our core deluge valve. So when we do go on a piggyback operation, that limits the low head injection flow to a tested preset value. So either the containment spray pump or the high head safety injection pump can just pump without operators having to really monitor and balance flow to ensure NPSH. That's one of the things that we did automate.

MEMBER BANERJEE: There's only one last

question which was there again for the Committee. Not everything could be resolved at the subcommittee. So a few things were left over. And one is that during some events you have your overpressure protection system you get exceed the compliance with SRP Section 5.22 whatever. Can you just speak to that a little bit?

MR. HALE: I believe this was the loss of external load event. It's a case where in the SRP it requires you to -- You can't take credit for the first stage turbine pressure. And then by the SRP you're also not allowed to take the first reactor trip. You've actually got to take the second reactor trip.

Under that configuration the RCS pressure would exceed the criteria. What we did was we applied nominal values and we were able to demonstrate we were within the criteria. Although that SRP criteria was not specific to Point Beach as part of the original design.

MEMBER BLEY: When you say "nominal values", you mean everything away from some conservatism.

MR. HALE: Yes. Right.

MEMBER BANERJEE: But not the bounding value.

MR. HALE: Right. Yes. But that specific design criteria was not part of the original Point Beach licensing basis. But in order to try and address the criteria seeing how we couldn't meet the specific criteria with the bounding values we went back and redid the analysis of using nominal values. And we're saying even though it wasn't part of our licensing basis we're able to demonstrate we could meet the SRP criteria in terms of taking the second reactor trip.

MEMBER BANERJEE: Could we hear from the staff their view on this because the staff found this acceptable, this procedure with nominal values? But could we just get a confirmation that why you found it acceptable? So we put this to bed once and for all.

MEMBER CORRADINI: So acceptable they have no comment.

MEMBER BLEY: While they're looking for somebody, I think I read into what you said. If you only have one reactor trip and one is still running, you meet the bounding value.

MR. HALE: Yes, that is correct. If we applies the first reactor trip we would meet the criteria.

MEMBER BANERJEE: Right. They're not

allowed to use that according to the SRP 5.22 or whatever.

(Off the record comments.)

In any case, we can defer it until later. But I just want confirmation for the Committee that we bring this thing -- Otherwise it will niggle at us. I hate to leave niggling bits.

Okay. And I think we are almost there, Mr. Chairman. But if there are any other questions? Any discussion?

MEMBER ARMIJO: I have a question. And this may have come up at the subcommittee meeting. But the general question is will you do any augmented ISI after as a result of the EPU or will you just continue with your current ISI and aging management programs unchanged?

MR. HALE: I don't believe Section 11 specific inspections will change. Certainly we will change FAC. There will be some changes to the FAC program. We'll update the CHECWORKS program. There will be some additional things that may fall into inspection scope, things that may fall out of inspection scope, depending on what the change in parameters. We are planning to do some external inspections of the steam generators from an erosion/corrosion standpoint after one cycle of operation.

So in answer to your question, yes. I think from a Section 11 standpoint ISI I don't see too much there. But from a FAC, erosion/corrosion and other aging management programs, we essentially as part of the EPU process address the impact on license renewal through all the system and component evaluations.

MEMBER ARMIJO: Yes. The reason I asked is there's a statement in the SER that says as "a result of the new EPU environmental conditions, chemistry, temperature, neutron fluence, will not introduce new aging effects on vessel internal components nor will the EPU change the manner in which component aging will be managed by the aging management program credited in topical report W14577" and so on.

And I thought that was -- I like your answer better than that statement because I think the environment actually is more aggressive.

MR. HALE: It may be, but some of those topicals and I was involved with license renewal both at NEI and some of the topicals and the reactor system components use threshold values for fluence and things of that sort like the radiation assisted cracking and some of those things. And from an overall perspective the way those programs were set up you may not see a change. The environment itself may aggress it.

Now from the TLA standpoint, the analysis standpoint, we had to update all the analyses for EPU, you know, the things that have fluence in it like reactor vessel integrity and some of those things. But some of the programs kind of say "Okay, this set of components, we're going to have to do this kind of inspection on."

MEMBER ARMIJO: That's kind of the key to my question. Because clearly it may be true that no new environmental phenomena are triggered by this higher increase in power. But the chemistry will get more aggressive because radiolysis is creating all sorts of oxidizing species and are at a higher rate than they were before. The temperature is higher which helps --

MR. HALE: In some case it's lower.

MEMBER ARMIJO: You know, the things that you worry about from stress corrosion cracking temperature usually doesn't help you. And there is a fluence threshold. I just didn't know if your analysis included some sort of a flux threshold addressing the more aggressive water chemistry or a temperature effect on stresses, thermal expansion stresses, things like that.

But, you know, that's all theoretical. But the way to get at it is augment your ISI.

MR. HALE: Right.

MEMBER ARMIJO: Particularly of those components that could be affected. And that's why I raised the question. Will there be a more detailed inspection of vessel internals?

MR. HALE: Yes. As part of our license renewal commitments, we are required at least once during the renewed operating period to perform a more detailed reactor vessel internals inspection.

MEMBER ARMIJO: Yes.

MR. HALE: So that is still on the books. That is still required and any effects associated with EPU would be picked up as part of that inspection.

MEMBER ARMIJO: Well, you'd like to catch it before anything breaks.

MR. HALE: That's true.

MEMBER ARMIJO: So okay. That's a better answer than what's in this SER. And I guess maybe I should ask the same question of the staff.

MR. MEYER: The internals inspection is

actually scheduled for the first outage after the uprate.

MEMBER ARMIJO: Yes. You probably wouldn't see it that quick because these are time dependent also. If there's going to be a problem, it will be there.

MEMBER BANERJEE: So, Dana, did you have a question regarding the rod ejection?

MEMBER POWERS: I don't know. Did you explore that in your subcommittee?

MEMBER BANERJEE: WE didn't particularly. So because of the --

MEMBER POWERS: I forget what page that's one. Maybe we could ask them just to --

MEMBER BANERJEE: It's slide 18.

MEMBER POWERS: If you wouldn't mind going back to slide 18 I did have a question. I wondered what irradiated fuel could tolerate 176 calorie per gram power input.

Jay, there's a microphone over there.

MR. KABADI: This is Jay Kabadi, NextEra. What was the question?

MEMBER POWERS: What irradiated fuel could tolerate this 176 calorie per gram power input from a rod ejection accident.

MR. KABADI: If your question relates to the recent data which shows for the lower calories per gram I think as a part of the review of this particular event it was addressed that based on the actual fuel burnup and all this number is very conservative the way it's calculated. I think I can look in fact at some of those statements in the SE that quotes why this number was found to be acceptable.

MEMBER POWERS: It would be very interesting because my recollection is fresh fuel can tolerate maybe a 180 calories per gram. But as you go up in irradiation you're assured of breaking the clad at the very least.

MR. KABADI: Yes. I think this issue was specifically a part of the review of this particular event. And the current criteria actually as the acceptance criteria for that has not been changed. But that is being looked at for the lower numbers and that probably may become the limit in the future. But this was specifically addressed for this particular event for in the SE.

MEMBER ARMIJO: Maybe the staff could answer the question.

MEMBER BANERJEE: Why 200?

MEMBER ARMIJO: Yes. Why is 200 acceptable?

MEMBER BANERJEE: We were missing Sam at this meeting.

MR. BELTZ: This is Terry Beltz, NRR. We're trying to get Sam in.

MEMBER BANERJEE: No, Sam. It's a different Sam.

(Off the record comments.)

MR. BELTZ: We're actually trying to get our staff available for the reactor systems to answer these two questions.

MEMBER BANERJEE: Okay.

MR. BELTZ: This is our Sam.

(Off the record comments.)

MEMBER BANERJEE: That Sam is the overpressure Sam. Right?

MR. BELTZ: Correct.

MEMBER BANERJEE: I don't want to drag this on. So if you would prefer to answer these later we can just table those two items and come back during the letter writing segment or something. It's up to the Chairman.

CHAIRMAN ADBEL-KHALIK: I think if the staff is prepared we would rather have the answer now.

MR. BELTZ: Okay. This is Terry Beltz, NRR. If you could, Dr. Banerjee, just repeat the question.

MEMBER BANERJEE: Oh, it was with regard to the SRP 5.22 use of nominal values to meet the criteria rather than bounding values. And I mean they got an acceptable result for that. And I know that the staff agreed to it. But we don't -- I think the Committee -- It would be useful to say why you agreed to that use of nominal values. What was the basis of that? And does it set a precedent for other plants and all that sort of stuff?

MR. MIRANDA: Okay. My name is Sam Miranda. I work for the Reactor Systems Branch in NRR.

I'm guilty of accepting the nominal value analysis that was for Comanche Peak. And I think that was a mistake. And the reason is that the -- and I explained it in the Point Beach SE. The reason is that this analysis is used to set setpoints for safety valves and pressure relieving devices and all the uncertainties need to be considered when you do that. And you can't really put setpoints like that in the text specs without having an accounting of all of the uncertainties.

The original analysis that Point Beach submitted for -- I mean Comanche Peak submitted using nominal values I understood that to be more of a design analysis because the overpressure protection analysis is based on ASME boiler code. And I looked at it in terms of a design analysis which could account for uncertainties later rather than up front.

And I believe that was the wrong way to go. I went back to the conservative safety analysis method with all of the uncertainties considered up front so that the results could be used directly to determine setpoints as needed. And it turns out the Point Beach case there were some modifications made to those setpoints in order to come up with acceptable results for the overpressure protection.

MEMBER BANERJEE: But was the calculation then repeated or just with these mods you were happy? Just the rationale for it I'm asking so that we don't want to set a precedent for this forever.

MR. MIRANDA: Yes. And I think I said that in the safety evaluation.

MEMBER BANERJEE: Right.

MR. MIRANDA: I said --

MEMBER BANERJEE: If you would just repeat it briefly.

MR. MIRANDA: For the record, no. The Comanche Peak approach that used the nominal calculations I don't think would be valid for overpressure protection calculations because the results of such calculations are used to set points for pressure relieving devices and those setpoints go into the tech specs.

MEMBER BANERJEE: And this applicant made appropriate changes.

MR. MIRANDA: Yes. Point Beach I think their calculation was acceptable.

MEMBER BANERJEE: Okay. Thank you. All right. So now we just have the last point regarding the fuel if somebody wants to speak to that. I'm sorry we are running over. Thank you very much. I think that's done.

CHAIRMAN ADBEL-KHALIK: The 200 calories per gram.

MEMBER BANERJEE: Yes.

MEMBER ARMIJO: Remind us why that's okay.

MEMBER BANERJEE: That was a good answer. Thank you. Took care of this problem.

MR. ROMANKO: This is Kim Romanko from Westinghouse. Getting back to that number on the circulation ratio, for the base load that we calculated, we came up with a circulation ratio of 3.75. Worst case for the EPU we're at 3.25.

MEMBER BANERJEE: Thank you.

MEMBER CORRADINI: So it goes down.

MR. ROMANKO: It would go down. Yes.

MEMBER CORRADINI: And what do you mean by "worst case"? I'm sorry.

MR. ROMANKO: This would be comparable to the number that we presented in the table.

MEMBER CORRADINI: Okay. Consistent with that number.

MR. ROMANKO: It's consistent with that number. And that's at 10 percent plugging. If we were to go down to zero percent plugging cold feedwater, we could be down as low as 2.85.

MEMBER CORRADINI: Thank you.

MEMBER BANERJEE: Okay. So sorry that we are running a bit late, but I'd like to thank you for your excellent presentations from NextEra and the staff as well. And I'll hand it back to you.

CHAIRMAN ADBEL-KHALIK: Thank you. At this time, we're scheduled to take a 15 minute break before we get to the next presentation on the status of groundwater protection task force efforts. So we will take a break until 4:00 p.m. Off the record.

(Whereupon, at 3:44 p.m., the above-entitled matter recessed and reconvened at 4:00 p.m. the same day.)

CHAIRMAN ABDEL-KHALIK: We're back in session. At this point we'll go to item number 6 on the agenda, status of groundwater protection task force efforts. And Mike Ryan will lead us through.

MEMBER RYAN: Thank you, Mr. Chairman. This briefing is a result of first our subcommittee meeting on January 12. A number of the documents we learned about then and several documents that have been published since that subcommittee meeting, so we've integrated that into our letter and hopefully we'll hear about the more recent developments during our presentation today. So without further ado I'll turn the meeting over to Louise Lund from NRR. Louise?

MS. LUND: Thank you very much. Yes. As we were asked to come and talk about the groundwater task force report and also the senior management review of the groundwater task force report, and second slide please? And I've been supporting this work by the senior management review, and I'll discuss the findings of the groundwater task force and the results of the senior management review and what happens next. With me to discuss certain aspects of this in more detail is Bob Hardies who will be sitting down there at the end, a senior-level advisor in materials engineering in the Division of Component Integrity of NRR, and Richard Conatser, a health physicist in the Division of Inspection and Regional Support of NRR. And Bob is moving his car from the Marriott parking lot so he'll be right here. All right.

And looking at the groundwater task force report, it was issued in June and in response to incidents involving radioactive contamination of groundwater in wells and soils at nuclear power plants the NRC convened a groundwater task report in March of 2010 to determine whether past, current and planned actions should be augmented. Chuck Casto - where's Chuck? Oh here, he's all the way back there - here today was a team leader for that task force. This review is basically an effectiveness review of prior task force work and prior NRC staff efforts on groundwater. And the task force started with that prior work and determined the facts and observations. The facts from the liquid radioactive release lessons learned task force which was put together in 2006 and beyond with regard to leaks and NRC actions. They developed conclusions and recommendations from - those are their facts and observations. They bundled those conclusions and recommendations into four themes with 16 specific conclusions and four key recommendations and issued their final report on June 11, 2010. Next slide, please.

The overall finding of the task force in its final report determined that the NRC is meeting its mission of protecting public health, safety and the environment. They could find no area where the staff had not lived up to their commitments and that the staff had followed their policies and guidance and direction with regard to response and regulation of groundwater. However, in view of stakeholder concerns the task force recommended that the NRC consider changes to the oversight of licensed material outside of its design containment - confinement. The first two themes from the groundwater task force report recognize that although there are design criteria for systems and components that contain radioactive material, there are limited maintenance regulations or guidance on maintaining those barriers as they were defined in the licensing basis. In reviewing most of the responses to all the spills and leaks since 2006 the task force looked at all the significant ones and what the task force saw were the disparate responses, differing responses to a given leak or spill, some of them similar types of leaks or spills but the NRC's response was varied. They thought in terms of public trust and reliability which is one of our organizational values that a more reliable NRC response should be developed which should also strengthen trust. The individual conclusions under each of them are presented in the next three slides which I've provided for completeness but won't cover in detail. As we discussed in the review of the groundwater task force recommendation, some of the conclusions involve ongoing industry and staff efforts such as a recommendation to incorporate the voluntary industry initiatives into the regulatory framework, reassessment of the radiation protection cornerstone performance indicator in the ROP and developing a technical basis for immediate remediation. Some of the recommendations, especially ones tied to communications, suggested additional actions that are not currently underway but are planned. Anyway, the - and the next three slides give the actual conclusions that we actually discussed in more detail in the subcommittee.

MEMBER RYAN: Before you leave the

individual conclusions, could you talk just a little bit about the NEI-07-07 initiatives and how that fits in?

MS. LUND: In fact we're going to do that and actually Richard is going to talk about the groundwater initiative and Bob is going to talk about the other voluntary initiative which is the underground piping and tanks. They're going to talk in more detail about those two.

MEMBER RYAN: Okay.

MS. LUND: Okay? NRR staff actions.

MEMBER STETKAR: And without belaboring this, but on - on the second slide of the conclusions the first one says consider using - NRC communication methods don't properly relay NRC staff assessments. Consider using third party validation methods.

MS. LUND: Right.

MEMBER STETKAR: What does that mean and what third parties are you considering?

MS. LUND: Okay. What had happened is when at certain plants we had developed a practice of doing split samples and getting confirmation of the groundwater sampling through split samples. However, in other plants we had not done that so it really depended on which plant the contamination was at. And so the idea here was to develop a protocol for doing that and when to actually do split samples, when to seek that confirmation. Because a lot of times the states do a split sampling program as well where we would get part of the samples, they'll get part of the sample. So it really does provide you know that confirmation, independent confirmation.

MEMBER STETKAR: Okay, thank you.

MS. LUND: Now, I'm moving to the key recommendations slide and these key recommendations were further reflected in the executive director for operations tasking memo to the senior managers which formed a senior management review group as a result of that tasking memo. And the idea was to look at the policy issues associated with an assessment of the groundwater protection regulatory framework and also look at, besides the policy issues, those issues in which the staff could be tasked to look at directly that didn't involve policy issues that the commission would need to weigh in on. And once the policy issues are addressed, to implement conforming changes to the - incorporate appropriate enhancements to the Reactor Oversight Program. And this is especially true with - there was a recommendation with regards to the performance indicator in the Reactor Oversight Program and I'm just going to touch on that briefly, what that recommendation was. In considering development of specific actions to address the key themes and conclusions in this report and conduct a focused dialogue with EPA, the states, and international regulators to develop a collaborative approach for enhanced groundwater protection strategies. In fact, part of the groundwater task force report did talk about how these other entities have a role to play in groundwater protection and also gave some history and also some ideas of this sort of collaboration, especially looking at the research that can be done collaboratively in other work.

Moving on to the senior management review, on June 17 the EDO sent a tasking memo to a selected group, designated them members of a senior management review group and this group was formed to consider the recommendations and conclusions of the report and to determine from that report what would be appropriate actions. They started in July and the first activity were to identify those recommendations and conclusions that could be evaluated by the staff and those that contained policy issues or potential policy issues that could be considered by the commission. And the ones to be evaluated by the staff were sent directly in taskings to the staff for their review. The senior management review group consisted of office directors from NRR and from Office of New Reactors, Office of Nuclear Materials Safety and Safeguards, Office of Federal and State Materials and Environmental Management Programs. We had the Region III regional administrator and the general counsel. The group was chaired by the deputy executive director for reactor and preparedness programs, Marty Virgilio. And on October 4 a public meeting was held to receive input on the potential policy issues from a diverse group of public and industry stakeholders to ensure the group had identified and were considering the right issues on which to focus attention as they were moving forward. This slide gives you a sense of the wide range of stakeholders that attended. In addition to those listed we also received written comments from the state of New York, the state of New Jersey, Union of Concerned Scientists, Beyond Nuclear, Riverkeeper and the Irwin Citizens Awareness Network. And the group carefully considered both the external and internal input on the report's conclusions and recommendations.

So to address the recommendations that contain proposed policy issues or regulatory changes the staff developed a SECY paper and that was to prepare for a commission meeting that was held on February 24 of this year.

MEMBER RYAN: It's 001-0019, correct?

MS. LUND: Yes. And we also put together a chairman memorandum. And the SECY paper was specific to addressing the first two themes which had a narrower focus on groundwater protection. The chairman memorandum was for the last two themes which were more specific to strengthening trust in the communication themes which are actually more broadly focused towards not only groundwater protection but can be used in other areas as well. Now the SECY paper reviewed the regulatory framework associated with groundwater protection to provide context to the paper similar to what was presented in an earlier SECY paper written by Bob Hardies, SECY 09-174 which is called Staff Progress and Evaluation of buried piping at nuclear reactor facilities. The SECY paper discussed the groundwater task force recommendation that the voluntary industry initiatives should be brought into the regulatory framework. The group recognized that the industry initiatives were comprehensive and if implemented together would improve the active management of buried and underground systems and groundwater contamination with a likely outcome of reducing leaks and groundwater contamination. The group concluded that in view of the progress being made by industry in this area, rulemaking or some other form of regulatory requirement to codify the voluntary initiatives would not result at this time in a substantial increase in overall protection of the public health and safety. You know, especially considering the length of time it takes you know to go to rulemaking.

MEMBER SHACK: Is this one of these NEI initiatives that although it's voluntary on the industry's part the whole industry takes part in it?

MS. LUND: Yes. They've all committed to do that.

MEMBER SHACK: They've all committed to it.

MS. LUND: Elements of these initiatives are still being implemented at the sites and Richard can answer - actually and Bob Hardies will discuss these initiatives and Richard will discuss observations from our regional inspectors that inspected the groundwater protection initiative at the sites and some of the planned staff follow-up activities for that particular initiative.

MEMBER RAY: Well, I think it's voluntary by the industry, not voluntary by the individual members of NEI.

MS. LUND: Right. And it's interesting because that was discussed in the commission meeting. Specifically they asked what does it mean when you commit to this and - and you're exactly right. The SECY paper discussed the groundwater task force recommendation concerning maintenance of non-safety related piping and tanks. The paper discusses the staff's efforts and the pertinent ASME code activities which recognizing the benefits to the utilities of proactive maintenance are developing a code case for safety-related buried piping and are considering the development of provisions for non-safety related piping as well. The staff is also working with NACE to optimize corrosion protection standards for nuclear plants and Bob Hardies will actually discuss both of those things in more detail.

The SECY paper discussed the groundwater task force recommendations regarding the current radiological performance indicator in the Reactor Oversight Program and the staff's plans to address this recommendation in the near future in the annual ROP self-assessment. So no details were provided in the SECY paper itself as to the future potential changes and the self-assessment is an annual activity that we engage in and it takes feedback from a number of different sources. And so this is an activity that is actually going to be happening in the near future, and there's a SECY paper that actually addresses the self-assessment. The SECY paper discussed the report's recommendation regarding immediate remediation of spills at NRC licensed facilities which is also being addressed by a current NRC process. It's the development of a technical basis in response to SRM-07-177 which will be completed at the end of this fiscal yea and will be the topic of future communication to the commission so no further details were contained in that particular SECY paper because it's an effort where there will be a SECY paper developed in the near term or other communication to the commission. So next slide.

So as I was saying, we split up those two themes into two different products. One was the SECY paper, the other was the chairman memorandum, and the public feedback received by the group reinforced the conclusions of the groundwater task force that we can make significant improvements to how we communicate groundwater incidents both internally and with our external stakeholders. And the senior management review group directed the staff to undertake a number of initiatives to strengthen trust and enhance the reliability of the NRC's response to groundwater incidents. Some of the initiatives are directed solely at incidents of radioactive releases to groundwater, but others are more broadly applicable to other incidences involving unintended radioactive releases. The staff is addressing actions to be taken now to more effectively communicate information on incidents involving the unintended release of radioactive material, for example, by improving what's on the website. The staff will establish an agency-wide community of practice for groundwater contamination issues. The NRC Communication Council has a stakeholder confidence working group which was established to evaluate how the agency can strengthen stakeholder confidence in NRC actions around reported incidents where the risk is low but there's high stakeholder interest. And the agency plans to reach out to trusted sources such as public health officials as a method of strengthening credibility, providing more information on health impacts instead of just risk using plain language and improving follow-up with concerned stakeholders when leaks are identified. A protocol to ensure consistency in collecting and splitting samples for independent assessment is being developed. Recent improvements have been made to provide easier access and context to the annual effluent reports. Instead of just having them available for each plant it actually puts them in a document and actually provides context to them. The low risk associated with tritium contamination needs to be placed in the proper context and communicated effectively with the stakeholders, yet the staff must appreciate the public has very high interest in events that may have low impact on public health and safety. A significant initiative is the effort to develop a standard protocol for engaging states on unintended releases of radioactive material because that's one of those areas where we found there was - the communication has been very different. And finally, the staff has initiated dialogue with international regulators to understand the regulatory approaches for groundwater protection and also within - with buried piping as well talked to international regulators about what they were doing with buried piping - focusing on resolution of issues involving underground piping and tanks. And the staff is also gathering information on domestic and international activities for modeling the movement of radioactive materials through the environment and through our Office of Research. In fact, there was a session this morning at the RIC that talked about a lot of those activities.

So what are our next steps? The staff has observed through the papers that we have sent forward, the SECY paper and also through the commission memorandum, we're awaiting direction from the commission on the activities describe in the SECY paper. Even though we sent it up as an informational paper they expressed interest in providing direction to the staff so we're awaiting their direction. And also the initiatives for improved communication, we're in the process of starting to develop those activities. And I -

MEMBER RYAN: Before we go on to the other speakers, let me just ask you a follow-up question. You mentioned efforts to - I think you were talking about improving groundwater models at existing facilities, existing plants. A lot of that work has been done. Can you comment on how much of that's been done and what's going on in that area now?

MS. LUND: Well, there's activities that the Office of Research is doing where they are looking at the tritium migration models. Now, I'm not an expert in that particular area, but I know that there are ongoing efforts and they are working with - directly with the Canadians and also with the French who have been doing a lot of research work in that and in fact the Canadians have a number of reports that -

MEMBER RYAN: Well, a number of the power companies, the utilities that own the plants now have done their own onsite geohydrologic investigations I think to come up with some models of the geohydrology of their own sites.

MS. LUND: That's exactly right.

MEMBER RYAN: They're localized, so they've done that, am I right?

MS. LUND: That's part - exactly. And that's part of the groundwater protection initiative is one of the elements - in fact that's one of the things Richard's going to talk about. There's actually 42 elements and I don't mean to steal your thunder here. The groundwater protection initiative has 42 elements to it and part of it is in putting together these hydrogeological models. So you do understand you know the specifics to each individual site. So if you do have a leak then you don't wonder where the flow goes. I mean in that you have an established model.

MEMBER RYAN: I think it's fair to recognize that there's been a fairly substantial industry-wide effort in that area.

MS. LUND: Right. You're exactly right.

MEMBER RYAN: Thank you.

MS. LUND: Are we ready for Richard?

MEMBER RYAN: Sure.

MS. LUND: Okay, good.

MEMBER RYAN: Any other questions at this point?

MR. CONATSER: And Mike, while they're queuing that up, some of the things that they've mentioned for the international community, getting input from the international community on the modeling really had to do with dose modeling as well. So there's a lot of efforts in that area so it's not just the hydrogeologic assessments.

MEMBER RYAN: Absolutely. The radioactivity in the -

MR. CONATSER: The pathway. I think we're ready. Good afternoon, my name is Richard Conatser. I'm a health physicist at NRR and I'll be speaking to you for the next 10 minutes or so on groundwater protection, some of the health physics aspects. Next slide.

Here's a brief outline of what I'm going to cover and it will be pretty brief. I did take down your comment there and I will go into NEI-07-07 in a little bit more detail, but basically what I'll go over today are the component parts of the leak spill issue. What I generally like to do is to - when I look at an issue like this I like to break it down to the component parts, the independent pieces of it so I can kind of wrap my arms around the issue because once you get that then you can get the solutions down right, you get your solutions for each one of the problems. So I'll put that on there just so it might help you, I don't know. Strategy and regulatory framework, I'll take a look at that, we'll take a look at that. NRC review of licensees' implementation of the groundwater protection initiative. We actually did inspections looking at implementation of the voluntary initiatives so I'll give you a little taste of what we found there, and then we'll wrap it up. Next slide.

MEMBER ARMIJO: I'm a little confused with the term inspection of a voluntary nature. You mean "inspection" means something very formal to address potential violations, regulations?

MR. CONATSER: What we did on that -

MEMBER ARMIJO: Regulation - you have an inspection.

MR. CONATSER: It's an excellent question and you're not alone in that regard. I can guarantee you that. No, what we did, this was a voluntary initiative, this NEI-07-07 that Mike was talking about, there was a lot of discussion early on as to what exactly we should be doing looking at that. So they had the initiative out there. What the NRC did was make a temporary instruction which was a formal inspection process basically to go out and look at the industry's implementation of that initiative. So even though many of those components in the initiative aren't regulatory-driven some of them are, but we wanted to see what the industry's progress was along those lines.

MEMBER ARMIJO: As you go through that could you point out where the things that are - what inspections are regulatory-driven?

MR. CONATSER: I can point out some of the tasks that are regulatory-driven, yes.

MEMBER ARMIJO: Okay.

MR. CONATSER: So the component parts, spills and leaks. Here's the way I slice and dice this. There's four parts and just about everything you can fit into one of these four parts. First, engineering. This is probably one of the most important ones because it all comes from pipe leaks or tank leaks, valves, et cetera, those components are leaking. So that's one issue there and you have of course the nuclear safety issue associated with pipes and performing their functions. There's a lot of things there that are regulatory-driven. The second aspect, once you have pipe leaks and it gets to the environment or to the ground, the health physics parts then take over. We have to monitor those leaks and spills, the licensees do, and of course the NRC has to oversee that effort, and then we have to make sure we have protection of the public. So although doses, the public doses have been very small from all the leaks and spills that have been experienced to date, they're generally in the range of 0.00 to 0.1 millirem per year, so we're talking very low, very low doses to members of the public basically. And remember, these are very conservative calculations as well. So doses are very small, actual health impacts are not expected and risks associated with these leaks and spills, if you look at risk they're similar to activities that we normally consider safe like airline flights, dental Xrays, those types of things. So just from a purely health physics perspective nothing really to be expected there. The third part of this is the environment. NRC policy is that if we protect the people with our regulations we protect the environment, but the environmental issues that you hear a lot about really go beyond the regulations. So you hear that more and more, you know, are you being a good environmental steward.

MEMBER RYAN: Richard, I think there's another step in between there, between the environmental stewardship principle or concept and NRC regulation, and that is that the groundwater is handed off from NRC regulation to other regulation, and guess what? The numbers don't match. They don't have the same protection levels in them. Could you - are you going to cover that later? If you're going to cover that separately that's fine.

MR. CONATSER: I had not planned on going into like the state regulations or anything like that, but yes, there are different you know state has different - there's different jurisdictions there. The state of Illinois imposes much lower. The NRC reporting level is 20,000 picocuries per liter. The EPA safe drinking water standard is 20,000 picocuries per liter for tritium which is 4 millirem. The state of Illinois though goes down to like I forget, 200 or 300 picocuries per liter. There has to be notifications in the state of Illinois, and different states have implemented different things. So I wasn't going to go into the individual states but yes, you're exactly right. There are different sets of rules.

MEMBER RYAN: Maybe I'll generalize and see if you agree rather than going through all the states because there are a number of different ones. New Jersey is another example where the standard by which it's judged on the NRC licensed property is a concentration standard, or a derived concentration standard that's higher than the typical handoff to either EPA groundwater or state groundwater limits. Is that a fair summary?

MR. CONATSER: Yes.

MEMBER RYAN: So what's compliant inside the fence perhaps, outside the fence is immediately not compliant.

MR. CONATSER: That's correct. There's a whole different set of rules for onsite versus offsite.

MEMBER RYAN: Right.

MR. CONATSER: NRC has those different

rules too. A lot of the effluent stuff applies to offsite areas -

MEMBER RYAN: As well, yes.

MR. CONATSER: So yes, that's a good point. There are different sets of rules out there and that's another thing. People will come back and say well the state of Illinois says this but you know, why doesn't the NRC do that. So there's -

MEMBER RYAN: And I think that's part of the communications and understandability and unambiguous kind of discussion that's got to you know help solve the communication question.

MR. CONATSER: And that's the fourth part is the communications. Once you get these three parts that I just mentioned, the engineering, health physics and the environment, you can do very good at each one of those individually but unless you communicate them well you're likely to fail basically on something like this. So those are the four pieces, parts. One last thing I'll say on this before we leave this slide. Many times we'll say you know from a health physics aspect there's no risks - the risks are very low there. Well some people immediately think well that means that it's good, or it's okay for pipes to leak and no, that's a separate type issue. You've got to keep that kind of framed in your mind properly I think. Next slide.

So the NRC strategy and the regulatory framework, two parts, short-term strategy and the long-term strategy. First of all, we'll continue the NRC inspections and the oversight that we normally do. We are assessing the implementation of the voluntary initiative, that's the NEI-07-07 and as a matter of fact we just completed in August of 2010 the first 2-year inspection cycle that we did on that, the temporary instruction is what we used to do that, and I'll have the next slide go into the results of that. But we did assess the implementation of the voluntary initiative for groundwater. That's the NRC inspections and temporary instructions. We've identified gaps in the effectiveness of the voluntary initiative and what we want to do is to verify that the implementation of this is improving over time. And we're going to use our routine processes, meaning inspections, to do that basically. So for the short-term strategy when you look at that there's a lot of we're relying on inspections and temporary instructions as a short-term strategy. No additional efforts in that regard. We have communications that we're doing, other things like that, but primarily from a regulatory perspective that's what we're looking at. Long-term, if there continue to be gaps we'll evaluate the need for more regulatory actions and right now we don't see a need for any rulemaking at this point.

MEMBER RAY: Well you know, one of the things that I've been looking for in what you've said hasn't come up and at this point I'm wondering if it won't come up. You talk about leaks and spills, but the way I think about the issue is unmonitored releases. And so we've been dealing with some new sites here, new plants with the aim at least in part of not so much preventing leaks but monitoring for any leaks, or monitoring releases. And do you think about it that way at all? Because monitoring for leaks seems to me like the issue that's most lacking I guess rather than making sure that things never leak.

MR. CONATSER: That's a very good point. As a matter of fact, that's one of the things we certainly do look at is abnormal releases is kind of what we call that. We have that built into one of our regulatory guides as a phrase. We do certainly look at the abnormal releases and those abnormal releases, the licensees have reported those in the annual reports each year and those do occur. Now, the difference between the leaks and spills that distinguishes them separate and apart from abnormal releases really is - there have been abnormal releases over a long period of time that have not drawn a lot of interest but yet when we have this very visible item of tritium in groundwater and migration to offsite areas, that's really piqued a lot of interest. So we're on a separate -

MEMBER RAY: I think of that as a release pathway that isn't monitored. The term "abnormal" sounds like well I released it where I always do but I released more.

MEMBER RYAN: I guess I differ in my view of that, Harold. I don't see it that way. An unmonitored release to me has the aspect that it's unknown often.

MEMBER RAY: Right.

MEMBER RYAN: And that to me is the key. And so you're really, you know, it's lucky that the magnitude's low and of low consequence but you know it could be higher. So I think that the aspect to me that's most important with the releases you've described is that it's unknown until some -

MEMBER RAY: Unknown or I call it unmonitored but it's like -

MEMBER RYAN: Well, it's not unmonitored. I mean, if you know it's a release and you don't monitor it that's a decision.

MEMBER RAY: Well, let's take a discharge line. We've had some of those. You made the point just recently that they needed to have monitoring wells in proximity to the discharge line, right? Well, that's what I'm talking about.

MEMBER RYAN: We agree on that part of it, but -

MEMBER RAY: To me if you have a discharge line it's a release that you intended to make, it just didn't all go where you intended it.

MEMBER RYAN: Exactly. Yes. And I think -

MEMBER BLEY: It's a loss of control issue.

MEMBER RAY: Well, but that implies that - I just want to make sure the line doesn't leak, you know, so I can control it so it doesn't leak. But I guess I'm wondering - I guess I'm wondering - I'm thinking of where the vacuum breakers leaked. Well, my God. Well, I've said enough. It's not abnormal, it's undetected, unknown, unmonitored, choose your word.

MEMBER RYAN: Well, a broken pipe that's leaking without anybody knowing about it to me is abnormal. It shouldn't be -

MEMBER RAY: Well, okay. We don't want to make semantics out of this. I just want to make sure that -

MS. LUND: Do you want - one of the things that there is a difference in the regulatory approach for piping, underground piping, for new plants than there is in existing plants. Maybe you want to cover that?

MEMBER RAY: Well, I don't want to take you off message here, it's just I wanted to raise the point that I think of it more in the way that I said than -

MR. CONATSER: Yes, that's from a more global perspective. I think if you look at it in that light there's really nothing wrong, but we almost separate out leaks and spills just because of the increased public interest for those particular type of events. So it's an artificial kind of separation really.

MEMBER RYAN: Harold, I will agree with you that semantics in this is very important.

MEMBER RAY: I, you know, I just think if you're going to have a discharge line as we recommended recently you ought to have a capability to monitor for leaks from the line.

MEMBER RYAN: Yes, absolutely.

MEMBER RAY: Period.

MR. CONATSER: And that is part of the initiative, part of the NEI-07-07 that I'll describe I think on the next slide.

MEMBER POWERS: Before you move forward, just to ensure that you're adequately interrupted. On the previous slide I was struck by your statement that doses are very low, 0 to 0.1 millirem if I recall. And I assume that those are doses you've calculated by some mechanism. My question I just wanted for information, what kind of a dose level can you actually measure in someone?

MR. CONATSER: You mean an actual dose measurement itself without calculation?

MEMBER POWERS: Yes.

MR. CONATSER: Well, we have micro R meters -

MEMBER RYAN: Not for tritium.

MR. CONATSER: Well, I'm just talking generally. I think your question was just dose, right?

MEMBER POWERS: My question's really general. But my question is general enough your response is probably going along the right track.

MR. CONATSER: You couldn't see any of this stuff with any type of measurement dose survey instrumentation. You couldn't see any of this stuff with that. It's just too low for that.

MEMBER POWERS: I wonder in your emphasis on communication if a proper terminology in a public format, rather than here at the ACRS might be public doses are unmeasurable.

MEMBER CORRADINI: Is that true?

MEMBER POWERS: I asked.

MEMBER CORRADINI: You can measure radiation at much lower levels than you can measure a whole lot of other things.

MEMBER POWERS: I didn't ask him about radiation, I asked him about dose.

MR. CONATSER: Now concentrations we can measure. We can measure the concentrations and that's how we do the calculations, but you can't - you can't really measure the dose on these very low levels of tritium. It's indistinguishable from background.

MEMBER RYAN: Well, you can't measure the dose from tritium at any level because it's such a low-energy data you can't detect it unless you take a sample and infer a dose from what's excreted. So you know, to be precise about all this you get to where you lose kind of interest in a public setting.

MEMBER CORRADINI: I guess my - the only reason I'm speaking up, this isn't my area, but I think we're going from communication to interpretation of the communication because I think that in the general public if you tell the activity and it's thousands of something they don't know. So you have to put it in a context. But I don't think you're ever going to get to the hope which is the dose - in that it's so low it's not measurable. I think you're right, I just don't think we're ever going to convince anybody of that. That's my.

MEMBER RYAN: And I think for the key radionuclide which a lot of this is surrounding tritium it's very easy to measure at dose levels, committed dose levels that would result from an intake that are trivial and you can certainly measure it.

MEMBER POWERS: I wonder also in your discussion you said - of different regulations you cited things, 20,000 picocuries and 200 picocuries. I wonder if it might not be better to use a unit of microcuries? My experience in this matter is I once had the opportunity to explain to lay people about the issues of picocuries and water. And after explaining things like picocurie content of beer, urine and a variety of other things the response to me was since I wanted to put 2 picocurie water into a sewer system they didn't really understand what a picocurie was but two of them sounded like a lot.

MR. CONATSER: You will see in many cases when some licensees report this in their annual reports you will see it in units of curies so that it'll be a number like 0.000001 curies or you know, whatever, you get the idea. It's kind of a numbers game. The reason that we don't - that I generally don't play that numbers game is because basically if you do - if you do change the numbers you eventually have to go back to what the NRC's reporting level is which is in picocuries and the EPA's drinking water standard which is in picocuries. So even if you begin to talk about it in curies or microcuries then they say well, what's the limit. I guess you could convert that to then -

MEMBER POWERS: I certainly could, but I appreciate your point and - but having been through it once I would convert. I don't think I'd use curies because someone had asked me what a curie was, but a microcurie I think is a useful unit.

MS. LUND: Not to interrupt Richard, but I just wanted to mention you know that there's been a lot of attention shown to this particular issue of how to communicate this best. Not only did industry go out and do a survey and realize that the way that they're communicating it really is not getting across to the people that they're trying to communicate to very well, but in addition to that you know we've also had some of the commissioners come and talk directly to some of the members on the senior management review group about their ideas of the best way to communicate it as well. I think that there just is a recognition that the communications that have taken place so far maybe aren't reaching the target audience in the way that they were intended and that's - in talking about trying to communicate health effects rather than using esoteric terms that people are apparently just not understanding very well is the next step from I think a lot of people's perspective of what to do.

MEMBER CORRADINI: I mean just - not to belabor the point, but I think Commissioner Magwood made it a point in his presentation yesterday about when he traveled to Illinois he was there for some sort of I think final decommissioning of Zion and went down to Clinton and had conversations with the general public specifically about tritium concentrations and releases. He did it in a relative sense. So I think that kind of goes back to what Dana was asking - or what Dana was pointing out relative to although manmade it's this, and if I compare it to that it's minuscule or small.

MS. LUND: Right, right. And the chairman was saying to us in the commission meeting that it's the same as eating a cheeseburger or something. You know, I mean I think everybody recognizes that this is an area where you know there's certainly room for -

MEMBER ARMIJO: You're not communicating in a vacuum. There are people much more skilled than the NRC that are communicating the opposite story, that these tiny, tiny amounts are in fact extremely dangerous to your health and they're on the air all the time. And so it's a real challenge. My concern is that you're really getting into a regulatory creek driven by public interest, stakeholder concerns, congressional, state, local officials, all these people driving us away from real health and safety issues into really what is good business practice. I think the utilities are doing the right thing, voluntary - present a better image to their neighbors and clients, but I just worry that as a result of this task force we could creep into some situation where the NRC is regulating something that has trivial - to health and safety.

MS. LUND: Well, given the questions and the direction the questions went in the commission meeting I think they share exactly the perspective that you have. And the - as far as a lot of the efforts that these initiatives bring from our perspective is a way for them to meet the regulations because at the end of the day that's what we're concerned about is that there is a program and it's rigorous and comprehensive enough you know to meet the regulations you know successfully.

MEMBER ARMIJO: You know, from the standpoint of a general public, someone who doesn't have an agenda, the issue is who do you believe, who's more credible, the NRC or the EPA. Both government agencies, two different numbers of what's - that's below concern. And so you have those discrepancies and somehow the NRC I think has to be the dominant, most believable, credible agency because otherwise it's going to be whatever local politician wants to get on the air and promote fear. It's not really justified.

MR. CONATSER: I think the communications have to be very clear, very unambiguous, very straightforward and I think there's - there's some efforts we're doing for communications to help that I think. And I think we have a ways to go in that area, I think you're exactly correct.

MEMBER ARMIJO: But you know, don't get me wrong, I think all the initiatives to improve the piping, the tanks, not neglect spills, all that is just good engineering practice and good business practice, but it somehow has to get - be taken - not to be forced into the regulatory framework where it's now - it's really a distraction in a way.

MEMBER RAY: Sam, that's why I think monitoring is the issue.

MEMBER ARMIJO: Yes.

MEMBER RAY: You should not have unmonitored releases.

MEMBER ARMIJO: Surprises are bad news.

MEMBER RAY: You should not have unmonitored releases. That is a legitimate regulatory matter I think.

MEMBER ARMIJO: Well that I agree with. That's why I was trying to find out which part -

MEMBER RYAN: I would pick up on Harold's point and Sam's second because it's really a matter of what you're going to do, not are the numbers in the regulations correct or not correct. So it's just a matter of an improvement in the mechanics of a program and specifically what you add to the things you look at and check. As Sam said from the engineering and monitoring standpoint it's the right way to go, so.

MR. CONATSER: And what we really want to do is to correct this at the source, right? And make sure the pipes minimize the leaks of pipes. Bob's going to discuss that here in just a minute. If we get over to Bob.

MEMBER RYAN: Let's get to Bob.

MR. CONATSER: Okay, let's see. The next slide here is assessment of the voluntary initiative. I'll discuss here a little bit about this initiative. There was a voluntary initiative put out, NEI-07-07, which is groundwater protection and that initiative had a purpose, had a purpose section in there that said there's two items that it wanted to do. One was improve management of situations involving inadvertent leaks and spills because there had been many leaks and spills and they were not managed - or there were lots of opportunities for improvements in the way those leaks and spills were managed. The second part of that was to improve communications with stakeholders. So that was the overall purpose of this NEI-07-07, and to break that document down, they broke it down to three groups of tasks I'll call them. Those three groups of tasks, there were 11 objectives and underneath those 11 objectives there were 42 individual program elements. So basically when you go in and look at the NEI-07-07 and look at the things it asks the licensees to do it would say like perform a hydrogeologic assessment. That would be like one element. It would say things like do independent evaluations of your program. Have a written program. There's like 42 of these things. And so the idea was if licensees - the idea I suppose, this is my interpretation of the NEI initiative - the idea there would be if licensees implemented all 42 of these tasks that they would be in a good position to deal with leaks and spills and would be able to manage it better and communicate it better. So anyway, that was the NEI initiative. Does that answer your question a little bit more about the initiative, Mike?

MEMBER RYAN: Yes.

MR. CONATSER: Okay. So we the NRC went in under temporary instruction TI-2515/173 and that's the temporary instruction for reviewing the voluntary initiative. And we implemented that in 2008 and we did our final inspection in August 2010 so that was basically a snapshot of the - what industry had done for those - during that 2-year period implementing the initiative. And what we found was overall in the industry 92 percent of the program elements across the industry were in the groundwater protection programs. So that was a fairly high implementation of the initiative when you look at that number. Of course that's an average over the whole industry, it doesn't say you know this plant might have been not good, or that plant may have been very good, so what we wanted to do was to get back - get down to which individual sites we'd need to be spending more time at perhaps. So we looked at this and we said okay, 60 percent of the sites had all 42 tasks in their groundwater protection programs and about 40 percent of the sites either missed one or more of those program elements, the 42 program elements.

MEMBER STETKAR: Richard, I know nothing about 07-07 but does the industry have anything like a peer review group either under NEI or INPO or somebody -

MR. CONATSER: Looking at this?

MEMBER STETKAR: Looking at this? You

know, it's - the staff has done this exercise -

MR. CONATSER: Yes. That's - yes, the third group in the NEI-07-07, the third group of program elements are for assessments of the program. The licensees are required to have their own assessments of the program done and then NEI has to come in with an independent group and come in and do assessments.

MEMBER STETKAR: Have they done that?

MR. CONATSER: They have. NEI now has come in and done assessments at all the sites and those assessments went about a week or longer, so it's a pretty in-depth assessment that the NEI group had done.

MEMBER STETKAR: Were they in parallel with your work?

MR. CONATSER: No.

MEMBER STETKAR: Or did they predate or post date?

MR. CONATSER: We - the NRC inspections typically followed the NEI inspections, but in some cases we were there before NEI.

MEMBER STETKAR: Okay.

MS. LUND: We received a report from NEI that - when they finished all the assessments.

MEMBER STETKAR: I was just curious. You know, you quote numbers here about percentages and things and if I - I wanted to get a read on how the industry is doing -

MR. CONATSER: As a matter of fact it's an interesting point because when we did - when NRC did our assessment we found one of the major areas where we found non-compliance or it was voluntary so I don't know how you'd call that, but they didn't implement that program step. One of the ones we found was relatively common was that they hadn't had the NEI assessment done.

MEMBER STETKAR: That's - thanks. Thank you. Continue.

MR. CONATSER: So. Now once we finished our assessment, our TI in 2010 we went back and found that at that time then NEI did complete all of their assessments. So it does take a long time to do all the plants. So this was a snapshot. Forty percent of the sites had gaps, that is, they didn't do at least one program element and there were different elements that seemed to reappear as common, common elements that were missed across all regions, one is remediation. There was a task in there to have a written program on how you were going to do a remediation. A lot of sites didn't have that particular aspect in their program. But the gaps from all this was entered into the licensee's corrective action program and when we look at this, these gaps are really related as far as I'm concerned here, I guess the NRC is concerned, the gaps were related to the readiness to manage leaks and spills. Just because a plant missed one element out of 42 it doesn't mean that they couldn't deal with leaks and spills, but there's a potential there that they may not be ready for whatever program element they didn't have implemented right. So that's the way we kind of looked at this in this assessment that we did of the voluntary initiative. And that's in review right now. I don't have it to give it to you guys but it should be out shortly.

MS. LUND: But the industry's peer assessment is publicly available. It came out maybe about a month ago, maybe a little less than that.

MEMBER SHACK: So a global one, or licensee by licensee?

MS. LUND: It discusses it globally.

MEMBER SHACK: I sort of figured it would.

MS. LUND: Ours actually - ours will discuss it licensee by licensee.

MEMBER SHACK: But the copy you get from the - from NEI discuss it licensee - it's a global again?

MS. LUND: Global.

MR. CONATSER: It is global. And then the last point here. NRC will continue oversight and inspections to close the gaps and as a matter of fact based on what we found we're going to implement another temporary instruction to go back out and look at those sites that did have gaps in their programs. Next slide.

And in summary there were four major elements of this leaks and spills issue. The engineering part of it which is to prevent and mitigate leaks. Bob will discuss that here in just a minute. Even though doses were low we want to maintain doses as low as reasonably achievable and the way we can do that is to minimize pipe leakage at the source. Health physics -

MEMBER BROWN: Can I ask one question? What do you do if one of the sites doesn't do any of them?

MR. CONATSER: Well, we didn't see that.

MEMBER BROWN: Well I'm just - it's about a regulation, I'm just -

MEMBER RAY: Charlie, when the industry makes a commitment like they -

MEMBER BROWN: I'm trying to understand your comment about the commitment versus voluntary a few minutes ago and I didn't ask the question -

MEMBER RAY: Basically it's enforceable.

MEMBER BROWN: Okay, it is.

MR. CONATSER: They shame them into it.

MEMBER RAY: No, it's not shame. Believe me, it's enforceable. If the industry says they're going to do something and everybody's obliged to do it and they don't, or somebody -

MEMBER BROWN: Then NRC -

MEMBER RAY: The sky would fall.

MEMBER BROWN: Okay. No, that's a good answer. That's - I didn't ask the question when you made the comment. Now I understand the point you made.

MEMBER RAY: Trust me, it would.

MR. CONATSER: The ANI -

MEMBER BROWN: Well, I know how it relates to my little program.

MR. CONATSER: The insurance companies, ANI, they wouldn't like that type of thing.

MEMBER BROWN: I've got it.

MR. CONATSER: Now, if licensees take this program and say in their procedures we will do this then of course we can get them for not complying with their procedures.

MEMBER BROWN: I understand that point, yes.

MR. CONATSER: Gotcha.

MS. LUND: And they do have to have a program that allows them to meet the regulations. So if it's not this program then what program are they using.

MEMBER BROWN: Okay.

MR. CONATSER: So there are some regulatory hooks there. Speaking regulatory hooks, I think Dana you asked me to say which one of these elements were actually regulatory-driven. Was that you?

MEMBER ARMIJO: I asked that.

MR. CONATSER: Okay. Sorry, Sam.

MEMBER ARMIJO: The leaks, unmonitored leaks might be one.

MR. CONATSER: The few things in there that are regulatory-driven were the reporting criteria. Licensees had to report - of course the NRC requires licensees to report the effluents that go offsite, that's always been the case, so part of this initiative was that licensees needed to report that. Now, in the NEI initiative it said licensees needed to report it at more detail than what we require, but we've always required that.

MEMBER ARMIJO: Okay.

MR. CONATSER: And then the other parts that's regulatory-driven are the notification requirements in 10 CFR 5072, in case there's going to be a news release that could be of interest to the public, that has to be reportable to the NRC under that 10 CFR 5072.

MEMBER ARMIJO: If they were going to report it to the state would they be obligated to report it to NRC?

MR. CONATSER: That's correct.

MEMBER ARMIJO: Okay.

MR. CONATSER: And I think those are just about the only program elements that are regulatory-driven out of that. And then let's see. The health physics monitor and protect. They were all low safety significance for these leaks. The risks were similar to the tasks we normally consider safe in everyday life. Additional staff actions may be necessary to improve transparency. We're upgrading our effluent reports, our summary of effluent reports. We'll continue to assess industry initiatives and close the gaps. And for the environment the regulations are really based on adequate protection of the public and that goes to you know we don't want to regulate on public whim, basically. We are there for adequate protection of the public. We're a regulator. And the last thing is communications. We're doing - there's some efforts planned for that, updating our web, putting out fact sheets, outreach to the public at meetings. We've put a list of leaks and spills on the NRC's public webpage, so there's various items we've done on the communication. I think there's more to do. So with that said that concludes what I had to say. Any other questions? And if not it's away on Bob.

MEMBER RYAN: Before we get to Bob and it may be a question for at the end, but I'd be curious about any interagency formal interactions you've had with either state or federal agencies. The state EPAs, the state rad folks, the state - I mean the federal EPA. Anything along those lines.

MS. LUND: Right and that's, you know, we had discussed especially during our October meeting last year we had talked to the states and we had also invited them to the commission meeting as well. And you know, it is very true that the states have a different perspective on you know how to manage this issue and because of that that's one of our proposals in this, in the communications aspect is to come up with a protocol where we work through the CRCPD and I'm going to forget what that actually stands for. The Council -

MEMBER RYAN: The Conference on Radiation Control Program Directors.

MS. LUND: Right. We were going to work through that and also with - because from state to state it can be a different department sometimes from state to state. It's understanding exactly who to work with and work through, and try to end up with - with a protocol where when we have these sort of issues with a plant where we're trying to get on more of the same page and be able to communicate more effectively we think it's really to their best interest and ours to be able to understand how to do that best. So that's our going-forward proposal. We're going to be working through our state liaison officers and other - in the regions we have this infrastructure to be able to do that outreach and coordination and that's our objective.

MEMBER RYAN: So that's kind of beginning already or is it?

MS. LUND: That's - in fact that's one of the things that is being worked through this memorandum, that chairman memorandum that I was talking about, that's one of the efforts that's underway.

MEMBER RYAN: Bob?

MR. HARDIES: Hi. I'm Bob, Bob Hardies, from the Office of Nuclear Reactor Regulation Division of Component Integrity. I'm going to talk about buried piping issues and also underground piping. Go to the next one.

Our objectives with respect to buried piping is that it maintain its ability to perform its safety function and any releases remain below regulatory limits. Current regulations, industry activities and codes and standards are adequate with regard to these objectives. We continue to monitor operating experience to validate that those conclusions remain applicable.

MEMBER RAY: Now, it was commented that new plants are required to meet a different standard than existing plants.

MR. HARDIES: I beg your pardon?

MEMBER RAY: It was commented that new plants are required to meet a different standard than existing plants do, for a discharge line for example. Is that correct?

MR. CONATSER: There's a rule for minimization of contamination for new plants, 10 CFR 20.1406 paragraph alpha. It talks about for new reactors they have to minimize contamination. Now in the past it had not been applicable to the existing power plants.

MEMBER RAY: We made a comment recently that a discharge line to a river should have a double wall pipe that allowed monitoring for leakage, that's what I was talking about, detecting leakage. It so far as we could tell wasn't a requirement. We thought that it should be done but that's as far as we could take it. And I just would I guess ask for your comment on that proposition.

MR. HARDIES: My understanding is that the new reactors are taking the opportunity to not get into this problem.

MEMBER RAY: Well, in this case they weren't taking an opportunity we thought they should which was by putting this double-walled pipe in.

MEMBER ARMIJO: Well, we actually wound up recommending monitoring at vulnerable -

MEMBER RAY: Well, we said two things, Sam. We said they ought to put in a double-walled pipe but there wasn't a requirement to do it. We were told by the staff that there was no such requirement. And the other thing was we recommended that they put in monitoring wells along the discharge line.

MEMBER ARMIJO: In the proximity of where a leak would be rather than 300 feet down.

MEMBER RAY: And it ran down a hill so it - the point is that in what you're saying, does any of that make sense?

MR. HARDIES: Yes, if that was an operating plant that wouldn't be a requirement that would be applicable to them.

MEMBER RAY: I know, but I'm telling you it's a new plant. V.C. Summer to be specific. Yes, 3 and 4.

MR. HARDIES: I guess I'm not sure I understand the question. Is it -

MEMBER RAY: Have you ever - does that sound to you like something that you're speaking about when you talk about new plants need to take action differently than existing plants do?

MEMBER SIEBER: Regulations don't require it.

MEMBER RAY: I know that, Jack, I already said that. But he made a comment and I'm trying to understand what his comment - how it relates to what we had recommended.

MR. HARDIES: I think there are various design solutions they could implement other than double-wall pipe. We couldn't tell them you must do double-wall pipe -

MEMBER RAY: But they hadn't done anything differently than the existing plant. This was a buried - direct buried single-wall pipe, it ran a mile or two to the river, and we said you ought to do something more than you're doing. And I'm just asking the question because you're I think saying that we're requiring people to do more than existing plants do. What do you think about what we said?

MR. HARDIES: I think what you said is a fine idea for a new plant that can prevent this problem in the future.

MEMBER RAY: But you don't see it as anything that the code committees or anybody is likely to -

MR. HARDIES: Actually the ASME code is working to share operating experience and there is a code that's - a committee that's looking at incorporating some of the lessons learned from operating plants into section 3 for design of new plants and whether or not that would be applicable to a new plant is dependent on when the new plant -

MEMBER RAY: Well, section 3 doesn't apply to a discharge line I'm sure running a mile or two to a river discharge point.

MEMBER ARMIJO: Well, that was high-density polyethylene too so that section 3 doesn't deal with that.

MEMBER RAY: All right, well never mind, I guess I can't formulate a question you can answer. Since you were talking about what I was interested in I thought I'd try.

MR. HARDIES: Maybe I'll touch on it, I don't know. I'm going to leave this slide, I'll come back to it.

(Laughter)

MR. HARDIES: When I get to the end we can do that again. This story starts in the middle of last decade in the Midwest with a leaking valve with mildly tritiated water and lots of mildly tritiated water. That ends up leading to the groundwater protection initiative where all the plants promised each other to look for leaks more closely, to monitor their wells at a uniform routine periodicity and report at a uniform lower or low level, and not surprisingly more leaks were discovered and reported. And when there's lots of leaks reported it gets the attention of stakeholders and stakeholders became involved in the issue. The NRC looked at it and the chairman directed the staff to look at buried piping issues in general. We did. We issued a SECY paper in December of that year. The industry also noticed that there were a lot of leaks from buried pipe and they created a buried piping integrity initiative. Groundwater protection initiative said look for leaks, report them when you find them, clean them up at some point, but they did not say prevent leaks and there was some explicit discussion of it. The buried piping integrity initiative says prevent leaks. It doesn't say you can prevent all leaks, but it says take actions to minimize leakage. Shortly after the industry issued the buried piping integrity initiative leaks were discovered at Vermont Yankee that increased this stakeholder interest a lot, and after that we issued a buried piping action plan. The buried piping action plan just tracked activities and codes and standards by the industry and by the NRC that we described in that SECY paper. We've met with industry periodically over the last year and a half, two years, and we have a meeting with them on the 30th of this month. And we sent them a letter last August asking for some information. That's my background. Next slide, please.

The buried piping action plan has a number of activities in it that can be categorized in four broad areas. The first is data collection where we're discovering what kinds of pipe are in the ground, what's around them, what do they contain, what safety function or carrying of radioactive material function do they have. The secondary is program assessment where we're assessing the initiatives. Third area is codes and standards which I'll talk about on the next slide and the fourth is regulatory activities which include things like keeping a website up to date that has information on buried piping activities. And also has - I included periodic step-back and a consideration of whether we need to take a different regulatory approach than we are, whether we need to perform some rulemaking. Go ahead to the next slide.

We've described the operational experience to the ASME code, a variety of ASME code committees over the last year and a half, and last August we had a management to management meeting here at headquarters and one of the subjects was buried piping. And as a result in November Section XI agreed to create a task group to address leaks from buried piping. That task group met in January for the first time, coming together to decide on an objective and a scope at the next meeting in May, but at a minimum the scope will be to improve the inspection requirements in the code that relate to safety-related piping, the piping that's you know required to control the reactor. But they are also going to consider either creating a code rules or guidance that would be applicable to piping that's not normally within the scope of the code, the piping that's not necessary to run the reactor but may contain low levels of radioactive material - have leaked and caused significant stakeholder interest and the code is going to consider addressing that piping, incorporating it into writing some guidance.

There's also NACE International which used to be called the National Association of Corrosion Engineers. They write guidance documents and corrosion protection standards for buried pipe for the petroleum industry, for a number of other industries that put piping underground. There's a lot of piping underground in this country that's subjected to these standards. There are not currently standards that are tailored for use at nuclear power plants. They have created a committee, its first meeting was last September, to write a standard for you know assessment of buried piping at nuclear power plants, corrosion prevention of piping at nuclear power plants, protection of piping at nuclear power plants. Next slide, please.

One of our actions is to write a temporary instruction. We have drafted it, it's in process. It's to be issued by the end of June of this year and that's to assess the buried piping integrity initiative and the underground piping and tanks integrity initiatives. We envision two phases in that, either two phases or two temporary instructions. The first one is a participating survey where we'll go to every site and see that they've done the first two or three steps, whichever number is required at the time we go visit, to ensure that they're actually participating in the initiative. The second would happen 18 to 24 months after the first one, after the initiative has had some time to work, and that one's to assess whether the actions being conducted as part of the initiative have an effect on degradation of piping. We're also in this regulatory area - we've revised the Generic Aging Lessons Learned report.

MEMBER RYAN: Just for the sake of completeness, buried piping is different from underground piping that's in a pipe chase, is that correct?

MR. HARDIES: That's correct. We should go to the next slide.

MEMBER RYAN: So we're really not talking about things that happen to be below-grade but are accessible?

MEMBER ARMIJO: But there are vaults that have leaked.

MR. HARDIES: Let me go through this slide.

MEMBER RYAN: Okay.

MEMBER STETKAR: Before you leave the -

MR. HARDIES: I'll let you go. I'll let you ask.

(Laughter)

MEMBER STETKAR: The license renewal stuff, we've been following that pretty carefully and we finally have some convergence on - in guidelines in GALL Rev 2 that most - let me say all of the recent license renewal applications that we've seen come through us let's say in the last few months seem to be joining. There are a large number of plants that already have had their licenses renewed that had a variety of approaches, less consistent with the current guidance. Have any notion what the agency is going to do about those preceding plants?

MR. HARDIES: You mean are we going to impose GALL 2 retroactively?

MEMBER STETKAR: Yes.

MR. HARDIES: I don't -

MEMBER STETKAR: Well, you can't do that retroactively. It's - I'm just asking for your spin on it. I've heard two or three other spins. If you don't have a quick answer -

MR. HARDIES: I'd like to say let me finish this slide but I'm not going to say that.

(Laughter)

MR. HARDIES: I got to go to a meeting with the industry a couple of weeks ago and it's their collective meeting, they have it every six months and they share operating experience. They're spending you know, you count it up and it's certainly over $100 million collectively on buried piping. Many, many plants who are already in license renewal are installing new cathodic protection systems or they're taking cathodic protection systems that no one has paid attention to in 15 years and a NACE certified guy has never seen and they're installing - you know, ripping out anode beds, putting in new ones, installing new rectifiers. There's an example last spring of a plant who did a buried piping inspection for this buried piping integrity group, actually I don't know whether they had renewed license or not, sorry.

MEMBER STETKAR: It's a question of where in time, you know, whether or not they're in progress or have already had their license renewed.

MR. HARDIES: I actually don't know with that one, but they discovered a pipe because of that inspection that was degraded and they rerouted the whole line and -

MEMBER STETKAR: Yes, we've heard some anecdotes, but more in the sense of kind of recent and in progress license renewal activities, not ones that were approved two or three years ago for example.

MS. LUND: One of the things we heard this morning in the RIC session was from Exelon and they talked about their experience there at Oyster Creek. And they were talking about how they have a 16-month $13.3 million plan to move the pipes into monitored vaults or above ground. And so they explained exactly how they went about doing that and you know, because Exelon typically, you know, they may do something at one site but they also evaluate the benefits of that approach for other sites as well. So I think you know Bob is sort of at the forefront of seeing what they're doing, but you know there seems to be a lot of activity in a lot of areas both doing things like this to minimize problems with monitoring and in addition to -

MEMBER SHACK: Is this another one of these industry-wide initiatives that everybody's buying into?

MR. HARDIES: Yes. Both of these two initiatives were passed with 100 percent chief nuclear officer participation and so they promised each other. Also, INPO is assessing performance with respect to this initiative.

MEMBER SHACK: So if we don't get them under license renewal we at least have them under this.

MR. HARDIES: Yes. We're doing a temporary instruction - inspection instruction, so we're going to assess participation, we're going to assess performance with respect to this and then

INPO's assessing performance with respect to this.

MEMBER SIEBER: Didn't we recently listen to a licensee who had a leaking spent fuel pool? It was leaking out on their property, didn't know where it was coming from, said they couldn't fix it and so it continues to leak. How is that a part of all of this?

MR. HARDIES: I won't claim that. That's decidedly not a tank or a pipe.

(Laughter)

MEMBER SIEBER: It's on their property they say.

MR. CONATSER: Generally for - I mean, if a licensee has a spent fuel pool that's leaking generally there's lots of tritium in that type of water and there's, you know, the activity in that type of water so -

MEMBER SIEBER: There's more than tritium in there.

MR. CONATSER: Usually they would address something like that - I would think that the NRC would have some type of a means to help them with that. I don't know that to be the case, but I fully expect that - that's not the health physics area necessarily, but.

MEMBER SIEBER: It's very similar to what we're talking about here. It's not the same I'll admit in a couple of ways. There's more than one plant that's in that condition. So it could go off their property. I mean, their property -

MR. HARDIES: Well, if it would go off their property the groundwater protection initiative -

MR. CONATSER: The NRC regulations would kick in for anything that goes off the site property they have to report. I mean, there's a regulation for that. So obviously they would need to be monitoring it to the extent certainly that they could report what is being released to make sure there's no impact, adverse impact on the public, et cetera.

MS. LUND: Also for decommissioning as well.

MR. CONATSER: And decommissioning aspects as well, that's right. So I would think that we would have something along those lines, but I can't speak to that fully.

MEMBER ARMIJO: We've heard it. You know, they argue and say we're trying to find it, we don't know how to find it, fix it. A lot of times they collect that leaking water, they think they're collecting it all, it's going into their rad waste system and they're treating it. Other times they don't know where it goes and they're trying to find out where it's going. But it's never good news to have leaking water anywhere. You pay for it later.

MEMBER SIEBER: I believe we've done one decommissioning and there are some surprised when you do one.

MEMBER ARMIJO: Containment corrosion, you name it.

MEMBER RYAN: Sorry, Bob.

MR. HARDIES: I'm going to jump back in. We have the buried piping initiative. It has like five program elements. They're writing a program and their procedures that was due last summer and all plants are done they tell us. We'll check that when they do the inspection. They did a risk ranking of the pipe because not all pipe is created equal. Some of it is steel pipe in dry sand and it's got nice coating on it, and some of it's aluminum pipe right next to the steel pipe maybe going into concrete with lots of water flowing by and some of it contains radioactive material, some of it might just contain potable water or plant heating or diesel fuel, so there's different importance of pipe, and there's different environment that causes it to degrade. So the next is risk ranking.

MEMBER ARMIJO: Do you include the new high-density polyethylene in your integrity initiative?

MR. HARDIES: If it's buried onsite and contains some liquid it's included in this initiative. As far as I know there's only two plants that have buried safety-related.

MEMBER ARMIJO: Duke and Catawba. I forget which one it is.

MR. HARDIES: Then - so the ranking was to be done by the past December. Then they make an inspection plan and they inspect more of things that are important and less or not at all of things that aren't important. The inspections are due after that and then it's 2013 December they're due to have asset management plans which are approaches for them to really deploy their funding more cost effectively but find by inspection, doing the condition assessment on the high-risk stuff and deciding whether they need to run it, repair it, replace it, re-inspect it. So that's due end of December.

The buried piping integrity initiative was issued November of 2009. Yankee started leaking in

January and a few months went by and it turns out that Yankee - Vermont Yankee leak was through underground piping. And they're different. Buried piping has dirt around it and it can be cathodically protected because it has dirt around it or concrete around it. It can carry current and get cathodic protection and you can stop it from corroding. Also, underground piping is in vaults or chases and it has air around it primarily and so you can't deliver current to it, so you can't protect it and that's why they're different. Buried piping leaks right into the ground by definition and underground pipe when it leaks leaks into a vault or something where you can collect the leakage.

MEMBER RYAN: Sometimes underground pipe chases have water in them, not air.

MR. HARDIES: Sometimes they do, yes. But you don't design - you don't design a cathodic protection system.

MEMBER RYAN: I understand, I just wanted to say that underground piping is actually underwater.

MR. HARDIES: So the industry, recognizing that buried piping integrity issue didn't cover the public confidence problem for them created the underground piping and tanks initiative which is identical in the actions that are required for the buried piping initiative but adds underground piping and tanks to the scope. At this point I'm going to note that these initiatives if they're effective take care of all the communication problems because if you stop leaks you can't you know communicate ineffectively about something that doesn't happen.

MEMBER RAY: But you said this only applied onsite I thought. Didn't you say that? Sure.

MR. HARDIES: As opposed to somewhere else?

MEMBER RAY: Yes, discharge lines.

MR. HARDIES: Oh no, it applies to discharge lines. It applies to the utilities piping that might have radioactive material in it.

MEMBER RAY: Okay, so it doesn't just apply onsite then because some discharge lines are a mile or two -

MR. HARDIES: Thirteen miles long. Some are longer I hear.

MEMBER POWERS: I would not be too optimistic about the ability to construe successful performance in a negative fashion. Were you telling me that things worked fine and we've been unable to identify any leaks offsite I would report that if I were a reporter as NRC unable to identify leakage offsite.

(Laughter)

MR. HARDIES: All right. We'll go to the next site.

MEMBER POWERS: We're not immune to communication issues.

MR. HARDIES: With respect to performance in these initiatives one of the things in the action plan, the first section was information-gathering in the buried piping action plan. We're trying to get a handle on the pre-initiative rate of significant degradation of buried and underground piping. So we're going back over EPIX, the INPO's database and INPO and the industry are actually gathering information to get a pre-initiative rate of degradation. And then we're going to take off the time between the beginning of the initiative and a few years of performance of the initiative because people are going to be digging up pipe, people are going to be doing a lot of inspection of pipe and they're going to find a lot of leaks that they wouldn't have if they hadn't disturbed the ground. In 2015 we're going to begin comparing the new - comparing the finding of significant degradation at that time with this pre-degradation - or pre-initiative rate, and that is our primary metric that we hope to use to assess the initiative's performance. If the rate of occurrence of degradation after 2015 is lower than it was before we started then the initiatives have been successful and we can use that.

MEMBER RYAN: I guess I would think carefully about how you use it because the rate of inspection that identifies these leaks is related to things like plant life extensions, license renewals, and other activities that you know are kind of at a peak at the moment. So I guess I wouldn't want to compare one rate versus another rate given the fact that the level of activity that's going to disclose them is probably changing over time. If the probability of finding a leak is constant over time you're absolutely on target, but it's probably not.

MR. HARDIES: Well, the groundwater protection initiative provides the method of finding a leak and it' s relatively constant over time.

MEMBER RYAN: - right now. So the leak rate a long time ago might be different than the leak rate today for that reason.

MR. HARDIES: It's a good point. We have to be careful of the numbers that we use.

MEMBER RYAN: Yes. I wouldn't be dividing one by the other and comparing percentages directly without some thought.

MR. HARDIES: Yes. It's hard to decide on both rates.

MEMBER RYAN: Right.

MR. HARDIES: We're going to continue to monitor operating experience and occasionally in our action plan we step back and evaluate the need to get commitments to the initiative. Someone asked earlier what happens if someone decides not to play. They have a deviation process. If they decide not to play they can formally say we're not playing. They submit it to the chief nuclear officers and they all read it and then talk to each other. But if a significant number of them didn't play we would consider writing letters to them and asking them to write letters back to us and make promises. Next slide.

So our objectives related to buried piping. They maintain intended function and releases remain below regulatory limits and current regulations and industry activities are compatible with these objectives but industry activities are improving, codes and standard are improving. And we continue to monitor events to make sure those objectives are being maintained. That's it. Thanks.

MEMBER RYAN: Thank you.

MS. LUND: I think just to sort of close this out you know I think that - I think I heard it mentioned earlier about it being good business. I think it's good business to do a lot of the things that are in the initiatives and certainly if they employ those techniques consistently, uniformly you know as the programmatic basis behind what they're doing we expect fully to see an improvement in this area and I think that it shows a lot more active management of these particular issues. So we're at a point right now where you know they've implemented mostly, you know, the groundwater protection initiative. They're just getting started doing the underground piping and tanks you know integrity initiative. We want to understand fully how they're doing that and how they're using these to meet the regulations. So that's our engagement.

MEMBER RYAN: As with a lot of these programs I kind of see it as there's a discovery phase that begins slowly and then discovery ramps up big time, and then action ramps up to go with that and at some point I guess in the future you'll see both of those go down and get to some level and then the performance metric all improve from that point on too. So and this is a Ouija board question, but how long do you think it's going to take before we get kind of through the major part of the discovery and corrective action phase and onto a more routine treatment of all this?

MS. LUND: Well, you have in your buried piping action plan I think one of his step-back times is - is it 2015 I think? Is that when you - is that in your action plan to sort of step back and assess?

MR. HARDIES: Assess rates in 2015.

MEMBER RYAN: Step-back and look is two years away so.

MR. HARDIES: But there are already results on buried piping. INPO is tracking and NEI is tracking. They make a report to NSIAC I think it's every six months. And I got to look at the last one and they have major degradation events. So they call leaks degradation event, but they also, if you dig down and you find 20 percent of the wall gone and you're still adequate wall thickness but they have criteria for what a degradation event is. And I think the numbers are something like 40-60-10 if you go over the last few years, and so you know the trend is -

MEMBER RYAN: So new discoveries are

dropping off is what you're suggesting.

MR. HARDIES: Well, we're only a couple of months in.

MS. LUND: We're sort of moving forward in a purposeful way to take a look at it.

MEMBER RYAN: I think that's clear that you've planted your feet on the ground and you're engaged on this, so. Mr. Chairman, I'll turn it back to you if there's no other questions for our panel of speakers.

MEMBER ARMIJO: Well, I'd like to thank the staff for a very good presentation. You put my mind at ease about regulatory creep which is - but -

MEMBER POWERS: As opposed to regulatory creeps.

(Laughter)

MEMBER ARMIJO: I didn't say that. So with that we're going to recess for about 15 minutes and we're going to come back to start working on some letters.

MS. LUND: Thank you.

MEMBER ARMIJO: Thank you very much.

(Whereupon, the foregoing matter went off the record at 5:29 p.m. and went back on the record at 5:38 p.m.)

MEMBER ARMIJO: We have one remaining item from the Point Beach and that is answer to a question related to the rod ejection accident.

MEMBER BANERJEE: But we need Dana.

MEMBER CORRADINI: Let's get to the answer though.

MEMBER ARMIJO: I'll fill them in on the answer. So why don't we bring the staff member who can answer the question and get a - and close that out.

MR. CLIFFORD: Are we waiting for Dana?

MEMBER ARMIJO: We'll relay the answer.

MEMBER BANERJEE: We'll relay the answer to Dana?

MEMBER SHACK: He knows the answer, he's just waiting for somebody to sell it to him.

MR. CLIFFORD: Okay, so the application calculated a maximum total calories per gram of 176 radial average fuel enthalpy. There's two thresholds that you have to consider when you're doing rod ejection. The first threshold is related to coolable geometry and there's a maximum total enthalpy that's used to prevent gross failure of your fuel rod and that's purely empirically based. And in Reg Guide 177 the value was 1 point - I'm sorry, 280 calories per gram and the staff has since reduced that to 230 calories per gram. The applicant calculated a value of 176 calories per gram which is significantly below the 230 calories per gram.

MEMBER POWERS: Where did the 200 come from?

MEMBER BROWN: Yes, they listed an acceptance criteria of 200 calories per, not 230.

MR. CLIFFORD: Correct. Many years ago - well, Reg Guide 177 says 280 calories per gram. That was known to be an error for many years. Now, Westinghouse maybe read the tea leaves and realized that the 280 calories per gram was not conservative so they initiated an internal criteria below 280 and they chose 200 calories per gram. Actually it's 225 for fresh fuel, 200 for irradiated fuel. So they voluntarily imposed a limit lower than what was in the reg guide. That's the basis of the 200 calories per gram. So by meeting the 200 calories per gram they meet our revised criteria of 230 calories per gram.

MEMBER POWERS: If we look at the database responsible for any of your numbers we find that it is universally for fresh or fuel taken to irradiations of less than 17 gigawatt-days per time. You're now using fuel at substantially higher burnups on that. If we look at what data we have for irradiated fuels we find that all of these limits are completely out of line with what's measured. Why do we persist then in using a reg guide that is completely orthogonal to the available database?

MR. CLIFFORD: Well, for coolable geometry the database is limited to what was done in the 1970s, the PBS burden tree. All of the data generated since then, and this is the Cabri, NSR, BIGR, IGR data, was generated to determine the cladding failure threshold, not the upper tolerance or coolable geometry.

MEMBER ARMIJO: So this is a coolable geometry criteria?

MR. CLIFFORD: Correct.

MEMBER ARMIJO: Only.

MR. CLIFFORD: Correct. The 200 is just simply to prevent gross failure, not to exclude cladding failure, just to prevent gross failure.

MEMBER POWERS: I mean, this seems like the most obtuse interpretation that I can imagine. We have data for low-burn up fuel that says gee there are two numbers I worry about, one where the clad ruptures and the other one where I get gross fuel damage. I now take fuel up and use it routinely at higher burnups and I take data and I say gee, the clad rupture number dropped, but somehow the gross fuel damage number has not changed.

MEMBER ARMIJO: Because it isn't gross. I mean, it's localized in a rod ejection. You fail a few rods and -

MEMBER POWERS: And those are the ones that I'm worried about. I mean, why - I just don't understand why we're - we seem to be deliberately ignoring phenomenological findings.

MR. CLIFFORD: Well, there is - let me see. There is a separate criteria that Westinghouse has that's consistent with our revised criteria, and that is they limit the volume fraction of fuel that experiences melting to 10 percent volume of the pellet for only the hot full power event. They use that because starting at hot full power you're starting at around 60-65 calories per gram so even though you have a very small ejected rod worth, and even though it's below prompt critical, you still can get fuel temperatures up to where you could have incipient centerline melt. Now, they limit that to less than 10 percent of the volume so to preclude melted fuel coolant interaction. Now, for hot zero power they ensure that they don't have melted fuel. So without the melted fuel they don't have the volumetric expansion in the fuel pellet which causes the fuel rod to - the gross failure of the fuel rod. So if you stay below 200 calories per gram you're not going to have the melted conditions for the hot zero power case.

MEMBER POWERS: How do I know that's true for fuel being taken up to reasonable burnups?

MR. CLIFFORD: Well, you also have to consider that if the highest ejected rod worth is not going to be above a high burnup fuel rod because the ejected - the worth of the control rod is - would be significantly lower if it was over a rod with 30, 40, 50, 60 gigawatt-days on it. So the highest ejected rod is coming - it will be located within a fresh bundle. So if you're maintaining your worst rod in the core below 200 calories per gram, then you're maintaining the - a much more benign transient if you were to eject another rod at another location and the rod in the core that was located over a third burn assembly.

MEMBER ARMIJO: But the bottom line is they are meeting the regulatory limit.

MR. CLIFFORD: Yes.

MEMBER ARMIJO: And more - greater - with more conservatism than the regulatory limit.

MEMBER POWERS: It is the regulatory limit.

MR. CLIFFORD: We've established a new criteria based upon PCMI cladding failure which is all the new data from Cabri and NSR and the Russian reactors. Now, the threshold for PCMI failure which this isn't violent expulsion of fuel, this is cladding failure. That starts out 150 delta calories per gram, change in calories per gram of 150 calories per gram. They're - the applicant is calculating a maximum delta of 144 so for their worst ejected rod they're not getting any PCMI failure. In other words, they're not - the volumetric expansion in the pellet does not cause failure of the fuel rod.

MEMBER SHACK: Now, how conservative are their calculations? Are they doing 3D calculations?

MR. CLIFFORD: No. They're still maintaining -

MEMBER SHACK: I thought that was the answer you were going to really give me -

MEMBER CORRADINI: Yes, they were doing conservative calculations to get to the -

MR. CLIFFORD: They're doing extremely conservative 1D, 2D synthesis. They're not using the - Westinghouse does have an approved three-dimensional calculation, but if they were to use that Westinghouse has imposed a 100 calorie per gram maximum. So they recognize that if they were to use their 3D kinetics they would then have to lower their limit from 200 down to something lower than that. So yes, that's a very good point. I forgot to mention it.

MEMBER ARMIJO: Okay, Dana?

MEMBER POWERS: I mean, it strikes me as we've got one of two things here. Either we're deliberately ignoring the information or we're using a criteria not reflected by the - by the numbers we're adopting. I mean, it's one of two things, neither one of which I like.

MEMBER SHACK: You haven't liked it for a long time.

MEMBER POWERS: And I haven't liked for a long time.

(Laughter)

MEMBER ARMIJO: Okay. At this point Sanjoy are you - as far as Point Beach is concerned -

MEMBER BANERJEE: Well, I actually bought early on into Bill's argument, but I wanted to know - I mean, this was not extensively discussed at the subcommittee meeting.

MEMBER SHACK: Because we know it's all

fiction.

MEMBER BANERJEE: Well, those calculations were very conservative clearly. I mean, we went to it. But I think we have to satisfy Dana on this matter.

MEMBER POWERS: Here we're trapped in a situation I never like to get into where the licensee has come in and he's meeting the criteria, he's doing what's been asked of him and what's been asked of him that's wrong. And at some point we've just got to say something. We've said something about it now for three research reports I know and it just persists.

MEMBER SHACK: And letters.

MEMBER POWERS: And letters, yes.

MEMBER ARMIJO: When was the last letter we wrote on this? A couple of years ago, maybe three years ago, on RIA and the new thresholds and everything else.

MEMBER RYAN: I could look it up.

MEMBER ARMIJO: I think we should reread our letter before we go much further.

MEMBER BANERJEE: But that threshold is there.

MEMBER ARMIJO: It's there, yes.

MEMBER BANERJEE: I'm fine with.

CHAIRMAN ABDEL-KHALIK: All right. Is there any further discussion on the subject? Okay. At this time let's - we have a draft letter. Let's - we are off the record. Thank you.

MEMBER ARMIJO: Thanks, guys.

(Whereupon, the foregoing matter went off the record at 5:49 p.m.)

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UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Presentation to the ACRS Full Committee

Advanced Reactor Program

March 10, 2011

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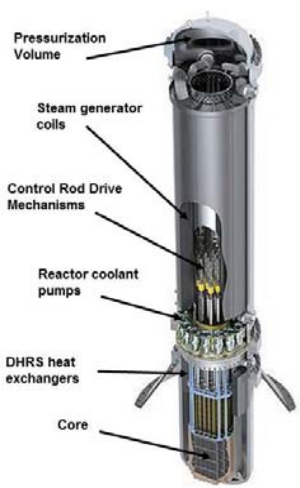
Protecting People and the Environment

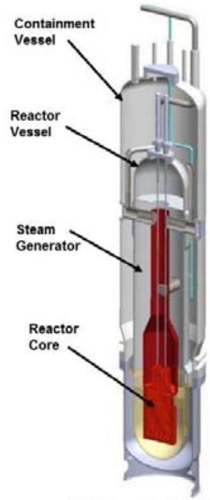
Current SMR Activities

William Reckley, Chief
Advanced Reactors Branch 1
Office of New Reactors

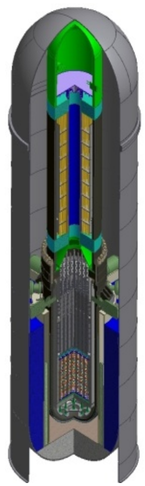
Advanced Reactor Program



mPower (Babcock & Wilcox)
125 MWe

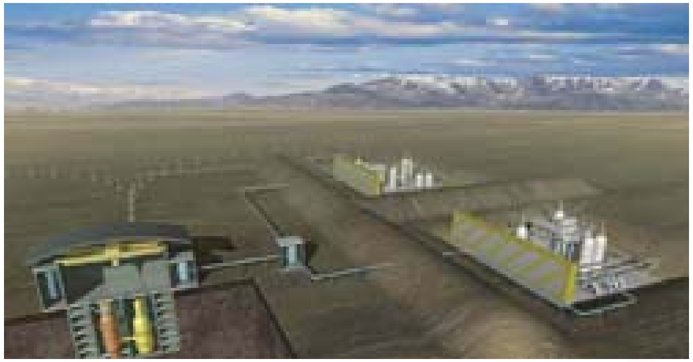


NuScale (NuScale)
45 MWe

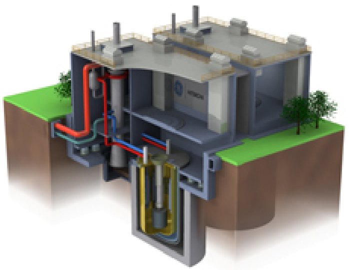


Westinghouse
200 MWe

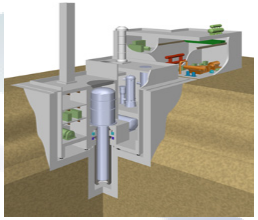
TVA Clinch River



NGNP - HTGR



GE-H PRISM



Toshiba 4S

Fast Reactors

Licensing Process Issues

- License for prototype reactors
- License structure for multi-module facilities
- Manufacturing licenses

Design Requirement Issues

- Defense in depth
- Use of probabilistic risk assessment
- Appropriate source term and dose consequence analyses
- Key component and system designs
- Aircraft Impact Assessments

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Operational Issues

- Operator staffing
- Operational programs
- Construction/installation issues
- Industrial facilities using nuclear process heat
- Security and Safeguards
- Offsite emergency preparedness
- Loss of large areas due to fires or explosions

Financial Issues

- NRC annual fees
- Insurance and liability (Price Anderson)
- Decommissioning funding

Control Room Staffing

- Approach
  - Tasking Analyses (NUREG 0711)
  - Staffing Exemptions (NUREG 1791)
- Related Issues
  - Plant Design, Event Analyses and Simulation
  - Overall Plant Staffing
- Possible framework, approaches expected to Commission in 3rd Quarter FY2011

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Security

- Approach
  - Security Assessments – Preliminary Designs
- Related Issues
  - Plant Designs, Mechanistic Source Term
- Performing Issue Identification and Ranking Assessment
- Possible framework, approaches expected to Commission in early FY2012

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Emergency Planning

- Approach
  - Engaging stakeholders on alternatives, including graded approaches based on evaluation of public dose in relation to PAG values resulting from severe accident
- Related Issues
  - Mechanistic Source Term
  - Process Heat Applications (NGNP)
- Possible approach described in upcoming SECY
- ACRS Full Committee Meeting – April 7, 2011

Summary of Key Technical and Policy Issue SECY Dates

SECY PAPER	DATE TO THE COMMISSION
Control Room Staffing	Q3 FY 2011
Risk-Informed Licensing	SECY-2011-0024 (Feb 2011)
Mechanistic Source Term	Q4 FY 2011
Emergency Planning	Q3 FY2011 (~April)
Physical Security	Q1 FY 2012
Manufacturing Licenses	TBD
Multi-Module Facilities	Q2 FY2011
Annual Fees	Complete (7 Feb 11)
Insurance	TBD
Decommissioning Funding	Q2 FY2011

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Use of Risk Insights to Enhance the Safety Focus of Small Modular Reactor Reviews

[SECY-11-0024]

March 10, 2011

Introduction

Staff response to SRM – COMGBJ-10-0004/COMGEA-10-0001

- Staff should provide the Commission a policy paper …
  - Near-term focus on integral pressurized water reactors (iPWRs):
    - Development of a framework …
    - Align review focus and resources …
    - Develop risk-informed licensing review plans for each …
  - Long-term focus:
    - Develop a new risk-informed regulatory framework …
- SECY-11-0024, "Use of Risk Insights to Enhance the Safety Focus of Small Modular Reactor Reviews"
  - NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," "Introduction," Draft Revision 3 (SECY enclosure)
  - [02/18/11; ML110110688; publicly available]

ACRS Future Plant Design Subcommittee – meeting 02/09/11

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SECY-11-0024
iPWR Review Framework

Approach:

- More risk-informed review process – graded approach
  - … detailed, in-depth review for SSCs determined to be both safety related and risk significant and progressively less detailed review for SSCs determined to be nonsafety related, not risk significant, or both
- More integrated review process –
  - … improve integration of the performance-based programmatic requirements that are applicable to SSCs into the SSC review process

Status Quo:

- ✓ Consistent with current regulations
- ✓ Consistent with Commission policy
- ✓ No change to SSC safety related/nonsafety related determination
- ✓ No change to SSC risk significance determination process

iPWR Review Framework – Integrated

SRP Acceptance Criteria for SSCs

- Design-related criteria
- Performance-oriented criteria
  - Capability
  - Availability
  - Reliability
  - Maintainability

Program Requirements

- Applicable to applicants for certified design or COL
- Staff review to support DC and COL issuance
- Include performance-based requirements
  - Technical Specifications
  - Availability Controls (e.g., RTNSS)
  - Startup Test Program
  - Maintenance Rule
  - Reliability Assurance Program
  - ITAAC

Correlation: Performance-Oriented Acceptance Criteria & Performance-Based Program Requirements

Acceptance Criteria Attribute	Program Requirements
Capability	Technical Specifications
Availability	Availability Controls
Reliability	Reliability Assurance Program
Maintainability	Maintenance Rule
	Initial Test Program
	ITAAC (inspections, tests, analyses and acceptance criteria)

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iPWR Review Framework – Integrated

Observation – For most SSCs, SRP acceptance criteria include criteria that address aspects of demonstrated performance (i.e., performance-oriented criteria) in addition to criteria that address aspects of design. Certain program requirements (e.g., technical specifications, availability controls for SSCs subject to RTNSS, maintenance rule) include performance-based measures (e.g., availability, reliability, maintainability) that correlate with performance-oriented acceptance criteria.

Review –

- Design-related criteria – no change to review process
- Performance-oriented criteria – Where correlation exists, framework provides for identifying program requirements as part of the SSC review and using these requirements to augment or replace, as appropriate, technical analysis and evaluation techniques applied to address performance-oriented acceptance criteria.
  [e.g., inclusion of SSC within applicant's reliability assurance program and maintenance rule program may be sufficient to satisfy performance-oriented acceptance criteria pertaining to reliability, availability, and maintainability of SSC.]

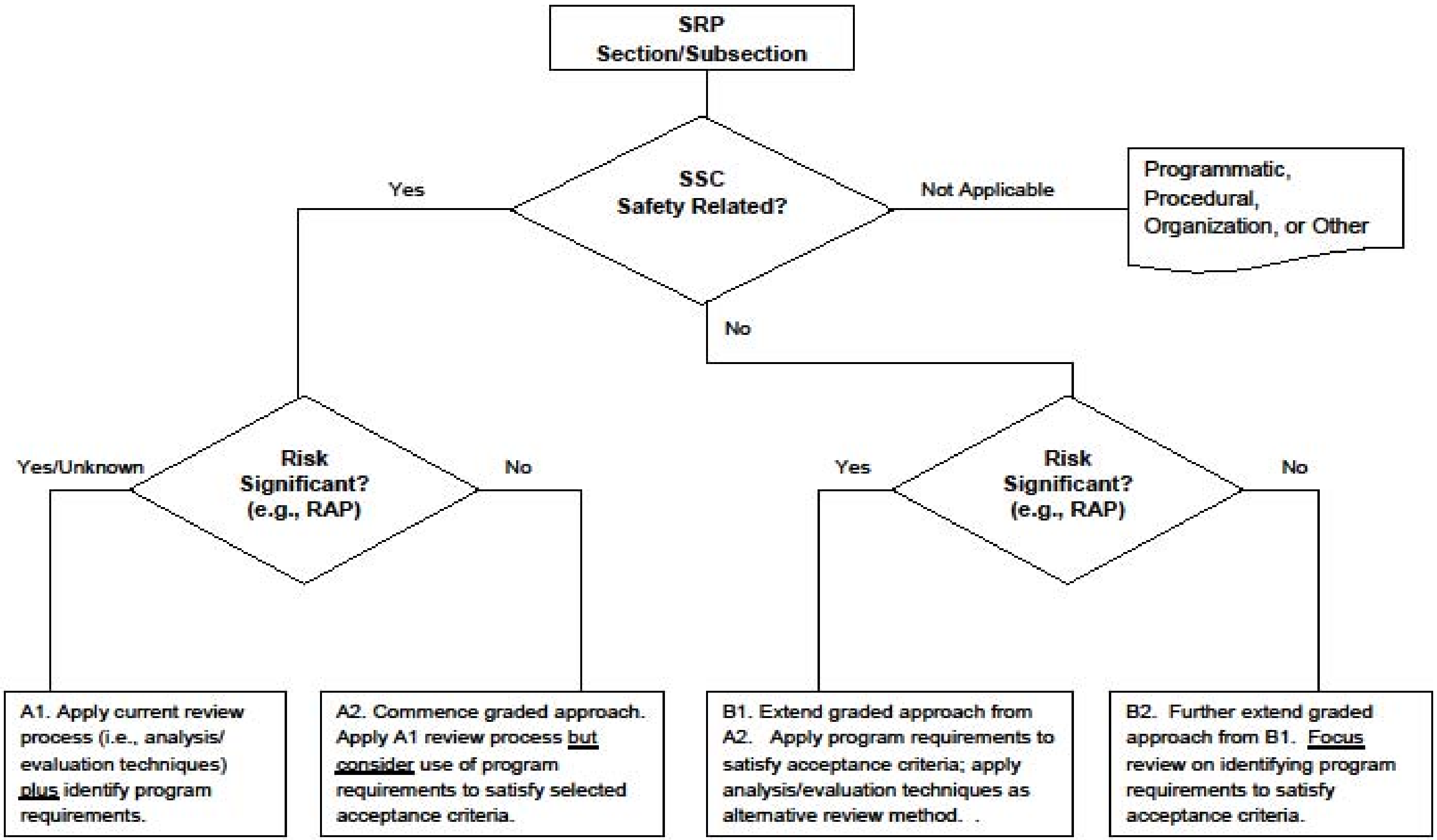
iPWR Review Framework – Risk-Informed

Graded review approach for SSCs

- Safety importance and risk significance determine level of review
- Detailed, indepth analysis and evaluation review (analogous to the current review process) applied to safety-related and risk-significant SSCs and progressively less-detailed review to other SSCs

Determination of whether SSC is safety related, risk significant, or both is prerequisite to implementing review framework
(e.g., risk significance may be determined using process similar to that used in identifying SSCs included in the reliability assurance program)

iPWR Review Framework – Risk-Informed



* For programmatic, procedural, organization, or other non-SSC topics (e.g., quality assurance, training, human factors engineering, health physics programs, operating procedures), the current review process is applied as provided in the SRP.

iPWR Review Framework – Examples

9.2.1 STATION SERVICE WATER SYSTEM

B1 (system determined to be nonsafety related and risk significant)

SRP Section 9.2.1 identifies the following acceptance criteria:

- *Protection against natural phenomena. Information that addresses requirements of GDC 2 regarding the capability of structures housing the service water system (SWS) and the SWS itself to withstand the effects of natural phenomena will be considered acceptable if the guidance of Regulatory Guide (RG) 1.29, Position C.1 for safety-related portions of the SWS and Position C.2 for nonsafety-related portions of the SWS are appropriately addressed.*

  Review: Criterion is design-related and requires technical analysis/evaluation techniques to address effects of natural phenomena.
- *Environmental and Dynamic Effects. Information that addresses the requirements of GDC 4 regarding consideration of environmental and dynamic effects will be considered acceptable if the acceptance criteria in following SRP sections, as they apply to SWS, are met: SRP Sections 3.5.1.1, 3.5.1.4, 3.5.2, and SRP Section 3.6.1.*

  Review: Criterion is design-related and requires technical analysis/evaluation techniques to address effects regarding internal interactions
- *Sharing of Structures, Systems, and Components. Information that addresses the requirements of GDC 5 regarding the capability of shared systems and components important to safety to perform required safety functions will be considered acceptable if the use of the SWS in multiple-unit plants during an accident in one unit does not significantly affect the capability to conduct a safe and orderly shutdown and cooldown in the unaffected unit(s).*

  Review: Criterion is not applicable to single-module site (analysis/evaluation techniques may be necessary for subsequent modules of a multi-module site

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iPWR Review Framework – Examples

9.2.1 STATION SERVICE WATER SYSTEM (cont)

- *Cooling Water System. Information that addresses the requirements of GDC 44 regarding consideration of the cooling water system will be considered acceptable if a system to transfer heat from SSCs important to safety to an ultimate heat sink is provided. In addition, the SWS can transfer the combined heat load of these SSCs under normal operating and accident conditions, assuming loss of offsite power and a single failure, and that system portions can be isolated so the safety function of the system is not compromised.*
  Review: GDC 44 includes both design-related and performance-oriented criteria. Design-related would be addressed by analysis/evaluation techniques. Performance-oriented may be satisfied by program requirements (e.g., RTNSS availability controls, initial test program)
- *Cooling Water System Inspection. Information that addresses the requirements of GDC 45 regarding the inspection of cooling water systems will be considered acceptable if the design of the SWS permits inservice inspection of safety-related components and equipment and operational functional testing of the system and its components.*
  Review: GDC 45 addresses performance-oriented "maintainability" – which may be satisfied by program requirements (e.g., combination of maintenance rule program, initial plant testing)
- *Cooling Water System Testing. Information that addresses the requirements of GDC 46 regarding the testing of cooling water systems will be considered acceptable if the SWS is designed for testing to detect degradation in performance or in the system pressure boundary so that the SWS will function reliably to provide decay heat removal and essential cooling for safety-related equipment.*
  Review: GDC 46 addresses performance-oriented "reliability, availability, and maintenance" – which may be satisfied by program requirements (e.g., combination of RTNSS availability controls, reliability assurance program, and maintenance rule)

iPWR Design-Specific Review Plan

- Implement iPWR review framework for each application
  – Revised NUREG-0800 SRP Introduction
- Design-specific review plan includes:
  - Unique plan for each iPWR design
  - Schedule(s) for pre-application and application activities
    - e.g., LWR DC and COL reviews
  - Standard Review Plan “tailored” to design (i.e., SRP sections added/deleted/modified/retained as appropriate to design)
  - Safety Evaluation Report template “tailored” to design (correspond to tailored SRP sections)
- Expand scope of pre-application activities

iPWR Design-Specific Review Plan

Pre-application activities include:

- Topical/technical reports – vendor submittal and staff review
- Audits of vendor information, programs, and processes
- Review of conceptual/draft/preliminary design information
- Determination (preliminary) of SSCs – safety-related or non-safety-related; risk significant or non-risk significant
- Requests for additional information (informal)
- Documentation of pre-application review in SER template format

Post-application activities include:

- Application Acceptance Review (formal protocol)
- Requests for additional information (formal)
- Determination (final/confirmatory) of SSCs – safety-related or non-safety-related; risk significant or non-risk significant
- ACRS meetings
- Review of completed/finalized application information
- Preparation of final SER

Coordination with Applicants

- SECY-11-0024 activities aimed at improving effectiveness and efficiency of staff review process for iPWRs (i.e., no changes to regulatory requirements applicable to SSCs or applications)
- However –
  - review process would be aided by improved documentation of SSCs and program requirements in applications
- Staff is engaging with potential applicants and other stakeholders – e.g., public regulatory workshops, NEI, ANS white papers

New Risk-informed Regulatory Structure
(advanced reactors – HTGRs, LMRs)

Risk-Informed, Performance-Based Structure development:

- iPWR insights
  - Conduct pilot study – apply principles of technology neutral framework (e.g., NUREG-1860) for review of application
  - Develop insights applicable to technology neutral framework
  - Schedule – FY2013
- HTGR insights
  - Continue NGNP pre-application interactions and review activities (e.g., white papers, ANS (draft) 53.1, public meetings)
  - Compare/contrast NGNP regulatory approach with principles of technology neutral framework
  - Conduct NGNP comparison study – apply principles of technology neutral framework for review of application
  - Develop insights applicable to technology neutral framework
  - Schedule – FY2014-15

New Risk-informed Regulatory Structure
(advanced reactors – HTGRs, LMRs)

Risk-Informed, Performance-Based Structure development:

- LMR insights
  - Continue limited pre-application interactions with potential applicants (e.g., PRISM, 4S)
  - Review ANS Standard 54.1 (under development)
  - Continue limited participation in international forums
  - Develop insights applicable to technology neutral framework

Staff recommendation to Commission

- Consolidate insights – iPWRs, NGNP, LMRs
- Develop recommendation to Commission
- Coordinate/integrate into Chairman's memorandum (02/11/2011) – chartered task force regarding new regulatory approach

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Future Interactions

- Plant Design Familiarization
- Plant Safety Features
- Plant Risk Assessments
- NRC Review Plans & Guidance
- Policy Issues

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Point Beach
Extended Power Uprate (EPU)
ACRS Full Committee

March 10, 2011

Agenda

- **EPU Overview…………………………………….. Larry Meyer**
- Modifications & Effects Related to Safety / Risk / Operations……………….……… Steve Hale
- Safety Analysis Overview………………………. Jay Kabadi
- Reduction in Plant Risk…………………………. Steve Hale
- Effects of Increased Steam Generator Flow Velocity………………… Steve Hale
- Human Factors and Operator Response Times / Actions Outside Control Room……… Mike Millen
- Power Ascension Testing……………………….. Mike Millen

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Picture of Team

A Big Package – Making Our Plant Better in Many Ways

- **Safer**
  - Improved plant risk profile
  - Upgraded AFW and control room ventilation
- **Many Important Legacy Issues Resolved**
- **More Tolerant of Secondary Component Failures**
- **More Reliable**
- **Site Personnel Integration Throughout The Project**
  - Up to 10 Plant SROs assigned
  - Strong ownership and teamwork
  - Pride in online work performed safely
  - 2,000,000 work hours without injury

Picture of Feedwater Heaters

Picture of Main Transformer

Picture of one phase of Generator breaker

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Picture of AFW Pump

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Picture of Main Feedwater Pump

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Implementing Auxiliary Feedwater (AFW) modifications that improve safety margins, system reliability and availability

- **New, higher capacity, "unitized" motor-driven Auxiliary Feedwater pumps in Primary Auxiliary Building (PAB)**
- **Maintain existing AFW pumps as standby pumps**
- **Improve 480 V bus margins during Loss of Offsite Power**
- **Elimination of manual operator actions**
  - Automated suction switchover to safety related water supply
  - Increased backup air supply for AFW pump mini-recirculation valves
  - Eliminated manual alignment of shared motor-driven AFW pumps

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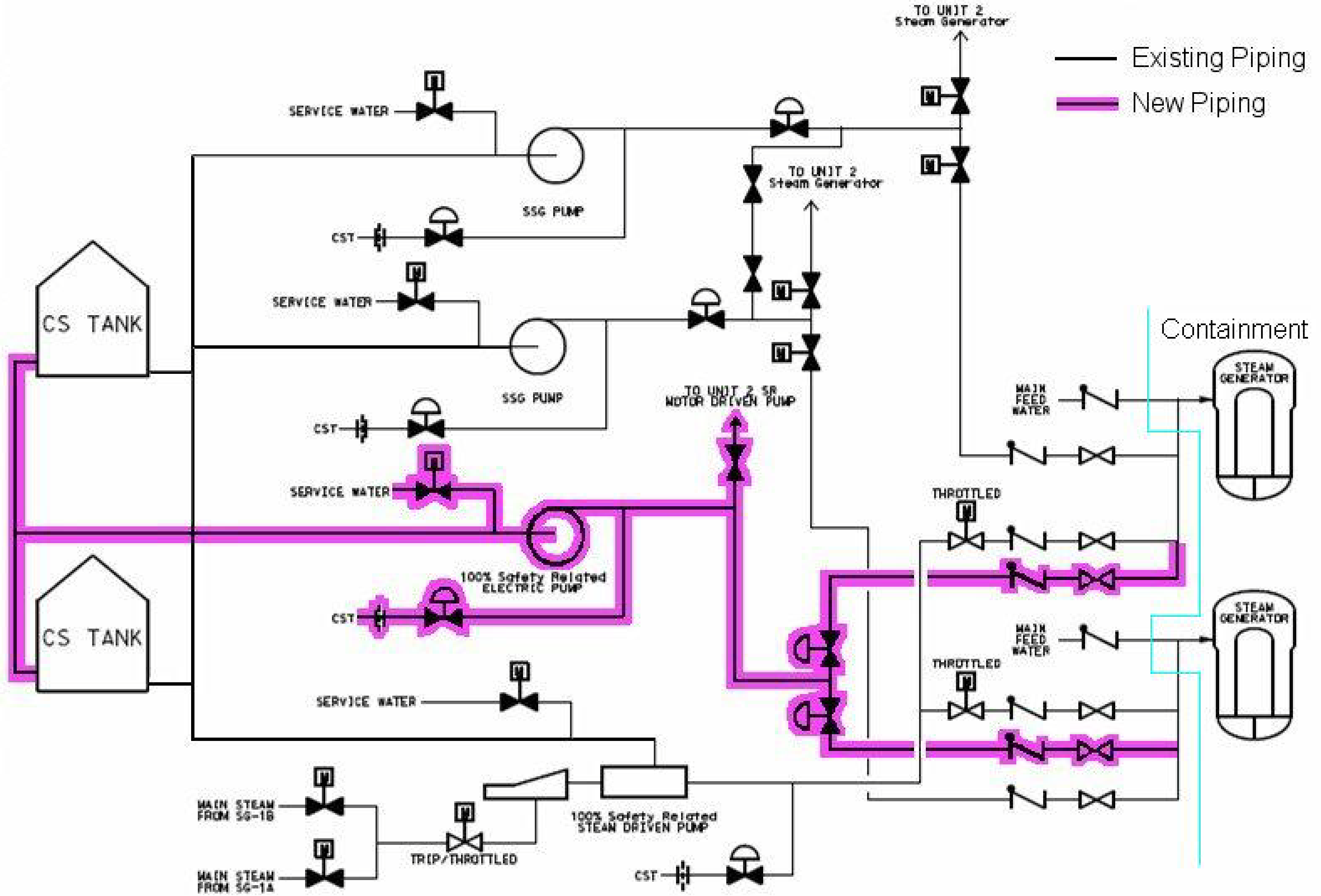
AFW System - Major Flow Paths Per Unit With Shared Standby Steam Generator (SSG) pump System

Graphic 1



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Modifications are being implemented that improve safety and plant margins

- **Fast acting Main Feedwater Isolation Valves**
  - Improves containment peak pressure response to main steam line breaks
- **Loss of voltage relay time delay setting changes**
  - Improves ability to maintain off-site power during transmission grid voltage transients
- **Reactor Protection System and Engineered Safety Features Actuation System (RPS/ESFAS) setpoint changes**
  - Documented uncertainty analyses using NRC-approved methodology
- **New Main Generator output breakers**
  - Improves response to generator trip
  - Improves normal voltage levels on safety-related buses

Modifications and changes are being implemented to improve the overall plant risk profile

- AFW automatic suction switchover to safety related water supply
- Increased backup air supply for AFW mini-recirculation valves
- Eliminated manual alignment of shared motor-driven AFW pumps
- Defense in depth by retaining existing shared AFW pumps as standby pumps
- Providing self-cooled air compressor
- Procedure change to improve reliability of Reactor Coolant System (RCS) depressurization

Agenda

Safety Analyses: Conservatisms/Improvements

- **Key changes beneficial to safety analysis**
  - Improved methods
  - Reduction of hot channel enthalpy rise factor ($F_{\Delta H}$)
  - Reduction in axial offset
  - Improvements in AFW system
- **Conservative inputs/assumptions**
  - Conservative physics parameters
  - Bounding plant operating parameters
  - Conservative trip setpoints
- **Conservative analysis Departure from Nucleate Boiling Ratio (DNBR) limit**
  - Safety Analysis Limit (SAL) for DNBR is conservatively set to maintain margin to the DNBR design limit

Conservative analysis methods applied for non-LOCA events with all results meeting acceptance criteria

	Event	Criteria	Result
Decrease (Loss) in RCS Flow **(Reduced Primary Cooling)**	Loss of Flow (Cond III)	DNBR (SAL*) ≥1.38	1.41
	Locked Rotor (Cond IV)	RCS Pres ≤ 3120 psia Rods-in-DNB ≤ 30%	2653 psia 25%
Overheating **(Reduced Secondary Cooling)**	Loss of Load (Cond II)	RCS Pres ≤ 2748.5 psia MSS Pres ≤ 1208.5 psia	2741.9 psia 1205.6 psia
	Loss of Feedwater (Cond II)	Przr Mix Vol ≤ 1000 ft^3	928 ft^3
	ATWS	RCS Pres ≤ 3215 psia	3175.1 psia
Overcooling	HFP MSLB (Cond III or IV)	DNBR (SAL*) ≥ 1.30 below 1st MVG	1.411
		DNBR (SAL*) ≥ 1.38 above 1st MVG	1.644
		LHR ≤ 22.54 kW/ft	22.51 kW/ft
	HZP MSLB (Cond IV)	DNBR (SAL*) ≥ 1.45 LHR ≤ 22.54 kW/ft	1.616 21.64 kW/ft

* Safety analysis limit DNBR has margin compared to the DNBR design limit
MVG = Mixing Vane Grid

Conservative analysis methods applied for non-LOCA events with all results meeting acceptance criteria (continued)

	Event	Criteria	Result
Reactivity Addition	Rod Withdrawal @ Power (Cond II)	DNBR (SAL*) ≥ 1.337 RCS Pres ≤ 2748.5 psia	1.337 2692 psia
	Rod Ejection (Cond IV)	Fuel Enthalpy ≤ 200 cal/g Fuel Melt (at hot spot) ≤ 10%	176.4 cal/g 9.8%

* Safety analysis limit DNBR has margin compared to the DNBR design limit

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Large Break LOCA analysis performed using NRC approved Best Estimate ASTRUM with results meeting acceptance criteria

<table>
<tr><th></th><th>Pre-EPU Value (1683 MWt)</th><th>EPU Unit 1 Value (1811 MWt)</th><th>EPU Unit 2 Value (1811 MWt)</th><th>Acceptance Criteria</th></tr>
<tr><td>95/95 Peak Cladding Temperature (F)</td><td>2128</td><td>1975</td><td>1810</td><td>< 2200</td></tr>
<tr><td>50th Percentile Peak Cladding Temperature (°F)</td><td>1225
(with ASTRUM)</td><td>1306</td><td>-</td><td>-</td></tr>
<tr><td>95/95 Maximum Local Oxidation (%)</td><td>8.52</td><td>2.61</td><td>2.57</td><td>< 17.0</td></tr>
<tr><td>95/95 Core Wide Oxidation (%)</td><td>0.81</td><td>0.386</td><td>0.154</td><td>< 1.0</td></tr>
<tr><td>Coolable Geometry</td><td colspan="4" rowspan="2">Long term cooling is maintained via operator actions. No impact on coolable geometry.</td></tr>
<tr><td>Long-Term Cooling</td></tr>
</table>

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Small Break LOCA safety margin is assured by core design limit selection

Parameter	Pre - EPU		EPU	
Analyzed Core Power (MWt)	1683		1811	
Hot Channel Enthalpy Rise Factor [$F_{\Delta H}$]	1.80		1.68	
Maximum Relative Power in the Hot Assembly [P_{HA}]	1.667		1.62	
Axial Offset (%)	30		13	
Steam Generator Tube Plugging Level (%)	25		10	
Replacement Steam Generator Model	44F – Unit 1	Δ47 – Unit 2	44F – Unit 1	Δ47 – Unit 2

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Small break LOCA analysis performed using NRC-approved NOTRUMP evaluation model demonstrated acceptable results

Parameter	Pre - EPU		EPU		Limit
	Unit 1	Unit 2	Unit 1	Unit 2	
Limiting Break Size	3-Inch		3-Inch		-
PCT (°F)	1205	1094	1049	1103	2200
Maximum Transient Local Oxidation (%)	0.03	0.02	0.01	0.02	17
Maximum Core-Wide Oxidation (%)	< 1	< 1	< 1	< 1	1

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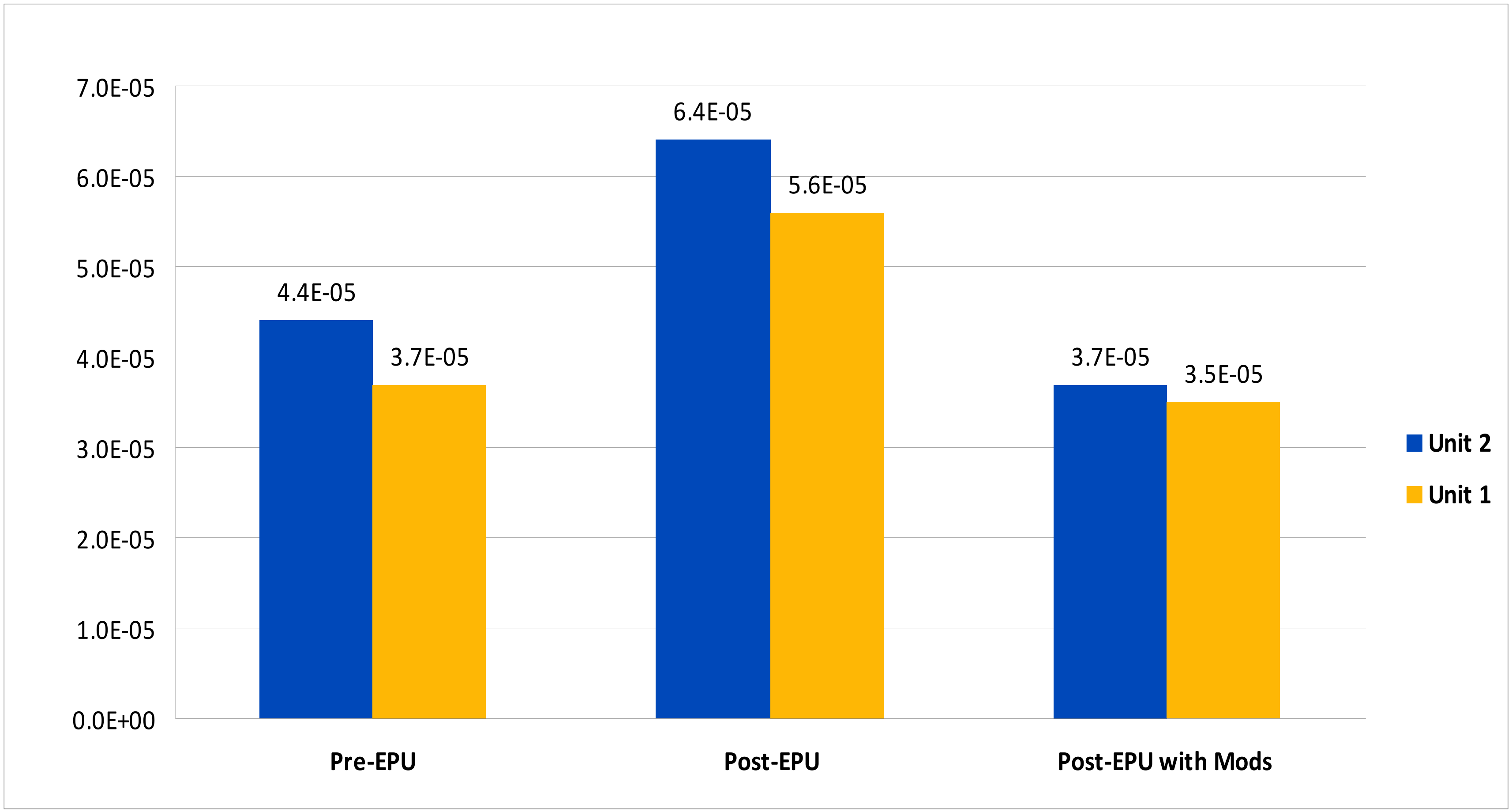
Overall the changes due to EPU resulted in a reduction to plant risks

- **Plant modifications were incorporated into the models**
- **Plant changes that resulted in a risk reduction**
  - AFW system changes
    - Increase backup air supply for AFW mini-recirculation valves
    - Auto switchover of AFW suction
    - Eliminated manual alignment of shared motor-driven AFW pumps
  - Provide self-cooled air compressor
  - Feedwater/Condensate system changes
  - Procedure change to improve reliability of RCS depressurization

With the installed plant modifications, the Core Damage Frequency (CDF) decreases below the present value

EPU Impact on CDF



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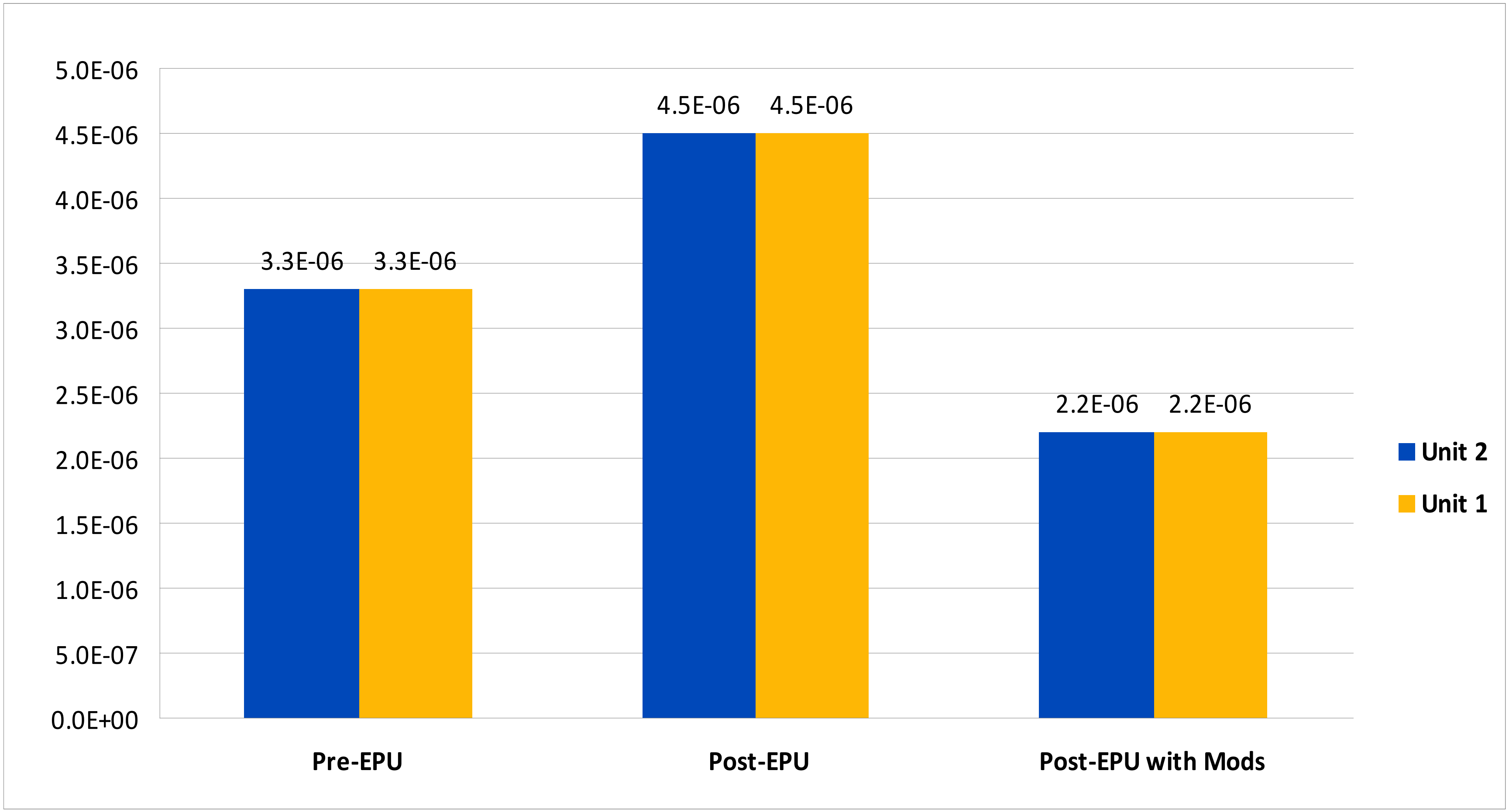
With the installed plant modifications, the Large Early Release Frequency (LERF) decreases below the present value

EPU Impact on LERF



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Analyses demonstrated acceptable steam generator tube wear at EPU conditions

Parameter	Acceptance Criteria	Results
Fluidelastic stability ratio	<1.0	Met with margin
Amplitude of tube vibration due to turbulence no greater than ½ of the gap between tubes (.180 in)[1]	<0.09 in	Met with margin
Demonstrate that unacceptable tube wear will not occur after the EPU[2]	<0.020 in	Met with margin
FIV-induced tube stresses remain below the fatigue endurance limit of the material	<20 ksi at 1E11 cycles	Met with margin

Notes:

1. **This considers the worst-case scenario that the adjacent tubes are moving 180 degrees out of phase**
2. **40% wear depth for the Model 44F and Δ47 steam generators would be 0.4 x 50 mils = 20 mils**

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Steam Generator parameters at EPU conditions are comparable to the current industry operating experience

Plant	Steam Generator Model	Velocity (Downcomer Tube Entrance) [ft/sec]	Volumetric Flow Rate U-Bend [ft^3/sec]	Velocity (V) (U-Bend Entrance) [ft/sec]	Mixture Density (ρ) [lb/ft^3]	ρV^2 (U-Bend) [lb/ft-sec^2]
Point Beach 1	44F	12.02	880	18.2	3.60	1190
Point Beach 2	Δ47	9.68	728	13.4	4.27	995
Turkey Point 3 and 4	44F	12.26	731	15.1	4.52	1031
Kewaunee	54F	12.09	817	15.1	5.11	1160
Indian Point 2	44F	None given	783	16.2	3.80	995
Indian Point 3	44F	12.12	818	16.9	4.06	1154

Operating experience shows excessive tube wear is not a concern for uprate condition

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Based on excellent steam generator operating performance no tube wear issues are expected at EPU conditions

- Hundreds of reactor operating years with no indication of tube vibration problems with steam generators comparable to Point Beach
- Periodic steam generator tube inspections have provided no indication of unusual tube wear
- Although not anticipated by analysis, on-going steam generator tube inspections will provide early indication if problems were to occur

Agenda

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There has been significant Operations involvement and participation on the project

- **Human Factors**
  - Design guidelines followed for optimization of human factors for new controls
  - New motor-driven AFW controls located on control boards near Steam Generator indicators matching location of turbine-driven pump controls
  - Plant equipment locations considered for ease of access
- **Procedure Changes**
  - Changes to emergency operating procedure set due to new AFW pumps, addition of MFIVs, and use of containment spray on sump recirculation
  - No significant change in strategy or operator actions
  - Procedures validated in simulator

No new actions outside of the Control Room are required; some have been eliminated

- **Eliminated actions outside of the Control Room**
  - Eliminated the need for local actions to reset Control Room filter fan breaker
  - Eliminated the need for local actions to gag AFW recirc valves for loss of Instrument Air (24 hour backup)
  - Eliminated Post Accident Sampling System (PASS) requirement to sample and analyze within 3 Hours
- **No other actions outside of the Control Room are affected by EPU**

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Some Operator response times and actions have changed, but are not considered to be a burden to the Operators

- **Control Room Operator Response Times**
  - Steam Generator Tube Rupture Event
    - -- Operator actions and response times remain unchanged due to EPU
  - Large Break LOCA
    - -- Establish Containment Spray on sump recirculation (20 minutes from time Refueling Water Storage Tank supplied Containment Spray injection is secured)
    - -- Transfer from containment spray recirculation to cold leg recirculation (3 hours and 10 minutes following termination of Safety Injection,10 minutes from termination of Containment Spray)
  - Removed action for operators to manually transfer AFW suction to service water

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Testing approach will ensure plant systems and equipment are operating within design limits without large transient testing

- Perform individual component testing to ensure components are meeting design requirements and expected performance
- Calibrate and test control systems; monitor their performance through power ascension to ensure individual system and integrated response is as expected
- Monitor pump flows and valve positions through power ascension to ensure equipment is performing as designed
- Perform limited transient testing including turbine overspeed trip test, and Steam Generator and Feedwater Heater level deviation testing to monitor integrated control system response

Testing approach is consistent with the current operating philosophy to minimize real challenges to the Operators and operating plant

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All testing is performed in a controlled deliberate manner

- Power Ascension Test Procedure coordinates hold points required during power escalation and directs individual testing activities and data acquisition
- Power is increased in a slow and deliberate manner
- Power ascension is stopped at pre-determined power levels for steady state data gathering and formal parameter evaluation
- Data is evaluated to pre-established acceptance criteria
- If unexpected plant conditions occur, the test will be stopped and power reduced to the last acceptable operating configuration or as directed by plant procedures
- A Test Review Board will be established to review and approve of test results at all power plateaus
- Management approval at selected power plateaus
- Anticipated duration of power ascension is 21 days

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Questions?

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Backup Material Testing

Testing approach will ensure plant systems and equipment are operating within design limits without large transient testing

- **Begins with individual test procedures during Modes 5 and 6 to demonstrate that structures, systems and components will perform satisfactorily**
  - Breaker and control checks
  - Control system initial setup and checks
  - Uncoupled motor runs
  - Individual valve testing

Testing approach will ensure plant systems and equipment are operating within design limits without large transient testing (continued)

- **Low power testing (5-15%)**
  - Turbine Generator checks and calibrations such as Turbine supervisory instruments, Electro Hydraulic Control system functional testing, Generator testing, Turbine vibration testing, Gland Steam system checks
  - Rotating equipment checks (flows, vibration, etc.)
    - -- Condensate pumps and Heater drain pumps
    - -- Feedwater pumps including transfer from recirculation to the feedwater regulating valves
  - Turbine Stop and Governor Valve Testing and Turbine Overspeed trip testing
  - Monitor piping vibration

Testing approach will ensure plant systems and equipment are operating within design limits without large transient testing (continued)

- **Power testing (15-50%)**
  - Control system tuning
    - -- Heater drain tank level and recirculation valves, Feedwater Regulating valves, Feedwater heater drain valves, Feedwater pump recirculation valves
  - Steam Generator level transient tests
  - Condensate and Feedwater Pump flow data and pump swaps
  - Establish dual Condensate and Feedwater pump lineup
  - Monitor rotating equipment and piping vibration
  - Monitor radiation levels

Testing approach will ensure plant systems and equipment are operating within design limits without large transient testing (continued)

- **Power testing (50-85%)**
  - Turbine Stop and Governor valve testing
  - Control system tuning
    - -- Heater drain tank level and recirculation valves
    - -- Feedwater Regulating valves
    - -- Feedwater heater drain valves
    - -- Feedwater pump recirculation valves
  - Steam Generator level transient tests
  - Condensate and Feedwater pump flow data
  - Feedwater heater 4 and 5 dump valve testing
  - Monitor rotating equipment and piping vibration
  - Monitor radiation levels

Testing approach will ensure plant systems and equipment are operating within design limits without large transient testing (continued)

- **Power testing (85-100%)**
  - Turbine Generator performance testing
  - Control system tuning
    - -- Heater drain tank level and recirculation valves
    - -- Feedwater Regulating valves
    - -- Feedwater heater drain valves
    - -- Feedwater pump recirculation valves
  - Condensate and Feedwater pump flow data
  - Feedwater heater 1, 2 and 3 dump valve testing
  - Cross over steam dump testing
  - Monitor rotating equipment and piping vibration
  - Monitor radiation levels
  - Steam Generator moisture carryover testing
  - Leading Edge Flow Measurement (LEFM) calibration checks

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Questions?

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Backup Material
Boron Precipitation

Backup Material

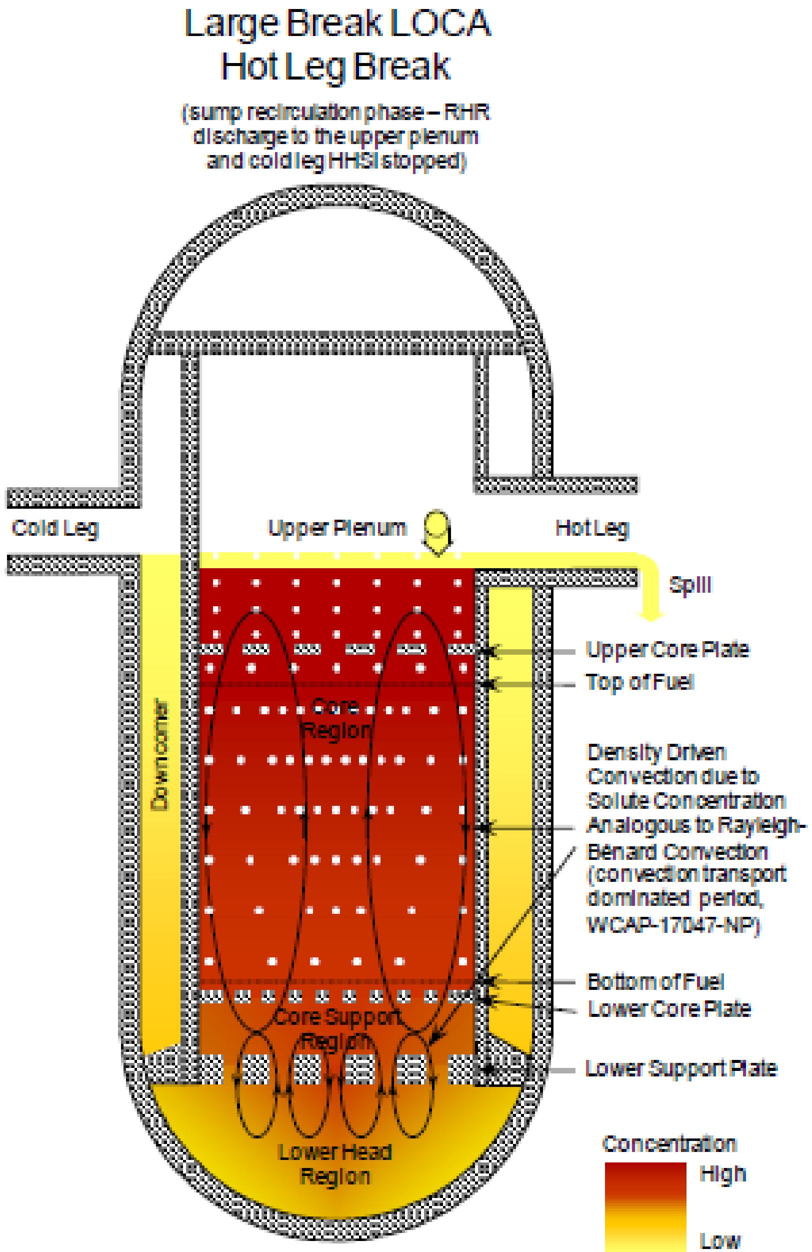

Figure 1 Predominant Bulk Solute (Boric Acid) Concentration Transport Phenomena between Core and Lower Plenum and within Lower Plenum

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Protecting People and the Environment

Point Beach Units 1 and 2 Extended Power Uprate ACRS Full Committee Meeting

EPU Power Ascension and Testing

Robert L. Pettis, Jr., P.E.
Senior Reactor Engineer
Quality and Vendor Branch
Division of Engineering
Office of Nuclear Reactor Regulation

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EPU Test Program

- Standard Review Plan (SRP) 14.2.1, "Generic Guidelines for Extended Power Uprate Testing Programs," specifically developed for EPUs, provides guidance for staff reviews of proposed EPU test programs; based on Regulatory Guide 1.68 and plant specific initial test program.

- EPU test program should include testing sufficient to demonstrate structures, systems, and components will perform satisfactorily at the proposed uprated power level.

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EPU Test Program (continued)

- Staff guidance considers original power ascension test program and EPU-related plant modifications.
- SRP guidance acknowledges that licensees may propose alternative approaches to testing with adequate justification. Specific review and acceptance criteria provided in SRP for staff evaluation of alternative approaches.

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EPU Test Program (continued)

- PBNP's program consists primarily of steady-state testing; does not include Large Transient Testing (LTT), e.g., Plant Trip, Load Swing and Load Reduction tests.

  - Test program will monitor important plant parameters during EPU power ascension
  - TS surveillance and post-modification testing will confirm the performance capability of the modified components
  - Acceptance criteria (Level 1 and 2) will be established and incorporated into test procedures by PBNP (ref: 10 CFR 50, Appendix B, and RG 1.68, Appendix A, Section 5)

Large Transient Testing

- Licensee justification for not performing LTT addressed certain review criteria discussed in SRP 14.2.1; consistent with previous staff approved EPUs.

  - LOFTRAN, used to simulate large load reduction transients, demonstrated acceptable performance
  - Industry operating experience at EPU power levels (Ginna and Kewaunee), including unplanned events at PBNP involving reactor trips, produced expected results
  - No new thermal-hydraulic phenomena introduced by modifications or changes in operating conditions
  - Extent of EPU modifications for balance-of-plant systems; computer modeling of plant transients

Staff Summary

- SRP 14.2.1 allows licensee justification for not performing all initial test program power ascension tests
- LTT not needed for Code analyses benchmarking
- Staff considered PBNP operating history, industry experience at EPU power levels, and no introduction of new credible thermal-hydraulic phenomena
- Extent and scope of EPU modifications
- Licensee conformance to staff approved SRP

Staff Conclusion

- The proposed EPU test program satisfies the NRC's acceptance criteria based on 10 CFR 50, Appendix B, Criterion XI, "Test Control;" RG 1.68, Appendix A, "Power Ascension Tests;" and applicable staff guidance and review criteria in SRP 14.2.1 for EPUs

- Licensee's use of LOFTRAN to predict performance at PBNP during uprated operational transients is acceptable as primary basis for not performing LTT

- Industry operating experience at uprated power levels at similar PWRs (e.g., Ginna and Kewaunee)

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Ginna EPU Startup Test Report

- Dynamic performance during power ascension was monitored, documented and evaluated against pre-determined acceptance criteria. Test data evaluated against its performance acceptance criteria (e.g., design predictions or limits)
- Due to number of BOP modifications, transient testing performed to provide additional confidence in the validity of LOFTRAN models and assumptions of plant modifications and integrated plant response to transients

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Ginna EPU Startup Test Report

- Large Transient Tests in the Ginna PATP
  - Turbine Overspeed trip at 20% EPU power
  - 10% Load Change at 30 and 100% EPU power
  - Manual Turbine Trip at 30% EPU power
  - Turbine Stop, Governor and Intercept Valve testing at 50% EPU power
  - SG Level/FW Flow Dynamic Test at 30 and 100% EPU power

Results: All parameters responded as expected according to the predicted design program

Ginna EPU Transient Operating Experience at 100% EPU Power (117% OLTP)

- January 27, 2007: Plant trip due to loss of electrical generation
- March 16, 2007: Plant trip and safety injection signal due to MSIV closure
- December 30, 2009: Plant trip due to loss of EHC System pressure

NRC approved Ginna EPU on July 11, 2006

QUESTIONS

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581st Meeting of the Advisory Committee on Reactor Safeguards

Point Beach Units 1 and 2 Extended Power Uprate

March 10, 2011

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Introduction

Allen G. Howe

Deputy Director

Division of Operating Reactor Licensing

Office of Nuclear Reactor Regulation

Terry A. Beltz

Senior Project Manager

Division of Operating Reactor Licensing

Office of Nuclear Reactor Regulation

Agenda

- EPU Overview
- Modifications and the Effects Related to Safety, Risk, and Impact on Operations
- Discussion of Reduction in Plant Risk
- Safety Analysis Overview
- Boron Precipitation Follow-up
- High Energy Line Break
- Effects of Increased SG Flow Velocity
- Human Factors and Operator Response Times
- Power Ascension Testing

EPU Overview

- EPU application submitted on April 7, 2009
- Licensing Report (Attachment 5)
- Auxiliary Feedwater Modification
- HELB Methodology
- RPS/ESFAS Setpoint Methodology
- Total of 12 supplements to the application
- Alternate Source Term application submitted on December 9, 2008

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Point Beach Units 1 and 2 Extended Power Uprate ACRS Full Committee Meeting

Safety Analysis

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Post-LOCA Boric Acid Precipitation

- Point Beach ECCS Design
  - Two-loop reactor coolant system
  - 695 psia accumulators
  - Low-pressure upper plenum injection (135 psia)
  - High head safety injection
    - Terminated upon drainage of RWST
  - High concentration boric acid makeup tank
- Hot leg break limiting for precipitation
  - LPSI and HHSI during injection mode provides flushing for first 20 minutes
  - HHSI secured at 20 minutes (recirculation mode)
    - Boric acid buildup begins

Control of Boric Acid

- Large Breaks
  - Reinitiate HHSI prior to precipitation

- Assumptions
- 1971 ANS Decay Heat + 20%
- Mixing volume is Time Dependent
- PWST and SIT Concentration 3200 ppm

Model Assumptions (NRC Staff and Licensee)

- 1971 ANS Decay Heat Standard + 20%
- Mixing volume is time-dependent
- RWST and SIT concentrations 3200ppm

Review Results

- Precipitation timing:
  - 4 hours 50 minutes (licensee)
  - 4 hours 25 minutes (staff)
- Licensee must initiate HHSI before precipitation is predicted to occur
  - Licensee modified the timing requirement to 3 hr 20 minutes
    - Originally was 4 hours 20 minutes – 4 ½ hour effective flush time
    - Staff was concerned about insufficient safety margin
  - Licensee agreed to terminate flow from BAST during LOCA (If not, causes a two hour precipitation time)
  - Flushing flow can be initiated in 10 minutes
    - Licensee confirmed 10 minute operator action time
    - Testing as part of operator training and qualification program
- Staff RELAP5 calculations confirmed non-limiting nature of SBLOCA

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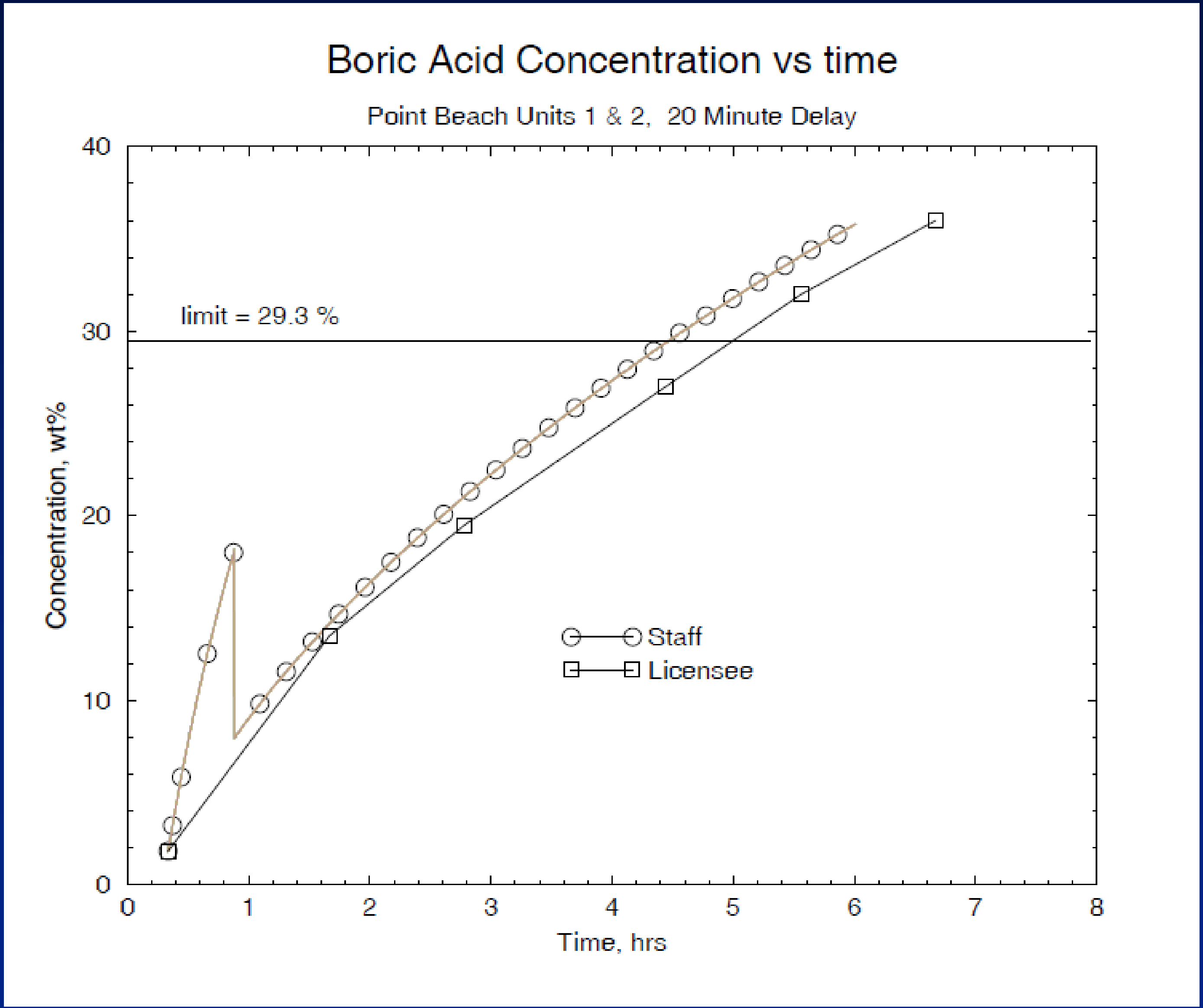

Conclusions

- Staff analysis confirmed
  - Non-limiting nature of SBLOCA (RELAP5)
  - Timing for boric acid precipitation
- Staff identified concerns with timing for boric acid precipitation control
  - Licensee revised boric acid precipitation control approach to satisfy staff concerns
  - Terminate boric acid storage tank flow
  - Initiate flushing flow earlier
- Staff finds Long Term Cooling evaluation acceptable

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High Energy Line Break Methodology

William (Billy) Jessup

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HELB Methodology Overview

- NRC staff reviewed licensee’s methodology and technical justification for proposed HELB reconstitution
- HELB reconstitution at Point Beach focuses primarily on:
  - Reassessment of piping systems classified as high energy systems
  - Updated criteria used to postulate pipe breaks outside containment
  - Use of new code to evaluate compartment pressure and temperature responses to HELBs
- Current PBNP licensing basis requirements related to HELB are based on the Giambusso Letter criteria (1972)
- Acceptance criteria based on compliance with PBNP General Design Criterion (GDC) 40
- Protection for engineered safety features against dynamic effects and missiles resulting from plant equipment failures

NRC Staff Review

- Reassessment of high energy line designations based on current licensing basis criteria
  - Eight systems meet the High Energy Line Criteria
- Break postulation criteria updated to use ASME B&PV Code Section III stress equations
  - ASME equations used for HELBs have been reconciled to equations used in code of construction
  - New breaks postulated at EPU conditions
- GOTHIC code used to determine compartment pressure and temperature responses due to HELBs
  - Staff accepted use of GOTHIC and found analysis results acceptable at EPU conditions

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Summary

- NRC staff review of proposed HELB reconstitution covered three primary areas
- NRC staff found the licensee's identification of high energy lines and dynamic effects protection acceptable
- HELB postulation methodology criteria using ASME stress equations was found to be acceptable by the NRC staff
- Licensee utilized LOFTRAN and RELAP5 for determining HELB M&E release analyses, corresponding compartment pressure and temperature responses determined with GOTHIC
- NRC staff found the licensee's approach for M&E release and compartment responses acceptable, results of analyses were also reviewed, verified, and found acceptable

Health Physics Aspects of Groundwater Protection

A Presentation for the

Advisory Committee on Reactor Safeguards

10-Mar-11

Richard Conatser
Health Physicist, NRR

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Outline

- Component Parts of the "Leak/Spill" Issue
- Strategy and Regulatory Framework
- NRC Review of Licensee's Implementation of the GPI
- Summary

Component Parts – Leak/Spill Issue

- **Engineering** – Prevent/Mitigate at the Source
- **Health Physics** – Monitor and Protect
  - Monitor the aftereffects
  - Ensure adequate protection of public (no challenge to Regs)
  - Public doses are very small (0.00 to 0.1 mrem per year)
  - Actual health impacts are not expected
  - Risks are similar to activities we normally consider safe
- **Environment** – Good Stewards
  - Environmental issues beyond regulations
  - NRC policy – Protecting people protects the environment
- **Communications** – Unambiguous and understandable

Strategy & Regulatory Framework

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- **Short-term Strategy**
  - Continue NRC Inspections and Oversight
  - Assess Implementation of Voluntary Initiatives
    - NRC Inspections
    - NRC Temporary Instructions
  - Identify Gaps in Effectiveness of Voluntary Initiatives
  - Verify if Implementation Status is Improving (Routine Processes)
- **Long-term Strategy**
  - Based on Gaps, Evaluate Need for More Regulatory Activities

Assessment of Voluntary Initiative

- NRC Temporary Instruction – TI-2515/173
- Snapshot of 2008-2010
- Overall average 92% program elements were in GP Programs
  - ~60% of sites had all 42 tasks in GP Program
  - Gaps in some tasks at ~40% of the sites (e.g., remediation)
- Gaps entered into the licensee's corrective action program
- Gaps related to readiness to manage leaks and spills
- NRC will continue oversight and inspections to close gaps

Summary

- Engineering – Prevent/Mitigate Leaks (Next Speaker)
  - Even though Doses are Low, We Want Doses ALARA
  - Minimize pipe leakage
- Health Physics – Monitor and Protect
  - Low Safety Significance (Similar to Tasks Considered Safe)
  - Additional Staff Actions to Improve Transparency
  - Continue to Assess Industry Initiatives & Close Gaps
- Environment
  - Regulations are based on adequate protection
- Communications (Web, Fact Sheets, Outreach, List of Leaks)

Groundwater Task Force Report

A Presentation for the

Advisory Committee on Reactor Safeguards

March 10, 2011

Louise Lund

Agenda

- Findings of the Groundwater Task Force
- Conclusions and key recommendations
- Senior Management Review
- Next steps

Groundwater Task Force Report (issued June 11, 2010)

- Completed review of charter items
- Determined facts and observations
- Developed conclusions and recommendations
- Identified four themes
- Identified 16 specific conclusions
- Identified four key recommendations

Overall Finding

- After a thorough review, the GTF determined that the NRC is accomplishing its stated mission of protecting public health, safety, and protection of the environment through its response to groundwater leaks/spills. Within the current regulatory structure, NRC is correctly applying requirements and properly characterizing the relevant issues.

Themes

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- Theme 1 – Reassess NRC's regulatory framework for groundwater protection
- Theme 2 – Maintain barriers as designed to confine licensed material
- Theme 3 – More reliable NRC response
- Theme 4 – Strengthen trust

Conclusions

- NRC response to leaks/spills has varied widely and has been case specific
- NRC Event Reports alert the public to leaks but no process exists to update the public on resolution or consequences
- NRC radiological effluent performance indicator does not provide meaningful data regarding groundwater contamination
- NRC processes do not disseminate low level groundwater experience to inspectors
- NRC findings associated with groundwater contamination that were based solely on “public confidence” require review
- NRC should consider incorporating the industry’s voluntary groundwater protection initiative (NEI 07-07) into the regulatory framework for groundwater protection

Conclusions

- NRC communication methods do not promptly relay NRC staff assessments of groundwater incidents. Consider using third-party validation methods for groundwater incidents
- NRC regulations do not address the maintenance of non-safety related piping and tanks that contain radioactive fluids
- NRC regulations regarding radiological impacts of facility operations vary for different types of facilities (e.g., power and research reactors, fuel cycle, in-situ recovery)
- The final decommissioning rule does not require early remediation even if potential contamination of drinking water aquifers or subsurface water bodies exists
- NRC staff should develop methods to more effectively communicate information on incidents involving a loss of confinement to the public
- NRC public Web site information is fragmented and in some cases, out of date

Conclusions

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- International regulatory authorities effectively communicate radiological monitoring results annually in a public report to their legislatures
- More than 65 countries (including the U.S.) use the International Atomic Energy Agency's International Nuclear and Radiological Event Scale to explain the significance of events associated with radiation
- Timely information exchange and cooperation regarding operational events that are below regulatory limits will help regulatory authorities respond to emergent issues such as buried piping tritium leaks
- NRC and international regulators should cooperatively develop technical understanding of radionuclide transport through environmental pathways

Key Recommendations

- Identify the policy issues associated with an assessment of the NRC's groundwater protection regulatory framework
- Once the policy issues are addressed, implement conforming changes to incorporate appropriate enhancements in the Reactor Oversight Program
- Consider development of specific actions to address the key themes and conclusions in this report
- Conduct a focused dialogue with EPA, States, and international regulators to develop a collaborative approach for enhanced groundwater protection strategies

Senior Management Review

- The Executive Director for Operations established a senior management review group to evaluate the GTF report, identify next steps, and make recommendations to the Commission about potential policy or regulatory changes

10/4/10 Public Meeting

- Environmental Protection Agency
- Department of Energy
- US Geological Survey
- State of Illinois
- Canadian Nuclear Safety Commission
- National Mining Association
- Conference of Radiation Control Program Directors
- Health Physics Society
- Prairie Island Indian Community
- Nuclear Energy Institute
- Licensees
- Public advocacy groups

SECY Paper: Overall Regulatory Approach to Groundwater Protection

Discusses:

– Regulatory Framework
– Incorporating the Voluntary Industry Initiative on Groundwater Protection Into the Regulatory Framework
– Considering Modifications to the Regulatory Framework to Address Maintenance of Non-safety Related Piping and Tanks That Contain Radioactive Material
– Revising the Current Radiological Effluent Performance Indicator in the Reactor Oversight Program
– Considering Immediate Remediation of Spills at NRC-licensed Facilities

Chairman Memorandum: Initiatives for Improved Communication of Groundwater Incidents

Discuses:

- Improved Communication Strategies
- Improved Annual Effluent Reports
- International Outreach
- Communication with States

Next Steps

- **Await direction from Commission on activities described in SECY paper**
- **Implement initiatives for improved communication**

Evaluation of Buried Piping at Nuclear Reactor Facilities

Bob Hardies

Nuclear Regulatory Commission

Senior Level Advisor

Office of Nuclear Reactor Regulation

March 10, 2011

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Summary

- NRC's objectives related to buried piping
  - Maintenance of intended safety function
  - Releases remain below regulatory limits

- Current regulations and industry activities are adequate with regard to these objectives

- NRC is monitoring and responding to events related to buried piping

- NRC is working to assess licensee implementation of the Buried Piping Integrity Initiative and the Underground Piping and Tanks Integrity Initiative

Background

- The Groundwater Protection Initiative led to enhanced groundwater monitoring and communication practices
- Several leaks from buried piping in 2008 and 2009 resulted in groundwater contamination
- September 3, 2009, Chairman Jaczko tasked the staff with providing a summary of activities related to buried pipe
- Industry establishes the Buried Piping Integrity Initiative, November, 2009
- December 3, 2009, SECY 09-0174 (ML093160004)
  - Look at regulations, codes and standards and industry activities

Background

- Leaks at Vermont Yankee in 2010 from underground piping (in a concrete vault) generated significant stakeholder interest
  - Definitions:
    - Buried – In intimate contact with soil or concrete; it can be cathodically protected
    - Underground – Below grade in a vault or chase. In contact with air.
- May 18, 2010, Buried Piping Action Plan (ML101480739)
- September 14, 2010, Buried Piping Action Plan update (ML102590171)
- Meetings with industry 10/22/2009, 2/24/2010, 9/21/2010, 3/30/2011
- Letter to industry August 18, 2010 (ML102300270)

Buried Piping Action Plan

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- Data collection
  - Historical rate of incidence
  - Affected systems
  - System classifications
- Program assessment
  - Buried Piping Integrity Initiative and Underground Piping and Tanks Integrity Initiative
  - Temporary Instruction for NRC inspection of Initiative activities
- Codes and standards
- Regulatory activities
  - Website
  - License renewal
  - Identify additional needs

Codes and Standards

- ASME Code
  - Met with ASME, Section XI management August 6, 2010
  - In November Section XI established a committee to address leaks from buried piping
    - Consideration of enhanced inspection requirements
    - Consideration of extension of scope to nonsafety-related piping that contains tritium

- NACE International (formerly National Association of Corrosion Engineers)
  - Task group to develop standards for nuclear buried piping
  - First task group meeting September, 2010

NRC Actions

- Inspection
  - Temporary Instruction for inspection of buried piping activities
    - Implementation by June 2011
    - Temporary Inspection instructions may exist through 2015
    - Seeking to understand implementation of:
      - Risk ranking processes
      - Inspection techniques and processes
- License renewal
  - Revised buried piping aging management program

Industry Activities

- Buried Piping Integrity Initiative, November 2009
  - Initiative requirements:
    - Write program and procedures
    - Ranking
    - Inspection Plan
    - Inspection
    - Asset Management plan
- Underground Piping and Tanks Integrity Initiative, September 2010
  - Similar requirements with added scope

Performance

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- Seeking to establish a pre-2010 incidence rate for leaks as a performance baseline
- Monitoring operating experience
- Evaluating need for commitments for initiative

Conclusions

- NRC's objectives related to buried piping
  - Maintenance of intended function
  - Releases remain below regulatory limits
- Current regulations and industry activities are compatible with these objectives
- NRC is monitoring current events related to buried piping
- NRC is performing action plan activities, including monitoring outcomes of industry initiatives

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Presentation to the ACRS Full Committee

Advanced Reactor Program

March 10, 2011