TECHNICAL GUIDELINES DEVELOPMENT COMMITTEE

MEETING DAY ONE-Addendum

NATIONAL INSTITUTE OF STANDARDS & TECHNOLOGY

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(*Note: The following closed captioning transcription is an addendum to* **END OF AUDIOTAPE 2, SIDE B** *as a result of an audio tape recording malfunction*)

MR. GOLDFINE: These draft requirements also require the vendor to specify its quality assurance procedures early in its process, early in its life cycle, not when the product is submitted for certification. In other words, this is generally considered to be important in quality assurance that quality assurance is not something that underlies simply manufacturing but also has specifies procedures that are vital during design, development, what have you. In any case, this particular issue, this particular requirement leads us to the open issue, the somewhat contentious issue that I am going to be making on the floor here. As I said, a key to the quality assurance success is generally considered to be that the details of a vendors procedures be developed, delivered and approved the appropriate authority before work on a

new product begins. A lot of people agree with this in the abstract but what does this mean and how can this goal be accomplished in the context of voting system certification, which of course is a special case and is the specific case that we're dealing with here.

If you look at the EAC's certification manual that was published a couple of months ago, the EAC manufacturer registration process would seem to be the obvious place for the examination and approval of a vendor's proposed procedures. Now, it fits right in. This is the time when the EAC approves the vendor to essentially go off and develop and deliver machines for testing. Problem though. The EAC manual doesn't specify a time frame for the manufacturer registration process. In an extreme case, it could occur the day before the vendor delivers its product for testing. In other words, a vendor could apply for registration, receive a certificate, and a day later, back up its truck to the testing lab and say okay, here is my product, test it. The problem is that if there were deficiencies that were discovered at this point, not the product itself but the procedures that were used to design and develop the product, it may be

too late at this point to do anything about this problem. It may be impossible to determine whether or not the delivered procedures. Remember, here we are talking about quality assurance. It's something a little abstract or above the machine or the product itself, maybe impossible to determine whether or not the procedures were in fact adhered to during the design and development stages. Now, admittedly, I used an extreme case here, but the goal is if you're going to be serious about quality assurance to insure that it underlies the entire life cycle, not just the last stages, and the end product and so on.

Okay, so there are a couple of possible solutions we present two of them here- one of which was drafted sort of as the straw man is to be explicit and require that the delivery -- maybe I should step back for just a second and be a little clear. As part of this process, part of the requirements require that vendors deliver a manual of their proposed procedures to be examined and approved by the EAC. What we're talking about really is the timing of this. The first solution requires that the delivery of the QA/CM procedures for approval " shall

occur during the manufacturer registration process as specified in the EAC testing and certification manual, and before the start of the design and development process for the given voting system.

This accomplishes the technical goal of insuring to the best of our ability, and there are a lot more details that would be supporting this and so on, but this would solve the technical problems of getting the manufacturer's procedures examined and approved in advance. But the way it's worded, it has the effect of specifying a time frame on this, on the manufacturer's registration process, since the deliver of are is linked to the registration process and the delivery has to be done before the start of the design and development process then it would seem that the manufacturing or manufacturer registration process would also have to be done at that point. This is not something that's contained in the EAC manual. It does imply a non-trivial additional requirement on the EAC manual, and technical issues aside, this may be outside the scope of the VVSG. So, this is why there's an issue here.

An alternative is of course to drop the “before the start of the design and development process”, remember back here, where was it? This clause over here, and simply link it to the manufacturer registration process and leave it in the hands of the EAC. Kick the ball to them and they're responsible for insuring that or attempting to verify that all of this is done in an appropriate time. There could be an informative discussion outside of the specific green requirements in the VVSG that advises that the vendor submission should be done before the start of design and development, as a possible additional bit of information. This of course is optional or remains to be decided, but the problem for this alternative, it defeats the goal to a certain extent, to a large extent of insuring in advance that the vendor has adequate procedures in place before that vendor actually proceeds to go ahead and develop and manufacture his machines. This issue was kicked around at the last CRT meeting there was participation in fact from a representative of the EAC there, but in the end, the advantages and disadvantages were argued and I didn't perceive that there was any consensus at the end

of that discussion. So it was decided to bring it up in front of the TGDC.

I just want to emphasize, this isn't so much a strict technical issue. Is it good or bad to do this as early as possible? It seems to be fairly broad agreement that yeah, sure, the question is how is the best way, the best feasible way of accomplishing that goal, and I sort of turn it over now to a discussion by the TGDC .

MR. CHAIRMAN: Can I have a point for clarification?

MR. GOLDFINE: Please.

MR. CHAIRMAN: Could you, given that in the end, what the guidelines are producing is to insure a certain level of performance, reliability, security, usability, accessibility for the voting systems...

MR. GOLDFINE: Right.

MR. CHAIRMAN: How it got to that point, how relevant is that? In other words, from your expert opinion on the QA/CM, mandating the specific process that the manufacturer got to that point, does that add additional value in terms of the outputs that we're looking for?

MR. GOLDFINE: Well it doesn't mandate a specific process. It mandates some generalities that the vendor

looks at and then says okay, in terms of my environment, my procedures, my history, the particular product that I have, here is how I will address these general requirements, and the vendor at that point puts together what's called a quality manual in which he certifies, yes, I will be doing this. Yes, I will follow these sorts of procedures in this particular manner for me. Yes, I will maintain the logs that are required of problems that arose during development, and I will do it in this sort of a manner and so on. Then, this manual, which is of course customized by and for the vendor, is then delivered to the appropriate authority and in this case, the EAC, who looks at it and says, " looks good. " it looks as though as best we can determine as best as humanly possible before the start of everything, as best as can be done in a general manner without dealing with specific Isolated issues, this looks good. We have proved your quality assurance, your set of quality assurance procedures. The issue, and I’m going to try my best to focus on a narrow but nevertheless what is an important and has many implications is to focus on the timing of this and what is the best way to do it.

MR. SKALL: If I may. I think that question was a little more general than that. The question essentially was: why do we care that quality procedures are in place in general, if in fact the end result is to accomplish the requirements in the VVSG, if you accomplish those requirements, who cares how you got there which is a philosophical question about the value of things like ISO 9000 for instance and I guess that could be debated. I don't know if anyone -- I think that was your question, right?

MR. CHAIRMAN: I'm not trying to raise the philosophical aspect again as to the value of ISO 9000, and it's a value and the industry recognizes the value of that but I'm not sure that necessarily has the same merit of requirements in VVSG as the output products, but so I'm not questioning the value of 9000 and 9001.

MR. GOLDFINE: Well if I could just say an answer to that is, well two parts to the answer. One is that it does provide us with an additional tool to help insure reliability. Certainly you can always come up with examples of ISO 9000 compliant organizations who produce garbage and so on, but it does provide one additional

tool, one additional hook that can be used as best as possible to help insure things.

MR. CHAIRMAN: If I could use the chair’s prerogative, I want a clarification. Is Mary Saunders here? Well, I apologize, but does NAVLAP normally look to see whether quality assurance programs in place? Is there a precedent under NAVLAP to insure that once someone goes for certification for final testing that at least some quality program was in place?

MS. SAUNDERS: (indiscernible)

MR. CHAIRMAN: Okay, so the lab does not reach down to see the vendors program. Okay, thank you.

MR. GOLDFINE: And the other quick half a sentence answer is that historically, this has always been considered important within the VSS and now the VVSG and we are following our mandate and looking at this. Lynn?

MS. ROSENTHAL: This is Lynn Rosenthal. Let me also try to clarify some of this as well. The quality manual is required. It needs to be there. It needs to be built. It does show what the vendor is doing as far as their design and their development and their process. That needs to be there so that the labs when they're

assessing the equipment have something that they could say oh, you have all the right processes in place. The idea that the labs are doing this in house, a whole lot of extra testing for functionality, for reliability, for security, that will in fact, hopefully, show if there were any problems that may have been designed in. So this is a tool by having this manual. It's just one tool and one extra way of looking to see if something jumps out. What is key is that when the last test a piece of equip am, what is key is that we have a high level of confidence that when they manufacture the next machine and the ones after that, that those machines would be of equal quality and at that same level as the one being tested. So this is really a question of is it worth having a very strict requirement and one that may pose timing issues? What do we get? What is the benefit of doing that, or is it one of these where it's really you have to submit it, I don't think there really is a question there but it's a matter of vendor beware if there is a problem in your manual, you may fail the testing and the certification, even though you pull it

up on the next day. I mean, it's a buyer or a vendor beware type of question, so there are two extremes here.

MS. QUESENBERY: It seems to me that quality, well, to the extent that use ability and accessibility and security for that matter are qualities of a product, that all of those need to be baked in from the beginning. I mean, if you look at say the FEC now EAC handbook on developing a user centered system, a system that ends up with good usability, it doesn't say magically do it. It says, you know, there's good established processes for how to do it that are good practice in the field and that should be followed. I find it very hard to imagine how far we could go back to mandate that. Having said that, and while I believe with all of the fibers of my professional heart that this is the right way to do it, in the end, I’m mainly concerned that the end results come out right. And that the work that we've been doing for the past four years has been about determining what coming out right means, and we wrote things like requirements that vendor conduct a test and submit that report in the hopes that not only because we wanted the results of that test and

we wanted that report but in the hopes that the vendor would say well I’m going to have to do a test at the end. Maybe I should be testing as I go along to make sure that the pieces were there- that the end would help hint towards the beginning.

MR. GOLDFINE: Well of course part of the advantage of the usefulness of a mandated QA procedure is to prevent those sorts of things from happening at the last minute, where the vendor comes in and it's discovered that it is not acceptable, and so on. Maybe if there were a strong QA process all the way through, we wouldn't have gotten to that point.

MS. QUESENBERY: I have to say, I’m dubious about the ability of a standard to mandate good behavior. I think we can mandate good outcomes but not good behavior.

MR. GOLDFINE: Well, there is a way of trying and I think the rest of the chapter has drafted or does attempt that and it's a focused issue, a question of timing.

MS. QUESENBERY: I’m sorry, just a follow-up and I guess this is actually a question for the EAC, but the case that you proposed is one in which a vendor arrives at the door of the, you know, with the truck at the door of

a testing lab with someone in the back and they are busy submitting their registration documents at the same time. Is there a process by which those documents have to be accepted or is it simply enough that they submit? Because if there is a process by which they read them and say yes, indeed we accept your registration, it's hard to see that those could happen one day apart.

MR. HANCOCK: That's exactly right, Whitney. We do have to look at their registration application and part of that is the QA manual and in fact, what's before you now, if you put a period before the word “before" up there, that's in place already. We do everything before that. That's the current practice.

MS. QUESENBERY: So the question really is, just before the start of the design, I think that's really the question before the TGDC here. And I guess one more follow-up question for Alan which is how do you determine when the design and development process have begun?

MR. GOLDFINE: Well, part of it is perhaps as part of a certification by the vendor that he's about to go out

and start doing it. We're talking about slippery slope here; I mean there's no doubt about it.

MS. QUESENBERY: I sympathize with your goal. I just find it hard to imagine how it would be --

MR. GOLDFINE: That's what we've been groping with for weeks now. In other words, the goal is clear but how do we accomplish the goal?

MR. CHAIRMAN: David and then John.

MR. WAGNER: I’m trying to understand better the justification behind this. So one answer that I sometimes heard for why one should evaluate process is instead of outputs is if it's too hard to evaluate the outputs to tell whether they are any good, sometimes it may be easier to evaluate the process to see whether the process is good. Is that what you're arguing for here or is there justification a little different?

MR. GOLDFINE: No. The justification is what is the best way to help insure that the product that are in fact delivered to maximize the probability that they are in fact good. We're still, you know, part of the justification is to minimize the risk, again, whether

this is our responsibility or not but to minimize the risk that products come in and they're junk.

MR. SKALL: Let me try to take a shot at that. If we consider our goal is to end up with as good voting system as possible, not just to pass and/or fail the ones that are bad, the more we build in from the beginning to help insure that happens, the better chance we have and at the end. If everybody fails and they cannot improve in order to pass, we don't have a good voting system. So if we build something from the beginning that does suggest we can do it with a higher probability we'll end up with a better product that's separate from saying whether it passes or fails. It’s trying to encourage better products.

MS. QUESENBERY: Wow, I’d like the user center design process for that. (Laughter)

MR. CHAIRMAN: John, did you --

MR. GALE: You got to put your patience hat on here with me for just a minute. As I’m hearing all of this discussion I’m thinking of all of the different kinds of manuals that apparently the vendors are going to be either required or by necessity produced. One is going

to be a manual that's going to go with the equipment if it is certified and approved. It's going to go out to the election officials and tell them how to use this piece of equipment. So that's one manual that makes sense to me. Another manual is a manual that expresses the design criteria by which they are going to produce thousands of these things once it has been certified. That makes sense in terms of quality assurance of the manufacturing process, once it's been approved. But this third one doesn't make any sense to me at all, frankly. If you're going to hand build a Porsche and you're then going to create a factory Porsche, it's created in an entirely different way. You'll have so much more trial and error and ambiguity and indecision and clarification when you're hand building the Porsche. You may end up with the same thing in a factory built version but the quality assurances and controls are entirely different, even though you may end up with the same end product. And so if I get this, we're saying okay, Mr. Vendor, you create this whole quality assurance document with a lot of infinite detail and then you also give us that hand built Porsche. I don't know how that quality assurance

document makes any difference to that first product- that prototype- because that's not how they are going to produce them from then on. So the only people, I can see benefiting- maybe it makes the test lab job easier, because they could see how they went through the process of hand building this Porsche, and all of the trial and error to get there, so what am I struggling with here?

MR. GOLDFINE: Well for one thing, I don't know if you read the discussion paper on QA/CM draft requirements, we don't feel that the quality assurance requirements, we don't feel that they are particularly onerous. If you look at them, they are very straightforward and fairly general. They do have to be customized by the vendor but it doesn't seem to be a big deal. We're not specifically requiring that there be, this was an earlier issue that there be third party formal certification- an ANSI certifier that would certify that the vendor adhere to ISO 9000 or anything like that. That would be the purview of the EAC to determine its criteria and so on. But I find it, maybe I’m wrong but I find it hard to believe that the design, development, and procedures that were used for the prototype are totally different

from the procedures that were used or that would be used when on the assembly line to produce the production versions- matter of fact that would seem to be a bad thing.

MR. GALE: But when you use a prototype, cost is kind of an open ended issue because you're trying to end up with a product without regard to cost that you can get certified and then you start worrying about efficiencies and economies of scale and how to produce these things so it seems like if we're producing a document that's going to make the testing of this equipment easier, then it's a design based testing, and I thought it was a performance based testing and that's just using my own language, but I thought in the testing process, you show up with this equipment that you hope meets all of these things and somebody tests it and see if it does and it's all performance related but we want to know how you design this thing too.

MR. GOLDFINE: Most of the VVSG is product-based but there are parts and there always have been that are design based. And this is one of them.

MR. GALE: So, who benefits then at the end of the day from this document you're talking about?

MR. GOLDFINE: It helps insure quality. I think the test labs do, and the vendors do. It's a means to help them produce a better product.

MR. GALE: Let me just finish a couple comments if I may. I don't like this gotcha quality that somebody mentioned that you produce this quality assurance document on the basis of one prototype and it can start going through the testing process and if your QA isn't found to be correct, that you fail and you have got to start over again. So I'd rather see a QA, if you're going to require QA, that it be maybe something would be filed at the end of the testing process rather than the beginning because both the lab and the vendor are going to learn, aren't they, from the interchange of the process of testing and certifying? So that if there are some gotcha's in there, they get remedies without throwing you out of the process.

MS. ROSENTHAL: Excuse me. I'm sorry, I just wanted to clarify and address your comment. There really are no gotcha's. The VVSG clearly identifies the requirements

of what needs to go into that quality manual, so the vendor knows in advance what those practices are. These are not new. These have been in the standard since 2002 in the earlier standards, many of these requirements. Do you have this section for the QA? I don't.

MR. GALE: Yes, Volume one, section eight and volume two, section seven.

MS. ROSENTHAL: And in fact, all the vendors up until now have created a quality manual that meets the requirements. We're not really changing many of the requirements other than saying you have to produce the quality manual and deliver it at a certain time. What a quality manual does is it documents a lot or it has the vendors tell us or the labs or the EAC what is their process of how they build and design their machine- what are they logging, what are they doing as far as testing. And these are requirements that are explicitly stated in the VVSG as well as they have to be able to show that they tested certain of their internal build processes, certain of their configuration processes, they need to be able to log and keep logging certain events and the quality manual is capturing all of that information, so

it's not a surprise to them. They should not be surprised by what is expected to be contained in that quality manual which is also guided by an ISO standard. So if they appear at the door and after review, their quality manual has something lacking, that would be a surprise, I think. They should not be surprised.

MS. QUESENBERY: Where is this material, in the VVSG binders?

MR. GOLDFINE: It's in the supplemental, the other volume. There’s not a proposal but a discussion of draft requirements in the meeting materials binder.

MR. CHAIRMAN: Okay. I think Mary first, then Patrick.

MS. SAUNDERS: I have a very brief comment. This is from the perspective of the testing lab as NVLAP looks at them. The test lab, you're right, looks at a particular voting system and configuration and does not reach back into the manufacturer's process for producing that initial or whatever it is number product or the process for producing products in the future. It's a one-time test and they don't exercise judgment. They test to the standards. The product system and configuration meet the requirements of the standard. Quality management systems

are the responsibility of the certification program which is the responsibility of the Election Assistance Commission. Whether you can produce repeatable products systems over and over and over again is a very simple point. Unfortunately, the procedure as written is unenforceable. You can't enforce this requirement to have a QA manual in place before the vendor starts design development of a particular system; I don't see how you would be able to enforce that.

MR. GOLDFINE: You can try.

MS. SAUNDERS: It's already covered in the certification.

MR. GANNON: This is Patrick Gannon. My comment kind of goes along the line of enforceability of how this could be implemented. First of all, has there been any direct input from existing manufacturers of certified equipment today as to whether or not they feel like sure, they would not have a problem providing such documentation ahead of time- so the first question was has there been that level of dialogue to date?

MR. GOLDFINE: We have not discussed that particular issue with the vendors. A lot of them claim to already

be ISO 9000 compliant but that takes in a lot of territory, but no, the answer to your question is no.

MR. GANNON: So help me understand just where is the QA/CM review done and how would having that review prior to the manufacturing or design process, you know, change the outcome? Would they then have to have the procedures reviewed ahead of time, before they start the design process and then after they complete it when they get ready to test their product or are we then having them come back and say okay, you submitted your plan of how you're going to do the process, but now that you've actually started building them and you maybe have changed the process based upon your own internal testing and QA work, you've now documented, you've revised your manual. Where is the requirement that then gets resubmitted?

MR. GOLDFINE: Well there is a discussion of that. There is a requirement for how to handle changes, on the fly-changes or changes during the development and manufacturing procedures. That is dealt with, but the point is that the earlier that it is done, and remember

these are customized by the vendor. The earlier it's done, the earlier potential problems can be identified.

MR RIVEST: So thinking about this from a security viewpoint, I guess the question we're asking is that the vendor may say they are going to run a variety of tests and bring in an external review team for security analysis and run software tools on the code to see if there's any kind of overflow or vulnerabilities or other things, etc, etc, but my understanding is that submitting a plan saying you're going to do those things though in no way commits the vendor to submitting the results of those tests which would be the thing that would be most interesting to say open ended vulnerability testing team or the lab looking at security issues. Is that correct?

MR. GOLDFINE: What you've just said is strictly correct, that the mere presence in a plan doesn't require it. Some of those things, however, are required by other requirements or should be required by other requirements within the VVSG or within the chapter dealing with this.

MR. RIVEST: The results of this test would be of more interest to the lab than just the fact they were going to do those tests?

MR. GOLDFINE: You may be right.

MS. QUESENBERY: Well, I think I’m hearing the concept of quality assurance as a process and quality testing as a part of that process, and I don't know if I have a question here but I want to put that on the table because it seemed to me that what you were talking about was having a quality process, like I just noticed between a user center design process and usability testing which may be part of that process.

MR. GOLDFINE: If I understand you correctly, I think yes. What we're talking about is not the testing of the product. I mean the whole rest of the VVSG is -(indiscernible)-It's an additional somewhat separate, somewhat disjointed tool that tries as best as can be done in this murky area to insure that the procedures and policies and what have that are followed by the vendor are appropriate and will have the best chance of leading to good results.

MS. QUESENBERY: So as a clarification, could you give me an example of a part of a QA process that you'd want to see if you were inspecting such a manual?

MR. GOLDFINE: I think the whole rest of the draft chapter deals with that. There are requirements for logs of problems that were encountered during the process, whatever it is.

MS. QUESENBERY: What's an example of a problem encountered?

MR. GOLDFINE: Well, a lot of this would be dependent upon what the vendor proposed. In other words, if they encountered a nasty problem with some of their software and it took them a lot of revisions to fix this, that might be a fact that the worthy of ultimately being available for observation by the EAC.

MR. CHAIRMAN: Okay, if I could, could you go to the slide nine where you have your two recommendations.

MR. GOLDFINE: Right.

MR. CHAIRMAN: As to how to do this and let me see if I can summarize and see if I capture this properly. So your first recommendation would be to sort of force the hand at making sure the quality assurance plan is in

place before they start the work which I think the discussion has shown is a significant burden to the EAC, it may be unenforceable, and since we really can't define when design development starts, it's sort of vague. On your second one, basically says okay, vendor, you “should”, it basically turns it from something that we're going to have a pass/fail to almost “this is good practice” and you have to submit the quality assurance manual anyway as part of the process. We really encourage that you take this serious when you do it from the beginning and it turns it into a best practice as opposed to a hard pass/fail.

MR. GOLDFINE: Well even in the second alternative, there is a pass/fail component. In terms of – (indiscernible)- Whenever it is delivered, conceivably a vendor could be flunked.

MR. CHAIRMAN: Yes, on the second one, this does not have a negative impact on the EAC, is that correct, in terms of the guidelines already produced?

MR. GOLDFINE: No, that's correct because that's the process they have already taken care of.

MR. CHAIRMAN: Right, okay.

MR. GALE: Mr. Chairman, John Gale, State of Nebraska. For purposes of getting it on the table, I'd move that we adopt the alternative that would require delivery of the QA/cm procedures for approval during the manufacture registration process as specified in the EAC testing and certification manual.

MR. CHAIRMAN: Okay, so that would be what this option is, this alternative option?

MR.GALE: Correct.

MR. CHAIRMAN: Are there any further comments or discussions on this?

Is there any objection to unanimous consent on this proposal? Hearing no objection, this passes by unanimous consent. Thank you very much.

MR. GOLDFINE: And that provides the consensus that I was or a consensus that I was looking for.

MR. CHAIRMAN: And more importantly -- You don't have to stand all day. (laughter).

MR. GOLDFINE: Unless I'm called back, yes.

MR. CHAIRMAN: But thank you very much. I appreciate you walking through. That was obviously a subtle issue but actually it has a ripple effect.

MR. GOLDFINE: Yeah, it has a ripple effect now, all of the remainder of this issue is fairly clear cut.

MR. CHAIRMAN: Now, David Flater review CRT changes I believe.

MR. FLATER: Thank you. If there is -- in the interest of good time management and doing the most important thing first, if there are no objections, I'd like to go to the second half of my presentation first which is about benchmarks. Are there any objections to that?- Benchmarks? Okay, so this is really the last significant piece of unfinished business from the stuff that I've presented in December. Now, just a quick review, what is a benchmark? Definition: it's a quantitative point of reference to which the measure performance of the system or device may be compared and in plain language, we're talking about the numbers specified in the requirement, such as the failure rate of the voting system shall not exceed benchmark, number. There are three benchmarks that are relevant here. One is for reliability, aka

failure rate. One is for accuracy, also known as error rate. And one is about the rate of misfeeds for paper based tabulators. Now, there were some issues that we were left within the previous VVSG. With respect to the time between failure, there was a resolution passed in December to essentially move away from meantime between failures and in addition, there was a lot of public input to the effect of the existing benchmark was not thought to be strict enough so bottom line is we need a new benchmark for reliability.

With respect to accuracy, we found number of ambiguities with the metric as it was specified. There's not necessarily a problem with the benchmark per se, but the way in which it is measured had some issues. The draft contains some clarifications to eliminate that ambiguity and at a minimum, we would need confirmation that the draft of clarification is acceptable. While changing the numbers is also an option.

Finally with regards to the misfeed rate, this is actually a combination of two old requirements, one which said paper based tabulator, using whatever terminology was current at the time, shall not misfeed

in the sense of jam more than one ballot in 10,000. The other requirement which raised eyebrows in the CRT committee said that the equipment shall not reject ballots that conform to all vendor specifications more than 2% of the time. That's 2%, and the committee heard that and said, um, 2%, we don't think so. So that's been harmonized with essentially those two requirements have been merged under the part of misfeed and to a one in 10,000 benchmark. And that is believed to be relatively non-controversial unless there are any comments on that. What we're expecting more discussion about is reliability and accuracy.

Now, from the December meeting after a long presentation about the test methods, we ended up with this unfinished business to carry forward, asking for input from election officials to give us the data necessary to derive specific numerical benchmarks to put in the document, meaning okay, here is the test method but what benchmark are we testing to? The method gives you a measurement and kicks out a number but you need another number to compare that to in order to determine pass or fail and so given responses to these questions about

failure errors and volumes, we could derive those specific benchmarks.

Now, after a period after the last meeting, we didn't receive input so we sent letters to both NASED and NASS. NASS declined to take a position and we did get a response from NASED which is posted on our public website which I'm going to paraphrase in the slides up coming. We unfortunately sort of ran out of time to deal with this issue in advance of this meeting, but we did discuss it at the CRT teleconference on the 15th of March and I have incorporated as much of that as possible into this presentation and last I heard, Paul Miller, he was on the line and I think he's going to have some additional comments as well.

Paraphrasing to the best of my ability with regards to reliability: feedback was: no failures that lead to unrecoverable votes are acceptable. Other cases are tolerance for failures depends on how hard it is to recover from those failures. There is no "typical" volume in which to base a benchmark. And they proceeded to discuss five categories of reliability and things that need to happen to insure that reliability. As you

can see, we have design issues for reliability, resilience to human error, manufacturing quality, maintainability of the equipment. And the ways in which these are addressed are different, I mean there's a volume test, usability testing, different test methods are applied. Now, the consequences in terms of the benchmark: okay, we have these test methods that are applicable; however, in order to empower test labs to advise rejection of systems that perform unreliable during testing, there still needs to be a benchmark for what constitutes an unacceptable rate of failure. Again, there needs to be a number with which to compare the output of the test method so even though the right answer in practice depends on many things and we do understand in practice it's very complicated and it's very hard to come back with some number and say that this is a typical volume for an election, there still needs to be a number in the VVSG in order for the test method to be effective. One option which I’m just going to throw out there, if we go back to the feedback saying no failures that lead to unrecoverable votes or could lead to unrecoverable votes are acceptable, what would

it mean if there were a benchmark of zero? What this would mean is when the equipment is being tested by the test lab, if a failure occurs, the equipment is rejected. We haven't proven that the equipment is never going to fail, ever, but in terms of the practical consequences, depending on the length of your test campaign, it's not necessarily out of the question to specify a benchmark of zero. I’m just going to throw that out there as a possibility and not advocate for it. So with regards to this slide we've sort of come full circle that having examined the feedback received so far, we still need a number. Now there's additional discussion here. Regarding our feedback, our tolerance for failure depends on how hard it is to recover from the failures. We cannot know its certification time with practical impact of different sorts of failures will be because it depends on the practices and procedures put in place by election officials. Election officials in turn will put practices and procedures in place as required dealing with the equipment that they have. So the argument is completely circular. We cannot determine

a benchmark this way. At some point, we need to know really what benchmark is required.