

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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BRIEFING ON NRC LESSONS LEARNED: DAVIS-BESSE REACTOR
VESSEL HEAD (RVH) DEGRADATION

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Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Tuesday
January 14, 2003

The Commission met in open session, pursuant to notice.

RICHARD MESERVE, Chairman of the
Commission, presiding.

COMMISSIONERS PRESENT:

- GRETA J. DICUS, Member of the Commission
- NILS J. DIAZ, Member of the Commission
- EDWARD MCGAFFIGAN, JR., Member of the Commission
- JEFFREY MERRIFIELD, Member of the Commission

(The following transcript was produced from electronic caption media and audio and video media provided by the Nuclear Regulatory Commission.)

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

Secretary

General Counsel

Mr. Art Howell, Director, Division Reactor
Projects, Region IV

Mr. William Kane, Deputy, EDO

Dr. Carl Paperiello, Deputy EDO

Dr. William Travers, EDO

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

Chairman Richard Meserve: Good afternoon, Ladies and Gentlemen. On behalf of the Commission, I would like to welcome you to today's briefings on the lessons learned, concerning the reactor vessel head degradation event that occurred at the Davis-Besse plant in Ohio.

The Commission considers the Davis-Besse episode as one of the most significant in the recent history of the agency. We are dedicated to resolving both the technical and programmatic issues that contributed to the degradation.

Assuring the public health and safety is the fundamental goal of the NRC. And the Commission is prepared to learn from this experience to ensure that we achieve that goal.

Since this discovery, the Davis-Besse reactor vessel head degradation has drawn a great deal of interest and comment from the agency, the industry, government at all levels, and the public. Many activities relating to this event are either underway or have been completed. The goal of this meeting is to discuss two specific activities; the findings of the

Lessons-Learned Task Force and the senior management review team's recommendations for agency action based on the task force work.

Other topics, such as the restart of the Davis-Besse plant, and the Inspector General's recent report on the decision to allow a brief period of continued operation in early 2002, are not before us today.

The reactor vessel head degradation at Davis-Besse serves as a reminder that safety is a joint obligation of the industry and the NRC. The industry is fundamentally responsible for the safe operation of the plants. The NRC is responsible for developing and maintaining an effective regulatory framework. Although much effort has been and is continuing to be spent on insuring that all safety concerns are resolved at the Davis-Besse Nuclear Power Plant, the Commission is focusing its attention today on the NRC's role in the event. Thus the NRC's performance is the main topic of today's briefing. This reflects the philosophy that we must learn from past events in order to avoid their repetition.

This afternoon we have before us representatives from both the Lessons-Learned Task Force and the senior management review team. We look forward to their presentations. Let me turn to my colleagues and see if any of them would like to make an opening statement.

Commissioner Greta Dicus: I do not have one.

Commissioner Jeffrey Merrifield:

Mr. Chairman, I do have a statement I would like to make. First Mr. Chairman, I would like to associate myself with the opening statement that you made. And I have a brief underscore I would like make.

Last week, the Commission, in a letter dated January 8th, weighed in on the issues that lead to the continued operation of Davis-Besse until February 16th of 2002. While I believe that letter speaks for itself, I want to make it clear that I don't think anyone should conclude that the Commission doesn't take the Davis-Besse issue very seriously.

Indeed, I would agree with the comments that the Chairman articulated. The discovery of the cavity in the reactor head raises one of the most serious safety issues that

the Commission has dealt with in recent memory.

Clearly, the Commission is to understand better how our inspection process could have missed the multi-year degradation of the vessel head at Davis-Besse. And further, we need to identify how we can improve our inspection and oversight process to ensure that this type of incident doesn't happen again.

It is my hope that the Lessons-Learned Meeting will provide us with these answers and allow us to move forward and resolve these problems. I look forward to the testimony of our staff. Thank you, Mr. Chairman.

Chairman Richard Meserve: Dr. Travers, you may proceed.

Dr. William Travers: Thank you, Chairman Meserve, and good afternoon. Joining me at the table this afternoon is Bill Kane, my Deputy for Reactor Programs, Carl Paperiello, my Deputy for Materials Research, State and Tribal Programs, and Art Howell, who is the Director of the Division of Reactor Projects, and for this meeting, more importantly, the leader of the Lessons-Learned Task Force.

As you know, I established the Lessons-Learned

Task Force last spring to review the degradation of the Davis-Besse Nuclear Power Station reactor pressure vessel head. The fundamental objective of the task force was to learn as much as possible from this experience in order to avoid similar situations in the future. This type of self assessment is a key to improving our effectiveness as a regulatory agency. And as you know, we have carried out Lessons-Learned reviews over time as a result of significant plant events or plant safety issues in the past.

The Davis-Besse Lessons-Learned Task Force completed its review and provided a final report in October. The Lessons-Learned Task Force Report was made available to the public. And the team held a public meeting to discuss the results of their review in Oak Harbor, Ohio in November.

Many of the members of the Lessons-Learned Task Force are here today. And I would like to express my appreciation to them for their dedication and hard work on this very important task. Art Howell will introduce each member of the team in just a moment.

In October, I established the senior

management review team, lead by Carl Paperiello, to review the Lessons-Learned report and to develop a proposed outline for addressing the recommendations contained in that report. The senior management review team completed its review and provided me with their results in a November 26th memo. This memo is now publicly available, and copies have been provided for today's meeting.

On January 3rd, I tasked the office of Nuclear Reactor Regulation and the Office of Nuclear Regulatory Research to develop an overall plan that follows the senior management review team's recommended course of action. The staff is going to complete that plan, including schedules and responsible offices, and provide it to me at the end of the February. At the same time, the staff will provide me with resource estimates and any impact on our existing work.

As I mentioned earlier, Art Howell is the team leader of the Lessons-Learned Task Force. And he is here today to brief you on the Lessons-Learned Report. Carl Paperiello will then discuss the conclusions of the senior management review team.

Also I would like to acknowledge that we have with us the Director of the Office of Nuclear Reactor Regulations, Samuel Collins, Jack Strosnider, who is the Deputy Director of the Office of Nuclear Regulatory Research, and Jim Dyer, who is our Regional Administrator in Region III. And they're all here with us today and can answer any of your questions should you have them.

With that, let me go ahead and turn it over to Art who's going to give you the briefing.

Mr. Art Howell: Thank you, Dr. Travers. Good afternoon Chairman, Commissioners.

Before providing an overview of the results and recommendations of the task force, I would like to briefly take a few minutes and introduce the task force members who are present at today's meeting, and also provide some background on the task force.

With us today is Dr. Edwin Hackett, of the Office of Nuclear Regulatory Research. He was the assistant team leader. He has an extensive background in the material sciences. Joe Donoghue of NRR has a background of reactor systems and licensing project

management. Bob Haag of Region II was a former resident inspector at another Babcox & Wilcox Plant, Arkansas Nuclear I, and was also formerly a senior resident inspector and is currently a regional branch chief. Tom Koshy of NRR was formerly an inspection team leader in Region I and also has extensive experience in reviewing operational data. Also, Joel Stiraufus of Region II was formerly a resident inspector. And Ron Lloyd with the Office of Research has extensive experience in conducting diagnostic evaluations and incident investigations, and also has a background in operating experience reviews. And finally, Pat Castleman of NMSS, who was also formerly a senior resident inspector and has extensive experience in inspection program development, both on the materials side and the reactor side.

Slide two.

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As Dr. Travers indicated, the task force was chartered in May of 2002 to conduct an independent review of regulatory issues associated with the prevention of vessel head degradation. None of the task

force members had any previous significant involvement in the regulatory oversight of Davis-Besse. In fact, I believe, none of the task force members had actually been to Davis-Besse before joining the task force. Our review was primarily introspective in nature. But we also conducted fact finding at the site to independently assess Davis-Besse's performance as they relate to our various processes.

Our focus was also on why the degradation cavity was not prevented. And, therefore we didn't spend much time on post-discovery issues or other ancillary issues.

We conducted two public meetings at the onset of the review to obtain input on our charter. One of those meetings was held near the Davis-Besse site where we did receive input from a number of external stakeholders which we incorporated into our detailed review plans.

We conducted another meeting near the Davis-Besse site in November of 2002 to discuss the results of our review.

The task force had a full-time observer from

the state of Ohio Emergency Management Agency while we were conducting fact finding at the Davis-Besse site.

Slide three.

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The Task Force Charter had us review the following five broad areas with respect to the reactor oversight process. We reviewed the inspection, assessment, enforcement, and allegation history, dating back to 1990. We chose 1990 because that period sufficiently envelopes the latent period associated with the formation of the degradation cavity.

Regarding regulatory processes, we reviewed various project manager activities, the license amendment review process, as well as the operating experience review processes, including the generic communications process.

We reviewed industry activities involving boric acid corrosion of low alloy steel and stress corrosion cracking of non-ferric materials. We also reviewed operating experience, nozzle cracking involving European and Japanese pressurized water reactors with a focus on the French experience because there was more information

available regarding the French experience.

We reviewed a program for handling regulatory matters involving several or a class of licensees with regard to boric acid corrosion and stress corrosion cracking.

To give you a sense for the level of effort of review activities, we estimate that we spent on the order of 7,000 staff hours conducting the review.

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The Task force made 51 recommendations, which I'll summarize in a few minutes. Following the issuance of the report on September 30th, we briefed the program office and regional managers on the results on October 3rd. We've also conducted staff briefings during their Region I and Region II inspector counterpart meetings this past December.

We plan to conduct staff briefings during the Region III and IV counterparts meetings later this month. We also plan to make a presentation at the Regulatory Information Conference in April.

We also briefed the ACRS on June 5th and 6th

on the charter scope and review objectives, as well as on December 5th, to discuss the results.

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At this point, I would like to provide an overview of the results. Regarding the first bullet, the potential for this type of problem was previously recognized. In the early 1990's, Babcox & Wilcox specifically assessed the potential damage that could occur to the reactor vessel head from a leaking nozzle. This was reviewed and assessed by the staff in the 1993 time frame.

Babcox & Wilcox concluded that their plants could operate safely for a minimum of six years with nozzle leakage that was undetected and uncorrected. To put that in context, the licensee for Davis-Besse concluded that nozzle III, which is the nozzle that lead to the degradation cavity, leaked on the order of six to eight years before it was detected.

Second bullet. During the 1990's, vessel head penetration axial nozzle cracking was not considered an immediate safety concern. The staff concluded that cracking would likely be axial and therefore there would

be a little potential for accidents stemming from a catastrophic failure of the nozzle. Also, the staff concluded that leaks would be detected by a generic letter ADA 05 boric acid corrosion control programs long before significant degradation could occur.

I would like to emphasize, however, that the staff at that time in the early 90's, did note that new information or subsequent events may require reassessment of the safety significance, and also at that time recognized the need for non-visual inspection of nozzles to insure that no unexpected leaks occurred. Staff also recognized that not all leaks would necessarily be detected by visual inspections, and therefore made a recommendation to industry that they should consider enhanced leakage detection capabilities.

However, subsequent to that period, a number of years elapsed as these subsequent actions were on-going. And in effect, this period throughout the 1990's essentially enveloped the latent period associated with the formation of the cavity at Davis-Besse.

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Lessons-Learned involving the unpredictability of boric acid induced corrosion rates were not well recognized by members of the staff and also members of Davis-Besse staff. While there have been no previous events like the one at Davis-Besse, there are more than thirty years of foreign and domestic operating experience involving boric acid corrosion events. Many of these events involve instances in which corrosion rates were significantly under-predicted because of erroneous assumptions involving environmental conditions, the nature of the leakage itself, and the relationship of the actual leakage rates to experimental data.

Some of these events involve components that are difficult to access during power operation of pressurized water reactors such as vessel heads. For example, in the 1986 and 1987 time frame, the licensee for Turkey Point identified a leaking conoseal in August of '86 but deferred repair and assessment of that conoseal until March of '87 because they assumed corrosion rates would be essentially negligible.

When they finally went in to remove the boric

acid deposits, on the order of about 500 pounds, they identified significant degradation of some of the studs for the closure head as well as degradation of the control rod drive mechanism ventilation ducting.

It was at that time or about that time that Westinghouse had informed the licensee for Turkey Point that there was a 1970 event at a foreign PWR, pressurized water reactor, in which there was more significant corrosion of the vessel head material than was anticipated. So it was in part because of that that they went in at that time to remove the boric acid deposits and make a wastage assessment.

The task force identified that a number of members of the Davis-Besse staff, as well as the NRC staff, were generally unaware of some of these events and generally believe that boric acid deposits on the vessel head would not be very corrosive because of the high temperature conditions. But we're concerned that boric acid deposits could obscure nozzles during visual inspections to detect leaks. So there was a concern there, but it wasn't focused on corrosion, per se.

There's been some discussion about whether or

not the corrosion mechanism at Davis-Besse is a new or a different type of corrosion mechanism, but essentially the leak occurred because of primary water stress corrosion cracking of the nozzle which lead to leakage that was undetected for a period of years, and subsequently allowed corrosion of the vessel head to occur.

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The task force identified three principle contributing causes to the event. On the first bullet, Davis-Besse, the NRC staff, and the industry follow-up review did not review, assess, and follow up relative operating experience in all cases. I would like to highlight one example in each of those areas.

With respect to Davis-Besse's performance, there were a number of precursor events, if you will, involving significant boric acid corrosion of other plant components. For example, in the 1998 time frame there was significant degradation to some of the nuts on the pressurizer spray valve. The licensee identified a number of lessons learned. Some of those include the

conclusion that red brown deposits equals major wastage and that there was pressure to operate with degraded components and that one can't really assess the true extent of damage until all the deposits are removed.

The point is that these lessons are essentially the same lessons as the degradation cavity that was discovered in 2002. Unfortunately, the corrective actions for this 1998 event were not effective in the identification of the cavity during the Spring 2000 refueling outage in which there was some opportunity to have done so.

Regarding NRC staff performance, the NRC staff did not verify through inspections, for example, that the generic letter ADA 05 Boric Acid Corrosion Control Program would necessarily be effective at detecting nozzle leaks. And regarding industry performance, industry -- this is a generalization, obviously, but didn't view foreign experience, say Bugey for example, as being directly applicable to domestic pressurized water reactors. And also, as I mentioned, there was no substantive progress for enhanced leakage detection capability.

Second bullet. The licensee for Davis-Besse did not assure that plant safety issues would receive appropriate attention as evidenced by examples of long-term system based repairs as a means of minimizing production impacts, which I'll come back to in a moment. Acceptance of long standing hardware problems, weaknesses with the Employee Concerns Program, weak self-assessments, multiple examples of procedural noncompliance, lack of management involvement in safety significant work activities, a lack of engineering rigor in their approach to problem resolution, and also strained engineering resources.

An example that highlights many of these problem areas involves the actual history of the head cleaning at Davis-Besse. For example, in 1996, the staff engineer who was involved in head cleaning activities initiated a corrective action document to document the fact that not all deposits could be removed because of lack of accessibility. In that document, he noted that these deposits could be obscuring nozzle leaks. And there was a recommendation that modification to the service structure around the reactor vessel head

be made in order to afford better access to the head itself.

This modification was never implemented, had been deferred actually since the early 1990's. And at the time of discovery of the degradation cavity, still was not yet implemented. Yet the plant was restarted from the 1996 and 1998 refueling outages with significant deposits on the head. And also during this period, there were different staff engineers who were involved in the head cleaning and inspection activities during three successive refueling outages. So there was a lack of continuity in terms of corporate knowledge about the status of the head.

By the time of the 2000 refueling outage, staff engineers had vigorous discussions with senior management to convince them that additional head cleaning activities needed to be conducted before starting the facility up from a refueling outage. They had conducted other activities to clean the head, but they were not fully successful earlier in the outage.

Nevertheless, the plant was restarted, even though these subsequent efforts were not fully affective

in removing all the deposits. The task force identified that some of these individuals, both staff and managers, were aware that the head had not been completely cleaned, had received training on the pressurizer spray valve event that I just mentioned the year before, and also had seen videotapes of head inspections conducted at the onset of the outage which graphically depicted significant boric acid deposits on the head.

Also just lastly I would point out, in regard to that example, there's a quality assurance audit of the activities during that refueling outage that noted head cleaning activities to be a positive strength.

Regarding the third bullet, the NRC integration of information, the task force concluded that the staff did not integrate known or available information regarding the symptoms and indications of boric acid leakage and corrosion into its assessments of Davis-Besse safety performance.

While much of the information about these symptoms implications were known, there was no concerted focused review conducted in order to get to the root of the problem. I'll give an example of that. The container radiation monitor filters were

being clogged continually for about three years, at least three years. This system is designed to actually detect reactor coolant pressure boundary leakage. The licensee had implemented a number of symptom-based activities to address this problem rather than trying to get to the root of the problem during opportunities while the plant was shut down.

The staff was aware of the frequent filter fouling but did not integrate all the various issues into its assessments. Some of these issues include hundreds of unplanned technical specification injuries to change out the filter elements, changing the sample points for the containment radiation monitors in order to reduce the rate of filter fouling, the impacts of iodine detector saturation on system operability, the processing of a license amendment to relax tech specs requirements for the containment radiation monitors, the acceptance of the licensee explanations for the leak sources, which ultimately proved to be incomplete or wrong, and the installation of portable hepa filter units in order to reduce the rate of fouling on the containment radiation monitor filter elements.

And finally, a lack of -- as I mentioned, a lack of licensee action to implement a systematic and rigorous plan to identify the source of leaks during the 2,000 refueling outage.

Other contributors. The task force identified other actual or potential missed opportunities to have identified the problem or other contributing issues involving, for example, inspection guidance, ASME code requirements, reactor coolant system leakage monitoring methods and requirements, inspection staffing issues, licensing processes, and the quality of some FirstEnergy documentation.

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That's a brief overview of the actual findings. Now I would now like to summarize the recommendations. As I mentioned, the task force made 51 recommendations that are summarized on the last three slides. Regarding the first bullet, improvement of inspection guidance, about one third of the recommendations pertain to inspection guidance. The task force made a number of recommendations involving

the inspections of boric acid corrosion programs and the inspection of control rod drive mechanism nozzles.

Also, a number of licensee performance issues involving some of the cross cutting areas were not identified as a result of implementing the routine inspection program.

And as a result, the task force made some recommendations, involving, for example, the screening of corrective action documents, a review of employee concerns program files, unplanned technical specification action statement entries, the treatment of operating experience during licensee review processes, and the influences on outage schedule.

We also identified that a number of the symptoms and indications were visible in the containment building. And as a result, we made recommendations to provide more focus to inspecting passive components in the areas that are difficult to access while the plant is at power, for example, the containment buildings.

Regarding the second bullet, assessing the effectiveness of operating review processes, the task force recommended that a sample of licensee actions taken in response to other previously identified generic

issues be assessed for implementation effectiveness, particularly those involving programmatic solutions where it's a living program that needs to be effectively implemented rather than just a simple hardware fix.

We also made a recommendation for the staff to conduct an effectiveness review of the operating experience review processes given the significant changes to these processes and practices since 1999. Regarding the third bullet, I'll just simply point out that visual inspections required by the code are not adequate to characterize the extent of nozzle cracking. These visual inspections, at best, are only affective at identifying cracks that have progressed to the point of leakage.

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Staff training. We identified that a number of staff members were not generally familiar with various operating experience pertaining to pressurized water stress corrosion cracking issues, boric acid corrosion control, as I mentioned a moment ago. So we made a recommendation to provide training in these two

technical areas, as well as other significant operating experiences or other issues out there.

We also made recommendations to provide additional training in the assessment of the reactor coolant system symptoms and indications, as well as provide some reactor oversight process refresher training.

It says leakage monitoring requirements and methods. Given the long standing nature of the symptoms and indications of boric acid leakage and corrosion, the task force made a number of recommendations pertaining to the assessment of the various leakage monitoring requirements and methods.

Assessment of stress corrosion cracking and boric acid corrosion data. There's a great deal of information that's known about both of these subject areas, however, some of the important details are not generally well known such as boric acid corrosion rates, the range of those boric acid corrosion rates, the extent of circumferential nozzle cracking, and boric acid corrosion events in foreign pressurized water reactors, and the extent of other alloy 600 nozzle

cracking issues involved in other parts of the reactor coolant system.

As a result, we made a recommendation to assemble this foreign and domestic experience, assess it, develop a plan to address and identify the issues as appropriate.

Final slide.

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Enhanced licensing guidance and reinforce expectations. The task force identified a few examples of a misalignment between written guidance and actual practice, for example, licensing project manager, site visits, and site assignment duration, and audits of licensee commitment management programs.

We also identified a couple of examples in which current guidance should be enhanced or clarified, for example the documentation of assessments of licensee responses to generic communications.

Finally, assess the effectiveness of actions stemming from previous NRC lessons learned reviews. Dr. Travers indicated a long history of conducting self-critical reviews in this area. The task force

performed a limited review of the Indian Point 2, Millstone, and South Texas Project lessons learned reviews, and at a very high level, identified some issues that are similar to the Davis-Besse lessons. For example, staff knowledge of pressurized water stress corrosion cracking, the integration of inspection findings, closure of open items, and the review of licensee submitted reports, just to name a few.

And as a result, we recommended that the staff conduct an assessment of these specific lessons learned reviews to assess corrective action effectiveness. And that concludes my portion of the presentation.

Carl Paperiello: Thank you. Good afternoon.

If I could have slide two.

<SLIDE NUMBER 2>

The Davis-Besse Lessons-Learned Report was issued on September 30th of 2002. In a memo dated October 3rd, I was tasked to lead a senior management review team to review the recommendations of the Lessons-Learned Task Force Report. The review team was requested to develop a proposed action plan. This plan was to prioritize the recommendations, establish plans

for addressing the recommendations, including time frames for completion, and identify lead offices. Any additional insights, as a result of this review, were also requested.

May I have slide three.

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In addition to the chair, the three principle office directors, Mr. Collins, Mr. Virgilio, and Mr. Thadani participated in the review. And we were joined by Mr. Ellis Merschoff, the Regional Administrator from Region IV, and Janice Moore from the General Counsel's office.

May I have slide four.

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The review team reviewed the lessons learned task force report. Personally, I was not familiar with the details of the Davis-Besse head corrosion. In fact, I was well aware of the general results and I had seen the photographs of the event. And the Office of Research was conducting work in that area. All the details, I was not familiar with.

I did read a number of the reports, both the

regional inspection reports as well as the April 15th and August 21st reports from the FirstEnergy Nuclear Operating Company.

The review team members endorsed the Lessons-Learned Review Team Report recommendations with two exceptions. We prioritized those recommendations. And the recommendations that receive the highest priority were those that, in our collective judgment, appeared to be more closely linked to the contributing causes that lead to the Davis-Besse event as well as actions needed to respond to the vessel head corrosion phenomenon.

Slide five.

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After reviewing and prioritizing the recommendations, the review team put them into four overarching categories. This was done because many of the recommendations were related, actions to implement one recommendation would have to consider the actions on one or more of the other recommendations, and some recommendations or grouping of recommendations were sufficiently complex to require the development of

action plans by the cooperative efforts of several offices. And I would note that the existence of the agency's steam generator action plan is a model for this sort of effort.

The areas that were covered included, the overarching areas, the assessment of stress corrosion cracking. This area included two action plans. One action plan was to develop the general issue of nickel based alloy susceptibility to stress corrosion cracking and boric acid corrosion of carbon steel. The other was to address vessel head inspections. This latter had an action plan already under development.

In fact, I would point out that the review team found a number of recommendations for which one or more offices had actions already underway. These actions were noted, but as a team we did not evaluate these actions to see how they specifically mapped onto the particular recommendation to which they seemed to be related. That will come in the charge that was given to them by the EDO.

A second area included the assessment of operating experience, and more important, how this

information works into our inspection and regulatory program as knowledge possessed by individuals involved in licensing and inspection.

The review team combines seven high priority recommendations into one high priority action item needing an action plan. And I would say that we put -- although there were a lot of recommendations on the inspection program revision -- we placed emphasis on informing the program with operating experience more than with just modification of generic inspection procedures.

The third area included the evaluation of inspection, assessment, and project management guidance. This area included three high priority items which the review team believes should be implemented over a very short period of time.

The fourth area involved the assessment of barrier integrity requirements. The review team recommended that six of the recommendations be combined into the development of an action plan. The review team recommended that lower priority recommendations be incorporated into the responsible offices operating plans

using the PBPM process.

The review team recommended that if the EDO, which the EDO has done, decided to implement the proposed actions, that a semi-annual status review be performed to evaluate the progress of activities and determine whether periodic realignments in these actions were needed.

The review team did not endorse two recommendations. The Lessons-Learned Task Force recommended that the criteria for the review of industry topical reports be revised to allow for NRC's staff review of safety significant reports that have generic implications but have not been formally submitted to the NRC for review in accordance with existing criteria.

NRC review of submitted topical reports is a very formal process, involving the writing of an SER. As this recommendation could be almost boundless, we did not think we could endorse that recommendation. However -- and the basis, of course, for this recommendation was that there was an existing EPRI report on boric acid corrosion that had some information on it that could have been useful in terms of rate of corrosion.

I think, essentially, we believe people ought to read reports. This involves books and papers and things like that. But the review of topical report has a great deal of formality about it that we just felt we couldn't endorse in terms of this recommendation. But we do encourage the staff to review professional literature for information that could be of value. And of course, this would be included in our operating experience reviews.

The second recommendation that the team did not endorse stated that the NRC should review industry approaches used by licensees to consider economic factors involved with vessel head penetration nozzle inspection and repair. The NRC should consider this information in the formulation of future positions, regarding the performance of nonvisual inspections of vessel head penetration nozzles.

The review group's position was the NRC decision on the types of inspections and corrective actions needed to meet NRC requirements will be based on the need to adequately protect public health and safety. The backfit rule guides economic considerations of cost

benefit.

Licenseses may elect alternative approaches based on economic considerations, as long as the underlying requirements are met. So we are not going to review their economic considerations unless there's a backfit appeal.

I'm going to conclude with the observation that the agency actions needed in response to the Davis-Besse vessel head event go from the most specific and immediate issues with PWR vessel head penetrations and head corrosion to the more general issues with corrosion overall, operating experience, and informing of the inspection and regulatory program and pressure boundary controls.

And these have to be balanced and managed with other issues such as -- and what comes to mind immediately is the steam generator degradation and security issues. The purpose of establishing action plans in a number of areas is to help ensure that actions such as the operating experience evaluation go beyond the Davis-Besse event and are balanced with other technical issues and differing sources of information.

I mean I don't think anybody is going to -- at least in the near future or over the next decade, forget about boric acid and its corrosive effects. But the next issue that comes along could involve degradation of wiring, it could involve digital circuitry. I don't know. So when we think about changing the inspection program and looking at operating experience, we just stick with corrosion and boric acid. We have to think about all of the events.

A major job is going to be defining it. We have a formal operating experience program. But what we're talking about here goes beyond that. It's essentially looking at a lot of sources of knowledge. The inspectors in the field do not have the time to digest the enormous volumes of data. We need a process for getting all that information and digesting it and then formally training the inspectors to inform the inspection process. I conclude my presentation.

Dr. William Travers: Mr. Chairman, that does conclude our presentation. You indicated, at the outset of this meeting, how seriously this agency has been taking the issues surrounding the

Davis-Besse reactor vessel head corrosion.

We've just given you a brief summary of our rather extensive lessons learned assessment. Our goal going forward is to -- and I hope it's obvious -- is to improve our programs. Not just in the area of boric acid corrosion, but much more broadly than that, as Carl has indicated. And I'm here to tell you that the staff is dedicated to that sort of improvement. And with that, we would like to answer any questions you may have.

Chairman Richard Meserve: I would like to thank you. I know that there was an enormous amount of work the staff has undertaken in preparing the Lessons-Learned Task Force Report and then, in turn, by the senior management review team, they go through each of the recommendations and sort and prioritize them.

We demand that our licensees undertake critical self-assessments, and we can ask no less of ourselves. We have to be prepared to confront this episode honestly and completely, and make sure that we've taken every step we can to make sure that we've learned from it, and we've responded to it, and we've dealt with the

situations that were presented to us.

I have just a few questions that were raised by the presentation here. I think that Mr. Howell indicated that nearly a third of the recommendations were ones that focused on the inspection activities. I know that before the Davis-Besse episode that we had not been devoting significant inspection resources on head corrosion on the expectations that the risks associated with it were significantly small, as not to warrant that activity.

You have recommendations for change, but I think we would like to hear what things you have put in place, and what things have been put in place today to give us confidence that issues associated with head corrosion are being appropriately examined by NRC inspectors.

Dr. William Travers: I'm going to ask bill.

Mr. William Kane: I think, certainly in looking at the bulletins that we've issued, getting licensees to focus their resources in this area, I think also in terms of communicating with our inspection staff, the regional administrators have each taken the

Davis-Besse Lessons-Learned Report and have personalized that, and have been renewing their expectations to their inspections staff, making sure not only are we looking at that area but we're also looking at other areas in the same way.

As it is pointed out in the report, issues such as long standing items where there were multiple indications over time that they were taking a long while to get to closure, those have been done.

We are also, within the EDO's shop, we're going out to the regions. I have been to two of the regions, going to a third one next week, reinforcing our expectations, certainly, our major disappointment with what took place, but also personalizing from a standpoint of what can we do organizationally and also on an individual standpoint, what can individuals do in taking a look at the Davis-Besse Report and putting that, not only on an organizational perspective but also on a personal perspective.

Chairman Richard Meserve: Are we completely confident of the status of the heads across the fleet with regard to head corrosion?

Mr. William Kane: I've got to tell you that with the programs that we've put in place, we have what we believe is a reasonable assurance that the heads are appropriately inspected. We will continue, we are continuing, to examine if there are additional needs, additional guidance, that needs to be put out. But we are confident.

Chairman Richard Meserve: I know that many of the Lessons-Learned Task Force recommendations were examined by the senior management review team and identified as high priority. But they also were indicated as having long implementation times. And I recognize for some things it just takes a long time to be able to put in place the corrective measures.

Do we have confidence that we are on top of any deficiencies, sufficiently now that the fact that it may take time to have the full implementation of the recommendation completed, that we're satisfied with the current status of our activities?

Mr. William Kane: Well, I think we are. When we chartered the task force to do its job, what we wanted to do was to get out all of the recommendations

without regard to where they were, you know, how they were prioritized. Then we have to take -- and that was the job of the task force -- to take those recommendations and to develop -- schedule, taking into consideration all the other work we're doing, and to factor those into our planning over time.

But there are, I would assure you, the regions, NRR, the offices, are also engaged. They started work on this report and the recommendations early on. I would say the Office of Nuclear Material Safety and Safeguards has also taken the Davis-Besse Report to see what lessons they can learn from their programs, which are not exactly the same, but certainly, some of the findings in here are relevant.

So we have started work already. We're not, while we're developing action plans as Carl had indicated, we're not waiting for the development of those action plans to start the work.

Mr. Carl Paperiello: If I can add, Mr. Chairman, at the time we met in October on this, there already were bulletins and temporary instructions for the inspectors addressing the boric acid corrosion

control programs and the vessel head penetration nozzles. So there were, as I said, we had found systems in place that addressed some of these recommendations. But we did incorporate them into these overarching plans. They sort of go out in a series of concentric circles with the greatest emphasis and urgency on the actual head corrosion and cracking of the nozzles to corrosion in general to the lessons learned, which will take a longer time to implement. But yes, we clearly saw that.

Chairman Richard Meserve: I see this issue as involving the conjunction, this issue presented by Davis-Besse, as involving the conjunction of two phenomena that we maybe hadn't appreciated as well as we should have. One was primary water stress corrosion cracking, in which we had thought the cracks were axial and, as Mr. Howell indicated, were ones where we didn't think the axial crack would pose an immediate safety concern.

And the other was corrosion, head corrosion, boric acid corrosion, where the belief had been that if there were fluid that collected on the head, it would

flash away the steam and you would be left with dry boric acid crystals that would not be all that corrosive.

We had a conjunction of the two things that occurred at Davis-Besse. And there's uncertainty associated both with, as you've indicated, with the rate of corrosion, uncertainty associated with understanding stress corrosion cracking. It was the mixture of the two that gave us this combination that has proven to be so difficult for us.

Mr. Art Howell: That is correct.

Chairman Richard Meserve: Are we satisfied that we are doing enough or will be doing enough as a result of this to understand these phenomena at a fundamental level? Are there research? I know there are some of the recommendations that relates to research. But are we doing enough? Are we funding enough?

Mr. Carl Paperiello: I'll speak for the Office of Research because they did brief me on what they were doing. After I finished this report, I asked them to come up and give me a briefing on what they were doing. They're doing a lot. The industry is doing a

lot. There's a meeting in the spring on this issue.

The purpose of pulling together the action plans will be to systematically look at all of this to see if there are holes in the thing. And I don't want to lose track of the fact. If things are related, in so far as I'm looking at primary water stress corrosion cracking and boric acid, are there other places where there is primary water stress corrosion cracking like BWR's that may not be boric acid but it's another thing? So make sure the program that we have is a solid program.

Again, I think boric acid, we'll all be very sensitive to boric acid. But, you know, what other phenomenon, you know, might we -- there is a lot of empirical data showing a lot of -- I won't say a lot -- boric acid on heads which did not corrode. My staff tells me that -- there was a research staff. There was quite a culmination of circumstances that lead to this thing actually occurring. So yes, whereas there was some data to show that, under circumstances, you can get high rates of corrosion, the common experience was that small quantities of boric acid crystals on the head

didn't result in corrosion.

Dr. William Travers: I think Carl is giving you the right answer. Number one, there is work going on. Number two, that the action plan should provide a systematic basis for making a judgment about whether it's sufficient.

Thirdly, I'll mention that the actual reactor vessel head from Davis-Besse is under rather close scrutiny. So there's a lot of metallurgical information data that should help with things like corrosion rates and that's the sort of thing that's being done, the results of which should provide some evidence of how this particular event and the mechanisms involved in this have proceeded.

Chairman Richard Meserve: Thank you. Let me turn to my colleagues. Commissioner Dicus?

Commissioner Greta Dicus: I'm going to follow up on some of the things that Dr. Paperiello was bringing up about what all we are looking at. Many of these are events and conditions that have occurred at some of our reactors and have been previously known and addressed as this one was.

But in the case of Davis-Besse, while we had known of vessel head penetration nozzle cracking as early as we had mentioned, 1991, and expended significant energy on the issue, certainly from 1997 on, with the issue of the generic letter that went out 97-01, which requested our licensees to outline their programs for monitoring and managing such cracking, my concern is are we really learning the lessons learned given that some of these problems keep resurfacing.

And I guess the basic part of my question, I think the history of Davis-Besse appears to show as time passed, both the licensee and the NRC have lost some focus on ensuring what we were doing.

I would imagine something like a vessel head penetration crack in such inspection activities will obviously be paid a great deal of attention to. But as Dr. Carl Paperiello brought up, do we have some other smoking guns out there that we are not paying the kind of attention to that we should? That would be, to me, the real part of these lessons learned.

I recognize that our resident inspectors have their hands full. They can't do it all. I know we have

a lot of things on our plate. And certainly we've been involved with security issues. But what processes are we putting in place?

Dr. William Travers: Well, I actually think there are a number of recommendations that stem from Art's task force report that speak to your question. It's a good one. Obviously in this case, although there had been evidence of boric acid corrosion experience, we haven't learned enough sufficient to avoid what occurred at Davis-Besse. I think -- I'll let you speak, Art, but some of the key recommendations and findings that stem from this report are, how we as an agency go about assuring that the operating experience and the history that we have is provided and reinforced in our inspection activities, in our training programs, and so forth.

So I think we do have to apply these lessons much more broadly than boric acid corrosion into areas where other experiences suggest that we need to follow on with communications that we've issued and perhaps have not done as good a job following up on.

Mr. Art Howell: Well, I would just like to

add that in the case of Davis-Besse we were focused, obviously, on boric acid corrosion and stress corrosion cracking. We didn't really benchmark other technical areas. We performed some limited benchmarking at two or three other facilities within these areas.

It's your very question that concerns us. And that's one of the reasons why we made the recommendations to go and sample some of these areas. I can tell you, in the case of Davis-Besse regarding, for example, the '97 generic letter, there was essentially no change in their behavior or actions as a result of that generic letter relative to implementing boric acid corrosion control programs. So the deficiencies that existed before that existed after that generic letter was issued.

So it's a fair question of, what other areas are out there. And we did make a number of recommendations to try to get at that issue.

Commissioner Greta Dicus: Because I think it's a process issue, how we prioritize on the basis of risk, for example.

Mr. Art Howell: Right. And we also, under

some of our processes, at least under recent changes, for example, in the generic issues process, short term verification of actions is mandatory. Whereas, under other processes that we have, it's optional. So we've made some recommendations at least to assess that practice.

Commissioner Greta Dicus: Okay. Thank you.

The only other question I have has to do with the four overarching categories that have been identified.

Resource estimates for implementation of these appear, as far as I can tell, to have not yet been performed on what's going to be needed.

Overarching area one, which is the assessment of stress corrosion cracking, and four, the assessment of barrier integrity requirements. The priority was strongly focused on the particulars of the Davis-Besse event, and of course obviously are already gaining a lot of attention.

But Overarching Area Two, assessment of operating experience, et cetera, training, review of program effectiveness, and three, which is the evaluation of inspection assessment and project

management guidance reflect, I think, how we address -- and this goes back to my first question -- generic issues long-term.

And to me these two areas, two and three, appear to me to be somewhat more reflective of the previous lessons learned, would be of a great deal more generic use to the NRC than areas one and four.

So how much are these activities going to cost? And would the NRC be better served if we focused our attention on the more generic issues first, given whatever resources might be necessary, rather than on the very specific areas? And again, it goes back to my first question.

Mr. Carl Paperiello: Talking about issue four, although it came out of Davis-Besse, it's more generic than that. And it turns out that we have requirements, tech spec requirements on measurements of unidentified leakage and the like that were frankly set thirty years ago. It doesn't necessarily reflect today's technology and what's capable of being done. And the real goal is you really don't want pressure boundary leakage at all. That's your goal. And so the

question there is, in terms of generic, is there something that has to be looked at? It would be fundamentally lead by Research, supported by NRR. And it's probably a much smaller effort overall in terms of resources than operating experience.

But I really think the operating experience is going to be the one that is the most resource intensive. The situation is this. The fact of the matter is we've had a lot of successes because we have had lots of generic communication. We brought to the utilities a lot of things and they were fixed. And even in the case of the pressure vessel head penetration cracking, plants have shut down, they found it, there were no events, not even a close call, and they were fixed. So I don't want to, you know -- it's this question of is the cup half full or half empty?

This is a human capital issue. I'll have to admit, it's an issue that's been in the back of my mind for quite some time. And that is, you can't have the inspector spend 100% of their time in school and they never inspect. So how do you get a balance of training versus -- if you're going to have a risk informed

inspection program -- and you have to.

You only have a couple of people. You have a lot of geography and a lot of people. You have to recognize that something you see that is off normal is significant. What is significant? That's the goal of what we're trying to do. There's going to be a lot of effort to take all the sources of information we have and distill that down into something we can formally train the inspectors on so we ensure they all come up to that level of knowledge.

Commissioner Greta Dicus: But we don't know how much this is going to cost.

Mr. Carl Paperiello: I can't tell you. And that's the reason, again, why we need an action plan. Because somebody has to sit down and work out all the details. Because I'm not even aware -- and this is why I said it goes beyond corrosion. Sitting right here, I can't tell you all the sources of information. And some people may know things that I don't know.

Commissioner Greta Dicus: Thank you. That's it.

Chairman Richard Meserve: Commissioner Diaz?

Commissioner Nils Diaz: Thank you, Mr. Chairman. Let me go and start where the Chairman started, but I'm going to ask the same question, probably more pointed. And I'm going to direct the question to the EDO. Can you assure us, can you assure the American people that presently, all nuclear power plants in this country have been inspected in a manner that is reasonable, say there is no similar hole in the head like Davis-Besse?

Dr. William Travers: We have actually had a lot of communication with the industry. We've prioritized the most susceptible plants to this sort of cracking. And they have inspected or provided us the plans. I think they're all inspected at this point. And they have done bare metal inspections.

So the answer to your question is yes. We believe we have, in hand, the assurance that the current fleet has done the kinds of inspections that would give us that sort of assurance.

Moving forward -- and I'll just mention very briefly because you may have other questions other than this one -- we are working to actively establish

whatever new requirements might be needed to provide, on a going forward basis, that continued assurance that the right inspections are going to be completed in the future and that our regulations are revised to insure we have the most formal regulatory mechanisms to assure that.

Commissioner Nils Diaz: But you can reasonably assure us? I don't know whether the word reasonable applies here? I'll take the word reasonable out.

Can you assure us that presently there is no indication that any other nuclear power plant in this country will have a similar problem.

Dr. William Travers: We have reasonable assurance, and I think that's the best I can give you, that given the inspections that have been done -- and we think they have been rather thorough -- that there are no further issues similar to Davis-Besse that exist out there.

Commissioner Nils Diaz: And there is a very short term program to conduct additional inspections to increase your reasonable assurance.

Dr. William Travers: That's right. Yes, sir.

Commissioner Nils Diaz: Thank you. Let me go back to the thing we're discussing. Something that is very important, which is why this happened and what we can do to prevent it. And it's the issue that I always call the delta. There's a physical phenomenon that takes place, and that physical phenomenon is manifested in many different ways. In this case there's some manifestation.

People took those manifestations and took no actions. And I think Dr. Paperiello has been talking about the fact that we need to establish a way in which, when a phenomena takes place and it is repeated and it is repeated and it may be increasing in magnitude, even if it's a small amount, that should trigger a corrective action. That should trigger an action from the licensee. And it should trigger from oversight from us.

I believe, but I might be wrong, that that's the heart of the issue in the short term and in the long term, that we need to develop a series of criterion, that when the delta gets to be a little larger than what we expect, we would investigate. When it continues to be there, then that deserves a corrective action.

Are we, in your lessons learned, on the way, in a reasonable period of time and in the long-term, going to be able to take care of repeated deltas that are indicative of deteriorating conditions?

Mr. Carl Paperiello: In my mind, in recognizing the risk significance of the off normal phenomenon you're seeing is so important. You can go and see a lot of things with a lot of condition reports. You can see a lot of things off normal. The only thing I can conclude -- and I'm basing this on a limiting amount of what I could read in the time that I worked on this report -- is people who saw the off normal phenomenon did not recognize its significance. Now, that's the only thing I can conclude.

In other words -- again, I may be reading things into it. We have an explanation for this, and the explanation is that it isn't very significant. Now, in retrospect you're saying, well, how could you have all this. But how people looked at it day-to-day, I don't know. I can only assume that they said, well, it wasn't all that significant.

I can see how that can happen. It happened to

me in my own health at one point where I had symptoms of something serious and I dismissed it. I thought it was some drug that I was on, prescription drug. It was a diuretic.

But you see I was an inspector. I was an inspector, I started out as an inspector. You saw things that were off normal. You had to make a judgment of how serious this was. And that means you had to understand what was going on behind it. So I just, you know, that's why operating experience is so important to get to the staff so that they can somehow, you know, relate this off normal phenomenon to something significant.

Commissioner Nils Diaz: Well, operating experience can give us baseline data, you know, filters clog with certain frequency. The processes of boric acid are this size. You know, once that baseline criteria is there -- and we should have it better and better as time goes on -- I believe that will be one of the great benefits of the oversight program, that baseline data would be generated more and more accurate as time goes on.

But we still need to establish these deltas.

And deltas are not only in magnitude. They have a recurrence. If they're systematically reoccurring, even if there's small, there's an indication that something is beyond the baseline.

And our lessons learned should really be focused in all of these areas, in making sure that these recurring deltas require corrective action.

Dr. William Travers: I think that's exactly a right sort of follow on from what we've learned at Davis-Besse if you look at some of what was happening in this case. Some of it wasn't necessarily viewed as significant, but there was a recurrence. And I think this is your point, you can correct me if I'm wrong. that this should have suggested a clue that there was a problem. And if you have that sort of healthy inquisitive nature triggered by off normal recurrence, then it might have assisted you, even without a detailed understanding to underpin it, to find what was causing the problem.

And I think that's a very basic point that many organizations use today in their operation of nuclear power plant programs. In this case it wasn't

used very effectively. But I can tell you that I know of programs that I've looked at closely, where just this sort of philosophy is the one that is one of many tools that are employed to trigger inquiries to question what it is that's going on to help you get out in front issues before they become of major significance.

Commissioner Nils Diaz: In other words, it's not only the magnitude of the phenomenon, but the periodicity. And I believe that there have been some criticism with the oversight program, whether the probabilistic aspects actually capture all of this phenomenon. But in reality, the information was there. We just were not focusing on the periodicity of it, which is fundamental to the oversight program.

Mr. Art Howell: I would agree. This problem transcends the changes to the inspection program. And fundamentally, you know, inspections were still essentially doing the same inspections. Focus has changed somewhat. But a number of recommendations made by the task force are to get at that very issue.

A number of recommendations involving, for example, not only the particulars, filter fouling and

reactor coolant system leakage, but also how many times do you enter a tech spec at some plants and how long do you live with a problem before you fix it. So those are more general types of suggestions that we made, both in inspector training and enhancements to the inspection program to address those areas.

Mr. William Kane: In the end it all drives back to the effectiveness of the licensee's corrective action program. If the licensee's corrective action program has a strong root cause component to it, it can drive down to take these various condition reports and all these observations and drive down to the root cause. If that's working well, you will get to the problem.

Commissioner Nils Diaz: It needs to drive a corrective action program even if the driving function is just additional inspection. Is that a fair assessment?

Are we on the right track regarding this fundamental issue that we're discussing? Have the Lessons Learned and the review team focused sufficiently on the fact that we need to establish the periodicity of these delta functions to the point that we can actually

address them in a corrective action program?

Mr. Carl Paperiello: I think so.

Commissioner Nils Diaz: Thank you,

Mr. Chairman.

Chairman Richard Meserve: Commissioner

McGaffigan?

Commissioner Edward McGaffigan: Thank you

Mr. Chairman. Mr. Howell, at one point in your report you talk about sort of personnel issues that may have contributed of did contribute to the event at Davis-Besse. We had a single resident there instead of the two that our policy calls for during much of the period. That resident was not fully trained in terms of having completed all the -- I guess, modules or whatever that go into a full training program.

We had a regional engineer position that was vacant for much of the period. And then at the PM level here at NRC headquarters we had, I think what you said was nine PM's in ten years or something of that sort. Now, there were other battles that Region III was fighting during this period, D.C. Cook, Clinton, et. cetera.

And it wasn't just we, but apparently according to the "New York Times" info there were similar views that maybe Davis-Besse was not the major problem in that region. But is one of the fundamental lessons that we learned from Davis-Besse that we have to have some minimum level of resources being devoted to a facility, even if we are consumed with problems at other facilities, and even if we think that the plant is pretty good? And do we need to have these positions filled and the inspections being conducted in some continuity in these positions?

Mr. Art Howell: First, before I answer directly, I just wanted to point out that it was very difficult for us to determine whether or not there was a direct causal relationship between some of this staffing issues and some of the underlying causes of the event. But certainly during the period, in 1999 there was these vacancies as you mentioned. It was a critical period because more and more of the symptoms and indications were becoming more prevalent. This was also during a period in which there was the transition to the revised oversight process.

So there were many activities going on. But having note of that, we also noted that there was a good level of awareness of some of these symptoms, both by regional staff, inspection staff, project management staff. So it's difficult to make a distinction between, you know, how hard you're working, because there are some vacancies, versus how you treat an issue that you know about.

But having said that, we did make a number of recommendations to address that, two in particular. One may sound somewhat simplistic, but to establish tracking and monitoring of resident staffing at the facilities so that perhaps some bounds can be put on that. And then secondly to understand what the impact of a plant that's under the aegis of Inspection Manual Chapter 0350 process, such as Clinton and D.C. Cook were at the time, and what impact that has on those resources. So we did make recommendations in those regards.

Commissioner Edward McGaffigan: I'll turn to the EDO. Are we trying now, sort of across the board, to be at the resident inspector levels that we're supposed to be at, the N+1 for one unit sites, the N for two unit and above sites, but at least two inspectors

per site, three at Palo Verde. And if we're not at that level, are we ensuring that there are adequate regional inspection resources being devoted to augment the single resident at the site?

Mr. William Kane: The expectation is, just as you said, that we do have sufficient resident inspector coverage. And one of the things we're looking at right now across all of the regions is just the impact of the decision to go to N and just how much the adequacy of the coverage. When we get through that evaluation, we'll be back with some information.

But I expect that, just looking at the preliminary numbers, it looks like we may need to make a change there. How we do that is, you know, a question that we have to work out. But we're seriously looking at that.

Commissioner Edward McGaffigan: And you intend to get back to us on that, probably at the annual meeting we have on the plants in the spring time frame?

Mr. William Kane: We would certainly be able to report progress on that, if not the solution.

Commissioner Edward McGaffigan: The issue of

training for residents, I was very interested in the dialogue between Commissioner Dicus and Mr. Paperiello. In some sense of trying to find issues that we don't know about, there is a great difficulty. Residents have their individual expertise. They may be an electrical engineer, they may be a materials engineer, they may be a structural engineer, whatever. But they are not experts on everything.

So a lot of the training of a resident inspector is probably teaching them when to yell for help; I'm coming across something here that I don't fully understand. And we have other resources in the agency to help them sort out whether this is significant or isn't. How does that work in the training program today? Somebody who's familiar with it, how do we help these folks like this young resident at Davis-Besse who was aware that these fillers were getting followed very routinely, et cetera, but accepted the licensee's explanation which turned out to be wrong. How do we help them?

Mr. Art Howell: The current practice is the inspector will become aware of an issue, he may not have

a background in that, and that bubbles up through the regional staff. And we essentially canvas our expertise to understand whether or not we know enough about the particular issue, background wise.

And if we don't, we dialogue with program offices to get the help. If we think we need to react in the short term, for example, through a special inspection or an augmented inspection, we get the right expertise. If it's a longer term issue, we work with the staff here in the program offices to help us to resolve those issues. That's the current practice.

Just like anything else, it depends on your level of prioritization of that particular issue in terms of how much attention it gets.

Dr. William Travers: But I think if you're asking the question, is there encouragement for people who have limited skills -- we all have limited skills -- to request assistance from the regional based inspection base pool, I think that's clearly something we do. And it's probably something worthy of reinforcement as a function.

Commissioner Edward McGaffigan: It strikes me

that it's not a failure of any resident to ask for help.

That should be well understood by all the residents.

It's success criterion.

Mr. Carl Paperiello: Commissioner, can I address this. Again this is something that I have been involved in, both on the regional side and here. We have counterpart meetings for our inspectors, whether they're residents or nonresidents. And we discuss issues. That's how we bring it before them.

I see the heart of our recommendation as making this more formal and strengthening what we do, and at least from my personal viewpoint, a recommendation to include the TTC, as rather than having people like me go out and talk about issues, which I do, is have the material distilled and have professional trainers present the material so in the same period of time we can actually present more material in a more packaged way.

But you are right. Nobody is going to have the knowledge to encompass everything in one person. But we're trying to send trip wires out there so that when somebody on the site sees a problem they can bring

it to management and bring it to somebody who is expert.

Commissioner Edward McGaffigan: Let me just go to the foreign experience issue again with Mr. Howell.

One of the points that comes up in the report, and certainly we've been criticized for it, is that in the early 90's, the French made a different decision from us with regard to vessel head replacement. We made our decision, as you stated it, based on our understanding at the time on the data that was in front of us, the French made the different decision with approximately the same data in front of them.

And today we haven't decided to require a vessel head replacement. What we instead are doing is, as Mr. Kane pointed out, we are putting in place, and have already put in place through the bulletin process, requirements, far reaching requirements, for inspection of the heads which, eventually, will lead to economic decisions by the licensees to replace the heads, in all likelihood have already lead to many.

To go back to that French decision in the early 90's, do you have any insight as to why they

reached the decision that, over time, they needed to replace their vessel heads?

Mr. Art Howell: We tried earnestly to sort this out. There are a lot of different views about their decision. So we had some dialogue with the French regulators.

Primarily, what we learned was that it was both a combination of both the recognition of the potential for catastrophic nozzle failure from circumferential cracking in combination with the potential for significant head degradation from a simple nozzle leak, whether it's axial or circumferential, that lead them to make changes to the inspection requirements which in turn, as far as we can understand, drove the economic decisions to change out the heads sooner rather than later.

And how the other information has been provided, some of it has been provided orally. It's not documented. Some of the trip reports we made, there were, perhaps, other factors. It seems to be a great deal of confusion about the actual experience at Bugey of whether there was simply axial cracking or circumferential

cracking. And that has complicated the picture. But based on our discussions with the regulators, that's what we learned during this evaluation located.

Commissioner Edward McGaffigan: In the early 90's, when the staff made the decision that it made it, was it fully aware of whatever the French reasoning was for the different decision they were making at the time?

Mr. Art Howell: Again, we discussed this issue with staff who were around at the time. One of the views was that it was more or less an economy of scale where, it's simply, faced with the unknown and the potential for the problem it was just simply easier to embark on a program sooner rather than later. And, because of the nature of their industry, was structured to, for example, make new heads, it was easier to do that.

But there's clearly some indication that there was some level of awareness that there was circumferential nozzle cracking associated with the Bugey experience because it's captured in the generic letter of '97.

Commissioner Edward McGaffigan: Was our backfit rule, which the French obviously don't have, unless

it's an adequate protection issue requires substantial increase tests for public health and safety. Was that a factor in the staff's early '90's thinking at all, do you know?

Mr. Art Howell: Based on what we can piece together, I do not believe that was a consideration. I believe that the large body of evidence suggested that most of the cracking, even at Bugey, was axial, and therefore, for the reasons discussed, not an immediate safety concern.

Commissioner Edward McGaffigan: Let me just finish up with more of a comment. I know this meeting is being followed probably by people who normally don't follow Commission meetings and we've used a lot of jargon here, including myself probably in the last five minutes.

But I want to commend you all for doing a very good Lessons-Learned Report. I think we are an agency that is transparent. And it's one of our strengths. One that tries to get ahead of issues, although, in this case, we were not ahead of it. But I think, if you look back over the past decade -- and I would welcome other

comments from you all as to other examples -- I think there are numerous examples where this highly technical staff, dedicated to safety, tried to get ahead of issues.

I would cite the maintenance rule in the early 90's, the amendment to the maintenance rule that we made in the late '90's that looked at greater amount of risk management in on-line maintenance which was increasingly happening at the plants. In part 70, the requirement for an integrated safety assessment.

The revised oversight process really was an attempt to try to improve the way we do oversight, and I think it has succeeded at places like Cooper in identifying issues early, in ways that perhaps the old process that we had, the old Systematic Assessment of Licensee Performance (SALP) would not have. So I think we have a lot of successes. And I think that the glass is far, far more than half full.

We had a problem here. We did not anticipate this. Hindsight is 20/20 that perhaps we should have. And I think there clearly are things that we should have caught and could have caught. But we do catch a lot.

And we do get out ahead of issues. And this is a staff that's dedicated to safety, is dedicated, whether they're in Research, or NRR, or NMSS, or any of our offices, to try and get ahead of issues. And I think we succeed far more than we fail.

Chairman Richard Meserve: Commissioner Merrifield?

Commissioner Jeffrey Merrifield:

Mr. Chairman, thank you very much. And I would second the comments made by Commissioner McGaffigan and would underscore my appreciation to the Lessons-Learned Task Force for what I thought was a very good and very thorough report.

I also want to thank Carl and his team, the senior management review team, for the work put in to help us sort through those and provide some prioritization. One of the things that was discussed by Mr. Howell today was the issue of -- and you eluded to it -- whether we would have identified this issue under the older program versus our new reactor inspection oversight program. And the answer to that is, apparently not.

Focusing on the new program, I think there's a

lot of buy-in on the part of the Commission and others that -- and I agree with Commissioner McGaffigan, our new inspector oversight program is, in fact, an enhancement and improvement over the former SALP program.

What's your sense, looking down the road, of what the big picture changes we're going to be making to that inspection program, relative to the lessons learned that you forwarded to us at the Commission?

Mr. Art Howell: Based on our review, we didn't see any fundamental changes that are required to the manner in which one inspects. Most of the focuses, refinements, and enhancements are to provide more focus, and certainly to the underlying technical areas. Having said that, the one issue that's still somewhat problematic is how to get to some of these attitudes and characteristics that were indicative of the lack of proper focus on safety through the routine inspection program, in other words, in the cross cutting areas? And that's really the challenge.

In terms of our recommendations, they're more structured in nature to get at some of those issues

indirectly. In the larger sense, I still think it's an open question about whether or not events of this type need to occur before these types of issues reveal themselves, versus, can you get them before they become such a significant problem. So we didn't have any broad reaching recommendations in those areas, but we think there are a number of focused things that we could do to help the inspectors be more successful at identifying some of those issues.

Commissioner Jeffrey Merrifield: Commissioner Diaz, I think, in a very good way, outlined that. It seems that we had a lot of the data points. But perhaps it was a myopic focus on perhaps one data point at a time that lead us in our ability to recognize that we had a lot more out there, and had we connected that it would have lead us to early understanding of what was going on here.

Mr. Art Howell: Yes, I agree with that. It's really a classic problem of integration of data and problem recognition where there is some clear appreciation for some of the underlying problems. The specific problems are being noted because there was

routine follow-up. Unfortunately, it didn't all come together. So how does one get at that? You get at that through reinforcing expectations, training, providing tools to inspectors through the inspection guidance, a number of things.

Commissioner Jeffrey Merrifield: This next question goes to Dr. Paperiello. Several of the high priority recommendations that you sort, some of them do have relatively long implementation times, greater than 24 month. I was wondering if you can discuss a little bit your comfort level with the length of some of those timetables for the higher priority issues, one of them being for example, the implementation schedule for determining whether the periodic inspection of a licensee's boric acid control program is greater than two years, it takes two years to do that. Are you comfortable with that particular recommendation and the time frame of that?

Mr. Carl Paperiello: I see this taking on several steps. There's what we're doing immediately under the TI and then the bulletin. But then the question is, the establishment of what is the total

program going to be, and how is it going to fit into everything else we do is going to be longer.

Some of these, when we took a look at time, it was mostly time to completion and not so much time to initiation. And there was some subjective judgment in that. I asked different members of the team, you know, how long was it going to take to accomplish this thing and whether it had to be action plans, and the item fitting into the action plan might have affected the time again.

Part of the reason I have a six month periodic review is that if this thing doesn't folder with experience, it's not going to be a very good action plan.

Commissioner Jeffrey Merrifield: That raises sort of a secondary question. One of the things that the Lessons-Learned Task Force did was review earlier task force results. And occasionally there's a tendency where some of the low and medium priority issues that are pushed out toward the back, eventually -- institutional memory being what it is -- sometimes they get lost in other priorities.

How are we going to make sure that we set up a program in order to track the recommendations, the 49 of which you have recommended that we accept, to make sure that some period down the road we do indeed have a follow up so that those don't get lost?

Mr. Carl Paperiello: We anticipate that a number of the recommendations are going to be folded into the action plans. And the action plans will be living documents that the EDO tracks specially. The other items will be incorporated into the office's operating plans. And I know for the offices that report to me, I follow. I sit don't, I get every quarterly revision of the operating plan, and twice a year I sit down, actually by division, and go through the relevant portion of the operating plan and make sure things that are in there get done.

Commissioner Jeffrey Merrifield: If you get a living document that will be provided to the EDO, is it fair to assume that that is a document that will be shared with the Commission so we too are kept aware of the nature of that action.

Dr. William Travers: I think I may have

indicated that in my memo that established the tasking to both NRR and Research.

Commissioner Jeffrey Merrifield: You may have.

Dr. William Travers: I remember a reporting period. I can't recall whether it was annual or semi-annual.

Commissioner Jeffrey Merrifield: The Lessons-Learned Task Force made several recommendations in the area of evaluating operating experience information. One might come to the conclusion that some of the functions performed by the former Office of Analysis and Evaluation of Operational Data or AEOD be resurrected. Now, for the sake of knowledge, I was one of those who voted in favor of changing that some years ago.

Given the recommendations of the task force, is there some sense -- well, let me back up. At the time that change in AEOD was made, some of those functions went to the office of NRR, some of those functions went to the Office of Research. Is there some sense in perhaps bringing those under one tent, either

under Research or under NRR? Any thought to that?

Dr. William Travers: I think that's something we're going to have to give some thought to. Certainly, we want to understand the recommendation as it's constructed against the issues that have been identified in Davis-Besse. I don't have a clear answer for you at this time, but it's going to have to be something that we're going to have to assess.

Commissioner Jeffrey Merrifield: Mr. Howell, have you thought about that as you were making, evaluating some of those recommendations?

Mr. Art Howell: Not directly. We didn't actually assess the individual processes. We looked at boric acid corrosion control and primary water stress corrosion cracking and how those two issues were dealt with by our various processes. So a number of our recommendations in that area are more limited in scope. And that's one of the reasons why we suggested that perhaps we ought to take a step back and reassess the effectiveness of all of those processes, given that we did undergo some significant changes three years ago.

Commissioner Jeffrey Merrifield: Again,

Mr. Howell, now that you've had some time to reflect on the task force effort -- the original report was issued at the end of September -- are there any additional recommendations not in the report that you think warrant further consideration? Anything you've thought of since then that you would want to tell us about?

Mr. Art Howell: Nothing that comes to mind.

Commissioner Jeffrey Merrifield: So you stand by the report?

Mr. Art Howell: Yes.

Commissioner Jeffrey Merrifield: A similar question to Carl Paperiello. Aside from the recommendations in the Lessons-Learned Task Force, does the team have any additional recommendations that they feel warrant consideration?

Mr. Carl Paperiello: There is a counterpart on the operating experience for the agency. And that is, what does the industry do? And that is, how does the industry train new engineers? And how does the industry's legacy operating experience get past on to new engineers?

You know, apparently the engineer who was

responsible for cleaning the vessel head in outage twelve was relatively new. I don't know what they mean by new, I just know what the report says. And I don't know what kind of -- not education, but, you know, things like operating experience get passed on to the engineer.

So I mean, I'm thinking about this thing and actually reading a lot of reports in preparation for this meeting. It has occurred to me there's a counterpart to our operating experience, what occurs on the industry side.

Dr. William Travers: I've had some discussions. And I know some other members of the staff have had as well with INPO, as well as other organizations. And I can tell you that there's an active effort to assess and perhaps make some changes to those industry groups that are principally keyed in on operating experience and the sharing of information among utilities such that, you know, they can all derive whatever benefits. And even their processes for how they go about in their interactions with these utilities and under what circumstances do they engage actively on

issues is something that I know INPO and others are assessing at the moment.

Commissioner Jeffrey Merrifield: Thank you, Mr. Chairman.

Chairman Richard Meserve: Thank you. On behalf of the Commission, I would like to thank the NRC staff, including Mr. Howell, Dr. Paperiello, and the members of the Lessons-Learned Task Force and the senior management review team for the presentations this afternoon. The task force and the senior management review team clearly did a great deal of work in a short time. The product is thorough, and we very much appreciate it.

Dr. Paperiello and the senior management review team did note a large number of high priority actions that are intended to correct the various deficiencies that were found. Some of them have started underway. As he's indicated, others will be accomplished in the future.

The Commission is very interested in the continuing work in this area. We will review the report that you've indicated that will be coming on a six month

basis as to the status of your actions very closely. So with that, I thank you very much again. And we're adjourned.

Thank you.

<Whereupon, at 2:50 p.m., the
Commissioner's Hearing adjourned.>