UNITED STATES NUCLEAR REGULATORY COMMISSION

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COMMONWEALTH EDISON COMPANY

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BWR OWNERS GROUP

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CORE SHROUD INSPECTION

One White Flint North

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Rockville, Maryland

Thursday, May 26, 1994

The above-entitled matter commenced, pursuant to notice, at 10:30 a.m.

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On behalf of Commonwealth Edison:

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PROCEEDINGS

[10:30 a.m.]

MR. STANG: Good morning. My name is John Stang, I'm the NRR project manager for the Dresden plant. We are here today to discuss core shroud inspections that Commonwealth Edison has performed at the Dresden and Quad Cities sites. This meeting is open to the public and the meeting will be transcribed.

Commonwealth Edison will discuss the core shroud inspection results;, the restart and repair plans, and discuss the operating units Dresden Unit 2 and Quad Cities Unit 2. In addition, we will hear from the BWR's owners group on the aspects of the BWR core shroud inspections.

Very quickly, I'd like to introduce the NRC's senior managers at the table. Mr. James Taylor, EDO; Mr. William Russell, Director of NRR, Mr. Ashok Thadani, Associate Director for Inspection and Technical Assessment; Mr. Brian Sheron, Director, Division of Engineering; Mr. Bob Jones, Deputy Director Systems Safety and Analysis; John Zwolinski, Associate Director for Division of Reactor Projects, Region III; and Jack Stronsider, Branch Chief, Materials and Chemical Engineering Branch.

Would any of you gentlemen like to make any opening remarks? If not, Mike, I'll turn it over to Commonwealth Edison.

MR. LYSTER: Thank you, Jon.

Good morning. My name is Mike Lyster, I'm the site vice president at Dresden. I'm also the Commonwealth Edison executive for the core shroud project, and also a member of the BWR owners group executive oversight committee.

Allow me to introduce the people that are at the table with me from Commonwealth Edison. To my immediate right is John Hosmer, our engineering vice president for Commonwealth Edison. Starting on the far right, Bob Moravek, who is the site engineer and the construction manager at Quad Cities; Bob Walsh, who is the project manager for the Quad Cities shroud project; Joe Williams, who is the Dresden project manager for the core shroud project; Tom Spry, our metallurgical lead on Commonwealth Edison and Jerry Whitman, who is our inspection lead for the core shroud project.

Thank you for your time and the opportunity that's been provided for us to discuss our reactor core shroud. The purpose of our presentation today is to provide the status report of our shroud investigations at Commonwealth Edison BWRs, including the LaSalle County Station, Dresden and Quad Cities. We will present the results of our examinations to date and we will discuss the repair and restart options for the grated shrouds at Dresden and Quad

Cities.

The current plant status is Dresden Unit 2 is in cycle 14, and the next scheduled refueling outage for the Dresden 2 is March 4th, 1995. Dresden Unit 3 is in the midst of D3 refuel outage 13, and the start-up date is currently projected to be June 30th, 1994.

Quad Cities Unit 1 is in refuel outage 13 and its start-up date is currently projected to be July 4th, 1994. Quad Cities Unit 2 is in cycle 12, and its next scheduled refuel outage is January 30th, 1995. LaSalle Unit 1 is in refuel outage 6 with a projected start-up date of June 20th, 1994. LaSalle Unit 2 is in cycle 6, and its next scheduled refuel outage is March 1, 1995.

The team goals -- we have assembled a project team that is comprised of corporate and site resources -- and the team goals have really been laid out with a charter whose major and single most focus is an objective of uncompromising reactor safety. We have also focused the charter on technical excellence. Our short-term objectives are to select and implement the best technically justifiable solution to the core shroud indication. In the long term, we would like to identify the root cause and resolve reactor vessel internals, integrated granular stress corrosion cracking issues.

We have an aggressive agenda this morning. Joe

Williams will talk about our shroud description; Jerry Whitman will then discuss the Dresden and Quad Cities inspections; Tom Spry will discuss the boat sample status. Bob Walsh will discuss some evaluations and assessments that we've done on the shroud. Joe Williams will discuss the safety assessment and repair options, and then I'll summarize.

It's my understanding that after this, the owner's group will discuss some issues and then we'll also have some technical interchange. So with your indulgence, we'll proceed through the agenda. Joe.

MR. WILLIAMS: Good morning. I'm going use this model to describe the function and the construction of the core shrouds at Dresden and Quad Cities. The core shrouds are made of stainless steel 304, it's about two inches thick; the shroud itself is about 20 feet in diameter and 20 feet tall. Its functional design bases are the channel coolant circulation through the core. Feedwater comes in on the outside, jet pumps pump it underneath and on through the fuel to provide cooling to the fuel; to provide refloodable volume for safe shutdown and maintain control rod insertion geometry by providing lateral support to the fuel assembly via the top guide and the core plate.

As far as the construction --

MR. RUSSELL: If you could keep the mic closer to

you, that way the reporter will be able to hear it better.

MR. WILLIAMS: As far as the construction, there are seven horizontal welds in this form -- formed welded shroud, H1 at the top through H7 at the bottom. We are going to be spending a lot of time soon talking about H5, which is this weld here, the core -- the shroud barrel to the core plate support ring.

Could you start the video please, and then pause it?

The interfacing systems -- well the resolution is -- it's jumping around somewhat -- the interfacing systems for the core shroud are the jet pumps, which you can see on the outside of this 3-D representation; core spray, which are the lines coming in at the top connecting to the core spray spargers just inside the top of the shroud; standby liquid control which comes in at the bottom and enters the core plate and the control rods themselves in the fuel, which are inside -- inside the shroud.

Would you run the video, please?

This is -- we'll just stop here. This shows you the core plate on the inside, the shroud barrel on the outside and the core plate support ring at the bottom. And this is the location of the H5 weld.

You can stop the video now.

Before we get into Quad Cities, I wanted to

briefly summarize the LaSalle County Station inspection. It was planned and performed similar to Dresden and Quad Cities. LaSalle County Station is a low carbon plant with approximately 8 years of operating time. All the LaSalle station welds were qualified with no indications found, and the inspection's scope included both OD and ID locations.

I'd now like to turn it over to Jerry Whitman to discuss the Dresden and Quad Cities Inspections.

MR. WHITMAN: Hello. I'm going to talk about the planning that went into performing the core shroud inspections, the inspection methods that we used and also going to share the results of those inspections with you.

A significant amount of planning went into the core shroud inspections at both Dresden and Quad city stations, and we began this effort early in January with a visit to CP&L for a lessons learned meeting in which CP&L shared their recent experiences with core shroud cracking at the Brunswick Station. After that, we've had discussions with Peach Bottom, General Electric and several other utilities and vendors in an effort to gain as much intelligence on the shroud issue as we could, prior to performing our inspections.

We also received an inspection tape from CP&L that they lent us so we could take it back and train our visual inspectors on exactly what the cracking looked like and get

some idea of the difficulties that they had in getting the pictures that they got to detect the cracking.

After seeing the nature of the indications that were found at Brunswick, we had to determine what method we would use to try and detect them if they existed, and that would be -- either visual or ultrasonic examinations were our choices. There are pros and cons to both of these examinations, and the choice we found wasn't quite as obvious as it might at first seem. Ultrasonics, of course, has the advantage of being able to characterize any cracking that may be found; however, at the time we made our decision, UT was only capable of getting to the -- excuse me, let me get that model -- UT was only capable of getting from the H1 to the H4 welds. It was not capable of getting any further down in the horizontal welds on the shroud. And also, the performance of the delivery systems in itself was in question for us because there is very little experience with performing these examinations when we made our decision.

Okay, now with visual examination, however, we could get all the way from the H1 to the H7 welds between the sections where the jet pumps come together and we could get through down and inspect all of those welds from the OD, and also the H3 -- and the H3 weld, which is right here, and the H4 weld, go through the top guide and also be able to

perform the inspections from the ID.

And at the time we made our decision on the method to use, we -- it was thought that the H3 and the H4 weld would be the most susceptible to this type of crack, that's what we had been seeing predominantly before the industry. So it was ultimately decided that we would use the visual inspection as our primary inspection method and we would use UT as secondary, and we felt that this gave us the best of both worlds with the flexibility of visual inspection to be able to get the most welds inspected, and also the ability to characterize any flaws, should that become necessary with UT.

Once the decision was made to use visual inspection as the primary method, we knew from our discussions with Brunswick and others, that the equipment and techniques that we would be using to perform that inspection would be very important. So, because of this, we went to great lengths to ensure that the inspection that we ultimately performed was the best enhanced visual inspection that we could possibly do, given the current state of technology.

We purchased high resolution cameras and monitors and recorders to get the best resolution we possibly could. In performing our examinations we used a 25 millimeter lens and a focal distance of between 1 to 5 inches from the

inspection surface. And this gave us an effective magnification at the inspection surface of approximately 2 to 5 inches; and later on you'll get an idea of what that actually looked like to us.

And I'd also like to note that although we maintained between 1 and 5 inches from the inspection surface, we were actually able to resolve the one mill wire, which is the standard requirement for performing an inspection like this at 12 to 15 inches away from the inspection zone.

We also paid very close attention to the lighting and lens angles, and we used drop lighting variable as well as variable power camera lights to be able to get the best lighting available in the area of shadows where they were harmful. And we also used nylon bristle brushes to clean the welds prior to inspecting them. And we used nylon so that we would not scratch the inspection surface and make it too bright so that you'd get reflections and couldn't mask any discontinuities you might find.

And the next phase of the planning process was the development of our inspection plan itself. And I'm not going to go into great lengths on our inspection plan, but I did want to point out a couple of key areas about it. And the first being what are the goals of the shroud inspection program for Commonwealth Edison. The primary goal of the

inspection program was to positively demonstrate the structural integrity of the shroud under all operating and design -- excuse me -- accident conditions. And once this was accomplished -- once our primary goal was achieved and the shroud was qualified, our secondary goal was to gather as much intelligence as we possibly could regarding the condition of the shroud within the time constraints of our outage.

Now to accomplish these goals, the inspection plans for both Dresden Unit 3 and Quad Cities Unit 1 were structured so that the initial inspection sample contained -- consisted of an enhanced visual inspection of all the welds from the H1 through the H7 welds from the OD, and the H3 welds and H4 weld from the ID.

We inspected these welds at various locations0 around the shroud between the jet pumps and at the access hole cover locations. And this initial inspection sample was designed so that after it was done, it could support a structural analysis of the shroud to achieve our goal of qualifying it.

And I guess now I'll share some of the results of our visual inspection with you if I could have the visual inspection table.

It's fairly difficult to see up there. You can see from the table that we had cracking identified in nearly

all of the Welds at Dresden Unit 3, however most of the cracking was very minimal. Only two weld locations did we find anything that we considered significant. And the worst cracking, of course, was identified at the H5 weld at the ring to barrel weld on the upper side of the core support -- core plate support ring. We inspected approximately 40 percent of this weld, which was 100 percent of the accessible areas between the jet pumps, and at all of the areas that we looked at, we found what appeared to be the same circumferential meandering indication in the all the areas examined. And although we couldn't inspect 100 percent because of the obstructions, we could certainly assume that it was 360 degrees around the circumference.

The Quad Cities -- if I could have the Quad Cities table up there. The Quad Cities inspection was very similar to the Dresden results. They did not find indications in the upper welds where we did, but essentially the only significant cracking was at the H3 and H5 welds. And once again, at the H5 weld, they inspected 100 percent of the accessible area and found numerous circumferential indications throughout the ring, and also considered them to be essentially 360 degrees since we could not look at the rest of the welds.

I guess to give everybody a perspective on what the cracking actually looks like to the inspector and how we

followed it around, I have a very short 4 minute video tape of some excerpts from the inspection. If we could play that tape and I'll try to explain exactly what we are looking at as we go through it.

Video sound down, please.

MR. WHITMAN: Now, what we are looking at right now is the area of the H5 weld that's not cleaned. In the lower portion of the screen is the ring material, and the upper portion you can just see where the weld bead starts. And just to give you an idea of some of the differences, also the lighting in this particular area wasn't very good. Just to let you know, even though you're close and you've got good magnification, unless the inspection is performed in the proper lighting, you can't see it.

Now this also is the H5 weld after cleaning, and that's the type of indication that we are looking at throughout it. This is in the ring material in the heat affected zone of the weld above it. To give you some frame of reference on sizes, those machine marks on the ring are approximate -- just under a 16th of an inch in spacing.

MR. WILLIAMS: Apart.

MR. WHITMAN: Right, apart from each other.

Just a moment, it will go on to the H3 weld. These are the indications we are seeing at the H3 weld, much more obvious than those at the H5 weld; however, they had

definite starts and stops to the indications. This is in the -- this indication here is in the shroud cylinder portion of it, not in the ring portion of it -- of the H3 weld. And at the H3 weld we did see significant areas of unflawed material more than sufficient to meet our visual inspection criteria.

MR. ZWOLINSKI: And you have characterized the depth on all these flaws?

MR. WHITMAN: Not -- on the H5 flaw, yes; not on the H3 flaw. The H3 was inspected from both the OD and the ID.

You can cut the tape now.

Okay now, because of the -- because the H5 welds at both Quad and Dresden failed the visual screening criteria, a supplemental UT examination was performed to characterize the flaws. Now this weld has never been examined anywhere in the world, so we had to develop a system capable of going down -- reaching down and interrogating that area. We also had a welded mock-up of the H5-H6 weld configuration made up so that we could qualify and calibrate the system to inspect that weld.

And then additionally since the extent of the indications that the H5 weld location were unexpected, the decision was made to corroborate the visual examination results in additional areas in the shroud where we could

only examine it from one side of the weld where we could only look at it from the OD. And that consisted of the H2 weld, the H6 weld and the H7 weld. Now like the H5 weld, the H6 and 7 weld were never -- had never been examined by ultrasonics anywhere else in the world. So we also had to develop a means of getting down to interrogate those welds. And we also fabricated a block to calibrate and qualify the system at that location.

Now Dresden has completed their shroud UT exams, and Quad Cities right now is currently in the process of performing them. And there is a table in here that gives a summary of the indications and it's on the screen now.

Once again we did find indications in the welds that we examined -- all of the welds, the H2, the H5 and the H7 weld -- the H6 welds found no indications whatsoever. And all indications except for the H5 weld were isolated, they did not appear to be continuous. And the H5 is where we found our largest problem, which is where we expected to find it. We found -- examined approximately 271 inches of the weld, which is all of the accessible area we could get to with the interferences that we had with jet pumps. And of that area that we examined, we found 127 inches of cracking. The deepest area -- this table reflects the deepest flaw depths throughout the length of the examination and it isn't representative of the average flaw depth. The

average flaw depth for H5 was .52 inches. And additionally, I guess I'd like to point out that greater than half of the area examined we did not find any indications -- and it would -- ultrasonic examination, although we did find those indications visually.

Now, the ultrasonic examination used is qualified to detect on that surface, up to a -- anything greater than a .125 inch flaw. So it's reasonable to assume that the remainder of that weld that they did not report indications, and the cracking is no deeper than one eight of an inch.

MR. RUSSELL: I have a question on your table. You indicate that the area scanned was 271 inches, and the flaw length that you identified and that's 127 inches out of the 271 that was scanned?

MR. WHITMAN: That's correct. So the remainder of that length was below the detectable.

MR. RUSSELL: Below the detectability, so it's less than one eighth?

MR. WHITMAN: Yes, that's correct.

MR. RUSSELL: Are you going to discuss the boat samples that you've taken to qualify for the NDE techniques?

MR. WHITMAN: Yes, we are. I was going to -- that was going to be the next thing I was going to talk about.

Aside from the qualification and calibration of the UT system at the H5 weld, the results of the UT system

are also being validated by boat samples. We're taking two -- hopefully we've already got them. We were in the process when we came here of taking two boat samples from the cracked locations in the ring material at the Dresden Station in order to validate these UT results. We intend to -- the purpose of taking those is to develop the ability to detect the depths accurately of the crack. And the results of these samples aren't known yet, but they will be included in our written response to the staff's request for additional information, or as that information becomes available to us, should you request it earlier.

And I guess, once again I'd just like to go over the primary goal of the core shroud inspection project at Dresden station. Our primary goal was to positively demonstrate the structural integrity of the shroud under all operating and accident conditions. And in order to do that, we put together a team of experienced people and used the latest developed technology, both visual and ultrasonic examinations, in order to perform the inspections and gather our information. And what if these latest technologies didn't provide us the information that we as Commonwealth Edison felt that we needed to have, we went out and took a step further and had that technology developed so that we could get the information that we felt that we needed.

And with that, I'd like to turn it over to Tom

Spry, he's going to be talking about the H weld boat sample analysis.

MR. SPRY: I'll give you the current status of the boat sample evaluation program; this is current as of about a half an hour ago.

First of all, we have two objectives in cutting boat samples out of the core plate support ring at both Dresden 3 and Quad 1. The first objective is to do a thorough characterization of the cracking and determine the causes of the cracking and the condition of the base metal.

The second objective is the UT benchmark to determine the degree of accuracy of the UT -- of the tracker UT sizing that we've been doing. We decided to take samples from -- two samples each from the H5 weld areas of Dresden 3 and Quad Unit 1. The samples are located on the outside diameter surface of the core plate support ring just over the access hole covers about 180 degrees apart, and that's this location here.

Our intent in cutting these boat samples is to capture a portion of the H5 weld and the base metal below the H5 weld. The boats samples are -- they leave a cavity approximately two inches deep and they recover a sample approximately an inch and a half deep at its deepest extent. They're about three inches long and two inches high. The samples were cut from the -- from these areas by General

Electric using electrical discharge machining.

Because of the timing with the cutting of the boat samples and performing the tracker UT, only the Dresden 3 samples are going to provide a benchmark of the UT accuracy. And right now the cutting of the second specimen from Dresden 3 is completed and those are -- they're making ready to ship those from Dresden to Argon National Laboratory right now. The two specimens from Quad have been at Argon for a couple of days and we just got started on the actual metallurgical evaluation of those specimens, did the very first cut yesterday from one of the Quad samples. And the only thing that we can say right now based on this very preliminary metallographic look at these things in the unetched condition, they do appear to -- the cracks do appear to be IGSCC.

Right now the schedule for the sizing validation of the Dresden presamples, it looks like we'll get those presamples to Argon sometime this afternoon or tomorrow morning, and I expect to have results of the UT sizing evaluation sometime next week. The complete evaluation of all four samples from a crack depth and metallurgical evaluation standpoint, that will continue for several weeks, but I do expect to have the UT sizing evaluation done sometime next week.

MR. RUSSELL: Do you have a cross section that

would show what the geometry is of the roll plate to the weld for H5 and H6, and what is the character of the plate? It looks like you've got a step down transition in diameter of the shroud barrel at that point.

You can provide it to them, they'll put it on the screen.

Looks like it's almost similar to what you have with the H2 H3, but what I'd like to do is describe the plate versus the barrel, and anything you know about how it was formed; was it torch cut, machined, how are these pieces put together? And some discussion of what might be the cause of the circumferential crack in H5. How much metal -- your figure indicated that you had remaining ligament of greater than two inches with potential cracking of --

MR. WILLIAMS: .84.

MR. RUSSELL: .84, which should indicate you've got three inches thick you've got -- generally the shroud itself only about probably two inches thick, which indicates you've probably got some kind of butt joint and a buildup of weld on the backside. So that's what I'm interested in you describing.

MR. SPRY: This is the configuration we have of the top weld, you can see there, is the H5 weld. It's a single-bevel double V weld with a double weld on the back side. The core plate support ring -- I don't have all the

details on the actual fabrication sequence of this.

MR. RUSSELL: It was basically butt welded to that, so that was not undercut.

MR. SPRY: Yes.

MR. RUSSELL: The crack is actually the heat affected zone from the welding.

MR. SPRY: It appears to be in the heat affected zone and below the heat affected zone in the core plate support ring base material. And so you would have end grain on the far right surface where it says location cracking indications, that's the end grain of the plate. This was cut from plate, it's not a forged ring. I believe there are six --

MR. WILLIAMS: Yes.

MR. SPRY: -- welds that fabricated the core plate support ring. Most of the welding is submerged arc, and so we expect to see cold work on the OD surface of that core plate support ring, although it's too early to say on the specimens we cut.

MR. RUSSELL: But the boat samples are going to look into the potential end grain effects and what the characteristics are in encapsulable base metal above and below the crack.

MR. SPRY: Yes, yes. We have a pretty substantial depth of actual base metal.

MR. RUSSELL: So you said it was a three by two boat sample; the three inches was going around circumferentially?

MR. SPRY: Yes, about an inch and a half. What they would capture with the EDM system that we have is about an inch and a half deep.

MR. RUSSELL: Okay, thank you.

MR. SPRY: That's all I have. Bob Walsh is going to talk about the operability of the assessments now.

MR. WALSH: I'm going to discuss the evaluations that were performed on the running units for Quad Cities and Dresden; Dresden Unit 2 and Quad Cities Unit 2.

The purpose of these evaluations was to determine whether the core shroud could refine performance required safety functions. Joe discussed these functions in his section. To summarize those functions, they are to channel coolant in the reactor, provide a floodable volume to two thirds core height, and provide structural support.

As part of the evaluation, a comparison of operating history was performed to compare critical reactor hours, reactor water chemistry history and hydrogen water chemistry. This comparison was between the running unit and the inspected units.

Based on this comparison, the evaluation was performed assuming that the condition of the running unit

shrouds was the same as the shrouds that were inspected. The preliminary root cause determination is that the cracking was caused by IGSCC, and the preliminary boat sample results have confirmed that.

The core shroud is flaw tolerant. It's made out of 304 stainless steel which has high ductility and high toughness, and there are low stresses on the shroud.

Based on the structural margin assessment that was performed, large flaws can be tolerated. There are large safety margins -- large safety margins are maintained based on the deepest observed flaws and the bounding crack growth rate.

To summarize the results of the evaluation, structural integrity is assured until the end of the operating cycle, and therefore the floodable volume will remain intact, the control rods will insert, and the load support required from the shroud will be provided. With that, I'd like to turn it back over to Joe Williams.

MR. ZWOLINSKI: Excuse me, on your operability assessment, was that for one cycle or for the remaining cycle for the operating units?

MR. WALSH: The remainder of the operating cycle.

MR. ZWOLINSKI: And, did you postulate failure at only H5 or also at H3?

MR. WALSH: H5 was the weld that we were

evaluating, based on the past and the screening criteria at H3.

MR. ZWOLINSKI: In your analysis was there a separation of material? Did the shroud actually fail?

MR. WALSH: In the operability determination part of it, no; but Joe is going to talk about the safety assessment part where we did evaluate that.

MR. ZWOLINSKI: Is there a mechanical interference between the support plate and the outer wall of where the shroud rests itself?

MR. WALSH: I guess I'm not sure what your question is. There is two inches between the shroud and the core plate, so the shroud would not be able to shift more than that two inches.

MR. ZWOLINSKI: That's the point I'm driving at. What's that distance from the base of H5 up to this support plate wall?

MR. WILLIAMS: About 16 inches.

MR. ZWOLINSKI: 16 inches.

MR. WILLIAMS: Okay. I'd like to discuss the results of the safety assessment we have performed for the operating units for the postulated leak failure of the H5 weld. I would characterize these results as preliminary because we are performing a 100 percent technical audit of all the work that was done to achieve this conclusion. We

expect that technical audit to be completed by June 15th.

You'll see in your handout the licensing and design basis loads we considered in our safety assessment. The shroud licensing load combinations from the sites for Dresden and Quad Cities are case 1, normal loads plus the design basis earthquake. Case 2, normal loads plus local loads.

In addition, we considered two load combinations that are in the shroud design basis, recirculation line break plus design basis earthquake concurrently, and main steam line break plus design basis earthquake concurrently. The event frequencies that you see are from the TRAs for both Dresden and Quad Cities.

I would -- overall the results are that the critical safety functions for all these load combinations would be accomplished, and I would like to discuss in a little more detail the results of the assessment for two load combinations. Case 1 is the recirculation line -- suction line break for Quad Cities and Dresden, and 2, for simultaneous main steam line break and design basis earthquake for Quad Cities.

One characteristic that we recognize in the recirc suction line break is that there will be a short duration asymmetric depressurization of the annulus region. Because this is short-term, there will be minimal lateral

displacement of the shroud, we concluded. The normal lifting forces that are present on this shroud because of the steam pressure drop through the steam separator would actually be reduced by the depressurization through the suction line break. And we concluded that with minimal lateral displacement, the two thirds floodable volume would be preserved, core spray function would be maintained, and the standby liquid control and control rod insertion capabilities would not be significantly affected.

MR. RUSSELL: What did you assume for a break opening time to conclude that the asymmetric loads were small? Because that generally is the controlling factor as it relates to asymmetric loading within the core shroud -- or within a BWR for that matter. The critical feature is assumed break opening time, and if you're saying that the loads are small and would not affect it in the relatively short duration, you must have made some assumptions about a relatively slow break opening time. So what kind of -- would you describe what you assumed as far as a break opening time?

MR. WILLIAMS: Yes. Can I ask for some help from the engineering team?

MR. ZWOLINSKI: Stand up and identify your please -- identify yourself, please?

MR. CHOE: My name is Hwang Choe from the General

Electric Company. The analysis that we helped to support of CECO assumed instantaneous to the break of the recirculation line. That therefore there is no time involved in the time for the breaking.

MR. STRONSIDER: Excuse me, one more question. Did the analysis consider potential rotation of the cylinder, or also local deformation of the cylinder in the area where the cracks might be, or did it only consider a translation? I'm interested in what sort of crack opening areas might be calculated at peak loads, and what bypass flow might have been associated with that.

MR. CHOE: Due to the time, the duration of this, the instantaneous opening break of the load, which is approximately 5 milliseconds, the biggest displacement that we have considered was lateral, which is very small, on the order of a few mills. And if there is any nonrotational motion, that has no predominant force to rotate the cylinder. And that therefore we have to consider that depending how rotational, the motion would be bounded by the lateral motion of the cylinder.

MR. ZWOLINSKI: Is that assumption based on mechanical interference or the sheer weight of the shroud itself?

MR. CHOE: This conclusion is based on pure shroud weight, which has not considered any mechanical

interference.

MR. WILLIAMS: I'd like to discuss the results of the concurrent steam line break plus design basis earthquake load combination for Quad Cities station.

Quad Cities is chosen because the loads are higher at Quad Cities than it is the limiting case. This is the largest depressurization rate for any accidents considered, and it is the highest shroud lifting load. During this event the shroud would lift approximately four inches -- there is a typo, the four inches was left out of your handout -- the lateral movement would be limited to less than two inches by the core plate and other mechanical interferences.

The conclusions of our assessment for this load combination are that, again, the control rod insertion would be assured, that reactor shutdown would be achieved, and standby liquid control would not be significantly affected, and the two thirds floodable volume would be maintained by the reactor coolant pressure boundary. In this case, the break is high, the steam lines are above the shroud, and although lateral displacement does occur, the intact coolant pressure boundary still provides a two thirds floodable volume.

Core spray function may be impaired because of the -- as the shroud lifts and shifts laterally, it could impact

the core spray piping and damage it. In particular, shear -- perhaps shear the inner piping out. However, core spray should still inject into the vessel and perform its function, again because the vessel itself provides a floodable volume and gets the water to the tank.

I, at this point, would like to reiterate that the Commonwealth Edison project teams approached a resolution of the core -- integrated core shroud at Dresden and Quad Cities, and have begun begin to identify and implement the best thought answer.

We do consider this a safety issue, but we have -- our objective is to maintain the original design requirements. And to meet those objectives we have been pursuing three resolution options, and are still pursuing those three resolution options with equal priority. Those are option 1, that safe operation can be assured for a limited period of time by inspection, testing and analysis. Option 2, to develop and implement an interim repair for one cycle. And option 3, to implement a permanent comprehensive repair.

I would like to present a short discussion of the repair options that we have developed and identified today. First for the interim repair.

The interim repair concepts we have discussed with about five vendors, and also internally within our teams at

CECO engineering, would require a schedule of 6 to 10 weeks to implement, design, fabricate and install. Those concepts are brackets or clamps at the H5 location; lateral bumpers here and/or here to take loads out to the vessel wall, lateral loads; or finally limited flaw removal by EDM, electrical discharge machining, in some locations on the H5 level. We are still pursuing these interim repair concepts; at this point I would characterize the results as all of them have technical limitations.

We have been discussing with five vendors and also internally, development and concepts for permanent comprehensive repairs. The objective of our comprehensive repair would be to accomplish a repair that takes no credit for all of the welds H1 through H7. The concepts we have identified with the vendors to date are brackets again, sets of brackets at each of the four levels or the welds, 4 to 6 brackets at each level. The brackets, we've concluded, are the longest to install. We have schedules for 12 to 20 weeks to design, fabricate and install these permanent repairs, and the brackets are the longest duration.

We've also identified several other concepts that I would characterize as rod fixes. Rods that run from the top of the shroud to below one rod or two rods in one location and 6 to 12 rods, depending on the approach. Some of the rods have bumper -- rod designs have bumpers that

bring lateral load down to the vessel wall, others have rods that are highly tensioned to basically clamp the shroud together and take credit for friction to carry the lateral loads.

I would now like to turn it over to Mike Lyster to summarize.

MR. ZWOLINSKI: Joe, one question on your safety assessment. Are you postulating that the 16 inch height is essentially the mechanical restriction that allows only a couple of inches of movement of the entire shroud?

MR. WILLIAMS: At the H5 location, yes, John.

MR. ZWOLINSKI: But when you go through your various transients are you not assuming that that base is fixed and only allows so much lateral movement?

MR. WILLIAMS: That the core plate is fixed?

MR. ZWOLINSKI: Right.

MR. WILLIAMS: Yes. It is bolted and welded to the core plate support ring, and the core plate support ring is fixed in place by the H6 weld.

MR. ZWOLINSKI: So for H5 I understand what you're saying. If we were talking about H3, that would no longer be applicable, is that correct?

MR. WILLIAMS: That is correct.

MR. SHERON: Let me ask one more question before you, if I could.

MR. WILLIAMS: Yes, sir.

MR. SHERON: You talk about the consequences, through wall cracking, the H5 weld and so forth. What about other welds that are within the vessel? Have you looked at the consequences? I mean what we've seen is that you're seeing cracking in places where it was not predicted to occur.

MR. WILLIAMS: Yes.

MR. SHERON: Obviously GE still does not predict or expect to see cracking in places where you've seen it. And that leads us to ask the question about, gee, is there cracking elsewhere that it's not expected and there is -- just looking at this diagram here, it's easy to start pointing to where there is other welds, and say what happens if there is cracking there.

MR. WILLIAMS: That's --

MR. SHERON: Have you done that analysis?

MR. WILLIAMS: We have -- with respect to the horizontal welds H1 through H7, we did -- we were concerned about the unexpected condition of the cracking on H5 worse than the cracking seen on H3. And as a result, we used UT to corroborate the visual qualification of the welds, H2, H6 and H7. With respect to the other welds, we intend to work with the owners group to address the condition of the other welds.

MR. SHERON: I'm talking like even down, you know -- I don't know whether this is a support piece or what, but all the way down to the vessel.

MR. WILLIAMS: Yes, it is.

MR. SHERON: I could always ask the question, a crack down there, would it go through cladding? I don't know. But the question is, what assurance do you have that you don't have a problem with cracking elsewhere in some of these other places around the jet pumps and so forth?

MR. WILLIAMS: We are going to work with the owners group to address the condition and inspection techniques for those of us in particular as well as others.

MR. SHERON: But you haven't done any specific safety assessment in terms of consequences of failure because that would lead to an unacceptable condition?

MR. WILLIAMS: No, we have not performed those assessments.

MR. TAYLOR: I think we'd like to know what the results of that are. If you're going to work with GE on that issue we'd like to hear that.

MR. RUSSELL: I think this is going to be discussed with the next group. Mike, why don't you summarize what the condition is as it relates to BWR at Commonwealth, and possibly we could have the owners group.

MR. LYSTER: Let me summarize. Our schedule for

decision making at Dresden 3 is in about two weeks, we'll have sufficient information and evaluation completed to make our decision as to which options will be selected for Dresden 3 and for Quad Cities 1 in three weeks. We have embarked upon a lot of information sharing, both through the nuclear network and the owners group and have had a number of people on site to look at our current status. We are also performing a reactor safety analysis and determining conservatively the adequacy of operation with the selected option. In the long term we want to implement our charter which does regard all vessel internals and probably includes optimum water chemistry to the vessels.

We wish to participate fully in industry efforts and provide -- to provide some leadership in resolution of reactor vessel internals. Our team goals do in fact coincide with those of the owners group, so I think it's a convenient time to turn it over to Carl, Terry and the vice chairman of the owners.

MR. RUSSELL: Let me ask a couple questions though first, as it relates to the Commonwealth Edison units.

Specifically, you don't have a lot of information on growth rate. Any time you go in and you find something for the first time, since you don't have a comparison from prior inspection to the next inspection, how do you propose or what thoughts do you have in mind regarding growth rate

and how long this may have been going on at the H5 location?

MR. SPRY: I'll be talking about that more in detail in the description of the structural margin assessment that we are in process of performing for H5. But to answer that question specifically, we have proposed to use the long-standing and well accepted 5 x 10 to the -5 inches per hour as correct.

MR. RUSSELL: Don't you use the generic IGSCC growth rate?

MR. SPRY: No, it's the bounding conservative breaks that we used in the past, because we really can't say when it might have been issued and, you know it's -- we'd just be taking a guess at that.

MR. RUSSELL: Is there anything unique about the construction techniques that were used that appear to cause this to go circumferential as compared to other locations where you use the same welding techniques, similar materials and you're not observing cracks?

MR. SPRY: No, I don't really think -- here again, without having the results of the boat samples, anything I say is just a preliminary idea. But based on the review that we've performed of the fabrication records, I don't think there is anything unique about it. It's just that it's a relatively thick, highly restrained, high-heat input weld that's not subsequent structurally. So that combined

with the fact that it's normal carbon 304 doesn't come to any surprise that there would be IGSCC at this location with the high residual stresses you have as a result of the welding process.

MR. RUSSELL: It appears that from a configuration standpoint, it almost looks like the experience we had at Dresden only -- not Dresden but Brunswick, only lower. That is, it's a slender gold weld to a plate that has basically an end effect where it was not undercut and full penetration weld of that plate. Have you looked at your stations to see whether you have similar weld configurations, is it similar for all of the stations? You indicated you inspected LaSalle and did you not see this at LaSalle based on the visual examinations done to date.

MR. SPRY: LaSalle is low carbon and much less operating time. Sir?

MR. WILLIAMS: I would like to add that H6 and H2, which we could not look at from both sides, are similar to the Quads cities, which was one of the inputs to our decision that we needed to corroborate the visual qualifications with UT supply.

MR. SPRY: Does LaSalle have forged rings? And we know that LaSalle has low carbon, and at this point I would assume that they've gotten plain cut plate for the actual rings, and -- so that the configuration would be very

similar. It's just, here again, they've been operating for much less time, the carbon content is low, otherwise I would expect it to be very similar.

MR. RUSSELL: Okay, thank you. I agree Mike, let's have the owners group come up and talk.

MR. TERRY: Here for the owners group, I'm Carl Terry representing the executive oversight committee, I'm vice chairman of that committee. Stan LaBruna would have been here except he was unavoidably detained.

But also from the executive oversight committee is Mike Lyster, who was up here previously for Commonwealth Edison, and in the background Roy Anderson is here from CP&L who is on our -- who is the executive representative for CP&L on the owners group.

Also up here to my right is Robin Dyle, who is the chairman of the materials subcommittee that's been heavily involved in this issue for all the internals and other materials issues for BWR for some time. Les England, who is chairman of the BWR owners group committee, overall, and Bob Pinelli, who is vice chairman and will be taking over as chairman of the owners group approximately midyear. Also John Hosmer, of course, is also up here from CECO.

We are here today to kind of give you an overview of what's going on. We do have a more detailed meeting coming up in the latter part of June where we'll really be

getting into this issue much more.

We really do appreciate the opportunity to come down here. We think it's important for NRC management to get more of an idea of what had been going on in terms of the owners group and the activities.

The overall objective today is to give you that summary presentation of that. Frankly, the owners group, I think somewhat like the NRC, certainly the executives, want to get more ahead of this issue than we have been.

I think we would perhaps disagree with some, that some of what we have seen was unexpected. On the other hand, the magnitude of some of the issues has come up is somewhat more than we had expected. In order to focus attention on that, the executive oversight committee, a couple of months ago, had a discussion about the need to heighten our involvement as executives in the reactor internals issues within the owners group. And what we have determined would be appropriate is to -- really somewhat separate from the owners group, although it's the same group of executives -- have an executive discussion of the appropriate actions to take to increase attention on this. That meeting is scheduled for June 10, including involvement by all of the executives as well as EPRI, I believe NEI will also be there, to really see what we can do to expand our involvement in this issue.

We are going to be going through shortly -- both Les and Robin will be talking about it. We do think though, to this point we have been pro-active in this. We want to go through the activities that have been involved going back, really for the past several years. The cracking itself in welds within a number of these internal components isn't a surprise. Although, as I indicated earlier, the recent inspection results do have a higher magnitude of cracking than we had expected, and that has intensified efforts among BWR owners.

There are 10 questions that we are working on that we were provided by the NRC, and we will be discussing those in detail in our upcoming June 28 meeting, although we are well along on a number of them in answering them; we do have drafts. We do want to ensure as part of that meeting that we get input from the BWR owners so we come in with a good perspective on what the entire industry of BWRs is looking at here. We realize that up to now -- particularly from the NRC's perspective -- it's been one plant at a time, and we do want give that broader visibility.

What we have done in terms of providing that response, Robin Dyle is on that full-time handling the answers to those questions and the coordination involved. And of course the executive oversight committee of the owners group has had numerous meetings, discussions,

telecons on the issue, and Les England, our BWR chairman has also been actively involved.

With that I'd like to turn it over to Robin to first give you an overview of what has been going on and Les will give you a perspective of what's coming up in the future.

MR. DYLE: If you would please put up the slide that's labeled past activities. Looking at the agenda there were five items that were shown to be addressed by the owners group in this discussion, and they had to do with the impact of Dresden and Quad Cities results, screening criteria, sample expansion, NDE acceptance criteria.

I guess the way to best answer that is that we are aware of what has happened at Dresden. I have been to the plant, Dresden has shared all their information with the owners group as has Quad, Mr. Lyster has committed to being open in sharing all that information as did Peach Bottom, as did Brunswick in the past. We will factor the lessons learned in, from those plants, as well as those plants that have done inspections and had lesser flaws and no flaws. We plan to have meetings with the ISI individuals to find out what was done to find those flaws, how to characterize them, what's the best way to do the inspections and what we should anticipate.

Based on that, then we would revise, if necessary,

the screening criteria, the acceptance criteria. We would give better direction on what type NDE ought to be used, what would be the minimum qualifications and those things. The sample expansion is one thing to be brought up. In an April meeting from the staff, they saw a lack of that in our owners group document, we recognize that. That will be also something that we will try to share with -- the owners come up with what we think is a proper approach, should you find a flaw, how big of a sample should you then select?

The other thing I would like to draw attention to, just a little bit of history on the reactor vessel related things we've done through the owners group.

Beginning in 1989 there was an internal station repair committee that was formed because of the concerns that we had with the occurrence. There was a recognition that there could be problems that we had not gotten involved with and we decided that was the thing to do. That committee developed inspection prioritizations and some repair development prioritizations over a two-year period. We issued a report in 1991 to the owners, we gave the executives an update with a letter, we submitted the letter to ASME section 11, recommending what type inspections we felt they should consider for adding to the code.

At that time we made a decision, instead of trying to develop repairs that -- with the development cost of $3

to $5 million apiece, and not knowing where the first problems occurred, we embarked on an effort to develop an evaluation criteria by which we could evaluate cracked components and cracked attachments in the vessel. That work is being continued and is slated for completion this year.

Other activities we've dealt with in the interim somewhat is fire drills, or other subjects that came up was reactor vessel integrity, when generic letter 9201 was issued --

To repeat, the activities that we've been involved with, one from generic letter 9201, this group dealt with reactor vessel integrity issues and developed the owners group proposal in response to that. We've worked with access hole cover cracking, we developed the generic evaluation for the radial cracking associated with access hole covers. We've put together the generic response to the upper shelf energy equivalent margins analysis, submitted that and that's been approved by the staff. We had jet pump main failures, we looked at that, we addressed that and we provided the staff with information associated with that.

And then the Brunswick cracking was made aware to us, we became heavily involved in that in trying to support their efforts. And at that point we have concentrated more heavily on internals, and particularly the shroud and the short-term trying to deal with those issues. We provided

this information in January at a materials update meeting where we gave the staff the current standing of where we were, and that is also discussed in April.

One of the things that we are presently doing, as Carl alluded to, is looking at the ten generic questions that were submitted. There is a draft of the safety evaluation for the generic issue that is being sent out to the utilities today to begin their review from an operational standpoint, consideration of emergency procedures, emergency operation guidelines and all of those things to make sure we do the job we need to do, and that is underway.

We've also looked at the current seal recommendations in light of the plants that are down. And the assessment of the owners group in conjunction with GE is that the recommendations for when inspections should start are fairly consistent given the incubation period for IGSCC. So we see no reason to change that immediately that until we have more lessons learned.

And with that, I'll turn it over to Les.

MR. ENGLAND: I just have a couple of additional remarks to add to what's already been said. The overhead that I provided to the projectionist depicts some activities that began pretty much in April as Carl Terry indicated, with our briefing of our executives, our annual executive

meeting. We appreciate the time that you took to come and speak to our executives at that time, and we have been keeping both the executive oversight committee and the executives appraised of events as they've evolved, and will continue to do that.

Of course, we are here at today's meeting to provide our basic overview of where we've been and where we think we are going. As Robin indicated, our efforts are now turning much more toward the -- not only the shroud issues but all the internals issues. And the purpose of our meeting in Atlanta on June 10, is to organize the appropriate industry corrective response and the resource allocation, and determine what the roles are for the industry executives, for the owners group, for EPRI, and for other contractors. So what we envision there is a larger effort focused on getting back ahead of this issue.

As Robin has indicated, when we spoke to you in April, we had talked about our lessons learned meeting, that meeting has been scheduled for the 15th of this month. And on the 28th we'll be back here to provide, in some detail, our review of the ten questions and also follow-up on what the industry response has decided at our meeting of June 10th, will be, and input at that time.

Beyond that, in the future we have another one of our materials update meeting scheduled in the July time

frame -- date to be determined -- where we will go over some of the other ongoing initiatives that we have in addition to the internals, feedwater nozzle inspection, RPC model inspection program. Again, the lessons learned and other ongoing activities that we have. And looking forward in the August time frame of our current plans, that would have us providing our proactive analysis the utilities can use to evaluate postulating crack locations to the extent that that activity might be modified by what happens on June 10.

So that's pretty much where the owners group is right now. We certainly have heard the message that the NRC has provided, and I think our utility executives have also recognized the importance of this issue and I'm confident that we'll be moving on and resolving these issues together.

MR. RUSSELL: Let me identify a couple of things that are going on. First, NRC has been contacting individual utilities that are currently in outages and have plans to restart from outages asking them whether they have inspected. And, if so, what results? And if not, the basis for not inspecting in their conclusions as to why it's acceptable to resume operation without having it inspected.

Clearly, things have changed as a result of the extensiveness of the cracking at Dresden 3. There are other facilities that have more hours of operation than Dresden 3 that have similar configurations. So the issues related to

Dresden 3 have implications for other facilities as well. This is clearly an issue that needs to be addressed in a timely manner. I want to make sure that the owners group is focusing on this issue. While we are dealing with this on a case by case basis, this is one that both the NRC and the industry need to put in context with a generic approach so that we are not continuing to review each one as they occur on a crisis basis.

We need to have a clear understanding of what inspections will be done against what criteria. What are the bases for decisions about repairs. And in particular, what kind of repairs could be considered appropriate. So I think that there is a substantial amount of work on this issue that is one that's going to continue in time. Stress corrosion cracking doesn't stop easily once it's initiated. And while there may be things you can do to slow it down with water chemistry or other approaches, this is an issue that needs to be addressed. So that there is a clear understanding as to what there are on the long-term implications. Clearly how you perform inspections, how you perform repairs have implications for personnel exposure. Those factors need to be considered. We hope that they are included in your program.

What I'd like to do is see if other members of the staff -- one of the reasons of having this meeting was to do

two things. One, to make sure that you're aware that we see this as a sensitive issue. We informed the Commission that we see it as an emerging technical issue that needs to be addressed. We need to provide reports to the commission, probably soon after we have all the information on the Dresden and Quad Cities and there has been time for the staff to review that. So I would expect them to report back to the Commission in sometime early to late July time frame.

MR. ZWOLINSKI: I've heard you characterize this very much as a materials issue. I would argue that there is a corollary or parallelism that evolves where you must be performing safety assessments that are indeed bounding taking worst case conditions. It may be fortuitous for Commonwealth that the H5 level is mechanically restricted. Had that been a higher level I think all of our attention would be much more aggressive to seeking resolution, especially had it been at the H3 level.

MR. RUSSELL: Let's finish one point of discussion first and we'll go to others, okay? I agree that you need to put this in safety context. And absent hard information on the plant specific basis you're going to have to do some bounding evaluations that assume that flaws exist. And with assumed flaws, show that you do not have a safety issue of concern. How do you go about doing that and what guidance you provide is something that the NRC is going to want to

look at very closely to understand how you performed those analyses.

To the extent the owners group can coordinate that activity amongst licensees and we can reach agreement on how such analyses should be done on how you would evaluate actual flaws once found, as compared to postulated flaws it is an important issue. That needs to be put in context and done relatively quickly. And we have a number of questions that relate to that that we've already provided to some, and we may have some more in the course of the next several weeks.

We are interested in meeting up to a meeting, whether it is in late June or early July where you have identified what is the program that you're following, and in fact what is the basis for your conclusions regarding the continued operation of facilities, given that this is an ongoing and continuing problem. I don't think we have time to wait for the ASME code process to catch up and provide guidance, that's an activity which takes on the order of years to complete.

So this is a now issue that needs to be addressed, and it needs to be generically when the owners group, making proposals, and the staff reviewing and evaluating those, decide whether we believe that what you proposed is sufficient. And then we are going to need to know that all

of the owners are in fact in agreement on what that process is. But and owners group, you do not speak for individual licensees. So there is going to be a need for individual licensees to identify whether they are following the owners group proposal or they're taking some alternative approach.

So those are some process types of issues that need to be addressed, and I hope you would address them when you get together in your meeting on the 10th of June, and that you are prepared to provide feedback to us as to whether this is an issue that you have the majority of the owners, or there are some that are going separate path, et cetera.

I also believe it is an important issue for you to share with other utilities, particularly those that are overseas. I know that we've gotten good information from the Swiss, and that's been shared with you. We need to make sure that it is shared back. There are General Electric design boiling water reactors operating overseas that have similar configurations, so I think this issue is one that you need to share with them as well.

We will be sharing our views with our counterparts in the regulatory agencies as well, but it's useful to have both parties provide their own perspective on the issues.

MR. THADANI: I didn't -- I have an observation more than a comment. Where CECO certainly was able to

understand what you have done and where you are going; and I guess the owners group, I would have liked to have heard a little bit more about your perspective on the issue. I didn't really quite hear that, and I guess we have to wait until late June. Those questions to us are very important though you touched on that. But we need to have reasonable assurance that things are okay in the number of questions today, and we'd really like to hear from you as early as you can make it. If its late June, okay. But those are important questions. And I was hoping I'd hear some more today. Well that's the comment.

MR. ENGLAND: Our schedule is to have all that work finished so we can give you full discussion on all ten questions at that time. At this point we appear to be on schedule to meet that. I think the indication that you would have today is going to have to be based upon having the similar work that CECO has done. What we need do is make sure that that work is applicable, no cross of product line, and that just takes a little bit longer to run the different variations of the designs and other factors.

MR. TERRY: I think though we should be very clear on this. We -- the executives as a group agree with the significance of this issue. There was really no reluctance to turn to the need for us to have get together to strengthen our involvement as executives as well as

strengthen the support that we are getting as an industry of this.

Also, as far as the safety issue goes that you brought up, the way we view this is, it is a dynamic situation in terms of the changes as we expect plans and learn things. But as we do this, we do update our own internal justification for continued operation. And certainly, if there is anything that affects that we would advise the other owners. When we discuss and review this issue at the executive oversight committee level, which is really our mechanism internally to more or less screen information that's there and make a determination as to what should be shared with the broader group in terms of the owners group itself. We review those kinds of issues in term of whether or not we have -- specifically whether we have any immediate new safety concerns, or if we really need to take more aggressive action in an area.

So, it is -- as Les indicates, we do want to come and answer and address the questions and reflect on how the larger body of utilities feel about them. I think that is going to take us the time through the end of June. But I don't want in any way to have you leave any impression that every executive on the owners group isn't sensitized to the importance of this and agrees to the important of this.

MR. THADANI: Thank you.

MR. RUSSELL: In fact I would characterize it, I probably arm twisted you a bit to get you to come in at this point in time. I recognize that the work is not completed, but I also want you to make sure that you've heard all the questions and the concerns such that you can come in a with a more complete program and have a more meaningful meeting when you do meet.

There is substantial information from Plant Hatch, their inspection results; Philadelphia Electric, from Beach Bottom. There is the Swiss experience that's been shared already. There is some indication that pulling all that information together collectively will give a much better answer than the approach that we've been on, which is case by case review.

That's really the main emphasis I wanted to provide, is that this does take comprehensive review, and instead of the NRC being the integrator of that information because we are doing it on a case by case review; I want the industry to get involved and come forward with a proposal to put the Staff in a review critiquing industry's proposal, rather than the Staff, with the limited information we have, on generating an approach.

So this is really one where I think the owners collectively need to carry the burden of responding to a number of issues. And it's not just limited to the shroud.

We've had hold down beams, manway cover cracking. A number of other issues, stainless steel in a rather hostile environment of radiation with reasonable levels of oxygen, et cetera, does crack. And so while it's not a surprise that cracking is occurring, the extensiveness of the cracking at this point in time for some facilities is a surprise. And that clearly raises questions about other facilities that have not looked. And that's why we are dealing with them on a case by case basis. What we need to do is put this back into a generic basis.

MR. ENGLAND: These are our plans exactly. We do stress that, and with respect to your comment on sharing our knowledge internationally, our plan is to include worldwide data gathering to be sure that we have the best information available. We have -- we currently have scheduled in the September time frame our annual international conference, and this will be a topic for that group as well.

MR. RUSSELL: Ashok, do you or Brian have other questions? Jack, have we shared all the technical questions we want them to answer at the next meeting.

MR. STRONSIDER: I think they would agree that we gave them a comprehensive list. As we go through the review we may identify other things, but. I wanted to understand the logistics, and this will have to be worked out. We did receive a report on core shroud cracking from the owners

group about three weeks ago. It doesn't reflect some of the most recent information, we all agree to that. And I want to understand if there is going to be an update of that, and will it include the response to the questions. And I make the point that we would like to see that in a time frame because we could complete a review, ideally, to support fall outages. We would like to have some sort of generic criteria, or understanding, in place at least. So we could have more discussions on that, but that's the direction that we need to be thinking about.

MR. DYLE: And I guess the simple way, I guess, we went through that, we answered the ten questions. We have the lessons learned meeting from all the utilities that have done inspections; at the same time have the utilities that are not yet inspected there so they can learn firsthand from people who did these inspections, and then we would update that evaluation, provide it to the staff prior to fall outages and we'll get the utilities. And then as appropriate, after each outage season, update that document until there is no need to do that. So this is a living documents in our mind that many continue to be revised as technically warranted.

MR. RUSSELL: I guess the only other observation I would have is that it may make the meeting more productive if we have something we can review in advance of the meeting

with you. That's why I say the late June early July time frame and we can factor in what it would take you to get a response in, I think would be a much more meaningful meeting if we had an opportunity to review that in advance of the meeting. I think to plan on trying to give us a response prior to -- the week prior to the meeting and staff can review and that would keep the meeting more focused.

MR. ENGLAND: We would be in a better position to respond to that in a week or so.

MR. ZWOLINSKI: The ten questions are broad, but that doesn't abdicate you folks from retaining a questioning attitude throughout, and there may be number 11, 12 and 13 involved as you get on with your work, and reporting on that is equally important. I thinks that's a challenge to you to pursue the issue aggressively.

MR. RUSSELL: We did not discuss how this might be detected operationally. Should we get it to the point we have failure or separation during normal operation, those types of issues we've discussed in prior meetings.

MR. THADANI: It's in the questions.

MR. RUSSELL: It's in the questions.

Bob, were there any other systems questions that we need to identify at this point?

MR. JONES: No.

MR. RUSSELL: Thank you very much for coming in.

[Whereupon, at 12:00 noon, the above-entitled matter was concluded.]

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission
in the matter of:

NAME OF PROCEEDING: Commonwealth Edison Company
Core Shroud Inspection

DOCKET NUMBER:

PLACE OF PROCEEDING: Rockville, MD

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Pamela Utter

Official Reporter
Ann Riley & Associates, Ltd.

AGENDA FOR CECO SHROUD MEETING

1. INTRODUCTION AND PLANT STATUS
2. SHROUD DESCRIPTION - JOE WILLIAMS
3. DRESDEN AND QUAD CITIES INSPECTIONS - JERRY WHITMAN
4. BOAT SAMPLE STATUS - TOM SPRY
5. OPERABILITY ASSESSMENTS - BOB WALSH
6. SAFETY ASSESSMENT - JOE WILLIAMS
7. REPAIR OPTIONS - JOE WILLIAMS
8. SUMMARY - MIKE LYSTER

INTRODUCTION AND PLANT STATUS

- TEAM INTRODUCTION
- PLANT STATUS
  - DRESDEN UNIT 2 - CYCLE 14
  - DRESDEN UNIT 3 - D3R13
  - QUAD CITIES UNIT 1 - Q1R13
  - QUAD CITIES - CYCLE 12
  - LASALLE UNIT 1 - L1R06
  - LASALLE UNIT 2 - CYCLE 6
- INITIAL EVALUATION RESULTS
- STRATEGIC ALTERNATIVES

SHROUD DESCRIPTION

- FUNCTION

  CHANNEL COOLANT CIRCULATION THROUGH REACTOR CORE

  PROVIDE REFLOODABLE VOLUME FOR SAFE SHUTDOWN COOLING

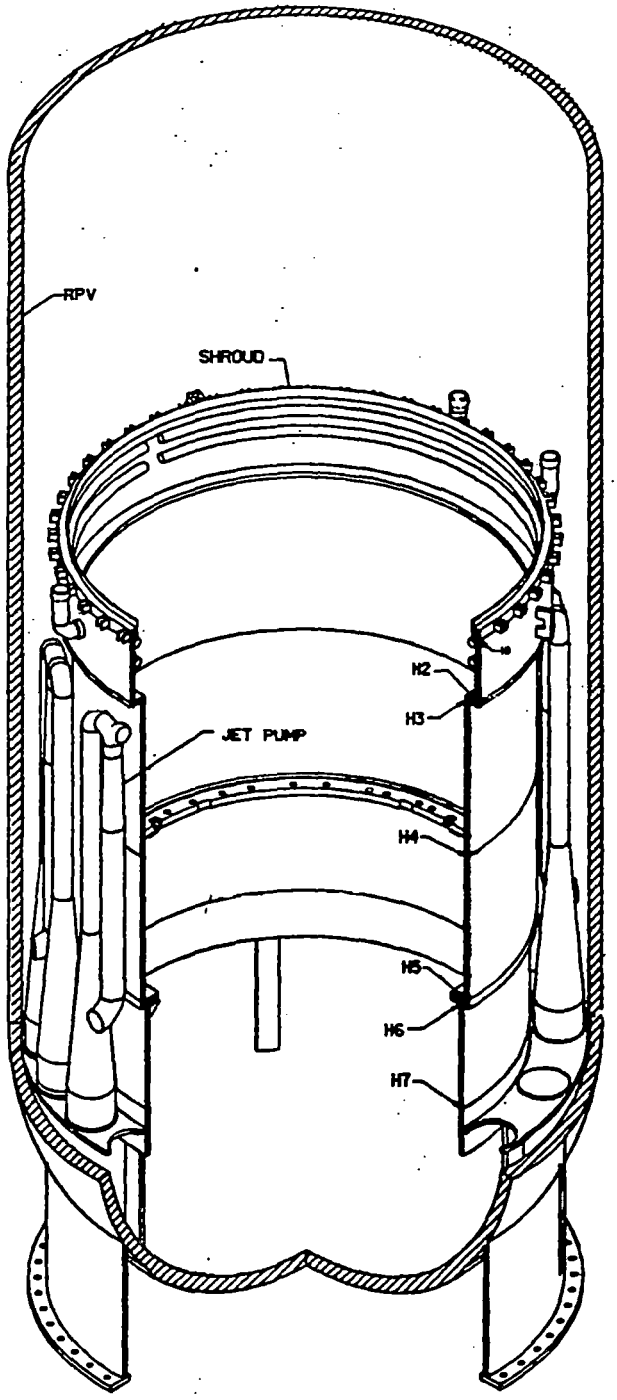
  LATERAL SUPPORT FOR FUEL ASSEMBLIES TO MAINTAIN CONTROL ROD INSERTION GEOMETRY

- GEOMETRY

  20 FEET TALL, 20 FEET DIAMETER

  2 INCHES THICK PLATE WELDED TO SEGMENTED SUPPORT RINGS

DRESDEN UNIT-3 CORE SHROUD



DRESDEN UNIT 3
SHROUD VISUAL INSPECTION STATUS

WELD #	SURFACE	AREA EXAMINED	INSPECTION RESULTS	QUALIFICATION STATUS
H1	O.D.	40° (76")	~4" CIRCUMFERENTIAL IN UPPER HAZ	QUALIFIED VISUALLY
H2	O.D.	39° (75")	< 1" CIRCUMFERENTIAL IN LOWER HAZ	QUALIFIED VISUALLY
H3	O.D.	71° (128")	NO INDICATIONS IDENTIFIED	QUALIFIED VISUALLY
H3	I.D.	235° (428")	133" CIRCUMFERENTIAL IN LOWER HAZ 44" CIRCUMFERENTIAL IN UPPER HAZ ~1" VERTICAL IN UPPER HAZ	QUALIFIED VISUALLY
H4	O.D.	54° (97")	< 2" CIRCUMFERENTIAL IN LOWER HAZ	QUALIFIED VISUALLY
H4	I.D.	124° (224")	< 2" VERTICAL IN LOWER HAZ < 4" VERTICAL UPPER HAZ	QUALIFIED VISUALLY
H5	O.D.	144° (259") 100% OF ACCESSIBLE AREAS	CIRCUMFERENTIAL IN LOWER HAZ FOR 100% OF THE AREA EXAMINED (ASSUMED TO BE ESSENTIALLY 360°).	FAILS SCREENING CRITERIA. ADDITIONAL EVALUATION IN PROGRESS INCLUDING UT.
H6	O.D.	64° (112")	< 1" VERTICAL IN UPPER HAZ	QUALIFIED VISUALLY
H7	O.D.	146° (96")	< 1" CIRCUMFERENTIAL IN UPPER HAZ	QUALIFIED VISUALLY

QUAD CITIES UNIT 1
SHROUD VISUAL INSPECTION STATUS

WELD #	SURFACE	AREA EXAMINED	INSPECTION RESULTS	QUALIFICATION STATUS
H1	O.D.	28° (52")	NO INDICATIONS IDENTIFIED	QUALIFIED VISUALLY PENDING LEVEL III REVIEW
H2	O.D.	28° (52")	NO INDICATIONS IDENTIFIED	QUALIFIED VISUALLY PENDING LEVEL III REVIEW
H3	O.D.	100% (651")	NO INDICATIONS IDENTIFIED	QUALIFIED VISUALLY PENDING LEVEL III REVIEW
H3	I.D.	100% (638")	133" CIRCUMFERENTIAL IN LOWER HAZ 35" CIRCUMFERENTIAL IN UPPER HAZ	QUALIFIED VISUALLY PENDING LEVEL III REVIEW
H4	O.D.	90° (162")	NO INDICATIONS IDENTIFIED	QUALIFIED VISUALLY PENDING LEVEL III REVIEW
H4	I.D.	68° (116")	~1" CIRCUMFERENTIAL IN LOWER HAZ	QUALIFIED VISUALLY PENDING LEVEL III REVIEW
H5	O.D.	155° (268") 100% ACCESSIBLE AREAS	NUMEROUS, RANDOM CIRCUMFERENTIAL AND VERTICAL INDICATIONS IN THE LOWER HAZ	FAILS SCREENING CRITERIA. ADDITIONAL EVALUATION IN PROGRESS INCLUDING UT.
H6	O.D.	134° (231")	~7" CIRCUMFERENTIAL IN UPPER HAZ	QUALIFIED VISUALLY PENDING LEVEL III REVIEW
H7	O.D.	86° (146")	NO INDICATIONS IDENTIFIED	CURRENTLY UNDER EVALUATION

DRESDEN UNIT 3
SHROUD ULTRASONIC EXAMINATION STATUS

WELD #	AREA SCANNED	FLAW LENGTH	FLAW DEPTH	REMAINING LIGAMENT	WELD SIDE	EXAMINATION SUMMARY
H2	278° (533.5")	45 FLAWS 114.7" TOTAL	0.75"	2.25"	LOWER	EXAMINATION COVERED ALL ACCESSIBLE AREAS, OR ~534" (77%) OF THE TOTAL 691" WELD LENGTH
	275° (527.5")	19 FLAWS 63.5" TOTAL	0.71"	1.39"	UPPER	
H5	149.5° (271")	70° (127.5")	0.84"	2.16"	LOWER	EXAMINATION COVERED ALL ACCESSIBLE AREAS, OR ≈ 271" (41.5%) OF THE TOTAL 651" WELD LENGTH.
H6	24° (42")	NO RECORDABLE INDICATIONS				EXAMINATION COVERED 4 ACCESSIBLE AREAS AT THE ACCESS HOLE COVERS, OR ~42" OF THE 650" WELD LENGTH.
H7	24° (42")	2 FLAWS 7.9" TOTAL	0.42"	1.83"	LOWER	EXAMINATION COVERED 4 ACCESSIBLE AREAS AT THE ACCESS HOLE COVERS, OR ~42" OF THE 650" WELD LENGTH.

BOAT SAMPLE EVALUATION STATUS

OBJECTIVES

ROOT CAUSE

UT BENCHMARK

TWO SAMPLES EACH FROM H5 WELD AREAS OF DRESDEN 3 AND QUAD CITIES 1

METALLURGICAL EVALUATION AT ANL

PRELIMINARY RESULTS FROM FIRST QUAD CITIES SAMPLE

CRACKING IS IGSCC

SCHEDULE FOR UT SIZING VALIDATION AND METALLURGICAL EVALUATION

DRESDEN UNIT 2 & QUAD CITIES UNIT 2

OPERABILITY DETERMINATION

- COMPARISON BETWEEN UNITS

  CRITICAL REACTOR HOURS

  REACTOR WATER CHEMISTRY HISTORY

  HYDROGEN WATER CHEMISTRY HISTORY

- ROOT CAUSE

  PRELIMINARY ROOT CAUSE IS IGSCC

  BOAT SAMPLE RESULTS WILL VERIFY THE ROOT CAUSE

- THE CORE SHROUD IS FLAW TOLERANT

  HIGH DUCTILITY

  HIGH TOUGHNESS

  LOW STRESSES

DRESDEN UNIT 2 & QUAD CITIES UNIT 2

OPERABILITY DETERMINATION

- STRUCTURAL INTEGRITY

  LARGE FLAWS CAN BE TOLERATED

  LARGE SAFETY MARGINS ARE MAINTAINED BASED ON DEEPEST OBSERVED FLAWS AND BOUNDING CRACK GROWTH RATE

- DESIGN FUNCTIONS

  THE FLOODABLE VOLUME WILL REMAIN INTACT

  THE CONTROL RODS WILL INSERT

  THE REQUIRED LOAD SUPPORT REQUIRED FROM THE SHROUD WILL BE PROVIDED

SAFETY ASSESSMENT FOR OPERATING UNITS

WITH A POSTULATED COMPLETE FAILURE OF H5

- SHROUD LICENSING LOAD COMBINATIONS (FSAR)

  NORMAL LOADS + DBE - EVENT FREQUENCY OF 5×10^{-5}/YEAR

  NORMAL LOADS + LOCA - EVENT FREQUENCY OF 3.0×10^{-4}/YEAR

- SHROUD DESIGN BASIS INCLUDES

  RECIRCULATION LINE BREAK + DBE - EVENT FREQUENCY 4.1×10^{-11}/YEAR

  MAIN STEAM LINE BREAK + DBE - EVENT FREQUENCY 5.6×10^{-15}/YEAR

ACCIDENT EVENTS CONSIDERED

- RECIRCULATION SUCTION LINE BREAK (QUAD CITIES AND DRESDEN)

  EVENT FREQUENCY OF 3.0 X 10^{-4}/ YEAR

  ASYMETRIC DEPRESSURIZATION OF ANNULUS

  LIFTING FORCES REDUCED BY DEPRESSURIZATION NO SHROUD LIFT

  SHROUD INTEGRITY MAINTAINED MINIMAL LATERAL DISPLACEMENT

  2/3 FLOODABLE VOLUME PRESERVED

  CORE SPRAY FUNCTION MAINTAINED

  STANDBY LIQUID CONTROL INJECTION NOT SIGNIFICANTLY AFFECTED

- SIMULTANEOUS RECIRCULATION LINE BREAK COMBINED WITH A DBE (QUAD CITIES AND DRESDEN)

  EVENT FREQUENCY OF 4.1 X 10^{-4} /YEAR

  SHROUD DOES NOT LIFT

  MINIMAL LATERAL MOTION

  CONTROL ROD INSERTION ASSURED

  STANDBY LIQUID CONTROL INJECTION NOT SIGNIFICANTLY AFFECTED

  CORE SPRAY FUNCTION MAINTAINED

  2/3 FLOODABLE VOLUME MAINTAINED

ACCIDENT EVENTS CONSIDERED

- SIMULTANEOUS MAIN STEAM LINE BREAK COMBINED WITH DBE (QUAD CITIES)

  EVENT FREQUENCY OF 5.6 X 10^{-15}/ YEAR

  LIMITING CASE

  SHROUD LIFTS APPROXIMATELY

  LATERAL MOVEMENT LIMITED TO < 2 INCHES

  CONTROL ROD INSERTION ASSURED

  REACTOR SHUTDOWN ACHIEVED

  STANDBY LIQUID CONTROL NOT SIGNIFICANTLY AFFECTED

  2/3 FLOODABLE VOLUME IS MAINTAINED BY RCPBS

  CORE SPRAY FUNCTION MAY BE IMPAIRED

  2/3 FLOODABLE VOLUME IS MAINTAINED BY RCPB

ACCIDENT EVENTS CONSIDERED

- MAIN STEAM LINE BREAK (INSIDE CONTAINMENT) {QUAD}

  EVENT FREQUENCY OF 4.1 $X10^{-8}$ /YEAR

  LARGEST DEPRESSURIZATION RATE FOR ANY ACCIDENTS

  HIGHEST SHROUD LIFTING LOAD

    SHROUD DOES LIFT A MAXIMUM OF 4 INCHES

    LATERAL DISPLACEMENT < 2 INCHES POSSIBLE

    2/3 FLOODABLE VOLUME MAINTAINED BY REACTOR COOLANT PRESSURE BOUNDARY

    CORE GEOMETRY IS MAINTAINED

  SBLC NOT SIGNIFICANTLY AFFECTED

  CORE SPRAY FUNCTION MAINTAINED

REPAIR OPTIONS

- INTERIM REPAIR - SCHEDULE 6 - 10 WEEKS

  BRACKETS OR CLAMPS

  LATERAL BUMPERS

  LIMITED FLAW REMOVAL BY EDM

  ALL HAVE TECHNICAL LIMITATIONS

- PERMANENT REPAIRS - SCHEDULE 12 - 20 WEEKS

  OBJECTIVE COMPREHENSIVE REPAIR FOR ALL HORIZONTAL WELDS - H1 - H7

  BRACKETS - 6 AT EACH OF 4 LEVELS - LONGEST INSTALLATION TIME

  PRETENSIONED RODS - 6 - 8 ON SHROUD OD, UTILIZE FRICTION TO CARRY SHEAR LOADS

  6 - 12 LIGHTLY TENSIONED RODS WITH LATERAL BUMPERS AT CORE PLATE AND/OR TOP GUIDE

  ROD DESIGNS TYPICALLY INSTALLED FROM SHROUD HEAD FLANGE TO BELOW H7

PAST ACTIVITIES
(RPV RELATED)

1989 • BWROG INTERNALS INSPECTION/REPAIR (IIR) COMMITTEE FORMED

1991 • BWROG IIR COMMITTEE ISSUES REPORT PRIORITIZING INTERNALS SUSCEPTIBILITY

92/93 • ACTIVITIES COMPLETED

- REACTOR VESSEL INTEGRITY - (GL 92-01)ADDRESSED
- ACCESS HOLE COVERS (AHC) EVALUATED
- AHC RADIAL CRACKING RESOLVED
- UPPER SHELF ENERGY ISSUE RESOLVED
- JET PUMP BEAM EVALUATED
- BRUNSWICK SHROUD CRACK ACCELERATES ISSUANCE OF BWROG SHROUD CRACK EVALUATION REPORT

1994 – MATERIALS UPDATE MEETING

FUTURE ACTIVITIES

4/28	BWROG ANNUAL EXECUTIVE MEETING - INDUSTRY DECISION TO SUPPORT PROACTIVE INTERNALS MEETING
5/26	CECO/BWROG/NRC PUBLIC MEETING
6/10	INDUSTRY MEETING AT ATLANTA SCHEDULED
6/15	RECENT PLANT INSPECTIONS LESSONS LEARNED MEETING
6/28	BWROG/NRC MEETING TO ADDRESS GENERIC INTERNALS QUESTIONS & RESULTS OF INDUSTRY MEETING
7/94	BWROG/NRC FOLLOW-UP MEETING ON MATERIALS ISSUES – FW NOZZLE INSPECTION – RPV MODEL INSPECTION PROGRAM – LESSONS LEARNED – RT_{NDT} DATA COMPARISON
8/94	BWROG COMPLETE/SUBMIT PROACTIVE ANALYSES ON INTERNALS SUSCEPTIBLE TO CORROSION CRACKING