Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title:	Advisory Committee on Reactor Safeguards Advanced Boiling Water Reactor Subcommittee
Docket Number:	(n/a)
Location:	Rockville, Maryland
Date:	Wednesday, April 6, 2011

Work Order No.: NRC-818 Pages 1-117

NEAL R. GROSS AND CO., INC.
Court Reporters and Transcribers
1323 Rhode Island Avenue, N.W.
Washington, D.C. 20005
(202) 234-4433

DISCLAIMER

UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, as reported herein, is a record of the discussions recorded at the meeting.

This transcript has not been reviewed, corrected, and edited, and it may contain inaccuracies.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

+ + + + +

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

ADVANCED BOILING WATER REACTOR SUBCOMMITTEE

+ + + + +

WEDNESDAY

APRIL 6, 2011

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:30 a.m., Dr. Said Abdel-Khalik, Chairman, presiding.

SUBCOMMITTEE MEMBERS PRESENT:

SAID ABDEL-KHALIK, Chair

J. SAM ARMIJO

DENNIS C. BLEY

CHARLES H. BROWN, JR.

MICHAEL T. RYAN

WILLIAM J. SHACK

SUBCOMMITTEE MEMBERS PRESENT (CONT'D):

JOHN D. SIEBER

JOHN W. STETKAR

NRC STAFF PRESENT:

MAITRI BANERJEE, Designated Federal Official

GEORGE WUNDER

TIM STEINGASS

TOM TAI

DEVENDER REDDY

DINESH TANEJA

ANGELO STUBBS

GREGORY MAKAR

MARK TONACCI

STACY JOSEPH

DAVID JENG

ALSO PRESENT:

SCOTT HEAD

COLEY CHAPPELL

MICHAEL MURRAY

TOM DALEY

STEVE CASHELL

WARREN ODESS-GILLETT

EDGAR BROWN

CRAIG SWANNER

T-A-B-L-E O-F C-O-N-T-E-N-T-S

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

8:39 a.m.

CHAIR ABDEL-KHALIK: The meeting will now come to order.

This is a meeting of the ABWR Subcommittee of the Advisory Committee on Reactor Safeguards. I'm Said Abdel-Khalik, Chairman of the Subcommittee.

ACRS Members in attendance today are Charlie Brown, Sam Armijo, Dennis Bley, Michael Ryan, John Stetkar and Bill Shack. Ms. Maitri Banerjee is the Designated Federal Official for this meeting.

In today's meeting, we are scheduled to discuss Chapters 10 and 14 of the Safety Evaluation Report related to the COL Application submitted by NINA for two ABWR units at their STP site in Texas. These Chapters were presented to us last year when the SER had open items in it.

In today's meeting, the staff will discuss how they have resolved these open items.

The staff and the Applicant will also discuss some follow-up action items from previous ABWR subcommittee meetings.

The rules for participation in today's meeting were announced in the *Federal Register* on March 23, 2011, for an open/closed meeting. Parts of this meeting may need to be closed to the public to protect information proprietary to the Applicant or other parties. I'm asking the NRC staff and the Applicant to identify the need for closing the meeting before we enter in such discussion and to verify that only people with the required clearance and need-to-know are present.

We have a telephone bridge line for the public and stakeholders to hear the deliberations. This line will not carry any signal from this end during the closed portion of the meeting.

Also, to minimize disturbance, the line will be kept in listen-in-only mode until the end of the meeting when ten minutes are allocated for public comments. At that time, any member of the public attending this meeting in person or through the bridgeline may request to make a statement or provide comments.

As the meeting is being transcribed, I request that participants in this meeting use the microphones located throughout this room when addressing the Subcommittee. Participants should first identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

We will now proceed with the meeting. And

I call on Mr. Mark Tonacci of NRO to begin the presentation.

MR. WUNDER: Good morning, Mr. Chairman and Members of the Committee.

I'd like to thank you for allowing us the opportunity to come to and present the staff's work on Chapters 10 and 14. I look forward to an engaging and positive discussion today.

And that concludes my statement. Thank you.

CHAIR ABDEL-KHALIK: We'll move on to the Applicant. Mr. Head?

MR. HEAD: Good morning. We appreciate the opportunity to brief the ACRS this morning. We're going to start with Chapter 10 on the agenda for today.

We have a couple of items of interest we wanted to share with you and then also discuss some ACRS action items on this Chapter.

With us today and myself are Mike Murray and Tom Daley are also here with me today, and they've briefed the Subcommittee before on other Chapters and other topics. And Coley Chappell and Jim Agles are here also today with us.

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

MR. CHAPPELL: Good morning. My name is Coley Chappell. Good to see you, Mr. Chairman, and Members again.

Just as was mentioned briefly previously, Chapter 10 was discussed last year on June 23rd. We went through a number of departures that resided in Chapter 10 as well as other departures that have consistency changes in Chapter 10, discussed COL information items and site-specific information such as the power cycle heat sink that was required to be completed by Applicant.

Items of interest since that meeting, the resolved RAIs that since that time have been addressed include a couple that are shown here. One is related to a departure -- Standard Departure 10.4-1 -- which had a nonsafety-related clean steam supply, a gland seal steam evaporator, which was not part of the certified design. So we answered a number of detailed questions on that in response to an RAI and resolved that issue.

Now we also revised a previous response to RAI 10.04.07-3. And we revised a Tier I figure -- 2.10-2a -- which shows condensate booster bumps on that Tier I figure for consistency.

Also since last year's meeting, we have

gone through a number of interactions with the staff -- meetings and RAIs and revised RAIs. On this page that we refer to RAIs 10.2-1 through 10.2-8, the latest submittal was on February 21st.

Just to run through a couple of the points, RAI 10.2-3 resolves some differences in specific valve setpoints that were referred to the SRP and the Toshiba design, for example, when the turbine control valves are full closed and when intercept valves are fully closed.

We also added some information into the FSAR regarding the power load and balance anticipatory trip function and how that supplements EHC speed control.

A number of RAIs in which the balance of those discussed the adequacy of the departure referring to the overspeed protection system. So the SDP departure replaced the mechanical overspeed with a redundant electrical overspeed and also included additional details in the FSAR in Subsection 10.2.2.

We also included site-specific ITAAC. And that site-specific ITAAC is part of what addresses Action Item #45. And we'll have a few slides on that.

With that, I'd like to turn it to over to our I&C Manager, Mike Murray.

MR. MURRAY: Good morning. Mike Murray addressing the Committee.

The picture we've got here in front of us will be will be added to the FSAR. It's a simplified diagram of the two overspeed trip functions -- how they're implemented.

We'll take a minute and go through the lower of the primary trip function. And then we'll talk about as we go to the top we'll talk about the diversity between the two.

If you look through -- follow through on the primary which will have a setpoint of nominally 110 percent, there's a speed wheel #2, and there's three passive speed probes. That means they don't have any excitation on them. So they are magnetic and sensed by those circuitries.

In the detection circuitry, there's speed monitors that convert that pulse signal into a comparator signal and then produces a trip signal if the overspeed setpoint is exceeded. And then it goes into a two out of three which is relay logic specifically in this particular circuit. And then with a two out of three function being met, it goes to the trip valves. And if you'll look, there are two different trip valves -- trip pilot valves. It takes both of those in order to initiate a turbine trip. So if you would de-energize one of the pilot valves, you don't get a trip. If you energize -- pardon

MEMBER BROWN: I misunderstood you. Sorry.

MR. MURRAY: -- turbine trip. That's correct.

So it takes both of those as an and gate basically hydrologically that both pilots have to be de-energized to actually adopt the trip header and trip the main turbine. So in it that makes it sink failure criterion acceptable as well as has required redundancy in it.

In the upper box, a lot of the type of methodologies are similar and the same except all of the equipment is diverse from what is used for the primary. The emergency trips at 111 percent setpoint. And this particular one uses a different speed sensor. We use an active probe which means it has a wetting voltage on it to produce the pulses that the speed monitors pick up as well as there's a completely separate speed wheel for those sensors to pick up.

And then it goes into a two out of three logic which is a solid state or basically a PLC-type logic that does the two out of three. It has speed sensors also, converts to signal to the trip signal, and then the two out of three logic which is diverse from what's used in the primary trip function. Then we'll monitor that logic in a two-out-of-three. Again, we'll de-energize a pilot solenoid valve. Again, it takes both of them to be de-energized in order to trip the main turbine.

Any questions on those? Yes, sir?

MEMBER BROWN: John, did you have one?

MEMBER STETKAR: Several. But go on.

MEMBER BROWN: Okay. I just want to make sure after going through this and the clarifications you all added to the RAI. There are three active speed sensors that are also used for the normal speed control?

MR. MURRAY: That is correct.

MEMBER BROWN: Okay. So those are shared sensors. But the normal speed control electronics is separate -- is a separate set of electronics. It's not the same electronics. At least that's what I got out of the RAI.

MR. MURRAY: And that is correct.

MEMBER BROWN: That's correct also.

MR. MURRAY: There's a separate set of electronics and a separate set of power supplies for that set of electronics.

MEMBER BROWN: Okay. And that was a question we had in one of the last meetings as to what are you sharing the electronics and just going to a set of trip functions. Okay. So that's been clarified in there.

MR. MURRAY: Right.

MEMBER BROWN: The next thing, you said those are going to be incorporated into a later revision -- these clarifications -- to a later revision of the COLA?

MR. MURRAY: That is -- those are for information in the RAIs will be incorporated in the next revisions.

MR. CHAPPELL: The next revision is expected later this year.

MEMBER BROWN: Okay. It said future revision and I just wondered what future was -- whether I'd still be alive or not yet when --

(LAUGHTER.)

MEMBER BROWN: Got to have a little humor there.

All right. So that answers my question on that. And I'll ask my other one later when we get to it.

MR. HEAD: Yes, we normally say future in our correspondence because we want to make sure it's acceptable to NRC before we put it in.

MEMBER BROWN: That's fine. Except I think it said part 9? No, that's the ITAAC that goes there.

MR. HEAD: That's the ITAAC. I think we're targeting it for August right now.

MEMBER BROWN: Okay. What part does it go in -- the text part? The description part? Is that part --

MR. CHAPPELL: Section 10.2.

MEMBER BROWN: Okay. I got that. Thank you.

CHAIR ABDEL-KHALIK: John?

MEMBER BROWN: That's all I had, John.

MEMBER STETKAR: Mike, the two trip valves, are they the same?

MR. MURRAY: Are the two trip valves the same? Yes. They're in one manifold device which is called an emergency trip device. They are the same.

MEMBER STETKAR: Show me a drawing of that, please.

MR. MURRAY: I don't have it with me.

MEMBER STETKAR: If you have one --

because I've been trying to figure out how -- I mean, I know how it works. But I'd like to see the Rube Goldberg electromechanical device that actually ports the hydraulic fluid. That could be a single device.

I'd originally thought it was a single device. With these cartoons, you convinced me that it was two different valves -- or two valves.

MR. MURRAY: Two valves within the device. Right.

MEMBER STETKAR: If the two valves are identical. So they are not diverse.

MR. MURRAY: That's correct.

MEMBER BROWN: There are two sets, aren't there?

MEMBER STETKAR: Can he answer the question?

MEMBER BROWN: Yes, I'm sorry. Trying to make you understand that --

MEMBER STETKAR: I'm trying to understand how it works too. So --

MR. MURRAY: Yes. There are not diverse. In fact we pointed that out I think in our responses that that was the only portion that was not diverse.

MEMBER STETKAR: So they could be subject to common-cause failure?

MR. MURRAY: Yes.

MEMBER STETKAR: Yes. Thank you. Yes.

You mentioned that the normal speed channels, if two of the three speed signals fail, you get a turbine trip.

MR. MURRAY: What I mentioned was if they exceed setpoint. But also in the information we provided, yes, if you have one failure, you do not get a turbine trip. You go to a two out of -- or you reduce the logic -- go two out of three. But a second failure of a speed probe will provide a trip.

MEMBER STETKAR: I'm trying to understand the definition of the term failure. A statement is made, the failure of any two of these speed sensors will result in a turbine trip. Does that mean if any two of the three speed sensors fail with speed zero, you will get a turbine trip?

MR. MURRAY: It senses the -- I want to make sure that my understanding is that it senses the failure mechanisms of the sensors as well as the speed monitors. And if there's a failure detected in the way it's monitored that it will provide a trip signal of that channel. And if it takes two of them, that'll be two -- if you have two failures, you get two.

MEMBER STETKAR: Let me try to -- I

understand failure modes.

MR. MURRAY: Right.

MEMBER STETKAR: If any two of those speed sensors detect speed at greater than -- this is the emergency trip -- 111 percent, you will get a trip signal. I understand that.

Now what I'm trying to understand because a lot of emphasis is made about how safe this is and if fail-safe, the statement is made that furthermore if any two of those three sensors fail, you'll also get a turbine trip. Now does that mean if the output signal -- I'm going to walk you down an aisle here so be careful.

MR. MURRAY: Yes.

MEMBER STETKAR: If any two of those speed signals go to zero, will you get a turbine trip?

MR. MURRAY: I don't have that information to answer.

MEMBER STETKAR: I'd like to know that.

MR. MURRAY: Okay.

MEMBER STETKAR: Now those are categorized as passive speed probes which means what? Do those speed-sensing circuits have any applied voltage to them at all?

MR. MURRAY: They sense the magnetic

change -- pulse of magnetic which makes energy. And that particular one monitors it.

MEMBER STETKAR: Okay. So --

MR. MURRAY: On the active, there's a wetting power supply.

MEMBER STETKAR: No, I just want to talk about the passive ones.

MR. MURRAY: Yes. And that is that it's basically a coil that monitors the change in magnetism.

MEMBER STETKAR: Okay. So you just pick up the change in the pulses on that. So they're not powered. Then maybe I'm not so interested in that failure mode.

The active ones for the normal primary trip do have an applied voltage.

MR. MURRAY: That's correct.

MEMBER STETKAR: What speed signal occurs if that voltage goes to zero?

MR. MURRAY: I can't confirm that. I know what I would expect, but I would just be telling you what I'd expect.

MEMBER STETKAR: Yes, right. I'd like to know what it does because I'm trying to do a little failure modes and effects analysis here, and I have some equations I'm going to ask about later.

I think that's all that I had for this.

If you do have some drawing that shows the internals of the emergency trip device and how the hydraulic ports are configured, those tend to be kind of interesting things. I don't know how interesting --

MR. CHAPPELL: We have a copy with us that we can show.

MEMBER STETKAR: Great. And I think that's all I have on this part. Thanks.

CHAIR ABDEL-KHALIK: So the follow-up item here is you want to understand what the word fail means?

MEMBER STETKAR: I want to understand what the word fail means in the context of the emergency trip sensors that are also the normal control, because there's a lot -- in the SER at least -- there are statements saying that this is diverse, it's redundant, and furthermore, if any two of these three sensors fail, you will get a turbine trip.

CHAIR ABDEL-KHALIK: Right.

MEMBER STETKAR: And that's apparently --

MR. HEAD: Yes, we understand. I got three of them. Failure of the detector.

MEMBER STETKAR: Failure of the detector, the wetting --

MR. HEAD: And if the wetting fails, which I think would almost be the same thing.

MEMBER STETKAR: I'm not going to guess in the configuration of --

MR. HEAD: And the internals, can we show that in a break?

CHAIR ABDEL-KHALIK: Yes.

MEMBER STETKAR: Sure. Certainly. Absolutely.

MR. HEAD: All right. And the other two, like I said, I believe we know the answer but we want to confirm that. And we'll do that after a break.

CHAIR ABDEL-KHALIK: All right. Thank you.

MR. HEAD: Okay.

MR. MURRAY: Any other questions on this slide?

(No audible response.)

MR. MURRAY: Next slide, please.

So additionally we've added two ITAAC to the site-specific area. And they both are related to the circuitry we just discussed, one being the trip signals -- the electrical overspeed protection functions. They're isolated and independent.

The acceptance criteria is there that we do confirm that the two electrical overspeed protection functions are diverse hardware as well as software firmware. And they are isolated and independent from each other. So there is ITAAC added specifically for that.

Any questions on this slide?

(No audible response.)

MR. MURRAY: Next slide, please.

The second ITAAC we've added has to do with the emergency overspeed protection functions and the normal controls which is Mr. Brown asked questions about just now.

The emergency overspeed acceptance criteria here is that the emergency overspeed protection functions are implemented with trip controllers that are separate from the normal speed controllers. And that's to confirm the separation from normal speed trip.

Any questions on this slide?

(No audible response.)

MR. MURRAY: Okay. I'll turn it back over to Mr. Chappell.

MR. CHAPPELL: All right. A number of

action items remain to be closed related to Chapter 10. I have these listed up here.

The first one that we've been discussing is on the previous slides regarding the overspeed protection systems. We're also going to address the action item that regards the main turbine missile analysis maintenance program. Also the strike and damage probability value of 10^{-2}, and the turbine rotor departure that was a basis of an audit.

This is a summary of the previous slides. I think we've captured the additional questions. And if there is no further discussion on this, we'll address those additional questions a little bit later.

Action Item #42 discusses the missile analysis and maintenance program. So we briefly touched on this in the Chapter 3 presentation back in October. And this provides this commitment -- 3.5-1 -- that addresses an Applicant requirement out of the DCD that a maintenance program will be submitted three years after receipt of the combined license that demonstrates the turbine missile generation and maintenance meets the minimum requirements for the missile probabilities.

As part of our responses to the Chapter 10, we provided reports that were not intended to satisfy this commitment but only to show some of the information that Toshiba has from Japanese plants. And these reports are referenced on this slide and have been made available.

MEMBER STETKAR: Coley, when do you want us to ask questions about these reports?

MR. CHAPPELL: My point would be on the last bullet is that those reports were provided ahead of time. We had had discussions about those with ACRS about when would they be available. The commitment is three years after receiving a license is when we would provide reports that would be intended to satisfy that commitment.

MEMBER STETKAR: Okay.

MR. CHAPPELL: So those reports --

MEMBER STETKAR: So you're basically telling us you don't want to have us ask questions about the analyses and those particular reports?

MR. CHAPPELL: I would suggest that if you have comments and questions that we would take those and ensure that they're fully addressed at a later date. I mean, this is something that would be provided with those reports to satisfy the commitment.

MEMBER SHACK: You may want to look at Section -- I didn't read the whole report -- but if you look at Section 4.4.2 on crack growth rates, equation 4.9 for the stress corrosion crack model has no applied stress in it which is rather unusual because one would think that would be the dominant parameter.

It then tells you that the table of data is fatigue crack growth data which is probably unusual because again you're talking about stress corrosion crack growth rates.

And there's a sign wrong in the logarithmic deviations in the table.

MEMBER STETKAR: Yes, the way those numbers are applied, they systematically --

MEMBER SHACK: But the one that concerns me most is equation 4.9 which doesn't have any applied stress in it which would be most unusual for a stress corrosion crack growth curve.

MR. HEAD: Okay.

MEMBER STETKAR: I'll pick up on the second report -- the turbine valve test frequency report.

I don't know. In the interest of time and the fact that you're actually not going to submit the turbine missile analysis for another number of years, I don't know how much worth it is to go into details about that particular for the Committee.

I'm going to give you a few highlights.

Number one, it does not quantify at all the likelihood of failure of the overspeed protection system itself -- period. So it only quantifies failures of the main turbine stop valves -- high-pressure turbine stop valves, high-pressure turbine control valves, intercept stop valves and intercept control valves. That's the only thing it looks at.

The equations for the basic failure of those valves are correct.

The numbers that are used in the analysis -- and I will emphasis the word numbers rather than data although the word data is pervasive. The numbers that are used in the analysis are quite misleading. They're derived from the operating experience of ten units in Japan of which ten units have had precisely one failure of one valve controller. And there is a lot of questionable statistics that are used to derive failure rates out to five significant figures from this evidence and -- is it six? I'm sorry. I only printed out five.

MEMBER BLEY: Some think seven.

MEMBER STETKAR: I'm sorry. Dennis is right. It's exceedingly large numbers of digits with things like mean failure rates of zero. And Dr. Power noted yesterday that I made the statement that zero is an exceedingly small number. I'll make the same statement today. The mean failure rate is not zero.

There are methods -- Bayesian analysis methods that can be used to look at evidence from operating facilities and look at the plant-to-plant variability in that evidence and treat it with appropriate uncertainty. Those methods are not used.

The estimated frequency of loss of the load is -- I don't want to use the word derived because that would imply too much actual relevant work -- is based on numbers from those same ten Japanese units. So it's not at all clear to me what the operating experience of ten units in Japan has to do with loss of load for the South Texas Project. So I'd be interested in making sure that your analysis looks at a plant-specific evaluation for the frequency of loss of load from all sources -- loss of off-site power, control system failures, switchyard failures, transformer failures -- anything that could cause a loss of load and that you just don't derive a number from those Japanese plants.

By the way, that number -- I don't know how it was derived. There was one event at one plant.

I can't figure out how the X number of significant figures of frequency that's calculated was derived. I think I know how it is. But I couldn't reproduce it. And then that number is magically multiplied by a factor of ten to be conservative.

So effectively, it uses a made-up number after many, many gymnastics to say, give you the impression it's derived from beta. It's not. It's a made-up number. You should have a better number for that for your plant.

And the other part of the equation is that the analysis uses the so-called stand-by failure rate model which is a linear model for incipient component failures that is directly proportional to the time between tests. That model is used without justification. It's used without any sensitivity analyses.

There are in fact two components -- two contributors to a complement failure. That is an incipient contributor that may indeed be proportional to the time between tests and something that people tend to call a shock failure -- something that is just simply because of a demand.

The degree or optimism or conservatism in this stand-by failure rate model depends on the actual proportions of those incipient failures to shock failures. And the stand-by failure rate model can give you conservative results, or it can give you optimistic results depending on the fraction of those two types of failure mechanisms and the test interval. It's not always conservative. It's not always optimistic.

But without some sort of reasonable sensitivity analysis to look at the sensitivity of that fraction of incipient failures versus shock failures over the range of test intervals that you're looking at, you really don't know whether the numbers that you're calculating are numerically conservative, or they could be numerically optimistic. There's no sense of that in there.

And I think that's probably enough. There are a lot more details.

So in summary, the major points are that you need to quantify failures of the trip functions themselves including everything that was on the drawing that you showed before and accounting for example for common-cause failures of the two trip valves which are not diverse. They may be the weak link in the whole system and they're not quantified at all.

If you're going to rely strictly on the valve data from those ten Japanese units, you need to correctly account for the variability in that data and uncertainties in the estimates of the failure rates. You need to provide some justification that the use of that stand-by failure rate model with the assumption that the failure rate is linearly proportional to the time between tests, that that assumption -- the results are not sensitive to that assumption or at least over the range of the proposed test intervals if you're looking at one to six months, for example. Or you need to do a plant-specific analysis for the frequency of load-rejection events.

Now, that's on the basic equation. What is not quantified is it is assumed that there's a precisely zero conditional probability of any rotor failures at design over speed or intermediate overspeed conditions. The analysis looks at three overspeed conditions: design overspeed, intermediate overspeed and destructive overspeed. It's assumed based on the results -- I think -- of the report that Bill looked at that the conditional probability of rotor failure at design and intermediate overspeed is effectively zero. It's not quantified.

The argument is made that the frequency of demands for those particular overspeed conditions times the conditional probability of rotor failure given that demand is negligibly small compared to the frequency of destructive overspeed conditions for which rotor failure is assumed.

I did a little calculation, and using the numbers that are in that report, the conditional probability of rotor failure at the design overspeed condition would need to be less than 2 x 10^{-4} for demand for that contribution to be less than ten percent of the destructive overspeed.

Now it's not clear to me because I'm not a fracture mechanics guy whether you can justify a 2 x 10^{-4} conditional failure probability at design overspeed. At intermediate overspeed, I can buy that argument. The conditional probability of failure in intermediate overspeed would only have to be less than about .25 to justify that negligibly small.

But the design overspeed condition, if you just use the numbers that are in that report and run them through, conditional failure probability would have to be less than 2 x 10^{-4} per design overspeed event which in this context is an overspeed somewhere between 110 and 120 percent. Effectively the way your trip systems work, somewhere around 110 percent since your trip setpoints are 110 or 111. But the way it's cast in the study, it's between 110 and 120. So look at that assumption of very low conditional probability of failure at design overspeed in particular if the rest of the numbers apply.

And now I'm done.

CHAIR ABDEL-KHALIK: Well, I'm trying to understand the basic question of the purpose of these two reports.

MEMBER STETKAR: Well, the reason I wanted to ask is they said that they're going to re-do the whole analysis. Now, if they're not going to use those reports at all, it's sort of worthless to discuss the reports. If they're going to use those reports verbatim and apply them, there are a lot of problems in those reports. And I think that's the message.

MR. HEAD: Well, clearly we were attempting to react to some of the questions that you all had asked.

CHAIR ABDEL-KHALIK: Right.

MR. HEAD: And we're asking ourselves the same question. In the context of the actual COLA process and the action item, are these reports of any value or appropriate at this point in time because they're not going to be used to close out -- as written, they're not going to be used to close out this commitment.

They do exist. We appreciate the comments that we received. My thinking at this point -- if I could just offer a -- is that we will capture in our Corrective Action Program that we've received some insightful comments on what's been created and that we need to address that as part of the closing-out process. And that would ensure that both our notes and the transcript is reviewed and we would understand our particular perspective on that because that's something that I think we owe it to ourselves to understand as we close this action.

What I suggest offering is --

MEMBER STETKAR: I think my concern is that we as a Committee will not be involved in the eventual close-out of this because it's a post-COLA issue. And my concern is more to get on the record cautions both for you in terms of doing the calculation -- the final calculation of record and for the staff that we really need to look at details of those calculations and understand where the numbers came from when they review that eventual calculation of record or audit it, I guess, because it's an audit function. So it's mostly to get kind of these concerns on the record.

It is surprising though that the two reports that you cite were dated September of 2010. Quite honestly, Scott, these are the kinds of analyses I saw people doing in the early 1980s when they didn't know how to do the liability analyses very well. They aren't the kind of analyses that should have been done in September of 2010.

That's a very strong statement, but they're not.

MR. HEAD: Okay. I understand.

MEMBER STETKAR: They're not very good quality analyses.

CHAIR ABDEL-KHALIK: Now the question I need to follow-up on the earlier question about the purpose of these two reports. How will that feedback impact your response to Action Item 42?

MR. HEAD: We are suggesting it's closed. We're suggesting that the actual report -- the work has to happen post-COL per the DCD expectation.

Admittedly, creating these reports has given us now a question at this point in time. But I believe since we're not offering these as for closure that where we really are is that having created them, having gotten the feedback -- and I understand the strong feedback on them -- that we're obligated to factor that into our thinking. And we have a process -- a Corrective Action Program -- that would allow us to ensure that that's captured.

We could even capture a reference in one of these or something so that it's there to make sure that this insight is considered as we actually create the final reports.

CHAIR ABDEL-KHALIK: Well, we'll sort of deliberate later on as to --

MEMBER STETKAR: We can deliberate on it. It's my opinion that with this exchange we've pretty much said all that we can say within the purview of our review function because the analysis is not being performed as part of the COL activity or submitted for review. So anything that's post-COLA is pretty much out of our hands.

CHAIR ABDEL-KHALIK: I need to sort of just work through the thought process of the purpose of these letters and the feedback that has been provided. And your planned response through the Corrective Action Program is that -- what is the purpose of this whole process?

MR. HEAD: Like I say, at this point in

time, it's not totally clear. But obviously it exists. And that's our proposal for reacting to the feedback we got because it would be inappropriate to obviously not to react to it.

MR. CHAPPELL: The initial question was this commitment that's three years --

CHAIR ABDEL-KHALIK: Right.

MR. CHAPPELL: -- from the COL --

CHAIR ABDEL-KHALIK: Right.

MR. CHAPPELL: -- won't be anything available. That's the concern.

CHAIR ABDEL-KHALIK: Right.

MR. CHAPPELL: And we reacted by trying to put something together in the time frame. At the time, we had six weeks or so to put something together for Chapter 10 and presentation to try to wrap things in. And so it was provided to try to attempt to give information to ACRS.

CHAIR ABDEL-KHALIK: Right. We are appreciative of that. I'm just trying to sort of see how these pieces fit together.

MR. STEINGASS: I have a comment on the process.

CHAIR ABDEL-KHALIK: Yes, sir?

MR. STEINGASS: Can you hear me? I'm Tim

Steingass with the staff.

Just to give you a little background, the turbine missile probability analysis originally was put in as a departure to submit one year prior to fuel load. We asked STP to revise that to three years after the COL license is granted. And that's consistent with all the other design centers. Okay?

We received the turbine missile probability analysis in a preliminary format. And we are not scheduled and we are not inclined to deal with a preliminary report. We informed South Texas verbally that that's our position at this time and that they have three years to submit the turbine missile probability analysis. So what we expect will happen is Mr. Head and his people will take your comments under consideration and revise it appropriately. And I'm here and heard your comments. And I can assure you we will within three years of these folks getting their license take all these factors under consideration.

So this is not a done deal. Okay?

CHAIR ABDEL-KHALIK: Yes. But the underlying reason for my concern is that these are recognized as reports that for lack of a better word are irrelevant to the question at hand. Maybe irrelevant is a strong word. And yet, the comments that were provided may be in essence incomplete given the nature of these reports.

So you will address these comments in your final report that will be submitted at the time it's scheduled to be submitted. But has it really received the appropriate level of evaluation and review?

MR. HEAD: Well, there's a specific comment that we have. But then there's the overall impression that this is not a 2011-vintage report. And I think that will color the entire creation of the final reports and our review that these were created as discussed rather quickly and they are not the final report.

So I think if all we do is go through and check off the individual comments and don't look at the bigger picture, that's not what we would expect of the staff at that point in time.

CHAIR ABDEL-KHALIK: Okay. All right. Thank you.

Yes, sir?

MEMBER BROWN: I wanted to backtrack to something a little bit less expansive on a comment you made. And I hadn't quite realized it when asked the question before.

You made a comment and it's in your RAI in the context, it says -- it's talking about the normal speed control units. And these are the active sensors. And John addressed what's a failure. But it says if you lose any two of the speed sensors -- the active sensors -- then you will initiate a turbine trip.

Whatever the mode of failure, we haven't got that defined as to what defines a failure, et cetera. And in my previous reading, I kind of felt that applied to the primary diverse system also. But then I went back and looked through and I could not find that in the RAI response, anything that addresses the passive sensors such that if two of them fail -- whatever the mode either -- there's no output or the output goes bananas or whatever the thing is that stays in one place -- couldn't find any reference to if you lost sensing on the primary system that you would get a turbine trip. So am I wrong?

MR. MURRAY: It does. It has the same function -- loss of sensor. And again, I can't answer the failure --

MEMBER BROWN: I'm not trying to deal --

MR. MURRAY: And I too looked for that yesterday and saw that we didn't specifically state that for the primary that it has the same sensing of failures and it's still two failures of the speed-sensing circuits would cause the turbine trip.

MEMBER BROWN: Okay. I guess I would like to ensure that that at least gets documented because it's conspicuously absent right now.

The other thing you mentioned in the context of the answer to John a minute ago was the way I interpret this, if you're operating it 100 percent rated speed and your just fine and all of a sudden your signals go away on two on them, it'll trip. It has nothing to do with whether you get a signal that goes above a trip function. If you appended one short, little stubby sentence that says when you exceed the trip. And I just wanted to make sure I understood it. It has nothing to do with the trip. If you lose the sensor and whatever that failure mode is, you get a trip.

MR. MURRAY: When a sensor is lost, it provides a trip signal. So if you lose two sensors, you get two trip signals.

MEMBER BROWN: Regardless of whatever the speed it's operated?

MR. MURRAY: That's right.

MEMBER BROWN: Okay. So I guess I'd be

satisfied somehow if we could get the write-up -- the description part specifically address the primary as well as the normal active speed sensors.

MR. MURRAY: And the loss of speed sensors.

MEMBER BROWN: Yes. And the loss of speed sensor discussion. And I think that's in 10.2.2.4, the turbine overspeed protection system. It's a description.

If it's somewhere else, I did not find it. I read through the rest of them while the other discussion was going on.

Have you got that Maitri?

MS. BANERJEE: Yes.

MEMBER BROWN: It's not a technical issue. It's just a matter of documenting the configuration.

MS. BANERJEE: Address both primary and normal speed sensors.

MEMBER BROWN: Well, the normal's addressed. We've got to throw in the primary overspeed trip sensor failure.

MR. CHAPPELL: And we need to explain in greater detail what the effect of the failure of those --

MEMBER BROWN: What that means.

MR. CHAPPELL: -- on the primary overspeed system.

MEMBER BROWN: Well, yes. That's what did you mean by failure. That's the question.

MR. CHAPPELL: The loss of the speed signals, what would be the result.

MEMBER BROWN: Yes. For the primary. And it's covered.

MR. CHAPPELL: Right.

MEMBER BROWN: There's a bunch of different subjects addressed in about five sentences -- switches from normal speed control to the loss of the sensors to the trip on the timer. It just kind of rolls right through them.

CHAIR ABDEL-KHALIK: Okay. It's captured then?

MR. CHAPPELL: Yes, sir. I believe so.

CHAIR ABDEL-KHALIK: Thank you. All right.

MR. CHAPPELL: All right. Moving on to the next action item. This talks about the strike and damage probabilities.

So we have discussed where this number came from -- 10^{-2}. It comes from SRP. And we quoted that in our FSAR in addressing the COL item. It talks about an unfavorable orientation for turbine generators so we choose a value of 10^{-2} for P2 x P3.

I wanted to point out a couple of items from SRP Section 3513 which was followed for this COL item that the calculations or orders of magnitude and that those calculations require a large number of dysfunctions and are fairly difficult. And so the staff accepts the value of 10^{-2} per the SRP for an unfavorably oriented turbine. That is the value we've selected.

In the SRP, they describe a range based on a number of factors as 10^{-3} to 10^{-2} for those probabilities. And then they say they accept the 10^{-2} value.

So going on to the next slide, the basis for this unfavorable orientation is from our dual-unit departure where we have since we have a single unit based on the orientation of the turbine as a favorable orientation to itself but an unfavorable orientation to the adjoining unit. So we say we use the unfavorable criteria of 10^{-2} for that.

In our previous discussions, we came away with the understanding that we should do a simple look at the geometry of it -- of the arrangement between the adjoining units and determine if that is a reasonable number. So we looked at the low-trajectory path of the single turbine acting on the adjacent turbine as well as the distances between the safety-related structures and the height of the buildings and did a simple horizontal plane/vertical plane cross section. And we came up with using a number of broad assumptions, no trajectories, straight path, taking into account no obstructions and using the entire building as the target rather than specific components. We came up with the value for the strike probability of approximately .007. And that is --

CHAIR ABDEL-KHALIK: This is just a solid-angle fraction?

MR. CHAPPELL: Just a straight angle looking at a square building and assuming no obstructions. So just any area -- surface area above grade.

And so that number we think is consistent with the 10^{-2} value of P2 x P3 and shows that that's reasonable for the orientation of the dual units and the gross geometry of the turbine generators for those structures.

Any other questions on this action item?

MEMBER STETKAR: I would assume that you will fold that into your eventual turbine missile analysis. But I don't want to assume anything. I would hope that you would fold it into it just to make it a plant-specific analysis.

MR. CHAPPELL: Right. Certainly the value of 10^{-2} --

MEMBER STETKAR: This is a confidence-builder.

MR. CHAPPELL: Okay.

MEMBER STETKAR: This is a confidence-builder.

MR. CHAPPELL: Okay. And the last item for discussion is addressing a departure -- STP Departure 10.2-2 dealing with the main turbine. This is the FATT and Charpy V-notch values.

This Departure was the subject of one of the departures that was a subject of an audit that was conducted in 2009. And the conclusion that the STP 3 and 4 COLA in a Departures report was is that this is a no-prior approval. We did the analysis according Section VIII.B.5 of Appendix A, Part 52. And this process was the subject of the audit.

Now on the next slide I have a summary of an engineering document that was reviewed in this audit specific to this Departure. And we have brought that documentation with us.

But just to summarize these items, the low-pressure rotor design is a forged monobloc design. And this is a not so recent industry development to improve those components.

And the lower stresses are associated with an alloy steel ASTM code that's used in the fabrication. It has greater corrosion resistance. And again, it's an approach consistent with industry practices.

And then there are reports that show that the rotor design and material properties -- and this is somewhat tied back to the previous discussion -- is that the overspeed conditions based on this design are improved resistance to overspeed conditions or overspeed conditions that would cause a missile generation.

And that's an outline of that report. So as I said, we do have that available that you can look through.

MEMBER ARMIJO: I'd certainly like to do that because the thing that got to me was the fracture toughness of this forged monobloc is quite a bit lower than that of the conventional -- the old rotors. And I didn't know whether it was because of the materials that you chose or because of the size and the complexity and the fabrication procedures to do the integral large forging.

And fundamentally, I just think if you can you should achieve the highest fracture toughness in this materials because ultimately if there's anything deficient in an analysis or an environment, that fracture toughness is your protection against serious accident.

So the question I had was why can't you achieve the fracture toughness properties that were achievable in the past.

MR. DALEY: This is Tom Daley. I'm mechanical engineering supervisor for STP 3 and 4.

You alluded to it in your question in that these forgings are huge.

MEMBER ARMIJO: I know that. Yes.

MR. DALEY: Ingots are 500 tons. I'm only aware that the only place where they can fabricate this is in Japan Steelworks.

So because the size of these ingots, you'll get differing material properties throughout the size. And you can see from our application that the wheel area -- the outside areas -- we do meet the fracture toughness and FAT temperatures that are indicated in the SRP. But when you get to the inner portion of the rotor is where we've got the lower fracture toughness and the --

MEMBER ARMIJO: Is it because you can't prove that the properties deep inside this forging are as good? Or is it because are the fracture toughness properties --

MR. DALEY: Well, you can prove it because they used the counter-bore for these forgings because at the center --

MEMBER ARMIJO: You could take out a sample.

MR. DALEY: Yes. They have the sample. But because of the process that was previously used, you had to get rid of that material because you didn't know where it was at. But for example, our rotors are not going to be center-bored because the processes have improved so that you have a better appreciation for what those materials are.

So again, you do know what the materials are. And material differences are because of the size of the rotor that you're dealing with.

MEMBER ARMIJO: Okay. So you may have much better fracture toughness properties than you're advertising here. You just can't prove it.

MR. DALEY: Yes. We're actually saying

that -- I think in our application we said that the FAT would be a -40 --

MEMBER ARMIJO: +40.

MR. DALEY: -- 40 degrees. We can meet the ASTM standard which is 30 degrees. We're confident we can do that.

MEMBER BLEY: Isn't the advantage you don't have the same crack initiation.

MEMBER ARMIJO: Yes.

MEMBER BLEY: It's a big deal.

MEMBER ARMIJO: It's a superior design.

MEMBER BLEY: So far I'm not aware of any of these having --

MEMBER ARMIJO: No. Believe me, I think the monobloc technology is the right way to go. I'm just wondering why you couldn't have both the design advantage as well as -- and maintain the fracture toughness that we used to have. And my --

MR. DALEY: As I mentioned, in the wheel area, we are achieving that level of fracture toughness. It's just that the inner portion of the ingot -- the inner rotor area -- we don't get the same.

MEMBER ARMIJO: So the time temperature, cooling --

MR. DALEY: That's correct.

MEMBER ARMIJO: -- all of that stuff is --

MR. DALEY: That's correct. And really I think with the monobloc design, no key way, no shrunk-on disks, it is an improvement. And with the material we're using, it does offer better corrosion resistance. And that's where we've seen the problems is on the stress prototype and so on.

MEMBER ARMIJO: Okay. If you have your documentation, I'd just like to take a look at it.

MR. HEAD: Well, Mr. Chairman, it is proprietary. But we're more than willing just to have a break-out briefing if --

CHAIR ABDEL-KHALIK: I think that would be worthwhile.

MEMBER ARMIJO: Yes, it's educational for me. Because I think I understand what's going on. But --

MR. DALEY: I can show you pictorially what we're talking about.

MEMBER ARMIJO: Okay.

CHAIR ABDEL-KHALIK: So tell me if you would, what would the 40 degree F and 45 foot-pounds values pertain to versus the 0 degree F and 60 foot-pounds specified in the SRD criteria?

MR. DALEY: Well, if you get your ingot and you're going to machine the wheel portions out, if you looked at the material furthermost out in the wheel area, the 0 and 60 foot-pounds would be that material. The material at the center of the rotor would have the lower --

CHAIR ABDEL-KHALIK: But nowhere in your application would you say that anywhere in this rotor would you meet the 0 degree and 60 foot-pound criteria.

MR. DALEY: I think we do say it.

CHAIR ABDEL-KHALIK: You do?

MR. DALEY: Yes. I think in the latest revision of the FSAR, we actually say the wheel. And it's a little confusing because you say there's no really wheel any more.

CHAIR ABDEL-KHALIK: Right.

MR. DALEY: It's the wheel area. And we say that that does exhibit the 60 foot-pounds and the 0 degree. We say the rotor, which again it's all one integral part --

CHAIR ABDEL-KHALIK: Right.

MEMBER SHACK: The rotor area.

MR. DALEY: -- area has the lower material properties.

CHAIR ABDEL-KHALIK: Okay. So --

MR. DALEY: And I do have a picture that shows that a little bit more clearly.

CHAIR ABDEL-KHALIK: Yes.

MEMBER ARMIJO: Maybe in a break-out, we'll take a look at that.

MR. DALEY: All right. Thanks.

MR. HEAD: Then the acceptable way of --

MEMBER ARMIJO: What?

MR. HEAD: -- we'll do that in a break-out?

CHAIR ABDEL-KHALIK: Sure.

MEMBER ARMIJO: Sure. I'll be available.

MR. HEAD: Okay. Coley?

MR. CHAPPELL: In summary, COL items, we have address those. Certainly we've had some discussion on at least a couple of those.

We have responded to all of the items, and we included in our interests the discussion here just some of the ones that are wrapped up are reviews.

Open items, results of that are that the items were closed or confirmatory. We have a number of changes as were alluded that will be included in the FSAR and in other parts of the COLA in the upcoming revision later this year.

The action items, we've gone through all these actions items. I think we have a number of follow-ups to several of those. So we'll capture those and address those a little bit later.

CHAIR ABDEL-KHALIK: Okay. Are there any additional questions to the Applicant on Chapter 10?

(No audible response.)

CHAIR ABDEL-KHALIK: Okay. All right. Thank you.

MR. HEAD: Thank you.

CHAIR ABDEL-KHALIK: We'll move on to the staff's presentation on Chapter 10.

MR. TAI: Good morning. My name is Tom Tai. I'm the PM for Chapter 10.

When I came before you in June for Chapter 10 Phase 2, we had a couple of open items. One of them is on the overspeed system and the other one is on the con safety water system -- Departure to cause effect, Tier I.

And I have with me Angelo who will talk about the condensate water system, and Devender next to Angelo and Dinesh to talk overspeed. And we also have a couple of actions that we want to close out with the ACRS today.

This is the team that we have. And Tim

Steingass is our component lead reviewer reviewer. And he'll be joining us when the subject comes up on the temperature issues.

These are open items and actions. And I'll pass onto Devender and Dinesh to talk about these.

MR. REDDY: Good morning, Chairman Dr. Said and Members of the Committee.

My name is Devender Reddy. I'm from the Balance of Plant Branch, in that Office. And I'm the lead reviewer for the turbine system, not the turbine rotor. And here we are going to present how to close this open item that we had from our previous ACRS meeting last year in the month of June.

As you know, South Texas had a plant-specific departure from standard design of ABWR. And we had an open item during the meeting last time -- a staff meeting we had in June. Also we had additional comments from this submitting last year. Particularly regarding the operational insights from NUREG-1275 Volume 12.

So basically the staff focused on the redundancy and the diversity factors of the control system, overspeed control systems. And also, we focused on the subsystem which is from the turbine trip lock to the fluid laser wire. And the second part actually came from your Committee through the comments.

Do you want to go to the next slide?

As you all know that South Texas in the primary mechanical, they substituted with other electrical overspeed system. And the staff's concern was with the redundancy and the diversity of this primary electrical system.

And also the concern was actually how the nominal speed, primary speed and the emergency electrical overspeed, all three of them are electricals and how they satisifed the design GDC criteria to achieve the redundancy of the diversity factors.

Next slide, please.

So as a result of the concern, the staff issued a series of RAIs. We received the RAI responses along with the FSAR mark-up which STP submitted. And based on the RAI responses as well as the FSAR mark-up, we performed the evaluation and then the findings that we saw in the responses were -- next slide, please -- as you already discussed with Applicant, speed sensors, hardware software, firmware, tripalogic signals -- next -- cabinets, these are overspeed systems predicated on the primary and the emergency are located in the same cabinet because that question came from your Committee last time.

Also the power sources, do they have the redundant power sources? And also when you compare the nominal overspeed and the individual speed, control systems from the nominal emergency, are they isolated and independent a feature tha this is the SRP criteria.

And in conclusion, we evaluated all these factors and determined that they satisfied NRC regulations -- particularly GDC-4 and the SRP guidance in Section 10.2. And we determined that we resolved the issue and we concluded that this open item is closed unless you have further comments.

And if you have any questions, address to Dinesh, you know, he's from I&C.

MR. TANEJA: Good morning. John, your question earlier about the failure mode. The way, you know, we understood the design. It's a classic TMR architecture, the triple modular architecture. And we had a meeting with the Applicant in February. And this was a presentation of their meeting to us back then when we were trying to understand the design.

In the classic TMR architecture, they have everything triplicated in that one. So the typical architecture really relies on using three inputs and then having three processing modules. And they use a median select of a concept where a median select signal is used by all three of the controllers to make a determination of what the median speed is. And then they compare it to the setpoints.

MEMBER STETKAR: That's for the normal control, for example.

MR. TANEJA: Then and a similar concept is used for the overspeed protection.

MEMBER STETKAR: That's not the way I read it. The way I read it is the median select is used for the normal speed control. It's a pretty standard turbine control logic.

MR. TANEJA: Right.

MEMBER STETKAR: It was not my understanding that there was any voting regarding quality of the speed signal for the protection, that it was strictly a two out of three.

MR. TANEJA: Let me show this figure. Maybe this might show --

CHAIR ABDEL-KHALIK: I'm not sure this is an appropriate way to conduct our business. If you have a slide to show, leave a copy of it and show it on the screen.

MR. TANEJA: Okay. All right.

MEMBER STETKAR: I think, Dinesh, my questions to the Applicant kind of get to the point of what happens if a speed signal -- two out of three speed signals go to zero speed is basically what I was looking for.

MR. TANEJA: Okay. Well, like I said, our understanding was that this was a TMR architecture. So they can clarify that one.

MEMBER STETKAR: It certainly is for the control part of it.

MR. TANEJA: Yes. And the overspeed part..

MEMBER BROWN: I agree with John.

MEMBER STETKAR: Not clear to me on that.

MEMBER BROWN: The way I read the RAI and the other information, it is a sensor, a sensor and a sensor and a controller, a controller and a controller. It's two out of three trips, and bang --

MEMBER STETKAR: Because three speed signals often treat them differently over the control part --

MEMBER BROWN: As opposed to a tree control mode. Obviously for the control mode, you have to do something with three signals and determine what you're going to do with them.

MR. REDDY: All three speed sensors -- Charlie? All three speed sensors go into all three of the controllers. Okay. They have three controllers.

MEMBER BROWN: On the overspeed as well as the normal --

MR. REDDY: All of them.

MEMBER STETKAR: Primary.

MR. REDDY: Okay. Let's talk about primary overspeed. Right?

In the primary overspeed, there are three passive pickups. So all three sensor signals go to three separate controllers. Okay? All three inputs go to each -- it's not like one and the one controller. Each controller receives three inputs from each. Okay? That input is used as a median select to determine what your operating speed is and compare to the setpoints and generates a trip signal, right?

Then there is a two out of three --

MEMBER STETKAR: Dinesh, can I stop you there?

Mike, is that true -- by the primary overspeed trip?

MR. MURRAY: This is Mike Murray. I need to look at the diagram again that Dinesh is looking at before I answer that.

MEMBER BROWN: He used the term control again also. And that's why I say just look at the primary overspeed trip system, not the control --

MR. TANEJA: I am talking about the primary overspeed.

This is what -- when we investigated it, this was my understanding. And I'm just explaining how I understood their design to be. Maybe I'm not --

MR. MURRAY: I would like for us to take a look at the diagram again and then --

CHAIR ABDEL-KHALIK: So why don't we just let the Applicant clarify --

MEMBER STETKAR: Because I'm certainly getting a much different impression from the statements that are being made this morning compared to what I read in the RAI responses. I thought I understood the way it worked. And apparently I don't.

CHAIR ABDEL-KHALIK: We have a follow-up action item for the Applicant to clarify this point. And rather than sort of trying to add further confusion to the issue, maybe we ought to wait until they respond.

MEMBER STETKAR: One just simple thing, and this is nontechnical and it's part of the theme of one should be technically accurate in one's reports. There is a sentence that I will read verbatim, but I will give you the reference first. It's in Section 10.2.4 of the SER which is a long section. It's under STP Departure 10.2-3. That sentence in the SER says, "The normal speed control unit utilizes three speed signals, and the loss of any one signal initiates a turbine trip via the emergency trip system."

I think we're all agreed that that's not true. So in the sense of technical accuracy in the SER, you ought to at least get the logic right.

MR. REDDY: What page?

MEMBER STETKAR: It's actually page number from my copy of the -- I gave you the reference. It's 10-10, I believe -- 10-10. It's Section 10.2.4 under the STP Departure 10.2-3. It was in the previous version of the SER, but I don't make editorial comments. I figured you'd catch that in the final one. But apparently not.

MR. TANEJA: We picked that up, I believe. I remember catching that error.

MEMBER STETKAR: Not in the version of what was construed as final that we had since received.

MR. TANEJA: Right. Thank you. We'll make sure that --

CHAIR ABDEL-KHALIK: Okay. Please continue.

MR. REDDY: Well, unless you have any questions, I think about the turbine system presentation --

CHAIR ABDEL-KHALIK: We may come back to you after we hear from the Applicant.

MR. REDDY: Sure.

CHAIR ABDEL-KHALIK: Thank you.

MR. REDDY: And actually I consider this printing of the clarification from Applicant and follow-up on this issue what was discussed. I consider this open item as closed.

CHAIR ABDEL-KHALIK: Let's just wait to hear. Thank you.

MR. TAI: Let's move onto the next open item on the condensate feedwater system.

MR. STUBBS: Okay. Good morning. My name is Angelo Stubbs. I'm with the Balance of Plant Branch, and I performed review for the condensate feedwater system.

When the Chapter 10 SER with open items

was issued last year, we identified one open item in Section 10.4.7. That open item was associated with a Tier 2 Departure that was taken in the COL application that altered the condensate feedwater system.

Basically what it did was it departed from what was in the DCD and changed the system arrangement as the number of some components when they added a traditional feedwater pump so that they could have one on standby. I think there's some feedwater drainpump changes. But they also changed it by fitting the system with a condensate booster pump so that they could operate portions of the system at lower pressure.

In reviewing that change, we looked at the Tier 1 information, and there appeared to be an inconsistency between the Tier 2 information and the Tier 1 information which they had incorporated from the DCD by reference.

The first slide here pretty much summarizes what the issue was when we came and talked to you last time at the ACRS meeting. And basically like I just said, we had a Tier 2 change that changed system configuration, and the Tier 1 information still reflected the DCD information which didn't incorporate condensate feedwater system that utilizes a booster pump. So the open item was for them to resolve that discrepancy between Tier 1 and Tier 2.

In resolution, they provided us with a revision to one of our earlier RAIs. And in that revision what they did was they revised the figure that the design description pointed to -- or the ITAAC pointed to design description figure to confirm that the system in the ITAAC was the system that we were approving in the design. And they updated that figure, and now the figure shows the condensate pump -- the relative location of the condensate pump. And it includes the condensate, moves the pump into Tier 1 figure.

So based on that, we reviewed that. We looked at the Tier 2 information and with the revised RAI response, we now feel like this issue is resolved and the open item can be closed.

CHAIR ABDEL-KHALIK: Okay.

MR. STUBBS: So any questions?

(No audible response.)

CHAIR ABDEL-KHALIK: Please proceed.

MR. TAI: We are on the action item 43 and ACRS asked the material. And Tim Steingass of CIB will address this.

MR. STEINGASS: Good morning, Mr.

Chairman, ACRS Committee.

My name is Tim Steingass. I'm the technical reviewer for this departure.

Under STP Departure 10.2-2, the Applicant selected a monobloc turbine rotor design from the original design, of course, which is shrunk-on discs. And the Departure lists values of 40 and 45 -- 40 degrees up and 45 foot-pounds for a fractured appearnce transition temperature and Charpy V-notch energy at the minimum operating temperature respectively which are different from the SRP acceptance criteria.

Next slide, please.

MEMBER ARMIJO: Tim, maybe this could clarify the thing for me. Are the SRP criteria the minimum properties of the forging? Or are they the average properties, or what?

MR. STEINGASS: Okay. The values are established at the outer periphery -- period -- minimum out of periphery, whereas these folks submitted their values from the center of the forging.

Next slide.

Because this is a Tier 2 departure, we went to South Texas to take a look at how these folks determined that they did not need to submit this departure for our approval. I was a member of the audit team. And we performed an audit there. And I've got to say Texas is probably the flattest place on earth.

But other than that, we reviewed their validation package and determined that the Tier 2 change proposed by the Applicant does not meet any of the criteria identified in Part 52, Appendix A, Section VIII.B.5 that would result in them notifying us of this change and asking for our approval. So the safety evaluation was written not to evaluate the departure but to evaluate our actions and our compliance and their compliance with the regulations.

However, just because they don't have to submit it to us for assessment, we assessed it anyway. And the reason for that is we really don't care what the regulations say when it has to do with a safety-significant issue. If it has to do with a safety-significant issue, we will make an issue out of it.

So in looking at this issue, the pure matter of fact is that this is low level. It's not a safety-related issue. This is an inherently good choice. It's a conservative choice. It's a good design.

And also if Mr. Armijo, I invite you to

look at -- in break-out session, I have a really slick report here from EPRI that was generated back in 1988 that shows that the fractured toughness values -- the FAT values -- from the center of these large monobloc forgings correlate quite well and favorably with the outer periphery fracture appearance transition temperature and Charpy V-notch temperatures.

MEMBER ARMIJO: Well, my question is do you have the best properties where you need them -- say at the surface -- and that you measure them in a place where you don't need them -- let's say in the center of a forging where time, temperature, cooling rates, all that sort of stuff -- can affect the properties. And I hate to see us lose fracture toughness when we've just gained by the use of a superior design -- the monobloc design. So it's like you're spinning your wheels.

But my feeling was that you actually were under-reporting or not claiming fracture toughness that you probably do have at the surface where you need it. But I didn't understand that. So I wanted to make sure that I did.

MR. STEINGASS: All right. I understand your concern. But way back then, the concern by the people that manufactured shrunk-on rotors say whoa --

MEMBER ARMIJO: I used to work for one of those guys. So I understand.

(LAUGHTER.)

MR. STEINGASS: Well, at Susquehanna, we had a shrunk-down rotor too. And we had one go.

The concern was that the center was the area that displayed the least favorable properties. So from South Texas' perspective, if they're reporting where the least favorable properties are and the values are still significantly below room temperature so that when you start up the turbine there's not any brittle fracture, it's a good thing. So from our perspective, that was an issue that made this a low-threshold item.

Finally, it's not a safety-related component. And the Applicant still has to -- regardless of what their fracture appearance transition temperature and Charpy V-notch values are, they still have to meet the turbine missile probability calculations because the two are technically intertwined.

Next slide.

So in conclusion, we consider it a monobloc design and apparently superior. The Applicant complies with the regulations. It's not a safety-related component. It's not a safety-significant issue. And our safety evaluation reflects exactly what we did and what they did with respect to this issue.

CHAIR ABDEL-KHALIK: Earlier you said that the 0 degree F and 60 foot-pounds criteria pertain to the outer periphery. Is that explicitly specified in the SRP?

MR. STEINGASS: Greg?

MR. MAKAR: This is Greg Makar also from Component Integrity.

I don't have the direct answer to your question in my head. The SRP when it was written was written when there were only the shrunk-on wheels, and there were no values from the center line. So that was the place to get the samples.

So whether or not it says that directly in the SRP, I'm sorry I don't know at this moment. But that's where those values come from. Those were the only available ones on the outside.

CHAIR ABDEL-KHALIK: Okay. Do you think the SRP should be modified to explicitly state where these values are obtained?

MR. STEINGASS: It would make things simpler, and we are in a process of looking at a lot of our SRPs. So this was definitely one of the candidates for that. Yes, sir.

MEMBER ARMIJO: Yes. As technology changes, the SRP should adjust.

MR. STEINGASS: Absolutely.

CHAIR ABDEL-KHALIK: All right. Thank you.

MR. STEINGASS: Thank you.

MR. TONACCI: Mr. Chairman?

CHAIR ABDEL-KHALIK: Yes, sir?

MR. TONACCI: If I could engage on one comment that was made earlier, I just can't leave it lie.

I think the statement was said we don't care what the regulation says. If there's a safety concern --

CHAIR ABDEL-KHALIK: Well, we took it in jest. I do know that we do care.

MR. TONACCI: I -- the regulation, but in fact Tim is doing his job to ensure himself of safety and the rest of the regulations required.

CHAIR ABDEL-KHALIK: Yes, sir. Thank you.

MR. STEINGASS: It's still on the record.

(LAUGHTER.)

MR. TAI: The last Action Item is 45 and

I think all our reviewers left. But this is the one that Denish referred to back in February and we met on the overspeed sensors that NINA proposed to add an ITAAC. And we'll leave that as a confirmed item in the RAI.

And that concludes our presentation.

CHAIR ABDEL-KHALIK: Thank you. Are there any additional questions for the staff on Chapter 10?

(No audible response.)

CHAIR ABDEL-KHALIK: Okay. Thank you.

Are you ready to make any additional presentation or should you wait until later?

MR. HEAD: They're still deliberating.

CHAIR ABDEL-KHALIK: All right. Okay.

Well, at this time, we'll take a 15-minute break. We will reconvene at 10:15.

(Whereupon, at 9:58 a.m., off the record until 10:16 a.m.)

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

At this time we'll go to Chapter 14. And the Applicant will present.

MR. HEAD: Thank you. We are here today to present Chapter 14.

Our agenda is a standard agenda. And we

have presented this chapter in some detail before and are with us today.

Don Bailey who was with us before and Steve Cashell and Coley Chappell. All of us have briefed the ACRS before.

So Steve, I'm going to go ahead and turn it over to you.

MR. CASHELL: There's an overview for Chapter 14 as we went through the last time. Chapter 14 consists of a lot of standard and all the site-specific test descriptions. ITAAC is part of Chapter 14, but it's actually addressed in each of the individual FSAR chapters. All the COL information items have been addressed, and they included testing requirements and when we would provide certain information -- test procedures and the like -- and then also the creation of the start-up administrative manual. And the start-up administrative manual actually contained the bulk of the COL license information items.

And finally we discussed this substantial ABWR start-up experience that Toshiba has and the start-up experience we have and the relationship between the two -- what we've done with Units 1 and 2 and how we'll integrate all this experience.

Here's just a quick chart of what Toshiba has done for three recent plants. Toshiba was the lead on two of the plants and then participated in the others.

Some items of interest that we have, we had a revision to the site-specific reactor service water and ultimate heat sink ITAAC. We received RAIs from Chapter 14 and from Chapter 9. We responded differently to these RAIs. And the long and short of it is we inappropriately referenced two figures that we shouldn't have done. We should have stayed with Tier 1. And the ITAAC were a little ambiguous.

And the ITAAC implied that there were alarms for ultimate heat sink temperature and level on the remote shutdown panel. And there are no such alarms. So what we did, we submitted a response to both RAIs that cleared up on both Chapters 14 and 9. And we clarified the tables in Part 9 ITAAC to describe what we did have there and what we were going to test.

And finally the other item of interest is the flow-induced vibration. When we met the last time, that was considered an open item and it was going to remain open in this chapter until it was closed. It's all going to be addressed now in Chapter

3. So it doesn't hold this chapter up anymore.

And that's all I had for Chapter 14.

CHAIR ABDEL-KHALIK: Any comments on Chapter 14?

MEMBER STETKAR: Yes, I had one question. I'll ask you and perhaps the staff also.

The staff asked a question about how the start-up administrative manual captures structures, systems and components that are not safety-related but important to safety because the initial test program should cover those items also. And the response points to examples of systems and equipment that are typically included in the reliability assurance program. But the examples emphasize only fire protection system, environmental qualification of electrical equipment, alternate rod injection system for ATWS and nonsafe purelated station black-out sources. And those are explicit criteria that the regulations make you look at. It does not make any mention of structured systems and components that might be on the reliability assurance program list solely because of results from the PRA or the expert panels that evaluate those items.

And I guess my question was how do we have assurance that those items that are important to safety identified solely because of the PRA or the expert panel evaluations are also folded into the initial test program because I didn't see any mention or any implication from the response to the RAI or the staff's conclusion on that response that would give me that assurance.

MR. CASHELL: I don't have any off-hand response.

MEMBER STETKAR: The response was -- I'm not sure I read the complete response because I read the staff's summary of the response. And it does say examples, but the examples are clearly within the constraints of those issues that fire protection black-out and ATWS basically that are delineated as things you absolutely have to look at.

MR. CASHELL: And I'm sure this is going to be driven by the PRA into the program.

MEMBER STETKAR: I'd just like to see some assurance that that loop is going to be closed because the population of those non-safety systems important to safety could be influenced pretty strongly. We've had discussions about the reliability assurance program. And I'm not going to re-open that whole discussion. I just was looking for assurance that indeed the feedback from those PRA or expert panel evaluations generated issues with feedback into that program and it wouldn't be lost.

MR. HEAD: Yes, we understand your question. And I don't see the answer in front of us right now. So we'll take this as a follow-up item that we'll get back either today or maybe we have to actually add the clarification.

MEMBER STETKAR: Yes. I don't whether it's just words or whether there's other issues let's say going on.

CHAIR ABDEL-KHALIK: Now will the staff discuss open item 14.03.02.09 related to the diesel generator fuel oil storage vaults?

MS. JOSEPH: We don't have a specific slide on that. The staff is here who formed that review if you have any specific questions on that. We briefly discussed it I believe at the whole committee meeting. But they are here if there are specific questions.

CHAIR ABDEL-KHALIK: Okay. We'll see. Thank you.

All right. Any additional questions to the Applicant on Chapter 14?

(No audible response.)

CHAIR ABDEL-KHALIK: Thank you. Are you

going to go to the follow-up items or do you want to wait until the staff presents their Chapter 14?

MR. HEAD: I think we have a follow-up item and then discuss some of the stuff from earlier this morning. We would do that during the next session.

CHAIR ABDEL-KHALIK: That's fine. So we'll move on to the staff's presentation of Chapter 14.

MEMBER STETKAR: By the way, Said, while the staff is getting set up here, I did want to -- but in my ranting, I forgot. I did want to compliment the staff on their RAI follow-ups on the turbine systems. I thought the RAIs were really good. They looked for common failures that we'd asked. And I thought they did a really good job on that. And I didn't have the opportunity to do it because I was too busy ranting about other things. But I wanted to make sure that's on the record.

CHAIR ABDEL-KHALIK: Yes. Thank you.

MS. JOSEPH: We're ready. Good morning. My name is Stacy Joseph, and I am the project manager for Chapter 14 Verification Plans. And I'll be giving the presentation today, but I'm joined by several of the technical reviewers who contributed to this chapter who are here to answer questions if you have them.

Today I'm going to discuss the closure of three open items in Section 14.2 that remain since our last meeting that we discussed the Phase 2 SER with Open Items. I'm also going to describe a couple of departures that were new to Chapter 14 in Revision 4 of the FSAR. And finally, we'll be discussing the late-breaking revision of the ITAAC for ultimate heat sink and reactor service water.

The first two open items as discussed by the Applicant had to do with the flow-induced vibration program. The staff requested that test abstracts be updated to reflect the FIV program. The Applicant revised Section 14.2 to basically point to the review being done in Chapter 3 and the Chapter 3 reference items. Unit 3 is going to be the prototype plant, and we'll be tested in accordance with the DCD and the Chapter 3 reference documents and the unit thoroughly tested in accordance with the Reg Guide 1.20 and the Chapter 3 reference documents.

The FIV program is still under review in Chapter 3 and will be evaluated in the Chapter 3 SER and presented at that time with the rest of the chapter.

CHAIR ABDEL-KHALIK: Okay.

MS. JOSEPH: For the final open item in Chapter 14.2, the staff proposed four license conditions for Section 14.2 initial test programs.

The first license condition requires that the licensee provide the pre-op and start-up test specification six months prior to the start of initial test programs and also approved procedures are also to be made available to the NRC 60 days before their intended use.

The next license condition requires that the licensee review and evaluate test results at the completion of pre-critical and criticality testing, low-power testing and at-power testing. The licensee is also required to notify NRO completion of each phase of testing.

Next the licensee is required to submit a schedule to NRO 12 months after COL issuance that supports NRO planning for inspections of the test program. The schedule is to be updated every six months until one year before fuel loading where they're to update the schedule every month.

The final condition is that any change made to the initial test program described in Chapter 14 in accordance with 50.59 or Part 52, Appendix A, Section VIII, that those need to be reported in accordance with the requirements.

These four license conditions are consistent with the generic license conditions being developed by the staff to be applied to all design centers.

There were two new departures in 14.22 and Revision 4 of the FSAR. The first had to do with Tier I 2.4-4, removing the criterion to have the temporary strainer for the RHR and high-pressure core flooder 50 percent blocked. We discussed that general departure in Chapter 6 last time. This is consistent with the upgrade for the suction strainers to the guidance of Reg Guide 1.8.2, Revision 3.

And the next departure has to do with the turbine design 10.2-1. And the test abstracts for the main turbine control system and main turbine auxiliary pre-op tests were revised to reflect the correct description of the intercept valves and intercept stop valves.

Section 14.3 and 14.3S of the staff's SER is largely a plainer document to where the ITAAC and also Tier 1 changes were reviewed just keeping track to make sure that all the important Tier 1 changes are reviewed.

There were two new departures -- Tier 1 departures that were talked about in 14.3. The first one is Tier 1 1.1-1 which modified the definition of as-built to clarify that the determination of the physical properties of an as-built SSC may be based on measurements and section tests that take place before installation in cases where it's technically justifiable, provided that subsequent fabrication handling, installation, testing don't alter any of the properties that were previously tested. This definition is in accordance with the most recent revision of the NEI document that's endorsed by the staff.

The second new Tier 1 departure as discussed earlier is the ITAAC for the RHR high-pressure core flooders, and RCIC were revised to remove the 50 percent strainer -- 50 percent flooding as discussed in Chapter 6.

Any new ITAAC that's ongoing review in Chapter 3, as this is a pointer document, Tier 1 will be updated to point to any new Tier 1 changes if there's -- Chapter 14 will be updated to point to where the review of any Tier 1 changes occur in later revisions of the SER. So there won't be any more technical discussion added to this chapter, but more to make sure that the other chapters contain lists.

And finally as discussed by the Applicant, during their presentation, NINA submitted a revised RAI response last week that revised the ITAAC for the ultimate heat sink and reactor service water to clarify their requirements for displays, alarms and controls for the main control room and remove shutdown system. The staff looked at those proposed changes and determined that the intent of the interface requirements of Tier 1 for these two systems are still met and that the new ITAAC are inspectable.

The staff will need to revise the SER to reflect the change as the current discussion in the SER for 14.3.5-2 reflects deletion of item 5 of the reactor service water ITAAC. This item probably has been added back in and clarified. So we will have to update our SER. But the overall conclusion about the ITAAC is unchanged.

And with that, any specific questions?

CHAIR ABDEL-KHALIK: Would you just remind us how open item 14.03.02-09 was closed?

MS. JOSEPH: I think David or -- there is a new ITAAC added for that.

MR. JENG: This is David Jeng on the staff. I'm the reviewer of the 14.3.2.

The RAI 14.3.2-9 relates to the ITAAC on the diesel generator fuel oil storage vault. Originally, the Applicant indicated they are going to do an ITAAC to ensure they comply with the design basis loads. The description was very brief and inadequate. So the staff requested them to provide a more cost-defined description including the loads items that were to be verified, the process, the procedure and acceptance criteria which pertained to problems on this item. And the Applicant provided all the detailed information requested by the staff.

So the ITAAC that is presented right now is adequate in detail and complete. And based on that revised submittal and the response to the RAI, the staff finds it's adequate including the dispute reconsideration reconciliation requirements. So the discussion in the staff SER addresses all this additional information provided and the staff accepted that issue and closed that RAI.

CHAIR ABDEL-KHALIK: Thank you. Are there any questions for the staff on Chapter 14?

MEMBER SHACK: Just on the flow-induced vibrations in Chapter 3, does that include the whole secondary system also? As I read Chapter 3, it looks focused on primary system.

MS. JOSEPH: Tom, I'm not familiar exactly with what's going on in Chapter 3. But our PM for Chapter 3 is here.

MR. TAI: I'm Tom Tai. I'm the PM for Chapter 3.

Right now, the flow-induced vibrations talk about basically the reactor internals -- the dryers --

MEMBER SHACK: Right.

MR. TAI: -- and all the internal components.

MEMBER SHACK: But how about the secondary system?

MR. TAI: No. Right now, the program does not talk about that.

MEMBER SHACK: The ASME code covers that. That's covered under a different place. I mean, I assume you still look at that before start-up.

MR. TAI: I have to doublecheck. I'm not too sure if it is in 3.9.6 or what. But I'll take an action to verify that. Because right now a lot of our effort -- a big part of our effort is to complete Chapter 3 is on the seismic design and flow-induced vibrations for reactor internals. But we'll verify it whether it's -- where is it being addressed.

MEMBER SHACK: Okay. Thank you.

CHAIR ABDEL-KHALIK: Any additional questions on Chapter 14?

(No audible response.)

CHAIR ABDEL-KHALIK: Okay. Thank you.

MS. JOSEPH: Thank you.

CHAIR ABDEL-KHALIK: I guess just to make sure we don't lose it, a follow-up action item that they will confirm that the flow-induced vibration discussion regarding the secondary system will also be included in Chapter 3.

MS. BANERJEE: Got it. Thank you.

CHAIR ABDEL-KHALIK: Okay.

MR. HEAD: I guess we'd like to have a presentation on Action Item 68 which the question was raised recently in the Subcommittee.

We'd also like to use the opportunity while we're up here to provide some feedback on some of the follow-up items that were identified earlier in the day.

CHAIR ABDEL-KHALIK: Yes.

MR. HEAD: And then I'd like to go ahead and just make sure after that that we'll go through the list and make sure that we've captured everything for the day at that point.

So I'm going to go and ask Mike to brief us on -- let's go ahead and go through the follow-up items that we had earlier today. Is that all right, Mike?

MR. MURRAY: No, let's wait on Dinesh. I think we ought to just go get Dinesh.

MR. HEAD: Okay. Well, let's dive into this one. Okay?

MR. MURRAY: Okay. So I'll lead the discussion -- Mike Murray again -- and with me is -- I'll let Warren and Ed introduce themselves. They'll be supporting them if there are any questions from Westinghouse.

MR. ODESS-GILLETT: This is Warren Odess-Gillett. I'm with Westinghouse Nuclear Automation Licensing.

MR. BROWN: Ed Brown. I'm with Westinghouse Electric. I'm a technical advisor to the Safety Systems and Monitoring Department.

MR. MURRAY: So let's go on to slide 4 if you would, Coley.

On slide 4, the question we had -- the open item out of Chapter 7 -- was provide documentation on the qualification testing for Common Q platform at 70 percent loading. And when we talked through this, we'll use the term AC160 because that is the original platform the Common Q is built upon and a lot of the qualification testing is done there.

So from a generic response, we'll go through in more detail some of the supporting information for these responses. There is information that demonstrates that there has been testing at loads greater than 70 percent. And we'll talk about those results a little bit farther in it.

Then the generic qualification testing, we demonstrated or it demonstrates that on a time response test done with normal loading as well as greater than 70 percent loading, minimal impact on the performance of the system.

Also we want to point out that in this one, we'll talk about when looking at the design of the system -- the software -- there are a couple of important factors that play into this. And one is the constraints and the design requirements and how that's managed. And it's managed within Westinghouse who is the sole provider of the platform, and is Westinghouse in this case. But there's a software program manual that describes the processes of software development.

And then there's application restrictions. And what the application restrictions importance of them is that they're very specific requirements for software as well as hardware that must be exercised to maintain the qualification. And that's a process that's done by the design engineers as well as through the verification and validation process that's independently verified that all those requirements are met.

MEMBER BLEY: Could I maybe ask you to do it? If not, I'll mention it to the rest of the Committee.

I had a chance yesterday to look through the applications -- the restrictions document with these folks. And it took me a while to understand what they were doing. But let me say what I heard and see if you guys agree with it.

Westinghouse has this document that tells them how to develop their systems. And part of what it does it says -- well, this package comes from the vendor with subroutines that do all kinds of things. And part of what they do here is they restrict their application software not to cause the subroutines that especially would challenge the determinism and other things they care about. And although those things are sitting there through this administrative control, they try to make sure that their software never cause those things. So I didn't know they did that.

MEMBER BROWN: Let me clarify one point on that.

This is a commercially-used platform. So it's got a lot of functionality that's incorporated in terms of different routines that other people may use. But their application restrictions literally go through and say don't do this, don't use, you can't use these functions because that's the way our thing is qualified without this.

So I just wanted to make it clear that it was a commercial, wide-band platform that is now being constrained into a somewhat narrow niche and restricted in what functionality and algorithms and things they can use. So I just wanted to --

MEMBER BLEY: And I guess the other thing for the subcommittee that made sense to me when I heard them talking about this was that because of that, they do get trouble reports from that broader industry that does include some of these things. But it also includes things that their system is using. So they get a much broader base of operating experience than they'd have if it was just from their own systems.

MEMBER BROWN: According to Ed Brown, the

Westinghouse rep, I guess I think you told me you all monitor these things on a quarterly basis?

MR. BROWN: Yes. We collect them and immediately do a screening to make sure there's no immediate Part 21-type evaluation.

MEMBER BROWN: And that's part of their responsibility.

MR. BROWN: Right. And on a quarterly basis, we do a detailed review to decide which things to be included into the next software revision.

MR. MURRAY: Okay. Next slide, please.

So this is a little bit more specific about the testing of the baseload software releases. Each time there's a new release, it goes under a set of testing. The test that is performed, it'd have to be agreed to by the Appendix B holder as well as the vendor that does the software.

Processor loads monitored, the results are recorded. In this particular type test, it indicated that the software performed properly at greater than 70 percent load and one example at least of one monitor that was running that had 80 percent loading and still didn't have any performance issues.

MEMBER BROWN: I want to make one observation that they made to me when I was going through this yesterday also. This part of the -- say they demonstrate -- this fundamentally demonstrated the process of what handled these loads doesn't crash. It has nothing to do with time response or whatever it is. It just says hey, it processes, continues to operate, does not crash, you don't get the Blue Screen of Death -- just to use an analogy to current commercial computer systems, at least Windows anyway. So that's this one. That's separable from the other concept of how does it respond in a deterministic time response manner which they'll demonstrate later.

MR. MURRAY: Next slide. And this is what Mr. Brown was just discussing is the time response version of it.

For the qualification of the Common Q with a Swedish reactor, there was test data that Warren was able to show us that there were two configurations set up normal load which would be a configuration of less than 70 percent which is what you would expect to always design the system at.

And then a secondary test which was at 75 percent loading. In other words, put enough applications in it to make it run at 75 percent loading and looked at the difference of the time response.

We'll flash up the two tables, let you have enough time to do a quick analysis of it. The bottom line on this is we studied it for a few minutes and were able to extract some information out of it. And there's 100 tests there. And what it shows is this is the normal -- this would be the less than 75 percent -- is that you get expected ranges of differences of what you would expect to see with where it starts the sampling at within it. And I think the min-max on this was like 24 milliseconds from min to max is what we had seen when we looked at this.

And when you're ready, I'll move onto the next slide.

PARTICIPANT: They already did.

MR. MURRAY: Okay. So the next slide shows a very similar set of data for 100 tests at 75 percent loading of the processor. What it indicates also is from the min-max was relatively the same. I think 28 milliseconds if you take the low and the high out of it. It's very consistent results. So it indicates that you're getting a consistent expected results out of it with the increased load of 75 percent.

CHAIR ABDEL-KHALIK: How are you reading this to give you a min-max difference of 28 milliseconds?

MR. MURRAY: I was looking at the -- maybe I picked the wrong ones.

MR. ODESS-GILLETT: The lowest number of the 100 and the highest number of the 100 samples.

MEMBER BLEY: Each of the 100 tests is testing the same function.

MR. MURRAY: That's right.

CHAIR ABDEL-KHALIK: I understand. But I don't see --

MR. MURRAY: I picked 45 as the low. Maybe I'm -- no, there's a 44. I'm sorry. But it's relatively close.

MEMBER BLEY: Tell them which tests.

MR. MURRAY: Okay. The test number would be -- oh, I found that -- 46, for example, is a 45. Test 25 is 73.

CHAIR ABDEL-KHALIK: And 25 is --

MR. MURRAY: And 25 is 73. And I just took that from it.

But if you look, there's also the average of each set of data. And there's the average overall.

CHAIR ABDEL-KHALIK: Okay.

MR. MURRAY: It asked the same thing I did on the table before.

CHAIR ABDEL-KHALIK: Thanks.

MR. MURRAY: Okay. Next slide.

So in summary, the test records demonstrate that it continued to perform at greater than 70 percent loads, and the response time it's minimally impacted on and is greater than 70 percent.

Software as we discussed, the V&V programs verify that the restrictions or application restrictions were properly applied. And that's shows independence of that. It requires independency for that verification.

MEMBER ARMIJO: What is a response time that would be unsatisfactory?

MR. MURRAY: It's all in accordance with the design of the system and the applications that it's to required. And then that's back to the safety analysis. So for saying that on here, I don't believe I could come up with one there.

MEMBER ARMIJO: Is it something that can be --

MEMBER BROWN: No. You take this information in terms of the performance of the platform. And then you say okay, how many of these do I have in a row? And you take your inputs, your signal conditioning -- these items -- and then your response of the drivers, and you get a composite time response. This is just a part of it. Then that time response has to obviously meet the overall transient accident analysis for the various casualties that we consider.

So this sets the baseline. So you look at the -- no, it's consistent with what I did in my other programs. You'd get a performance basis for this part. And then you look at the tails and say okay, you have boundary conditions on the tails. And that's what you test for. And then you come in an overall number based on a combination of all the parts -- all the components in the series.

So this could be 200 milliseconds. And if it met the action in it, that's fine.

MR. MURRAY: Yes. And as we discussed in the Appendix that we added to the FSAR in the last briefing of Chapter 7, in there it describes an analysis of just that, that says what we expect the results would be and the time response of that. And that is a deliverable out of the detailed design.

CHAIR ABDEL-KHALIK: Okay. From what I heard from Dennis and Charlie, we should consider this Action Item closed?

MEMBER BROWN: I'm happy with it. I'm

satisfied with it. I think John is also. I'll let John speak for himself.

CHAIR ABDEL-KHALIK: Okay. Thank you.

MR. HEAD: Okay. Then Mark, we want to go into the morning follow-up.

MR. MURRAY: Yes, we want to clear up one thing. And I think there's some pictures --

MS. BANERJEE: Let me distribute it.

MR. MURRAY: Yes, please. And Dinesh, do you want to sit with me?

And there was some confusion about -- we discussed a lot about the emergency trip and how it was done triple with triplicate redundant-type processes. And Dinesh pointed back out to me what I had -- didn't bring that slide show with me nor remembered at the time.

But the primary as the picture will show is done in a very similar fashion. Again, it's still diverse in the particular modules that do it. But each module senses the speed sensor -- all three speed sensors.

Now, Mr. Stetkar, I'm going to try to answer your question in general terms and see if you're less acceptable.

But in a triple-redundant type

configuration with each module looking at each sensors' input, it has the ability to do cross-checking quality checks on the signals because it's looking at all three sensors. And if one is out of range, then it will detect that out of range either loss of electrical or loss of signal out of the range of the other two. And it would then flag it within itself.

Now if any one of the modules see two sensors bad in this, which then it would see it and then it would do a trip.

Yes, sir?

MEMBER BLEY: And by that from what you just said before, these are two out of three high. These are two out of three out of range.

MR. MURRAY: It could be out of range. It could be loss of electrical signal --

MEMBER BLEY: Which would essentially out of range.

MR. MURRAY: -- out of range. That's correct.

MEMBER BLEY: The base of your mechanisms sounds like it's out of range.

MR. MURRAY: Out of range. If I were to cut the wires to one of the sensors coming up, either inactive or passive or active or passive -- either or. And if I cut the wires, then that particular sensor would show --

MEMBER BLEY: What's the middle one out of range?

MR. MURRAY: Pardon? See I don't know the ranges -- those specifics. What was your question again to make sure I understand it?

MEMBER BLEY: We know what the high end overspeed is. When is it out of range low?

MR. MURRAY: I don't know where the window will be set between the three overspeed sensors.

MEMBER BLEY: That may not be set.

MR. MURRAY: But that would be in the detailed design. You'd set a window of what's your expected quality ranges of the sensors.

MEMBER BLEY: So to John's question, failure is the signal is either too high or too low?

MR. MURRAY: Too low. Too high, too low, loss power.

MEMBER STETKAR: Too high would have to be interpreted as --

MR. MURRAY: As out of range.

MEMBER STETKAR: -- it's a legitimate --

MEMBER BROWN: Why would one? I mean, it

depends on what you select is too high. I mean, if one of them is reading -- if your maximum range is say 150 percent -- just to pick a number -- and one of them is reading 120 and the other two are reading 105, does that mean it's out of range and I would have selected that to say that's one of the trips in each of the three channels? It's not out of range. I mean, this is --

MR. MURRAY: It would -- wait for the trip set system. It's a fuzzy way for the trip set systems.

MEMBER STETKAR: It would sensed as a bad sensor.

MEMBER BROWN: Well, how do you know it's not right?

MR. CHAPPELL: These are typically selected as you go through and develop how these signals are processed. And so if you have three signals and you can compare those signals, you may look at two of them, you may look at a third and come up with an averaging signal or come up with a median signal. And you'll do a signal comparison, and you'll have a setpoint that'll kick it out.

The speed it senses varies over a wide range. It's not just 1800 rpm all the time.

MR. MURRAY: The exact algorithm that's being used in these modules I can't tell you what that is.

MEMBER BROWN: Okay.

MR. MURRAY: But a lot of the clarification is that it's triple vented as well which was not very clear in the discussion earlier until Dinesh had pointed that out.

MEMBER BROWN: Well, you've made it clear that all three go to all --

MR. MURRAY: Right.

MEMBER BROWN: -- as Dinesh mentioned in your earlier conversation. It's just that and for a normal control function, I couldn't pony up to the fact that you use a median or a summed of all those you lose one. But I don't know what your median is because now you've got a high one and a low one. There's no median anymore. So again, it's algorithm-dependent.

But for an overspeed trip function, unless the thing slams to 200 percent or 150 or it goes to zero, after that it's difficult to envision. I mean, 120 percent where the other ones are at 105 would not indicate necessarily a bad sensor. I don't know how narrow you make that.

MR. SWANNER: This is Craig Swanner.

If it went to 120 percent, that's over the trip value. That can --

MEMBER BROWN: Yes, that's a good point. I would have put a -- well, that's not what he said, I don't think.

MR. MURRAY: If it sensed above -- we said that earlier -- if it sensed above setpoint, it will provide the trip. So the failure high on it would be -- it's a good point that Craig made -- it would be sensed as above it.

Now, one sensor above setpoint does not trip the turbine. But it does put that particular --

MEMBER BROWN: Relative to your picture.

MR. MURRAY: That's right.

MEMBER STETKAR: If it was only one out of the three and the normal control system, the normal control system would just basically ignore that.

MR. MURRAY: If one was greater than setpoint, it would be seen by all three monitors as a trip, then it wouldn't make the two out of three logic to actually trip the turbine.

MEMBER BROWN: Or the normal.

MR. MURRAY: Or the normal.

MEMBER STETKAR: Normal control function

on the control function because I think --

MR. MURRAY: Okay. We're normal -- okay. It would ignore that. It would ignore that as well.

MEMBER STETKAR: It really would ignore it. It wouldn't adapt to it.

MEMBER BROWN: If one -- I'm slow. Please forgive me. But if I had one sensor that went -- I've got three sensors going to each one. So if one sensor goes to say 115 percent, that's over the trip value.

MR. MURRAY: That's correct.

MEMBER BROWN: I would have one trip signal on each of the three control.

MR. MURRAY: Correct.

MEMBER BROWN: Now does that make the controller trip?

MR. MURRAY: No.

MEMBER BROWN: You'd have to take two of them in each controller and then you do two out of three.

MR. MURRAY: Two out of three on two controllers.

MEMBER BROWN: Of the three controllers?

MR. MURRAY: That's correct.

MR. TANEJA: My experience -- I did a similar implementation in engineering when I designed this thing. In a classical TMR application, actually the three inputs are validated and interpreted as one value of say, 1800 rpm, right?

MEMBER BROWN: For control or trip functions?

MR. TANEJA: For control and trip functions.

Because the way the TMR works typically -- the architecture -- the algorithm is used.

I'm talking from my experience. I don't know how this is being done.

But a typical TMR architecture, you get three inputs coming into one controller. Okay? That three inputs are derived into one value based on an algorithm. It's comparing the three inputs relative to each other. And if one is obviously out of range as compared with the other two, then that is assumed to be a bad signal nor an alarm.

MEMBER BROWN: It deviates from the other two.

MR. TANEJA: It deviates from the other two. All right?

Then those two become the drivers. And then you take the average of the two as the input speed signal. Okay? And then it's compared to the setpoint and generate a trip based on that.

So two out of three logic is again done after it receives three inputs from each controller separately. Right? This is my experience how that was done in a TMR application -- a classic way of doing it.

So the algorithm that does validation of those input signals -- see, you have a common speed wheel, right? And so it's got the tooth on it. They should all be reading exactly the same thing. And your magnetic pickup, passive -- all it's looking at is a bunch of teethes spinning out in front of it.

Ideally speaking, I mean, these are installed and whatever 120 degrees apart or whatever on that wheel. We should be seeing exactly the same thing, right? So one of them is obviously out. The algorithm looks at that relativeness and also looks at like low or under-range conditions. You could set it to whatever value. You want to set it to 122 percent. And you put that algorithm into logic or into the circuit when the speed is above say 400 rpm or 200 rpm.

I don't know what the turning gear -- usually the rotors are set on a turning gear, right? They're always rotating. So they're always running at some low rpm all the time. So you say that if it's below, I would consider that to be a failure.

So you can set these things to whatever your machine is designed to do. So it's all relative to how your machine is designed.

MEMBER BROWN: You could do that with a turning gear because it's a fixed motor drive that's just rotating it. So it's always going to run it -- I mean, it's an ac motor.

MR. TANEJA: Right.

MEMBER BROWN: It's going to run it whatever the --

MR. TANEJA: Whatever the rpm -- gearing is on that one.

MEMBER BROWN: I'm not arguing with that.

MR. TANEJA: So if the speed was below that, then you could say that if I'm not detecting minimum of that speed and if it's below that on that input, then it says that's a bad input.

MR. MURRAY: I guess what we would like to say also from an Applicant perspective is we don't know what that algorithm is just now, John. And as we continue with the detailed design there and apply it to the monitors, we would set those algorithms to sense those sensor failures.

In general terms -- I'm trying to answer your question as best I can.

MEMBER STETKAR: This certainly helps me.

MEMBER BROWN: The text in the RAIs was not particularly crisp, as well as RAI-8, whatever that --

MEMBER STETKAR: You can read RAI-8 -- the words -- and get a different impression about how the trip logic treats the signals compared to the normal control.

MR. MURRAY: The normal control and the normal emergency.

CHAIR ABDEL-KHALIK: So John, as far as knowing what the meaning of the word fail is, has that clarified it?

MEMBER STETKAR: I know functionally more that it's out of whatever that not yet defined tolerance range is is failed.

MEMBER BLEY: Fail is not going to be defined before --

MEMBER STETKAR: The pure definition of fail in a crisp, analytical form is not defined yet and hasn't been.

MEMBER BROWN: And won't be.

MEMBER STETKAR: And won't be. And I'm

okay with that.

CHAIR ABDEL-KHALIK: Okay. So we will close this question.

MR. HEAD: Okay. I basically had two on the failure of the detector. And then if the active fails, I think -- did we cover --

MEMBER BROWN: No, it is the primary sensors. There's another in RAI- whatever that 10.2-8. Item 15 says loss of two of the active and normal and emergency sensors. The primary sensors are left out totally --

MR. HEAD: Right.

MEMBER BROWN: -- in all the discussion. I couldn't find anything.

MR. HEAD: And I was going to suggest that one is --

MEMBER BROWN: That's open.

MR. HEAD: -- is open because I think we've agreed that we want to enhance the -- on that RAI. So I'll leave one open that we'll go back and look at the RAI and consider enhancements to that description.

MEMBER STETKAR: But in the context of the system design, failure of those things would mean the same thing as if the signal is out of the preset tolerances.

MR. MURRAY: Either way. It will be using algorithms. They won't be the same because they're diverse and they're software designs. But you'll have to set a basis for them. Philosophically you'll use the same technologies and type of algorithms similar to the tech failures on it.

So the action is to enhance the RAI response and the information to provide clarification that failure of a sensor -- how it's treated in the primary. I looked for that as well and couldn't find it.

MR. HEAD: And then from that discussion th is morning, we had a follow-up item on the internals of the trip device that I believe you and Tom discussed.

MEMBER STETKAR: Yes.

MR. HEAD: Has that been --

MEMBER STETKAR: I think so. I think it's worth mentioning. I think I know how it works. But it's worthwhile for the remainder of the Subcommittee to perhaps hear that.

MR. HEAD: Tom, could you describe the --

MR. DALEY: This is Tom Daley.

A mercy trip system consists of two

solenoid trip valves. And those two solenoid trip valves are fairly simple solenoids. They're not complex with diverse flow paths in them.

They're both located in the front standard of the turbine. So they're located there to keep it away from any missile hazards, pipe whip, high-energy sort of lines that might affect them.

MEMBER STETKAR: To kind of answer my question, where I got confused was you made the statement this morning that they're both installed in the emergency trip device manifold or something like that which led me to question the electromechanical hydraulic configuration, because I've seen some pretty innovative designs. Let's call them that.

And I think you told me that these are -- what you just said and just make sure that I understand -- these are just two basic solenoid operated valves each of which has two coils and a single spool. We must de-energize both coils for the spool to move so that you drain the fluid. Is that right?

MR. DALEY: That's correct. And they're both the same. And they are therefore subject to a common-mode failure. And in fact, in our failure modes and effect analysis, they represent the one, two, three, four and five levels of potential that we have to deal with.

I also pointed out that that's for the emergency and the primary trip systems. There's also the normal PLU function that uses the fast-acting solenoid valve to dump the fluid directly from the valves themselves. And that's located in the EHC system itself which is in a different location.

MEMBER STETKAR: And that would be enacted. I think if the power-load imbalance is greater than 40 percent, that --

MR. DALEY: Forty percent. That's correct. And that's sets up staff if we have a trip anywhere, it'll keep it less than 120 percent -- the design overspeed.

MR. HEAD: So I believe -- I'm sorry.

MEMBER BROWN: One other question. During the break after our discussion, I was reading back through 10.02-8. And on page 9 down towards the bottom, the speed sensors and the valves I thought were the only two shared components on the normal control and emergency trip system.

MR. MURRAY: That speed monitor is a part of the speed sensors. That's what you're discussing?

MEMBER BROWN: Yes, it says here the speed sensors and speed monitors are the only shared components. And I had no clue what a monitor was. I thought it was the controller.

MR. MURRAY: It converts again the pulse to --

MEMBER BROWN: Okay. It's the signal conditioning for the sensor. Okay. You can stop if that's what that is.

MR. MURRAY: -- sends it to the control and it also sends the trip signal into --

MEMBER BROWN: Thank you. Got it.

MR. HEAD: So I believe from that morning condition we have the one follow-up item to enhance the RAI response. And we'll look at the whole thing to make sure it addresses some of what we talked about today.

I had proposed that the follow-up item regarding the trip system or the turbine probability that I had proposed that it was closed. You obviously want to discuss that some more. But our action will be to go place in our corrective action program an attachment to that follow-up item to the COL item the insights that we received today. So that will happen so that we're ensured that we go back and give that the scrub that it needs when those reports are finished.

CHAIR ABDEL-KHALIK: Is there a timeline for your corrective action program to respond to things of this type?

MR. HEAD: Well, it'll be there attached so that when it's built, that's available for people to look at. And then when STP or NINA is ready to sign off on that that they'll have that to look at to make sure that these topics have been addressed. So right now, it would stay open and it would have a two- or three-year time frame to address -- be closed. Like I say, that's the proposal on that one.

Then we had a follow-up item to provide the report in our validation package. And we're going to support that with a review this afternoon -- Sam and --

MEMBER ARMIJO: If we close up before noon, we can do it --

MR. HEAD: Absolutely.

And then we have a follow-up item with respect to how is the insights from DRAP applied to the start-up program and any expectations that come with that.

MEMBER STETKAR: And my particular concern was that the way I read the information, I want to just make sure that the stuff that's on DRAP that's populated directly out of the PRA without regard to the other sort of if I could call it deterministic fire protection aspects.

MR. HEAD: Yes. Those are given.

MEMBER STETKAR: It's the other complement of equipment.

MR. HEAD: We understand it has that.

MEMBER STETKAR: Yes.

MR. HEAD: And that was my summary of the follow-up items from the report.

MR. TONACCI: I think -- excuse me. This is Mark Tonacci.

I think we had one additional one that came up just a moment ago about the FIV and does that expand into the balance of plant.

CHAIR ABDEL-KHALIK: Correct.

MR. TONACCI: Tom perhaps could answer that.

MR. TAI: Yes. This is Tom Tai, Chapter 3 again.

I just want to follow up on Dr. Shack's questions on the flow-induced vibration. I checked and it is in 3.9.6. 3.9.2. is all about reactor internals. 3.9.6, we put it under the operation program because I wanted to make sure that they do have a program for start-up tests and the pre-op tests.

CHAIR ABDEL-KHALIK: Thank you.

MS. BANERJEE: I have one more. Dr. Stetkar pointed out an inaccurate statement in the Safety Evaluation Report, Section 10.2.4. Is staff going to revise that?

CHAIR ABDEL-KHALIK: One out of three versus two out of three?

MR. TONACCI: The answer is yes. We'll look at that and make the necessary changes.

MR. REDDY: This is Devender Reddy. Dr. Stetkar, that was a typo. Actually with regard to that, we wanted a final SER.

CHAIR ABDEL-KHALIK: Well, that means we didn't get that.

MEMBER STETKAR: That apparently means the document that I was reading that I was told was the final SER was not.

MR. REDDY: Apparently.

MEMBER STETKAR: Which is a different issue but perhaps more troubling than then one versus two.

MR. REDDY: We did correct that.

MR. TONACCI: We did.

PARTICIPANT: So we may have corrected it on a draft version. But the version we sent to you was the official version. If we made changes after that, we'll have to come back around and either represent it if it's significant or in some other way get it authorized. We don't just willy-nilly make changes to the SE.

MR. CHAPPELL: There are at least two locations in the SER that make reference to a loss of speed signal in one location. It makes a reference to the number in each of those locations. So it's possible it was corrected in one location and not the other. So I can work with Steve Cashell and point those sections out and make sure it's clarified.

CHAIR ABDEL-KHALIK: Okay.

MS. BANERJEE: Is it worth following?

CHAIR ABDEL-KHALIK: The staff will make sure it's done.

Let's just ask the question about Action Item 42 and the proposed response of essentially closing this item by inputting the comments that were provided today into their corrective actions program. This pertains to the turbine missile analysis -- the two reports that were provided.

Are there any concerns about that given the timing of when the final reports would actually be available?

MEMBER STETKAR: Said, I think in our advisory capacity and what we're limited to do in this -- our role in this process that stops at issuance of the COL, I think we've done everything that we can do. We will not see the final turbine missile analyses whenever they are completed. And I think we've made our concerns at this point pretty clear. And it's now up to the Applicant and the staff to follow up when the final analysis is completed and make sure that at least some of the concerns that we've raised were addressed. Whether there are any other concerns at that time, I mean, it's out of our hands at that point.

CHAIR ABDEL-KHALIK: Right. Any other comments regarding this specific issue?

(No audible response.)

CHAIR ABDEL-KHALIK: Okay.

Before we close, let's just see if there are any comments from members of the public.

Is the phone line open?

MS. BANERJEE: I'll go check.

CHAIR ABDEL-KHALIK: Okay.

MR. BROWN: The phone line is open.

CHAIR ABDEL-KHALIK: The phone line is open? Okay.

Are there any members of the public on the bridgeline who wish to make a statement?

(No audible response.)

CHAIR ABDEL-KHALIK: If there is someone on the line, if you would just sort of make some sound so that we know that the line is indeed open.

PARTICIPANT: Yes, the line is open.

CHAIR ABDEL-KHALIK: All right. Thank you. Okay.

Are there any members of the public here who wish to make a statement?

(No audible response.)

CHAIR ABDEL-KHALIK: Okay.

MS. BANERJEE: Mr. Chairman, can I just say that these two pages are going to be added to the transcript. If anybody has any problem with it, let me know.

CHAIR ABDEL-KHALIK: The copy that was provided?

MEMBER STETKAR: We were in open session here, right? Is there anything that's considered proprietary on that?

MR. HEAD: That was a public meeting is what happened.

CHAIR ABDEL-KHALIK: Okay. Let me just go around and see if there are any additional comments that Members would like to make with regard to these two chapters or the responses to the follow-up items.

MEMBER SHACK: No.

MEMBER BLEY: None for me.

MEMBER ARMIJO: None.

MEMBER RYAN: None for me.

CHAIR ABDEL-KHALIK: Okay.

MEMBER BROWN: None on that. I just want to say I thought they did a good job of bringing in the information on the Common Q platform. That was a very thorough presentation of information yesterday. At least that's my opinion.

PARTICIPANT: I'd second that.

MEMBER BROWN: So I thought that was a good set-up.

CHAIR ABDEL-KHALIK: John?

MEMBER STETKAR: No. Other than to again say that I really appreciate the effort that the staff put into the follow-up RAIs on the turbine overspeed and turbine control systems. And as critical as I was of those two reports, I really do appreciate you submitting those and giving us the opportunity to kind of give you feedback on them. Thanks a lot.

CHAIR ABDEL-KHALIK: Well again, let me express our thanks to both the staff and the Applicant for a through presentation. Thank you very much.

This meeting is adjourned.

(Whereupon, at 11:17 a.m., the hearing was adjourned.)

Nuclear Innovation North America LLC

South Texas Project Units 3 & 4 Presentation to ACRS ABWR Subcommittee

Chapter 10 "Steam and Power Conversion System"

Agenda

- Introduction/Attendees
- Chapter 10 Items of Interest
- ACRS Action Items
- Chapter 10 Summary
- Conclusion

Attendees

Scott Head	NINA Manager, Regulatory Affairs, STP 3 & 4
Mike Murray	NINA I&C Manager, STP 3 & 4
Tom Daley	NINA Mechanical Engineering Supervisor, STP 3 & 4
Coley Chappell	NINA Licensing, STP 3 & 4
Jim Agles	NINA Licensing, STP 3 & 4

Chapter 10

Chapter 10 was discussed at the ACRS ABWR Subcommittee meeting on June 23, 2010, summarized as follows:

- Tier 2 departures, standard and site-specific
- COL License Information Items
- Site-specific supplemental information, *e.g.*, related to the main cooling reservoir and the circulating water system, not included with the standard plant design.

Items of Interest

- Resolved RAIs not closed at the time of the previous ACRS presentation:
  - RAI related to turbine gland seal steam departure (STD DEP 10.4-1), which added a non-safety related gland steam evaporator as a clean steam supply to main turbine shaft seal glands and various turbine valve stems.
  - Revised the response to RAI 10.04.07-3 by proposing a new Tier 1 departure (STD DEP T1 2.10-1) to show the addition of a condensate booster pump on Figure 2.10.2a.

Items of Interest (cont'd)

- Since the previous ACRS meeting, RAI 10.02-1 through 10.02-8 revised responses were submitted (2/21/11) related to the turbine generator.
  - RAI 10.2-3 response describes the basis for valve closure setpoints in the Toshiba design and compares to setpoints noted in Standard Review Plan.
  - RAI 10.2-5 response describes how the power load unbalance (PLU) anticipatory trip function supplements the normal EHC system.
  - RAIs 10.02-4, -5 and -6 responses describe the adequacy of two electrical overspeed trip systems and provide additional details on redundancy and diversity in FSAR Section 10.2.2
    - Include site-specific ITAAC.
    - Addresses ACRS Action Item #45

Items of Interest (cont'd)

RAI 10.02-4 revised response added a figure to FSAR Section 10.2:

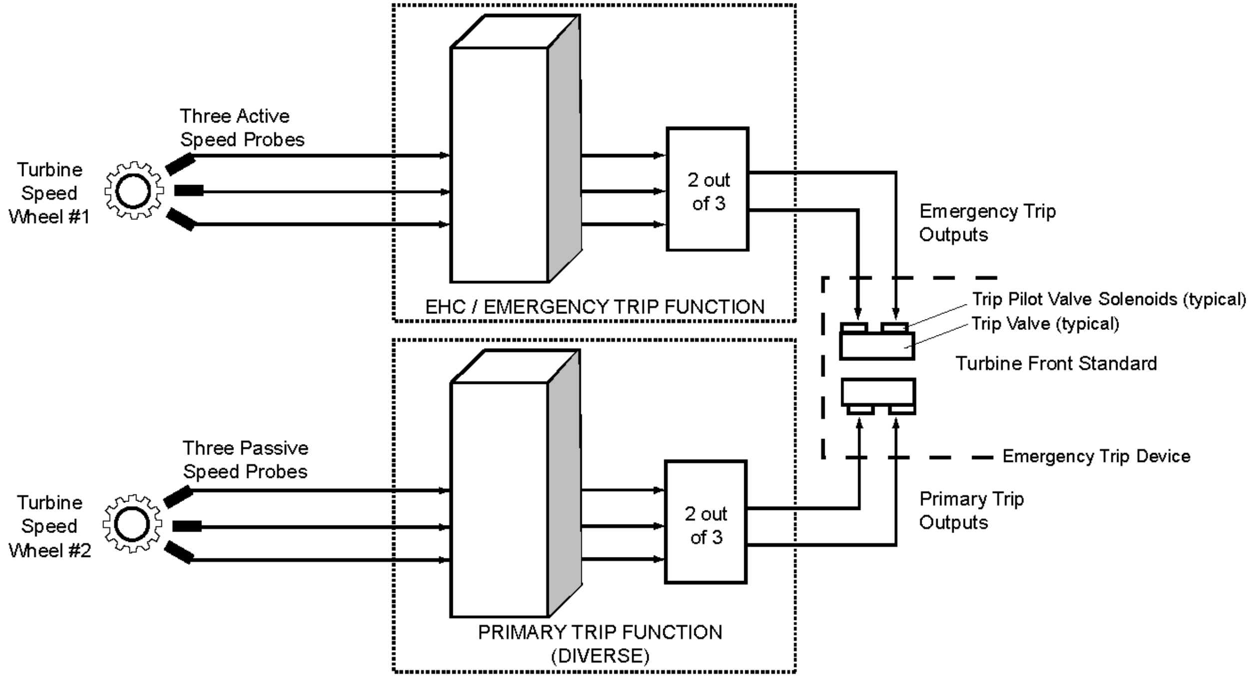


Figure 10.2-5 Turbine Overspeed Trip System Functional Diagram

Items of Interest (cont'd)

Site-specific ITAAC (RAI 10.02-6 revised response):

Design Requirement – Trip signals from the two turbine electrical overspeed protection trip functions are isolated from, and independent of, each other.

- ✓ **Acceptance Criteria** – the two electrical overspeed protection functions have diverse hardware and software/firmware that are isolated from, and independent of, each other.

- This requirement is consistent with AP1000 requirements.
- Independence and diversity between the primary and emergency electrical overspeed systems.
- This site-specific ITAAC is in addition to ABWR DCD Tier 1 ITAAC Table 2.10.7 for the main turbine system overspeed protective actions.

Items of Interest (cont'd)

Site-specific ITAAC (cont'd):

Design Requirement – Trip signals from the emergency overspeed protection trip function are separate from the control signals from the normal speed controllers.

- ✓ **Acceptance Criteria** – the emergency overspeed protection function is implemented in trip controllers that are separate from the normal speed controllers.

- The signals used to generate the emergency overspeed trip are not the same signals used for normal speed control.
- The emergency overspeed protection system is independent and diverse from the primary overspeed protection system.

Chapter 10 Summary

- All COL License Information Items have been addressed.
- All responses to RAIs have been submitted.
- All SER Open Items are closed/confirmatory.
- All related ACRS Action Items have been addressed.

Chapter 10

Questions and Comments

Presentation to the ACRS Advanced Boiling Water Reactor Subcommittee

South Texas Units 3 and 4 COL Application Review

Advanced SER Chapter 10
"Steam and Power Conversion Systems"

April 6, 2011

Staff Review Team

- **Project Managers**
  - George Wunder, Lead PM, DNRL/BWR Projects Branch
  - Tom Tai, Chapter PM, DNRL/BWR Projects Branch
- **Technical Staff**
  - SBPA, Chief, John Segala
  - SBPB, Chief, Samuel Lee
  - SBPA, Reviewers, Devender Reddy, Angelo Stubbs
  - CIB2, Chief, Michael Norato
  - CIB2, Lead Reviewer, Timothy Steingass
  - ICE2, Chief, Ian Jung
  - ICE2, lead Reviewer, Dinesh Taneja

Ch. 10 Advanced SER Topics of Interest

Section 10.2 Open Items	Turbine Overspeed
Section 10.4.7 Open Item	Condensate and Feedwater System
ACRS Action Items	Action Items 43 and 45

Section 10.2 Open Items - Main Turbine Generator System

Issue:

- In lieu of primary mechanical and back-up emergency electrical overspeed protection devices, STP proposed two electrical overspeed trip devices.

- The staff's concern was whether the two electrical overspeed protection devices have adequate diversity and redundancy features.

Section 10.2 Open Item - Main Turbine Generator System

Resolution:

- The staff issued RAIs requesting applicant to address staff's concern.
- The staff reviewed and evaluated the applicant's responses based on design features, location and installation, and operational and testing considerations of these devices.
- The applicant also provided a site-specific Tier 1 ITAAC.

Section 10.2 Open Item - Main Turbine Generator System

Resolution:

- The staff found the following diverse and redundant features between the primary and emergency trip devices:
  - Speed sensors – three passive for primary and three active for emergency
  - Hardware and software/firmware – trip logic functions for both use diverse electronic means. The primary uses separate speed wheel from the normal and emergency trip device.
  - Trip logic and signals – two-out-of-three logic is employed in both

Section 10.2 Open Item - Main Turbine Generator System

Resolution:

- Diverse and redundant features (cont.):
  - Cabinets – each trip device is installed in separate cabinet
  - Power sources - each has its own redundant power supplies
  - Control signals from the normal and emergency back-up are isolated from, and independent of, each other.

Section 10.2 Open Item - Main Turbine Generator System

Conclusion:

- The staff determined that there is adequate diversity and redundancy built between the two electrical overspeed devices under emergency and abnormal conditions, and therefore meet the intent of GDC 4 criteria and SRP guidance in this regard.

Section 10.4.7 Open Item - Condensate and Feedwater System

Issue:

- STP COLA departs from the CFS standard design and adds new SSCs (Condensate Booster Pumps) comparable in importance to those provided in the design description, functional arrangement, and ITAAC Tier 1 design in the ABWR DCD.
- The STP COLA incorporates the associated Tier 1 section of the DCD by reference with no departures. Open Item 10.04.07-3 requested the applicant update the Tier 1 CFS design description and/or functional arrangement in Section 2.10.2 so that it is applicable to the site specific CFS design which uses both condensate and condensate booster pumps.

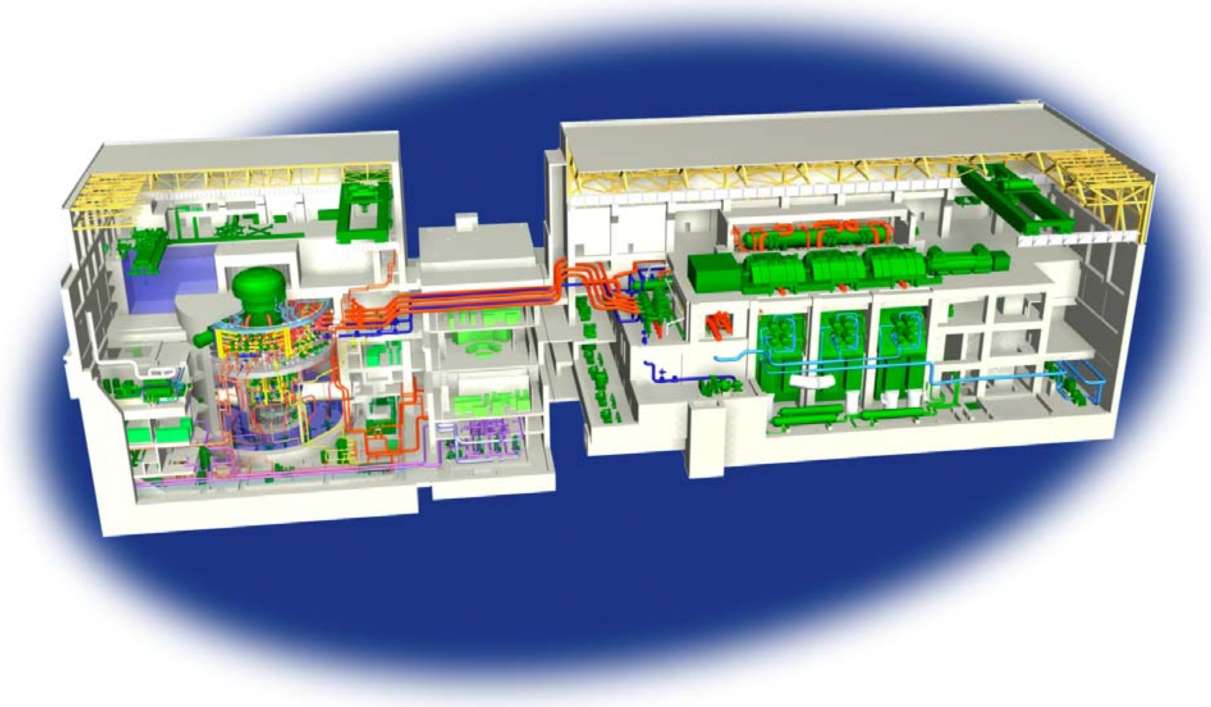
Section 10.4.7 Open Item - Condensate and Feedwater System

Resolution:

- The applicant proposed a new Tier 1 departure which revised Tier 1, Figure 2.10.2a.
- In the revised Figure 2.10-2a, condensate booster pumps are now included as part of the basic CFS configuration.
- The staff reviewed the proposed revisions to the Tier 1 information and found it acceptable since the information in Tier 1 is now consistent with the plant design described in Tier 2.
- Incorporation of the proposed Tier 1 change is being tracked as a confirmatory Item.

Nuclear Innovation North America LLC

South Texas Project Units 3 & 4 Presentation to ACRS Subcommittee Chapter 14 "Initial Test Program"



Agenda

- Introduction/Attendees
- Chapter 14 Overview
- ABWR Experience
- Items of Interest
- Conclusion

Attendees

Scott Head	NINA Manager, Regulatory Affairs, STP 3 & 4
Coley Chappell	NINA Licensing, STP 3 & 4
Tom Daley	NINA Mechanical Engineering Supervisor, STP 3&4
Steve Cashell	NINA Licensing, STP 3 & 4

Chapter 14 Overview

- Standard and site-specific test descriptions
- ITAAC addressed in individual FSAR chapters
- All COL Information Items addressed
  - Testing Requirements
  - Startup Administrative Manual
- Substantial ABWR startup experience

Toshiba Experience in ABWR Construction and Initial Test Program (ITP)

Plant	Rated power (MWe)	Construction period (months)	Preoperational test period (months)	Start up test period (months)	COD	ITP Lead	Nuclear Island (NI) Constructor	Turbine Island (TI) Constructor
Kashiwazaki-6 (K-6)	1356	51	10	11	1996/Nov	Toshiba	Toshiba/GE	Hitachi/GE
Kashiwazaki-7 (K-7)	1356	51.5	12	9	1997/Jul	Hitachi	Hitachi/ GE	Toshiba/GE
Hamaoka-5 (H-5)	1380	56	13	11	2005/Jan	Toshiba	Toshiba	Hitachi

Items of Interest

- Revision to site-specific Reactor Service Water (RSW) and Ultimate Heat Sink (UHS) ITAAC.
- Initial RAI responses did not provide clarity
  - Inappropriately referenced Tier 2 figures
  - ITAAC were ambiguous
    - Implied alarms for UHS functions at remote shutdown panel
- Recent submittal clarified Part 9 ITAAC Table 3.0-1 (UHS) and Table 3.0-5 (RSW)

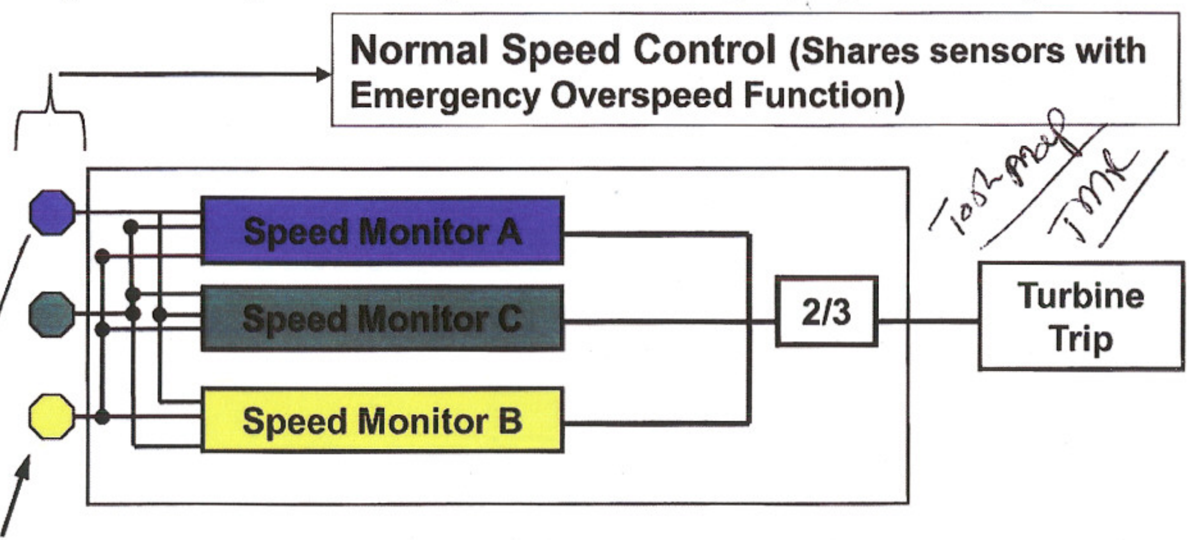
Items of Interest (cont'd)

- Flow-induced vibration will be addressed in Chapter 3.

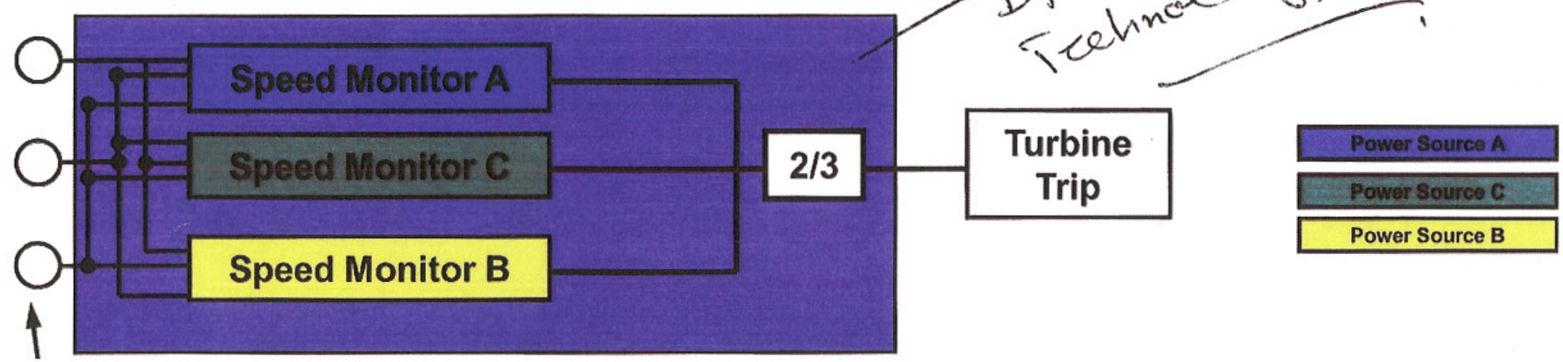
Chapter 14

Questions or Comments?

Primary Overspeed Trip and Emergency Overspeed Trip Functions

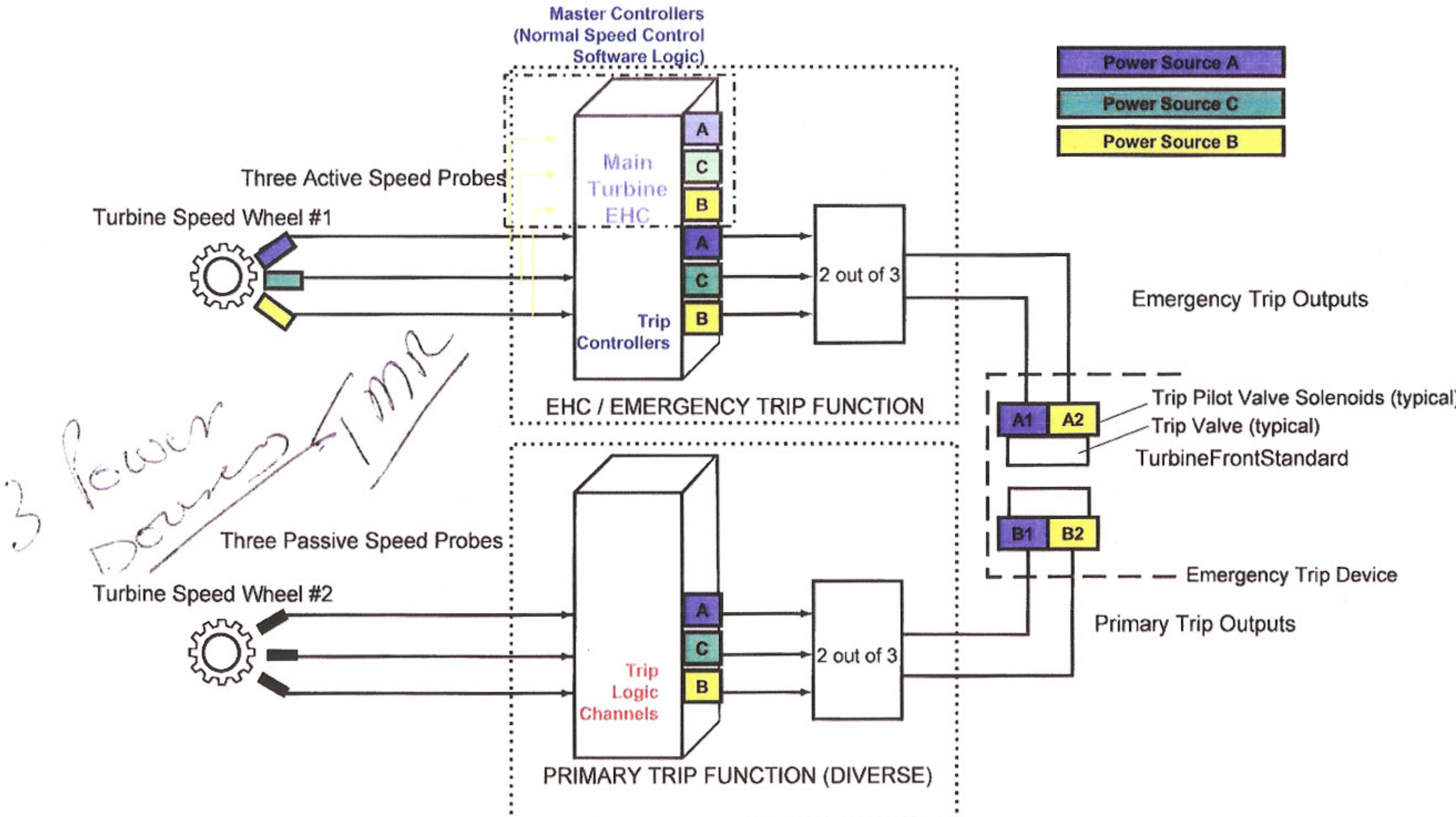


3 Speed Pickups (Active) for Emergency Overspeed Trip Function
(Active detector needs power supply)



3 Speed Pickups (Passive) for Primary Overspeed Trip Function
(Each passive detector needs no power supply)

Summary of Turbine Overspeed Protection including Power Sources



U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Presentation to the ACRS Subcommittee

South Texas Units 3 and 4 COL Application Review

Advanced SER Chapter 14
"Verification Programs"

April 6, 2011

Staff Review Team

- **Project Managers**
  - George Wunder, Lead Project Manager, DNRL/BWR Projects Branch
  - Stacy Joseph, Chapter Project Manager, DNRL/BWR Projects Branch

- **Technical Staff Reviewers**
  - Garrett Newman, Frank Talbot, CQVA
  - Dinesh Taneja, ICE2
  - Bhupendra Bhatia, Amar Pal, EEB
  - David Jeng, SEB2
  - Yuken Wong, EMB2
  - George Thomas, SRSB
  - Raj Goel, SBCV
  - Steven Williams, Robert Kellner, CHPB
  - Devender Reddy, SBPA

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Summary of Technical Discussion Points for South Texas COL Chapter 14

Open Items 14.02-6 and 14.02-8	Startup tests related to flow induced vibration
Open Item 14.02-4	License Conditions for Initial Plant Testing
Departures New to Section 14.2	STD DEP T1 2.4-4 STD DEP 10.2-1
Departures New to Section 14.3/14.3S	STD DEP T1 1.1-1 STD DEP T1 2.4-4
Revised Response to RAI 14.03.05-2	Revisions to Site Specific ITAAC: Table 3.0-1 Ultimate Heat Sink Table 3.0-5 Reactor Service Water

Flow-Induced Vibration Assessment Program

- Open Items 14.02-6 and 14.02-8 required STP to update the preoperational and startup test abstracts to reflect FIV program
- STPNOC submit revised responses to RAIs and revised 14.2 FSAR to designate that:
  - STP Unit 3 is the US ABWR prototype plant tested in accordance with the ABWR DCD and STP Unit 3 FIVAP (in Chapter 3).
  - STP Unit 4 is a non-prototype category I plant utilizing the inspection method in accordance with RG 1.20 and STP Unit 4 FIVAP (in Chapter 3).
- Flow-induced vibration pre-operational and startup testing for STP Units 3 and 4 is described in Section 3.9.2 of the FSAR and FIVAP references. The FIVAP is evaluated in Chapter 3 of the SER.

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

ITP License Conditions

- STP proposed post-COL commitments to address COL License Information Item for “Test Procedures/Startup Administrative Manual”

- The staff identified that COL Information Item should be controlled by License Conditions

- The staff sent an RAI requesting applicant to inform the staff if the staff’s proposed license conditions are considered appropriate

- Staff evaluated the applicant’s response to the RAI and proposed license conditions.
  - Provision of Test Specifications and Preoperational and Startup Test Procedures
  - Test Phase Completion and Provision of Results
  - Provision of Test Schedule
  - Control and Reporting of Changes to the ITP

Departures New to Section 14.2

- STD DEP T1 2.4-4 - RHR, HPCF and RCIC Turbine/Pump NPSH
  – Test abstracts for RHR and HPCF were revised to remove criterion that temporary strainer be 50% plugged throughout test.
- STD DEP 10.2-1 – Turbine Design
  – Test abstracts for “Main Turbine Control System Pre-Op test” and “Main Turbine Auxiliary Pre-Op Test” revised to reflect the correct description of the intercept valves and intercept stop valves. Verification of this change is being tracked as a confirmatory item.

Departures New to Section 14.3/14.3S

- STD DEP T1 1.1-1 – Definition of "As-Built"
  - The Tier 1 definition of "as-built" is modified to clarify that the determination of physical properties of an as-built SSC may be based on measurements, inspections, or tests that take place before installation in cases where it is technically justifiable, provided that subsequent fabrication, handling, installation and testing do not alter the properties.
  - This definition is in accordance with the latest guidance endorsed by the staff in NEI 08-01 Revision 4.

•STD DEP T1 2.4-4 - RHR, HPCF and RCIC Turbine/Pump NPSH

  - ITAAC for RHR, HPCF and RCIC were revised to remove criterion that temporary strainer be 50% plugged throughout test.

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Revised Response to RAI 14.03.05-2

- Ultimate Heat Sink and Reactor Service Water ITAAC revised to clarify requirements for displays, alarms and controls for main control room and remote shutdown system control panels
- Reference to RSW heat exchanger isolation valves removed from site specific ITAAC
- Staff reviewed proposed changes and determined that the changes are acceptable
- SER will need to be revised to address addition of Item 5 in RSW ITAAC. Change does not affect SER conclusions that UHS and RSW ITAAC are acceptable.

Chapter 14 Advanced SER

Conclusion

ACRS Action Items

ACRS Action Items related to Chapter 10 are discussed on the following slides:

- #45 Provide RAI response on turbine overspeed sensor redundancy and diversity
- #42 Main turbine missile analysis and maintenance program
- #59 Value of 10^{-2} per year per plant for product of strike (P2) and damage (P3) probabilities
- #43 Documented basis for turbine rotor integrity (FATT and Cv) departure

Action Item # 45

Provide the RAI responses regarding redundancy and diversity of turbine overspeed sensors including power supplies.

Response: RAI 10.02-1 through 10.02-8 revised responses were submitted (2/21/11).

- Provided additional details on redundancy and diversity for the turbine overspeed protection system in FSAR Section 10.2.2.4
- Provided site-specific ITAAC.
- Discussed on previous slides.

Action Item # 42

Main turbine missile analysis and maintenance program.

Response: As discussed with Chapter 3 presentation on 10/20/2010, FSAR Subsection 3.5.4.5 (COL Item 3.13) provides the following:

> "A turbine system maintenance program will be submitted within three years following receipt of a COL that includes the probability calculation of turbine missile generation and shows that the turbine meets the minimum requirements as given in FSAR Table 3.5-1. (COM 3.5-1)"

COM 3.5-1 addresses the COL applicant item stated in Section 3.5.1.1.3 of the ABWR DCD.

Action Item # 42 (cont'd)

- To demonstrate consideration of operating experience obtained from the Japanese plants, the following reports were developed:
  - "Analysis of the Probability of the Generation of Missiles from Fully Integral Nuclear Low Pressure Turbines," Toshiba Technical Report UTLR-0008-P, Rev 1, September 2010.
  - "Probabilistic Evaluation of Turbine Valve Test Frequency," Toshiba Technical Report UTLR-0009-P, Rev 1, September 2010.
- The reports provide a basis for, but are not intended to satisfy, the requirements of COM 3.5-1.

Action Item # 59

Explain FSAR section 3.5.1.1.1.3 description "conservative" as applied to the value 1e-02 per year per plant chosen for product of strike (P2) and damage (P3) probabilities.

Response: STP 3 & 4 FSAR Subsection 3.5.1.1.1.3 states:

> "Per Acceptance Criteria 1 of Standard Review Plan (SRP) Section 3.5.1.3 for unfavorable turbine generators, a value of 10^{-2} per year per plant was chosen as a **conservative** value for the product of strike probability (P2) and damage probability (P3)."

From Acceptance Criteria 1 of SRP Section 3.5.1.3:

- Calculations are "order of magnitude" only, and can be reasonably assumed to fall in a range that depends on turbine orientation.
- The staff does not encourage applicants to calculate P2, P3, or their product due to assumptions and modeling difficulties.
- The staff accepts P2 x P3 of 10-2 per year per plant for unfavorably oriented turbine.

Action Item # 59 (cont'd)

STP DEP 3.5-1 addresses the change from a single unit with favorable turbine orientation to dual unit STP 3 & 4 in which the orientation is considered unfavorable to safety-related systems of the adjoining unit.

The turbine missile ejection impact on the adjoining unit (P2) can be estimated using a simple model based on information provided in FSAR Figure 3.5-2 and other figures:

- Using this simple model approach results in an estimate for P2 of approximately 0.007, or ~0.01 (10^{-2}).
- Result is consistent with SRP 3.5.1.3 accepted value of 10^{-2} for P2 x P3 for unfavorably oriented turbines.
- Estimates do not consider obstructions between the turbine and the adjoining unit safety-related buildings (e.g., turbine building, radwaste building, service building, and control building annex), or locations of specific safety-related targets.

Action Item # 43

Provide the documented basis for adequacy of turbine rotor integrity related to FATT and Cv departure (STP DEP 10.2-2).

Response: This departure, STP DEP 10.2-2, was evaluated as a Tier 2 departure, and complies with Section VIII.B.5 of Appendix A to Part 52, as documented in STP 3&4 COLA Part 7, Departures Report.

- During an audit conducted in 2009, NRC staff reviewed additional documentation related to the bases for departure evaluations, including STP DEP 10.2-2.
- The audit report concluded that there is reasonable assurance this Tier 2 departure does not require prior NRC approval.

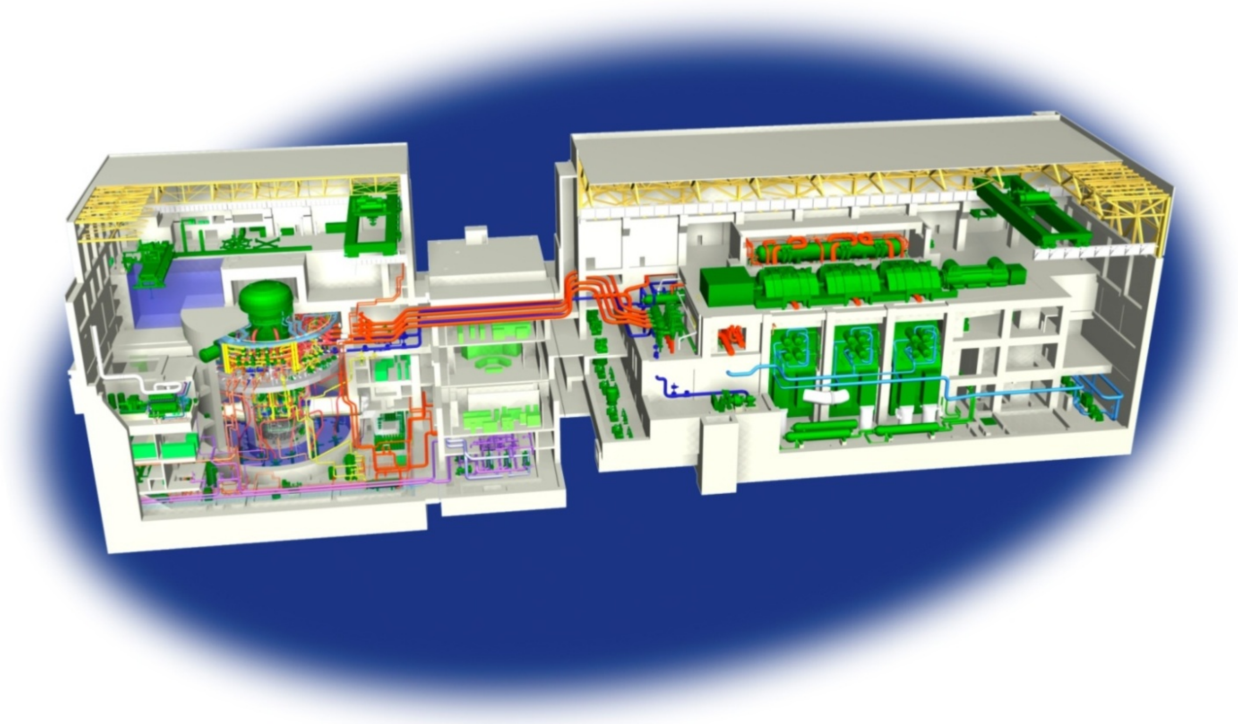
Action Item # 43 (cont'd)

Information contained in the additional documentation included:

- Design of the large low-pressure (LP) rotors will be of the forged, monobloc design, consistent with industry practice.
- The lower stresses experienced in the monobloc design are accommodated with Ni-Cr-Mo-V alloy steel (ASTM A470), the material used in the fabrication of the rotor.
  - Greater material resistance to corrosion.
  - Approach is consistent with industry practice.
- Reports which indicate that, for the rotor design and material properties, design overspeed conditions do not result in significant missile generation probabilities.
  - Reports reference analysis methodologies that are consistent with industry standards.

South Texas Project Units 3 & 4
ACRS ABWR Subcommittee Presentation

ACRS Action Item #68



Agenda

- Introduction/Attendees
- Action Item #68
  Provide testing of Common-Q platform at 70% loading
  - Overview
  - Discussion
  - Summary and Conclusion

Attendees

Scott Head	NINA Manager, Regulatory Affairs, STP 3 & 4
Mike Murray	NINA I&C Manager
Warren Odess-Gillett	Westinghouse Engineering
Ed Brown	Westinghouse Engineering
Coley Chappell	NINA Licensing STP 3 & 4

Action Item # 68

Provide documentation of qualification test of Common Q platform at 70% loading (demonstrating AC160 base software testing).

Response Overview

- Generic Common Q AC160 Processor Software Release Test demonstrates Processor Module operates > 70% load
- Generic AC160 Qualification Testing demonstrates response time performance at loads up to 75%
- Application programs are constrained by design requirements
  - Software Program Manual
  - Application Restrictions

Generic AC160 Software Release Test

- Each AC160 Base Software Release undergoes a product type test, conducted under high processor loads
  - Processor load is monitored
  - Results are recorded in the type test record
  - Documentation exists that demonstrate the AC160 base software was tested at ≥ 70% load.
    - For example, latest Release Test demonstrates processor loads up to 80%

Generic Common Q Qualification Testing

- Initial platform qualification was performed for a reactor protection system for a Swedish reactor
- Response time tests were performed at the following conditions
  - Normal load
  - Additional "dummy" logic added to increase load to 75%
- Results indicate that increased load has minimal impact on response times

Response time TEST CASE 1 - NORMAL PROGRAM

No.	t_1	No.	t_1	No.	t_1	No.	t_1	No.	t_1
1	56 ms	11	56 ms	21	52 ms	31	50 ms	41	54 ms
2	53 ms	12	55 ms	22	49 ms	32	50 ms	42	47 ms
3	62 ms	13	63 ms	23	49 ms	33	62 ms	43	54 ms
4	54 ms	14	59 ms	24	52 ms	34	49 ms	44	48 ms
5	52 ms	15	60 ms	25	51 ms	35	58 ms	45	51 ms
6	54 ms	16	53 ms	26	52 ms	36	54 ms	46	44 ms
7	52 ms	17	61 ms	27	51 ms	37	59 ms	47	54 ms
8	57 ms	18	57 ms	28	55 ms	38	51 ms	48	47 ms
9	59 ms	19	54 ms	29	51 ms	39	47 ms	49	48 ms
10	51 ms	20	52 ms	30	56 ms	40	60 ms	50	51 ms
avg.	55,0 ms		57,0 ms		51,8 ms		54,0 ms		49,8 ms

No.	t_1	No.	t_1	No.	t_1	No.	t_1	No.	t_1
51	56 ms	61	56 ms	71	65 ms	81	65 ms	91	57 ms
52	62 ms	62	60 ms	72	63 ms	82	57 ms	92	49 ms
53	64 ms	63	57 ms	73	57 ms	83	59 ms	93	57 ms
54	64 ms	64	57 ms	74	46 ms	84	49 ms	94	51 ms
55	57 ms	65	52 ms	75	44 ms	85	53 ms	95	44 ms
56	62 ms	66	58 ms	76	55 ms	86	51 ms	96	50 ms
57	57 ms	67	61 ms	77	63 ms	87	61 ms	97	60 ms
58	67 ms	68	56 ms	78	59 ms	88	66 ms	98	57 ms
59	68 ms	69	53 ms	79	57 ms	89	60 ms	99	56 ms
60	60 ms	70	58 ms	80	52 ms	90	59 ms	100	50 ms
avg.	61,7 ms		56,8 ms		56,1 ms		58,0 ms		53,1 ms

Total avg.	55,3 ms

Response time TEST CASE 2 - SYSTEM LOAD AT 75 % USING DUMMY LOGIC

No.	t_1	No.	t_1	No.	t_1	No.	t_1	No.	t_1
1	73 ms	11	64 ms	21	62 ms	31	60 ms	41	67 ms
2	58 ms	12	64 ms	22	65 ms	32	54 ms	42	68 ms
3	73 ms	13	51 ms	23	61 ms	33	59 ms	43	69 ms
4	64 ms	14	54 ms	24	68 ms	34	61 ms	44	65 ms
5	65 ms	15	49 ms	25	73 ms	35	53 ms	45	64 ms
6	63 ms	16	62 ms	26	63 ms	36	58 ms	46	45 ms
7	69 ms	17	59 ms	27	61 ms	37	52 ms	47	67 ms
8	70 ms	18	59 ms	28	67 ms	38	55 ms	48	48 ms
9	58 ms	19	63 ms	29	61 ms	39	59 ms	49	62 ms
10	68 ms	20	58 ms	30	65 ms	40	57 ms	50	57 ms
avg.	66,1 ms		58,3 ms		64,6 ms		56,8 ms		61,2 ms

No.	t_1	No.	t_1	No.	t_1	No.	t_1	No.	t_1
51	56 ms	61	60 ms	71	60 ms	81	59 ms	91	54 ms
52	57 ms	62	68 ms	72	60 ms	82	69 ms	92	58 ms
53	72 ms	63	60 ms	73	52 ms	83	73 ms	93	63 ms
54	54 ms	64	56 ms	74	60 ms	84	57 ms	94	57 ms
55	61 ms	65	60 ms	75	58 ms	85	68 ms	95	60 ms
56	54 ms	66	65 ms	76	58 ms	86	58 ms	96	50 ms
57	57 ms	67	68 ms	77	65 ms	87	63 ms	97	54 ms
58	61 ms	68	59 ms	78	50 ms	88	66 ms	98	67 ms
59	57 ms	69	64 ms	79	53 ms	89	63 ms	99	58 ms
60	49 ms	70	66 ms	80	57 ms	90	58 ms	100	59 ms
avg.	57,8 ms		62,6 ms		57,3 ms		63,4 ms		58,0 ms

Total avg.	60,6 ms

Summary

- Review of the test records have demonstrated:
  - AC160 continued performance at loads > 70%
  - AC160 response time minimally impacted by loads > 70%
- Software design and V&V processes are governed by Common Q Software Program Manual (SPM) and Application Restrictions for original application and subsequent modifications

Questions and Comments

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

ACRS Action Item 43
Background

- Departure STP DEP 10.2-2 selected a monobloc turbine rotor design
- The departure lists values of 40 °F and 45 ft-lbs for a fracture appearance transition temperature (50 percent FATT) and Charpy V-notch (Cv) energy at the minimum operating temperature, respectively, which are different from the SRP criteria of 0 °F and 60 ft-lbs

ACRS Action Item 43
Background

- CIB2 performed an audit at Bay City, TX to review the process for determining if NRC approval was required under Part 52.

- Audit team reviewed applicant's validation package and determined that the Tier 2 change proposed by the applicant does not meet any of the criteria identified in 10 CFR Part 52, Appendix A, Section VIII.B.5 that would result in the requirement of NRC approval of the departure.

- ASER was written to reflect staff actions and applicant’s compliance with the regulations.

ACRS Action Item 43
Staff Technical Considerations

- The forged monobloc design is inherently superior to the shrunk-on disks
- EPRI report EP-5619, “Center Fracture Toughness of Monobloc Rotors,” dated January, 1988, shows that deep-seated values for FATT and Cv correlate with the outer values in the SRP
- The applicant has committed to meeting the Turbine Missile generation probabilities with these values
- The turbine is not a safety-related component

ACRS Action Item 43
Conclusions

- The staff's ASER reflects the appropriate level of detail in accordance its actions
- The applicant complies with 10 CFR Part 52, Appendix A, Section VIII.B.5
- Not a safety-related component
- Not a safety-significant issue

ACRS Action Item 45

- Action Item: Provide RAI response regarding redundancy and diversity of turbine overspeed sensors including power supply – ITAAC acceptance criteria are very general in scope
- ITAAC included in response to RAI 10.02-6 in NINA letter dated 2/21/2011

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE MEETING ON ABWR

April 6, 2011
Date

PLEASE PRINT

	NAME	AFFILIATION
1	Steve Cashell	NINA - STP 3 & 4
2	TOM DALEY	NINA - STP 3 & 4
3	Craig Swanner	MPR
4	Jim AGLES	NINA STP 3 & 4
5	Steve FRANTZ	MLB
6	Edgar Brown	Westinghouse
7	WARREN ODESS-GILLETT	WESTINGHOUSE
8	ROBERT QUINN	WESTINGHOUSE
9	Michael Murray	NINA STP 3&4
10	Coley Chappell	NINA STP 3&4
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE MEETING ON ABWR

April 6, 2011
Date

NRC STAFF SIGN IN FOR ACRS MEETING

PLEASE PRINT

	NAME	NRC ORGANIZATION
1	Stacy Joseph	NRO/DNRL
2	Mark Tonacci	NRO/DNRL/BWR Branch
3	Michael Norato	NRO/DE/CIB2
4	Dinesh Taneja	NRO/DE/ICE2
5	Angelo Stubbs	NRO/DSRA/SBPA
6	Devender Reddy	NRO/DSRA/SBPA
7	Gregory Makar	NRO/DE/CIB1
8	Francis X. Talbot	NRO/DCIP/CQVA
9	Samuel Lee	NRO/DSRA/SBPB
10	Tim Steingass	NRO/CIB2/
11	Nanette Gilles	NRO/DNRL/NRGA
12	Amar Pal	NRO/DE/EEB
13	Chris Welch	NRO/DCIP/CTSB/CIT
14	Frank Chapman	NRO/DCIP/CTSB/CIT
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		