United States Election Assistance Commission

Public Meeting

Interdisciplinary Roundtable Discussion

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VERBATIM TRANSCRIPT

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PUBLIC MEETING

INTERDISCIPLINARY OFFICIAL ROUNDTABLE DISCUSSION

DR. KING:

Okay, I think we're ready to get started, if we can take our seats. Good morning, everybody, and welcome to the seventh and final roundtable discussion on the topic of the draft version of the VVSG that's now out for public comment. This is the seventh in the series of roundtables, prior roundtables -- and many of you have been at the prior roundtables that met with academic security experts, with equipment manufacturers, with voting system test labs, with the voting advocacy groups, with election officials, and now we're here today with an interdisciplinary roundtable with representatives from each of those groups.

And what I'd like to do is to begin first with introductions of the panelists and if you could briefly introduce yourself, the organization that you represent, and your role within that organization. And Carolyn, I'm going to start with you and then we'll work around the table and we'll end with Brian.

MS. COGGINS:

Okay. I'm Carolyn Coggins with iBeta Quality Assurance and we're one of the VSTL's, voting system test labs and I'm the QA Director for Voting.

DR. KING:

Keith.

MR. CUNNINGHAM:

My name is Keith Cunningham. I am the Director of Elections in Allen County, Ohio, a position I've held for approximately eleven years.

DR. KING:

Okay, thank you. Pam.

MS. SMITH:

I'm Pamela Smith, Verified Voting Foundation and President. We also have a sister organization called VerifiedVoting.org.

DR. KING:

Thank you. Alec.

DR. YASINSAC:

Alec Yasinsac, I'm at Florida State University for another three weeks and then I'll move down to the University of South Alabama. And I'm also working with the USACM on voting issues and we'll release our comments later today, on the VVSG.

DR. KING:

Go Jags.

DR. YASINSAC:

Go Jags, that's right.

DR. KING:

Tim?

MR. RYAN:

I'm Tim Ryan. I'm with the AEI-Brookings Election Reform Project. This is a four year cooperative project between the American Enterprise Institute and Perkins Institution headed by Norm Ornstein and Thomas Mann.

MR. DICKSON:

I'm Jim Dickson with the American Association of People with Disabilities.

DR. KING:

Thank you, Jim.

MR. BEIRNE:

And I'm David Beirne, Executive Director of the Election Technology Council, the National Trade Association of Voting System Providers.

DR. KING:

Okay.

MR. LEWIS:

I'm Doug Lewis, Executive Director of the Election Center in Houston.

DR. KING:

Doug, thank you.

DR. GILBERT:

Hi, Juan Gilbert, Associate Professor at Auburn University, Computer Science and Software Engineering.

DR. KING:

Juan, thank you.

MR. GALE:

John Gale, Secretary of State, State of Nebraska, member of the TGDC and a member of the Standards Board.

DR. KING:

John, thanks. Mark.

MR. SKALL:

Thank you. Mark Skall, NIST, National Institute of Standards and Technology and I'm the Division Chief of the Software Division and also the Program Manager for the voting project.

DR. KING:

Thank you, Mark. And Brian.

MR. HANCOCK:

Thank you, Merle. Brian Hancock, Director of Testing and Certification for the Election Assistance Commission. Thank you for coming today on behalf of our commissioners and our executive director. In fact, I'd like to recognize Commissioner Donetta Davidson in the audience. And let's see, anybody else here? Not yet. I know our executive director is here and will be joining us probably later this morning and we'll recognize the other commissioners, as they perhaps come in later today.

As Merle said, this is the seventh, it seems like perhaps the twelfth or fifteenth or the twentieth of these that we've had recently. But we think we've done a fairly reasonable job of bringing all of the participants in, something that we did not do in 2005, and we really feel very important for this dialogue, is to bring everyone in and let everyone have a say on the draft document.

Just to remind you all, the public comment period on this version of the TCDG Draft ends today at 5:00. Please get your comments in, if you haven't already done so. We have received over the past three or four days, as many comments as we had received up to that point during the entire public comment period. And I think there is about 900 sitting out there right now that are yet to be published and then we have till the end of the day so. I won't

say we're looking forward to it, but we're certainly anticipating a process where we will work with the NIST staff to go through the comments, categorize them, and look at the comments that we get from the public, as well as, the comments that we received at these roundtables. It will take us a little while to synthesize everything and to see exactly what we want to propose for our commissioners. But again, thank you and get those comments in, if you haven't at this point.

I'll also thank the man most responsible for putting this on, Matt Masterson sitting over there, thank you, Matt, once again. And the guy that makes this all run, Merle King, thank you, Merle.

DR. KING:

You're welcome, Brian and thank you. A couple of housekeeping things before we begin. One, if you have cell phones or PDA's particularly Bluetooth or WiFi enabled, that the mikes are going to pick up, now would be a great time to mute those and I know the rest of the folks here will appreciate that, too. When you wish to be recognized today, if you would put your tent card up, that will help me keep track of who would like to speak and in what order. And an important thing is, to recognize that we have about three hours for discussion this morning until lunch and then another hour when we come back from lunch for summary. We've got eleven panelists. We've got seven questions. The importance of self regulating the duration of your comments cannot be overstated this morning. So if you have a comment that can be told without a story leading up to it, Doug, that will be beautiful.

MR. LEWIS:

Just, you know, you just -- I feel like Rodney Dangerfield already.

DR. KING:

But it is important that we do keep on track. We do have seven questions to cover and we will take a break right at about 10:30 and then we'll break for an hour at lunch. And when we come back from lunch, it's been the custom with these roundtables, each person here will be given about five minutes to pull together the most important thing that you would like to go into record, regarding this draft of the VVSG. And it can be a reflection on things that you've heard. It can be responses to things that you heard, but everybody will be given an opportunity at the end to make a statement into the record, in that closing hour that we have when we come back from lunch.

There's a couple of folks who have volunteered to give introductory statements to open each question and if there is no one to volunteer for that, then I will do my best to motivate each question to open it up. And I think right now, all I've got is David and Alec. Is there anybody else that's volunteered for a question? Okay, very good. Well with that, then, let's begin and Matt, if you could go ahead and put the first question up. And Alec has volunteered to motivate that first question. Alec.

DR. YASINSAC:

Just to clarify, I didn't volunteer, I said I can help any way I can and he said okay, lead the first question. So, I will try to -- the first question regards the ability to reduce costs of voting systems, without compromising core functionality. And it's interesting because as an academic, I have some real strong opinions about

software engineering, as Juan doing software engineering in a way that applications can be developed. But not just from an academic standpoint, I also, in 20 years in the Marines, I wrote code. I designed and developed applications. I operated and ran facilities that executed applications and did the user interface on how those things were done. So, it's not all ivory tower stuff that I'm talking about here.

And my contention is that, these applications, voting systems applications are high assurance applications. They're priority of our critical infrastructure and they need to be engineered with that in mind. And we can both reduce costs and actually improve functionality, reliability, capabilities, and features, if we adopt rigorous engineering processes in our development procedures. And how can the VVSG handle this? Well it could be -- it can require as a standard, that the voting system vendors report as part of their process, how mature the processes are that they develop with. And those can be recorded via mechanisms that are well established and responded to the Software Engineering Institute in a process called CMMI and there are others out there, that would allow us to focus on getting the product right the first time, having a high probability that any product that is submitted for certification will pass, which is critical.

It doesn't make sense to be trying to recertify and reprocess systems that have failed. There's no good way to do that. It's an ugly process and we need to avoid it. We need to give the vendors a standard that they can engineer to and then they can produce products that are high quality and that will be accepted when it

goes to any -- to the certification from a reliability security and process standpoint.

Now to finish up my initial comments here and hopefully get some discussion, I think what we have is, we have a product standard and there's a mention in another one of the comments that I've seen already about Deming [ph]. Deming is about process. And the notion here is, quality processes produce quality products. We will never be able to eliminate product standards. We will have to look at the products that come out, because they're not guaranteed to be good because they're quality processes. But if we don't back up and start looking at the process, that these systems are developed with, we're never going to achieve the goal, which is producing high assurance systems that are voting systems. And that's my introduction to the comment and I'm happy to engage questions and thoughts.

DR. KING:

Okay, thank you, Alec. I've heard another expression and I think it relates to what you said, which is, the wisdom of attempting to test quality into a system that's not been engineered into it, initially. So, that's I think something that came out of some discussions at the IEEE . All right, any comments or follow on to Alec's lead in? Mark?

MR. SKALL:

Yeah, well this is really a completely different track than what Alec said. Clearly this is a very large standard. It's going to cost a lot of money to implement all of the features. One of the things that I know the TGDC looked at, at least briefly, is, whether in fact, it

should be an all inclusive standard, i.e., should conformance be mandated for all the functionality or should we break it up to various segments or levels?

So, one of the thoughts I had and I believe I brought it up at the previous roundtable, I forget exactly which one, was that we could break this up into levels and ask for conformance to not be dependent upon all the functionality, but if you conform to a specific subset or a level that would suffice, that would reduce the cost. We could possibly break it up, so that you would have sort of a minimal level with all the core functions that we believe are absolutely necessary, have another level on top of that, perhaps a third level on top of that. If we can do that and segregate the functionality that we believe is absolutely mandatory from the ones that are perhaps desirable, you can have, again, conforming implementations that would only conform to less functions. Of course, if you conform to the second level or third level it would be even better but you could still get a certificate from the EAC. That would be a way to perhaps reduce costs.

DR. KING:

Okay. So, one alternate model perhaps might be a stratified conformance model. Okay, thank you. David?

MR. BEIRNE:

David Beirne, the Election Technology Council. I just wanted to provide my comments from the standpoint of reducing costs. And I think that's one of the concerns that we have as an industry, is what we're seeing with the current certification process, is that certification costs are increasing 300 to 400 percent through over a

year and a half of pending certification, with not a single product certified, as of yet. The real concern is that, all of those certification costs get placed into a bucket, that essentially, will be used to establish a price point. And the concern we have is, how do we build in efficiencies? And I think, it goes back to when we're adopting the VVSG, to make sure that we have clear performance protocols and standards, by which we know how the systems are going to be judged. And I think, that needs to be done prior to the adoption of the VVSG, which will go a long way to standardize costs and so that the industry partners can anticipate the final cost for certification and build that into their pricing schedule.

DR. KING:

Okay, thank you. Carolyn.

MS. COGGINS:

One of the things that I've taken, more as somebody who actually is using this standard on a daily basis, is really a practical approach to this. This is really a very small industry. It has a huge impact on the country, but it's not got a lot of players. And one of the things in the approach -- well, actually it does have a lot players. It has -- it goes across a long line of people from, you know, the manufacturer, ultimately down to the voter. And part of the process is that, it's almost a development of the format of the standard. It's not taking into account, how can we streamline this process so that somebody who is doing the state certification can look at the report and really trace it back to the standard.

You know, in terms of how we've set up our processes, all of our processes as a test lab, actually go into how can we facilitate

that ultimate report that we're providing? So, we actually start with the report and work our way back to, how can we make this an efficient process? And that's something that I don't think we're looking at this document as really being the starting point where we can get a practical holistic and cohesive perspective. You know, if we can -- it's almost like, what's the usability of this document? And I don't think that aspect was in the initial design. It -- what does someone at the county level need, in order to look at a report and have a good feeling that, here are the key pieces I need in that report to tell me whether or not this thing is going to work for me or what else I need to do.

And I think that's one of the aspects of the standard that hasn't really been looked at. It's just, who's it going to touch? Who wants to use this? And is there a way that we can all look at this process and make it work for everyone.

DR. KING:

Okay. Doug and then Jim. Doug.

MR. LEWIS:

Struggling with, what is the appropriate mix of requirements and needs and assessments and still coming back to, what is rational and reasonable in terms of how to manufacture a system that jurisdictions can afford, is always going to be, I think this is a question we're going to be faced with for almost ever, in this process. We're at the point that, at least from what I'm hearing now, and Brian, maybe you can confirm some of this, is that the systems have gone from maybe $500,000 for testing now, to where we're looking at 2.5 million for testing. And the vendors, at some

point, obviously have to pass that along. In the meantime, they don't have anybody to pass it along to, because they're not selling anything because the market is muddled, you know. So, what I think we're looking at, if we're not careful is, we're going to look at an intense contraction of the available supply of voting systems. And reality is reality and if this gets to be so expensive, that you can't afford to play, then there has to be a different way to finance it.

We struggled with, over the years, this question of, should the federal government, for instance, be paying for all of the testing? Well then, the answer to that was, as we got to looking at, if you do that, then you've got every fly by night outfit in the world deciding that, since you're going to pay for it, they will come use you as their alpha testing and their beta testing, too and you end up with a process that then, the federal government is spending, you know, zillions of bucks for stuff that's pretty marginal.

At the same time, we can't just assume that, it seems to me that, this whole marketplace has no breaking point in terms of cost. It does have a breaking point. And what we want, I think, what everybody who's sitting around the table wants, is robust systems that are safe to vote on, but I'm not sure we're going to ever achieve perfection in any of this. And I think, that unfortunately for our recognition factor here, is that we all want, we strive for perfection, but to sort of insist on it from the very beginning is very difficult.

And let's also remember this is -- we're making this up as we go along. There's not been any of these testing programs

anywhere else in the world. We invented this process. We invented the idea of testing voting equipment and finding out, could we set the standards for it and all that. We're still learning. And as we're learning, we're going to make some mistakes in this and some of it is going to be expensive mistakes. And some of it is going to be embarrassing mistakes, on occasion.

I think we need to set our expectations, that what we're trying to do is come up with something that's robust, something that contributes to the continuous improvement of voting equipment. That's what we're looking for. And hopefully, some day, we'll get to the point that we're as close to perfection as we can be. But I think, we've got to get past the fear that it's not going to be perfect and therefore we can't approve it or therefore, we've got to load on 95 more tests, in order to make sure that it is perfect. Finding this balance is not going to be the easy part of this process.

DR. KING:

Okay, thank you, Doug. Jim and then Brian.

MR. DICKSON:

I wanted to go back to Carolyn's point, about the usability of the document and just lift up one example that I think speaks to the problem that she raised and that is, that the accessibility requirements in this document are scattered in several places. And I think that leads to confusion. We said, in our formal testimony, that there should be one, well, either one section on disability or at least an appendix, where all of the accessible features are listed, because I know from the point of view of my community, this is not a user friendly document. It's a very confusing document.

DR. KING:

Okay, thank you, Jim. Brian.

MR. HANCOCK:

Thanks, Merle. I want to kind of touch on a couple of things Doug was alluding to, and, you know, I think it's important, you know, there's not one -- going to be one way that we can tackle this. I mean, we need to deal with the issue of cost savings, which actually, we've already been thinking about and we started, we had an initial meeting last year that we hope to follow up on. But it's also going to be financial incentives. What we know, no matter how, what the percentage of how much more expensive this is going to be. It is going to be more expensive and there's nothing we can do about that. So, what we need to do is look at it, how can we save in this area? How can we work with states to bring more testing to the federal level to save the states money? But we also need to make the Congress and state legislators aware that, you know, they're going -- at some point, they're going to have to pony up money if they want better systems and better testing, you know, it's just the way it is, you know. Again, it's a small industry. Election officials can't afford to have those costs passed down to them, you know, on the basis that it's going now.

I think one of the other things that's affecting the initial cost right now, is that we're dealing with a new program, as Doug mentioned. The players in this program are essentially used to working in an unregulated industry. We're bringing some more rigor and although not exactly regulatory functions, it really, almost goes to that in some levels. And so, there's a maturity aspect that

we just can't get around. It's going to take a while for the program to mature. I think we'd all like to have a very mature program. We'd like to be where the FCC is right now but they're been doing this for 40 or 50 years and they have gone through their own growing pains, it was just quite awhile ago and people tend to forget about those things. So, we're there right now. And we certainly hope it doesn't take us 40 or 50 years to do this, but there's no getting around the fact that there are going to be some growing pains and some maturity issues that we do have to deal with.

DR. KING:

Okay, thank you, Brian. I've got David, then Alec, then Pam.

MR. BEIRNE:

David Beirne, the Election Technology Council. There's a -- certainly there are some precedents that we can look at, from a policy standpoint with the federal government providing grants or incentives to spur innovation. We see that with the Energy Reform Bill. I believe there was some grants or innovative programs that were intended to encourage the manufacturers to retool their plants, so they could accommodate the new café standards for gas mileage. That's certainly something we can look at, but I don't know that the industry is all that eager to have a handout from the federal government, with any type of funding mechanism.

I think in the short-term, one thing we've proposed as a cost saving measure, because the key aspect is to make sure it's a fixed cost, so that you can plan for it accordingly. Understanding that you're already in the marketplace, how do you incur and carry on

and pass the cost, the increased cost to the consumer, while making sure that you're not creating a market failure. The economics of this issue have not really been fully examined and I would certainly encourage everyone or to have more roundtables such as this, to start discussing it.

But in the short-term, I think one thing we can do is, with the VSTL process, although the EAC cannot set a rate for certification, there may be something where we can look at, in making sure that the VSTL's, during the accreditation phase, just as a proposal, is to submit a fixed cost, just as they would for a bidding process, to say this is how much we're going to charge for the entire circle of life, to give you a certified product. And that would go a long way to, at least, shore up and create some fixed costs, so that the vendors can build that in and build around from a planning standpoint, to make sure that they understand what they're getting involved with.

DR. KING:

Okay, thank you, David. I would like to recognize Commissioner Carolyn Hunter, just joined this morning. Good morning, Commissioner. Okay. Alec, then Pam, then John.

DR. YASINSAC:

I'd just like to go back to the original statement where we started with and reflect, a second, on what's been said. Mark mentioned, we should go through a tiered pricing structure, where we have absolute necessity in things that are desired and tiered into structures. Well, I would hope that the VVSG is limited to absolute requirements here, that we're not trying to get into what people may

want in our standards system, but that, again, goes to the product nature that we have, in the standard.

Mr. Lewis is interested, obviously, in the fact that the costs are becoming exorbitant and we're unable to sustain a monotonically increasing or geometrically increasing, testing cost structure and I -- that's absolutely correct. We can't do that. Brian mentions, the states have to be ready to pay and the states have to be ready to pay, that's correct. And David would like to have a fixed pricing structure. We all would like to have that.

But the bottom line here is, we're not going to get any of those things, unless we take steps to insure that the products that are coming into the certification process are high quality products. And that the processes that develop those products, are high quality. And I've not heard a soul either endorse or challenge that tenet, that I've made here. And I've not seen anybody put forward an initiative that will help to get to that process.

So, while it helps a lot to complain about exorbitant costs, makes us feel better, until somebody steps forward and says, we've got to put this standard of process in place, we're not going to see a lot of improvement in any of these complaints that have been made, that I see.

DR. KING:

Okay, thank you. I've got Pam, then John, then Carolyn. Pam.

MS. SMITH:

Yeah, I think it's important to think about the costs, a little bit in terms of, not only the costs up front to vendors that may get passed along, but also what the costs are down the line. If a system turned

out not to be rigorously tested and failed in the field, then who's going to bear that? That's going to get borne in the jurisdiction where something goes terribly wrong. So, that's one thing.

I do actually support the idea that Alec mentioned. I think that fixing a problem before you release, is going to be an order of magnitude or so, less costly than having to fix it after you ship the system. So, there you go, I do support it.

DR. YASINSAC:

Thank you, thank you very much.

MS. SMITH:

I don't have the solution for you though, the plan you suggested, but I support it. But also, like what Mark suggested, which was a phased or stratified adoption of the most critical factors, first. And I think that, that says, you know, we're not necessarily leaving out factors but that it's possible to reduce costs, by doing it in a phased fashion.

DR. KING:

Okay, thank you. I've got John and then Carolyn. John.

MR. GALE:

Thank you, Merle. Well I guess, as an election official for a state, there are several things I would like to comment on. I think there are some macro forces at work here, that are going to impact whatever we decide. This is not a singular step forward, in terms of election technology.

One trend I think, is multi-channeling. We're going to see more and more states offering more and more kinds of opportunities for people to vote. It's not going to be just, this kind of

system. It's not going to be just, a high technology piece of equipment in every precinct. We're going to mail-in ballot only precincts and counties. We're going to voting centers. We're going to states, like Oregon, that are all mail-in ballots. We're going to early voting. We see telephone voting developing, like in Vermont. So, focusing on this and considering a steel ring around the tree and that if we can strain it enough through this testing process and through the VVSG, that will force everything into this high tech compliance and forget the costs, that's the price you pay for high tech.

I will tell you, I hear nothing from county officials, in the Standards Board or in National Association Secretary of State, the bottom line dollar is going to drive whatever we do. And if we drive this cost so high, it means that election vendors, election equipment vendors are going to go out of business manufacturing. They're going to go into service oriented work, in terms of ballot design and layout. They're going to go into assisting with voter registration systems. There are going to be software -- they are going to abandon the whole idea of manufacturing, simply because the costs have become too high to pass on. Our counties are not going to buy super technology, super expensive equipment. The counties are property tax based. The state's budgets are usually constrained and they are not contributing to election equipment. And consequently, if you drive this process, you're going to end up with vendors from Latin American and Asia, because they can absorb those lower costs and then we're going to have to decide if

we're willing to have foreign manufacturers of our election equipment.

The other possibility is, we just, will have state's abandoning these voluntary standards. These are voluntary standards. Twenty-six states have said well yes, we'll get onboard with voluntary standards set by the EAC, but once that cost price reaches a certain limit and the counties say, we aren't going to yield to that, the states are going to abandon the idea of going with voluntary federal standards. And you're going to find generic equipment coming in, with states setting up their own, kind of low cost labs to certify their own equipment and this whole process of this hugely complex expensive testing and certification is going to become an anomaly. It will be just simply abandoned on the beach.

So, I think you have to consider what's happening on the macro side and what's happening to the vendors, what's happening the county based system. I guess one of the other things is, you could go to a system where the manufacturers can't manufacture precinct based equipment because it's too expensive, so you're going to have to go to high tech state purchased equipment, where maybe you have a state system that's all mail-in ballots and one or two super optical scanners that are going to process statewide ballots. And then, maybe manufacturers will go into the business of manufacturing those because the state can afford two or three of those, as opposed to precinct based systems.

So, if we're going to have precinct based voting, we have to consider the cost, the simplicity, and the reasonableness of poll workers using that equipment.

DR. KING:

Thank you. I do want to note, I think John is the first person to use the descriptor, simplicity, as a desirable attribute of voting systems. So, after five months of this, I've finally heard that word, so thank you, John. I've got Carolyn, Keith, and then David. Carolyn?

MS. COGGINS:

I was just going back to the, kind of, the idea of a fixed cost and with the VVSG. I mean, one of the aspects of that is supposed to be coming out with this iteration of the VVSG, are the test methods. And in order to get towards, you know, the idea of fixed cost, we've got to get products coming into the pipeline, in a state where they are ready for certification. And by having it -- the test methods have, in my opinion, have to come out with the standard because the manufacturer needs to have an idea as to, okay, this is exactly what I'm going to be tested to. And the advocate has to know that this is what they're going to get tested to and the person who is going to be buying the voting system has to be able to look at it and say, okay, this is what they're going to be tested to.

And I think we can get closer to a true certification, if the manufacturer has truly gone through that process and knows exactly what they're going to be tested to. Now, you still are going to have some aspect of interpretation there, but there's, just the fact that we've gone through so many -- well we haven't, you know, we've got a half dozen to a dozen interpretations that have come

out of standards that have in some cases really haven't changed since 1990, but that aspect of the interpretation of what that test is going to mean, is, you know, that's where this is a mature industry that's reexamining what's been out there for a long time. And that's one of the difficulties for the manufacturers and for -- I thought we already discussed this, so many years ago, but it wasn't discussed -- it didn't -- it never had a blessing, it just got discussed.

And so, if, that's one of the key things that I just think that this standard has to come out as a mature document. It has to be fully functional.

DR. KING:

Okay, thank you, Carolyn. Keith, and then David, and then Mark.

MR. CUNNINGHAM:

Thank you. Just a couple of comments, maybe, from the local perspective. First off, I think Secretary Gale is right and actually, I would say we're even past the point of local counties purchasing election equipment any longer. It's beyond their means. But at this point, election equipment is either going to have to be purchased by the state or the federal government. And I would submit that, had not the Help America Vote Act appropriated the money that it did, we would still be using punch cards in many counties.

Which brings me to this point. You know, the local official has moved, in a matter of just a few years, from punch cards to DRE's, by and large, with nothing in the middle. We just went from a walk to subsonic, or maybe even in some cases, supersonic speed. I think the average, you know, I'm very flattered to be in this group of people, most of whom are far more educated than I in

much of what we're talking about. I think that the local official is absolutely and totally confused by most of this. They don't understand logarithms. They don't understand cryptography. They -- you know what they're looking for the same type of thing, that when you buy a lamp it's got a UL sticker on it because they're involved in making this work.

You know, and my focus, as I've said at the last roundtable, basically, is on usability. You know, are my people going to be able to set this up? Is it going to work? You know, how dependable is it? And I think that, you know, we have to consider, in talking about the funding, Boards of Elections had the -- well, they definitely were the -- in 2000. The Boards of Elections used the punch card equipment up through about 2004. They had to be the last organizations on the face of the earth using that type of equipment, to try to do some kind of accurate compilation of data. And why was that? It was because of funding. Nobody wanted to fund it.

I am saying that I use with my commissioners, whenever I get into a budget battle with them, I just look at them and say, well you think a good election is expensive, wait until you see the cost of a bad one. This is beyond -- I guess my point is, this beyond the local level of funding.

And Mark, I wanted to ask you one question. When you talked about a tiered standard, are you basically saying, that equipment could be sent to the market based on three different levels in certification, basic, you know, intermediate, and advanced and I guess my question in that would be, what would be the incentive to move beyond basic certification, if that was the case?

MR. SKALL:

Yeah, well, in writing the standard, I like to think of conformance rather than certification, because that's the necessary next step. The way I envision a possible scenario is, the standard defines conformance in terms of tiers, so everyone must conform to the first tier. The second tier which would encompass the first and second tier, if you conform to both of those you'd get a certificate, that would be a little bit different. And if you conform to the next level up, which would be everything again, including a third tier, you would get a certificate that says you conform to that. And what differentiates the certificates is the market.

So essentially, if we can differentiate and say these are absolutely mandatory and I disagree with Alec a little, but yes, they're all mandatory, they're all important, that's why we put them in. But there are certain things that are more basic. There are other things that are put in to push the envelope. For instance, open ended vulnerability testing, very, very important, but it's sort of at a level different than the absolute conformance of requirements. There are many other things like that. The marketplace will determine that.

So, there is that model in other standards, where you can conform to different levels and what determines whether, in fact ,you are better than the next person, is whether, in fact, the marketplace decides that your additional functionality is worth the additional cost of your product.

DR. KING:

Okay. Let me go to David and then come back to Mark. Mark had another point. David.

MR. BEIRNE:

I just wanted to build off of Secretary Gale's comments, with regards to the framework for the VVSG. And one of the biggest things is that, for it to be successful, the states that currently opt into this voluntary framework must remain within the voluntary framework. And we're already seeing stress points occurring within a number of a states, where there are already either, have already chosen to leave the voluntary framework or are considering building in exceptions. And I think that goes contrary to how we all come about to this place here today.

And certainly from the industry standpoint, one way to build in cost efficiencies is to make sure that the VVSG is a, excuse me, is a functional document. One that is flexible enough for the states to see that it does recognize its challenges and makes it willing to stay in and see the process bear itself out. And I think we're not seeing that currently and that's what we're concerned, as an industry moving forward, is to make sure that it is still robust enough that it has teeth added to it by the states. And that's really where the teeth come into play, is that, the states are choosing to require federal certification for the voting systems. And I just want to make sure that we don't lose sight of that.

DR. KING:

Okay, thank you, David. Mark, and then Juan, and then Tim.

MR. SKALL:

Thanks. I just want to expand a bit on what Carolyn said about testing. Most people think, at least in this environment, is testing as important, because it allows a certifier, in this case the EAC, the test labs, to make decisions, go and no go decisions, about whether, in fact, implementations, or in this case voting systems, pass and should be certified in this and then sold.

Testing is much, much more than that. Testing is a way, as Carolyn said, which allows the implementations to get the bugs out early. And the tests, at least in our opinion, need to be developed early on, not later, after the fact. If they're developed early, the voting system manufacturers can use those, not only to get bugs out in the implementation, but get the bugs out in the VVSG. We find that when we write tests early, you have to look at requirements. Often times, you find those requirements are not precise, they're ambiguous and perhaps they're wrong.

One really good way to vet the standard, is to write tests and look at each requirement and try to test it. So, it's extremely important to do this. NIST is, in fact, producing a comprehensive test sweep for the next VVSG. We're working on it as we speak. It will not only, we believe, be comprehensive, but be uniform because if all test labs use one test sweep, you will get the same result, regardless of which particular test lab test, which is very important. So that's something we're working on, something we believe in, and we think will really improve the process.

DR. KING:

Okay, thank you. Juan and then Tim.

DR. GILBERT:

Okay. I'd like to speak to Mark's tiers, but I would like to change that from a tier to component based testing. I think, one way to potentially reduce costs is certify components, such as hardware or software and have some kind of separation there. If you could imagine, if you look at other industries, you have hardware that can be certified and the software, independently can be certified to run on the hardware.

So, rather than each vendor coming to the table every time, saying, I need to have certification for this brand new product, this brand new software, this brand new -- is it possible to do a component based certification and will that actually reduce costs? I envision, something of the nature, where you have a hardware somewhat certification, that certifies with respect to usability, security, accessibility, reliability, and the same thing with software. And then, it could speak to Alec's notion of the process as well to developing that software.

I think that notion of this component base approach could significantly reduce costs. And in actuality, it could open up new markets and increase the competition, because if I specialize in software, then maybe I want to write software that can run on different hardware and things like that. So, I think that is an option to reduce costs.

DR. KING:

Okay, thank you. I've got Tim, and then John, and then Keith. Tim.

MR. RYAN:

I'd also like to build off of Mark's comment on the tier certification system. This is something that resembles something that we've

discussed at the AEI-Brookings. One thing that someone said in one of our meetings is that, you know, one way to make this document much more simple and, in a way, more elegant, would be to whittle it down to the -- just the basics, the bare minimum standards, and then we weren't really thinking of a tiered certification system, but rather just a separate document, just in best practices, things that we think are a good idea, in a general way, but we're not so sure that we're ready to, you know, to be fully committed to it and we still want to give the states flexibility, but sort of suggestions or examples of good systems, to be pointed to, as examples for the states.

DR. KING:

And Tim, if I could just, for my notes, separate the document into sort of a minimum conformance and a best practices, kind of stratify it in that direction?

MR. RYAN:

Yes.

DR. KING:

Okay, thank you. John and then Keith.

MR. GALE:

Well, a couple of things, in regard to the VVSG recommendations. Taking into account that there are other alternatives out there that states may well explore, such as internet voting and all mail-in ballot voting, if the machine technology isn't affordable. But, I think there are things in the VVSG that can be looked at. For example, both from the county and the vendor point of view, the device specific hardware cryptographic requirements, really, is causing

tremendous heartburn out there, because if you have a device that is only precinct specific, that means that the election administrators can't, in the county, can't move that piece of equipment to another precinct, because that precinct is busier. It has more volume. It has more load. They need a piece of backup equipment. Right now they have that flexibility. Once you have that device specific cryptographic requirement, then that piece of equipment cannot be used outside of that precinct. And if that piece of equipment, one of those pieces of equipment goes down, there is no way to bring in a replacement piece of equipment. And so, they lose tremendous flexibility at the very point of interaction, at the time of conducting the election, when this stuff is critically important that they have that flexibility.

So, if there is a way for a state to opt out of that requirement and say, we'll take the risks on that. We'll do, with Georgia, we'll use DRE and we'll have Kennesaw State provide that management envelope or cover, for best practices, to take care of some of these risks. That would be, to me, a very practical approach to some of the VVSG requirements.

Also for example, updates in firmware modifications. The way I understand these is, if it's a piece of equipment that you want to update for and it hasn't gone through the newest standards, the whole piece of equipment comes back through, in terms of upgrades and firmware. Well, both the manufacturers and the counties are going to pay for the cost of that and look with horror at that, because it had that flexibility in the past, suddenly they won't.

I mean, it's as basic as, okay, let's change the case of an AutoMark, because they're so heavy and let's put a cheaper case on it. Technically, you would have to run the AutoMark back through the certification process, because you're changing the weight of the case and the -- and so, there's an absurdity to a certain level, of this inability to do upgrades and firmware modifications. Obviously, at some point, there's a bright line, where you don't want to give that core function or core requirements, but there seems no built-in flexibility, which is exactly what the election administrators need on election day, because they've got to make that election work. They want every person to vote and every vote to be counted. If they don't have that flexibility and if these pieces of equipment they paid a lot of money for, go down, they have some very expensive paperweights that have not performed to make that election work.

DR. KING:

Okay, thank you, John. I wanted to follow up on something that John said. Later on, in our discussion today, we will be asking the question, how can we create models for evaluating tradeoffs and the tradeoff that you mentioned, John, was the flexibility derived from the ease of deploying equipment on election day versus the security of knowing that a device has to come back in from that precinct.

And I wanted to point out that, these discussions brought up these kind of things and I think again, you're the first guy who said, well here's one way we can do it and the states can opt out. Now, so now, we're looking at a couple of different views. Mark's brought

up a stratified model. Tim's brought up a model that, kind of, separates minimum components from best practices. And now, John's talking about a component, componentized model that would enable states to opt out of specific, perceived, onerous requirements. That's interesting to see these different models mature.

I've got Keith, and Doug, and then Carolyn, I'm going to let you have the last word on this question. The issue of cost comes up in a couple of different formats, so there's still plenty of time, but we do need to move forward. So Keith, Doug, and Carolyn.

MR. CUNNINGHAM:

Just to quickly pick up on that theme of the flexibility. We also, move equipment, post election and pre election, in that off period, based on use. Optical scan voting machines have a lot of moving parts. If you've got one that 1,000 votes have been cast on routinely, and another that 300 votes have been cast on, you want to switch those machines out, just to even wear, so flexibility is critical.

I guess, maybe I'm tilting at windmills here, but it seems to me that the whole purpose here, was to create a set of universal standards, test sweep to match, so that, we could all agree on, at some point, and sort of lesson the acrimony and get past this, because it seems to me, we're just stuck in this. And when I think what troubles me the most is that, A, states, I guess states rights, are important. You know, if states are going to opt out, that's not going to help us. And the other thing that's not going to help us is, federally certified laboratories, then, going outside of this

environment and attempting to undercut it, by working directly with states and I think we're beginning to see some of that happen. Not necessarily with your organization, but I think that is a corrosive, will have a corrosive effect on our ability to maintain good standards for a long period of time. That's troublesome, I think.

DR. KING:

Okay, thank you, Keith. Doug and then Carolyn.

MR. LEWIS:

I wanted to speak first, to Juan's point on component testing. Brian will remember that we went through looking at some pieces of this in the early days, in the NASED testing program and what we discovered was, is that vendors would test components, but then, when you put those components together as a system, they didn't operate the same as they did as a component. And so, it was one of the things that, some years ago we decided that now, a voting system is a voting system, so if you're to test it with a component, it's got to be tested with that voting system, as a component, to make sure that it does indeed work and can be sold that way, but it can't be, we've tested this component, this component, and if you put the three component's together, then it's okay to use it as a voting system, because we discovered there were flaws in that, considerable flaws. And so, I would hate to see us get to the point that we go back to that. I think the unified approach of making sure that, if you test a component and improve a component, it also works as a part of a complete voting system, with whatever manufacturer. It's going to have to be tested with that manufacturer's components, in order to make sure it works.

In terms of the change order process, we've struggled with this for the entire life of the program. And I think you spoke to it and certainly John Gale has spoken to it, it's how do you get to the point that you recognize that a change is a substantive change, or is a cosmetic change? And how do you assure all the doubting Thomas's, that you've made the right decision when you do that? And to look at, what does that mean, in terms of being able to make the process work smoother and quicker and less costly, versus, oh, but, yeah, when you did that you, you know, you ignored X,Y, and Z. And so, the change order process is one that, if we do not conquer it and cannot get to the point of conquering, it simply means that you end up having to retest every system, every time you make a change to it. That is -- that's probably the kind of decision that will end up killing the program, eventually. You just can't live with that kind of environment, of where, everything has got to mean an entire system reworked completely.

Number three, enabling states to opt out, it seems to me, I think, Keith has really put his finger on this, is that, it sounds like a good idea, in practice it doesn't work very well. And if you really look at what the federal government is trying to say is, if you're going to use this equipment in a federal election, it will do X, Y, Z, and therefore, that's what we're developing standards for. And there's never been a requirement that states had to do it for their own purposes this way, but gee, if you're going to use if for a federal election, then at what point do we separate federal elections from state elections and run those separately?

And so, it seems to me, whether we like it or not, the standards that come, that control federal elections actually control all elections, from a practical standpoint and practical purposes.

DR. KING:

Okay, thank you, Doug. And Carolyn.

MS. COGGINS:

Just, in this discussion, just in kind of the last little bit, we're talking policy and the VVSG and that's something that should not be together. I mean the requirements for the VVSG should be, you know, the technical requirements. The policy is the EAC. And that's where we're seeing also, some, you know, that has to be in balance, as far as going forward, because that's also part of what has been in the climate, in the last couple years, is that, we're going to test to this, but the policy says, okay, if there are engineering changes that you can identify.

I mean, the standard can say, here are the things you have to look at, to assess whether or not this change is significant. It's the policy of the EAC that tells us whether or not it has to go through retest, in some ways. And so, that needs -- those documents, the things that govern us, as an EAC lab, has to be in balance with all of this and, you know, we've run into a few conflicts where -- with our NVLAB accreditation, where we're told to do it one way and something from the EAC, we're shaking it out and it's conflicting. So,, those things have to also come into balance.

DR. KING:

Okay, thank you. Well that's a great segway into Question #2. That was good, that was good, because Question 2 introduces the

notion that, the VVSG is administered by a certification program, within the EAC. And that often, as Carolyn has pointed out, the notion of the standard, the test, the metrics, the administration of the standard, all, kind of, get pooled together and this question is now an attempt, in part to tease it apart a little bit, and say, are there things that are related to the VVSG...

MS. SMITH:

He really wants to talk about this issue.

MR. SKALL:

I'll turn it the other way.

DR. KING:

I'm going to take that as a sign that Mark really wants to talk about this next question. He's getting his mics ready. To retrace the genesis of this question, are there things that are associated with the VVSG, that are best discussed in the context of the management of the certification program? And I'll put one topic out, perhaps to start discussion, that has been mentioned in a couple of the roundtables, is that, the open ended vulnerability testing. There's been discussion about whether that should be a part of the VVSG, or whether that is something that can be administered as a part of the certification program.

So, with this question, I'll reread. What specifically can be done with the proposed VVSG standards and certification testing procedures and infrastructure, to reduce time and process of a candidate system? And I think, for those of us that are in election administration, we would attest that there are relatively small and short windows of opportunity to introduce voting systems into a

jurisdiction. Sometimes the public perceives it as being a very short-term task. Most of us recognize, particularly, at a statewide level, you're looking at years of planning and possibly a year of rollout and implementation. So, when we are looking at the time and process that the latest standard, the 2005 standard, is imposing upon systems, there is a concern that 2007, or whatever the year designation is assigned to the standard, may produce substantially long time and process, that may not be in sync with the jurisdictions' planning and funding cycles.

So with that, I'll open the question up. I see Alec is ready and then Brian.

DR. YASINSAC:

Well, I give, on this one, several bullets as well. I'll just hit those bullets and let you, let it pass onto the next person. I believe that the, again, the proper procedure here, the proper thing to reduce the timing in certification, is to incentivize quality development. If you have -- high quality products are uniformly easier to test than low quality products. It's just the nature of the beast.

Provide streamline certification procedures, for systems that were developed under certified and mature development processes. If you know it's been engineered in a certain way, then you can streamline the certification process, to make it happen more easily.

Make the certification process, for non-mature process development systems onerous and expensive. So, if you want us to be a fly by night and do things by the seat of the pants, then

you're going to have to pay more. It's going to be more rigorous for you and hard to get your systems through.

Make reexamination expensive. If you are willing to submit a product that's not ready for certification, the certification process, once -- fool me once, but don't fool me twice. If it gets -- if a system fails it needs to be very expensive to go through a recertification process.

And then track vendor performance and certification and use those previous measures to gauge what level of maturity their processes are in. And that way we are going to necessarily reduce the length of time that it takes to get these systems through the certification process, if we do those four things.

DR. KING:

Okay, thank you, Alec. Brian.

MR. HANCOCK:

Thanks, Merle. Certainly, one of the things that it's going to be incumbent upon the EAC to do for this process, is to work more closely with state election officials and state certifiers of voting systems. You know, the traditional model that's sort of happened in the past is, you know, the system comes into the federal process. It takes however long it takes and then it goes to the states and take however long it takes, you know, and they each have their own speed, some longer, some shorter.

I don't think there's any reason and we've been exploring with, particularly with Pennsylvania, some ways, where the processes can develop more in parallel. You know, the states, generally, know which systems they're going to want to purchase or

pull down to their counties and there's no reason that they can't work with us, more closely, with their testing. You know, expensive testing can be brought up to our level. We can assist them with that, but while our testing process is going to go on, because it likely will be the more lengthy process, there's no reason that they can't be working on their state testing, as well, and I think that would, in the long-term, shorten the process to get systems to market.

DR. KING:

Thank you. Jim.

MR. DICKSON:

I wanted -- it doesn't directly answer your question, Merle, but it speaks to a point that you raise, that has been on my mind for a long time. I think, one of our underlying problems here, is the expectation that change in voting systems can happen quickly and that we have that expectation amongst the public and state legislatures, in Congress and amongst the media. And I don't know whether, in what venue the EAC should put out there, but I think that it's important that we educate the public policymakers and the media, that these changes take time. And if we could, somehow, get that into the public discourse, it would have lots of -- it would make this process run a whole lot smoother.

DR. KING:

Okay, thank you, Jim. Alec.

DR. YASINSAC:

I just wanted to speak to Brian's comment, on making these processes parallel. That's a potential -- appears to be a savings in

the time. The problem is, what happens if the system fails federal certification testing and the state's expended the effort to go through their part of the testing process, then the product has to go back and be reengineered and as Doug talked about, then you'd have to do -- really start from ground zero, unless you've devised an architecture that supports Juan's issue of component testing.

And that's, I think, the difference between what Doug was saying and what Juan was saying is, that for a component based process, you have to have an overriding architecture that defines what the components are and it takes time for that to happen and we're nowhere near maturity, in the voting system's design, such like, maybe, in the automobile industry or in the electronics industry, where any third party person can make components, because everybody knows that they do. We're not there with voting systems yet, so, the integration testing would be necessary. But I don't know how you would parallelize that and not risk wasting retesting, and retesting, and retesting, and retesting. At this point, it would be a very difficult thing to do, I think.

MR. HANCOCK:

Well, we're going to make sure the manufacturers develop your maturity model, so that's more...

DR. YASINSAC:

Well, there you go, okay.

DR. KING:

Thank you. I have Juan and then John.

DR. GILBERT:

I just want to speak back to that idea of component testing. When I put that out there, I want to make this clear. I don't think that -- I'm not making that a recommendation. I'm saying, that's inevitable. The cost -- our discussions that we had on the previous topic, it's clear the costs are going to get to the point that it's going to not be feasible to take whole systems through repeatedly. This process will break down. That's going to happen. That cost is just not going to stabilize.

So, getting to Doug's point, I wasn't suggesting that you certify components and then let people build them and just work with them. There would be an integration module. So, what I'm suggested is, exactly what Alec is saying, that at some point, there needs to be a discussion or the start of formalizing components. When that's going to happen, I don't know, but it's inevitable, because I believe and I don't know when it's going to happen, but I believe the cost to build, to certify, and to actually get a process in time, is going to have to be too high and it's going to break down. And then, the only model we will have, that will be able to work, will go to a component based model. Imagine, you have someone who specializes in hardware, they get it certified and someone comes along who is good at the software. They're going to -- they may be willing to split the cost for the integration testing.

So, there's all of these different models, on not only reducing the cost, but also reducing the time, at the integration level and even at the lower level. So, I think this is something that will occur whether or not we get ahead of the curve, we'll have to see.

DR. KING:

Juan, one of the things that's also come about, with the component testing is, the need to standardize interfaces between components. Is that also a part of what you're proposing in component testing?

DR. GILBERT:

Yeah, well that's -- as you know, that's one of my expertise. So, I think the interface definitely, I mean, we've seen incidents where we know bad ballot design or poor interface has been a serious issue. And that's why I said, that you can have hardware component testing, with respect to usability, meaning, how easy is it to set up and use, the hardware, the security of the hardware, the accessibility or ergonomics of the hardware, as well as, reliability of the hardware. If you take those four conditions and then you can drop them right on the software. Is the software usable? Is the software secure? Is it accessible? Is it reliable? And then, I'd actually throw in what Alec mentioned, about the process by which these things were built. Those could be documented and then evaluated as well.

So, I would say, that if you take a software vendor and you have a hard -- you have say, four hardware platforms that can be four different integration tests, that could be shared. Now, the different pricing models and they may not want to get certified on all four. You may get certified on two. If they -- it's going to be a lot of demand coming from local jurisdictions, saying, well, we like this vendor, can you certify your software on that particular vendor? And it, there may be different cost sharing models there, as well.

So, I think, again, I think this model is inevitable and that unless some miracle happens, where the entire system costs and I

don't see how it's going to happen, is going to go the opposite direction down to the certification process. I just don't see how it's going to happen.

DR. KING:

Okay, thank you. John and then Doug.

MR. GALE:

Well I'm very intrigued by Professor Gilbert's thoughts on that, because it comes back to this flexibility issue. If you have just two or three federal labs and they're going to do the end to end testing of the whole process and you get two or three plugs in that pipeline, and they're backed up and you have an election coming up and there's no alternative, except to stand in line behind all those plugs in that pipeline.

You have flexibility like the -- if you could use some of the established state testing labs, like Florida or Texas or California and have them certify it for a particular component. So, if you get backlogged, if you have an election coming, you can out -- the EAC test labs can outsource to the state labs for particular component testing that they've already been certified for. Or maybe, you can certify some of those state labs for the whole process, when there's a backlog, but you've got to have that flexibility that you mentioned, Mr. King. If you have elections coming up, the elections are going to happen. They're not going to wait for the certification and so you better have a way to have alternative resources, to complete the certification process. I think established state labs are one way to, maybe, handle that component testing, to move more products

faster through that system, rather than singular pipelines for the whole process.

I wanted to mention a couple other things. Since we're talking about reducing time in the process, there's two things on TGDC I never was quite convinced that I understood the necessity for and it's probably because I'm a lawyer and not a scientist, but requiring the vendors to come up with the technical development package, as part of the certification process, seemed like an enormous cost to prepare that and did it really help speed up the certification process or did it slow it down? And if the development package wasn't as precise as the instrumentation and there are errors, does that mean that you kick out the development package along with the instrumentation, because they didn't quite correspond and then they start all over? I think that was always a huge issue.

The other thing was, I can understand the analysis of source code and the need for understanding the source code for, whether it's optical scan equipment, or whether it's DRE equipment, but going from analysis of source code to analysis of source code logic, where there's so much subjectivity to that process, I wasn't ever convinced that either one of those things were really going to help the objective process of the certification and instead was going to put up roadblocks and it's going to kick stuff out and require we start over again. Thank you.

DR. KING:

Okay, good. I've got Doug and then Carolyn.

MR. LEWIS:

Part of, probably, the slowness at this point of the process is caused, and it seems to me, two contributing factors to this, are that you have to establish, fairly early on, a method by which you know why you're being delayed. You need to know, is it because the lab has asked the vendor for something and the vendor just hasn't supplied that yet? We discovered in a lot of places over the years, that the labs were getting blamed for things that clearly they had issued and asked for information or data or equipment and didn't have it and then, until they had it, they couldn't proceed with the testing. And so, you need to know exactly where that -- what's causing that, so that you know, you can pinpoint at what point it -- what process is breaking down, if necessary.

Secondly, I think the environment that we're in today, in elections, has created a paralysis of fear that we're all afraid to make a mistake, at this point. And this is -- this would be like trying to raise children and expect them to never make a mistake. And that you, as a parent, are never going to make a mistake. The truth of the matter is, is that we have a process that is evolving. It was invented by America. It is a process that is going to go through its learning curves. The truth is, is that the EAC eventually is going to certify some systems that will prove to have some faults. That's reality. To expect anything other than that, seems to me, to be insanity, because these systems, I guess, you could keep them locked up for 20 years, in a desire to try to make sure that everything you put through them, as you finally put the Good Housekeeping seal of approval on, it is going to be a magnificent system. But that's not going to happen.

We're going to -- voters are so creative about doing things none of us anticipated they could do, that we discover new flaws that we didn't know -- that our testing didn't relate. And so, we go through that. And it's going to happen. And so, we've got to kind of get out of this paralysis of fear and move on. Get something certified, get it out there, and then we're going to have to hope for the best. We're going to have to hope that our testing is robust and that our standards are robust, but the truth is we learn from experience. Because we will see something, we will go back and rewrite a standard. We'll go back and rewrite a test plan, so that we make sure that we don't miss those kinds of things in the future.

DR. KING:

Okay. I wanted to follow on Doug with just an observation on your comments that in many industries the do nothing alternative is a valuable thing to consider and unfortunately, in the election field, because of pressure from legislatures, even the lifespan of the equipment itself, may not give us those 20 years to ride out a working system. And so, there's many things that conspire to force us into innovation and from a jurisdiction level, often we're not looking for the innovation. I've got Carolyn and then Alec.

MS. COGGINS:

I think, just in terms of looking at the standards, our approach to this question has been more about what can be done within the standards to make things work a little better, and again, going into the idea of building quality into the first point. And that I think is, you know, it is realized that the standards do have good, clear information.

The idea of the source code review, that is an issue that we feel, you know, can be changed, instead of it being this all or nothing, that's based on these qualitative assessments, going to more quantitative. And it's a little difficult, I don't want to get off too much into discussion, but we're seeing -- we have a standard that says we've got to walk through all this stuff manually. And well it -- the way that the requirements are set, we have to walk through it manually. It's not something that we can use a test tool that will work in all sorts of ways. And I think that's one of the aspects that we'd like to see, is that, we look at going to some tools that can look at, for non-maintainable code and non-testable code, code that isn't executed in unit testing. We've got issues with dead code.

Also, going back to the TDP, the idea of the technical data package is to provide information to the -- that the jurisdictions and the test labs need. And they -- and it doesn't -- because a piece of information is missing, it doesn't stop testing, it doesn't hold up testing, it doesn't stop us from certifying, somewhat. We do require that they deliver it, ultimately. But it's -- it is a big piece of this and I think that the TDP could be revisited to say -- to see, what is really going into the hands of the jurisdictions and what do the jurisdictions really need to have in their hands? And what do the labs need in order to test the systems?

Yes, I think there -- it is a little bit difficult, as far as having -- it's a great deal of information that's being requested and it does generate a lot of the discrepancies, but it's not something that's necessarily holding up or making you go back through or -- you know, the thing that really holds up testing is, when you've got

something that, well from a functional standpoint, it's not working or even within the code.

I do think the coding standards should be revisited because I think that -- and it's kind of hard to have -- to get into the issues, in this environment, but we can do better at reviewing -- making this more about maintainable code, making this more about maturity of the organization and the quality of the organization.

DR. KING:

Okay. I've got Alec, Pam, Juan, and then David you're going to get the last word. We're going to take a break after that, so Alec and then Pam.

DR. YASINSAC:

All right the -- there's a -- frequently, there's an argument made, that because you can't achieve perfection, then you don't need to worry about excellence or high assurance. And I think we need to be very, very careful not to fall into that trap. There's no doubt, software will never be perfect, but we can develop high assurance software, software that works an overwhelming majority of the time, that does not fail. You just -- you see it happen in the defense industry and all the industries. We can produce software that is fully functional, that is safe, that is secure, and that just doesn't fail, to the level that we need to have it, if we develop through the appropriate processes. And so, that's where we need to get. I agree that we're never going to test our software into perfection. It's not going to happen.

Just a quick note on software review, because I've done lots of it and I understand lots of different perspectives here. In

response to Carol, we've recommended and you'll see my comments in the VVSG comments coming up by the end of the day, today, about incorporating testing tools into the process, to give some additional objectivity to this. There are tools out there that give you greater depth of objectivity in the code reviews, that address many of the security issues, dead code, circular logic, lots of things that can be caught with tools and we've recommended that.

But the critical idea of OEVT, is that, software is inherently subjective, that the only way to get a good view of the logic, is to look at the code. Now, I also contend that there are significant limitations that you've identified, on the ability to identify faults in code. All we can do, really, with code review, is we can determine the quality level of the software. We can't determine if the code is perfect or even very, very good. What we can determine, is, if it's bug filled, that we can find, with our eyes, that we can't find with tools, there are lots of them we can find that way, we can determine if it was developed through mature processes or not. And that's a critical component, I believe, with the certification process.

DR. KING:

Okay, thank you, Alec. Pam and then Juan.

MS. SMITH:

A just real quick note. A technical advisor that I often rely on, has passed along a story from when he was teaching. He said that, grading good assignments took little to no time and grading poorly done assignments can take forever. So, I thought that was something the testers and Alec might appreciate.

DR. KING:

That's very true. Juan and then David.

DR. GILBERT:

I won't say much on this, because I, you know, this is kind of my soapbox thing, which I'll come through on #5. But I think a lot of the things, the situations where we -- the conversations we're having today are a result of lack of research done ahead of time. We kind of jumped into this and thought it was easy to do, as been mentioned already. So, we made a lot of mistakes. And I think, one of the things to correct this, is that, we can address a lot of the things that Doug was mentioning, if we were to take a moment and conduct research about them. We need to investigate some of these things. There are tools, like what Alec is talking about, that could be used, that have not been used in this particular domain. Now I would stop and pause and say, well maybe, we should have taken it and investigated their success in that domain, but we haven't done it. We may use it in this domain and get great results, we may not, but no one's researched that. No one's actually done it. So and again, I'll come back to that later, but I mean...

DR. YASINSAC:

We have done it in Florida, in our lab.

DR. GILBERT:

Oh, good.

DR. YASINSAC:

We've used these tools on voting systems. And the California test did and also the Ohio test did.

DR. GILBERT:

See, so there again, it's the research that has been done, that can be useful to help solve some of these problems. And if we don't do the research, we end up where we are today. So, and I'll come back to it on 5.

DR. KING:

Okay, than you, Juan. David, last word.

MR. BEIRNE:

Well, I was going to throw a few things out there, which is, we're currently in a process that is still being defined and improved upon. And I think that when we looked at this question, on how to reduce time and process of certification, we were struck with the fact that we have not yet finished the certification process, in its entirety. So I -- while we're considering the next draft of voting system guidelines, we're still in the process that we're trying to figure out.

So, I think one thing that we need to do, is look at, you know, bringing the folks together after the certification process has been completed for all of those that are currently pending certification and hearing directly between the VSTL's and the manufacturers to find out what -- where the discrepancies were occurring or where were the challenges that delayed a lot of the certification issues? And I think that's first and foremost that needs to be looked at.

And I think this also speaks to the need that Carolyn brought up for, you know, specific test methods and test scripts that define what is being measured for the system. I mean, we could talk about how the systems are being looked at and they're not adequate or they're not functioning, but often times, you know, we're still dealing with an environment in which the industry has

anticipated where things are going or what is being looked at and I think it's basically been turned on it's head, in many ways. And so, it is a constant learning process and we shouldn't lose sight of that.

And also, one thing that goes to the time in process and goes back to the cost and how this all relates and I think it also speaks to the need for some sort of component testing or tier process, is that, you know, the need for software upgrades among the states, is critically important. And if you're looking at the overall cost, if they continue to rise, the industry is going to consistently look at it and say, do I need to reduce the frequency in which I'm submitting myself for upgrades to maximize my investment? It's just the practical, you know, challenges of dealing in the marketplace, as to, how do I maximize my value to my customers, meeting their demands, but also making sure that I can stay in business? And so, there has to be some sort of allowance or consideration of the economies, the economics of this. And certainly, I think it speaks to the component aspect or just the fact that software upgrades are going to be consistently necessary, because states change their legislation from time to time. And that's something that we need to definitely look at, to make sure it remains viable.

DR. KING:

Okay. I heard something reflected in a couple of comments in here, that I don't think has come up before, at the roundtable discussions. We've talked about risk assessment, as an overall process, but we've not talked about an analysis of the testing pipeline, its processes and the where and why, the impediments in

that process. And so, maybe as a precursor to Question 2, I heard a couple people talking about, before we make changes in the management of that pipeline, make sure that we understand its current structure and its behavior.

Let's take a fifteen minute break. The restrooms are out the door, straight across the hallway, to the left of the water fountains. And let's return here, right at a few minutes till and we'll get started on Question #3. And Matt, if we could put up Question #3, please, thank you.

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[Recess from 10:30 a.m. until 10:45 a.m.]

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DR. KING:

I would like to get started again. We need to try to stay on schedule. We've got five more questions, to finish up before lunch. And this is typical. Normally, in the first session, sometimes we only cover one question, so we actually did pretty well this morning. But let's look at Question #3. What specifically can be done to increase the efficiency and economy of efforts, within the testing process at the federal, state, and local levels?

Over the past five months, in these roundtables, we've heard a lot of discussion about the cost and extended time schedule, and a topic that's not often brought up and that is, opportunity cost. And in an environment in which budgets, appear to be, at the state level, very tight, going into the next cycle, when a jurisdiction expends resource on redundant testing voting systems, what are they not going to be able to spend that money on? So, I think there's not

only the actual outlay of costs associated with state and local jurisdiction testing, but also the opportunity cost, of where those funds could be applied elsewhere.

So, the question here is, what specifically can be done to increase the efficiency and economy of efforts within the testing process at the federal, state, and local level? I've got -- Tim has a flag up already, so I'll call on you.

MR. RYAN:

` Okay. This is a -- a thought that I had towards the end of the last session and I think it bears on all three of the first questions, including this one, so I'll throw it out there now. I think Doug is right when he says that, no matter how many certification standards you come up with, something is going to go wrong. You're not going to stop that from happening, you're never going to have a perfect system. And so, one thing that I think the federal government should take into account, as they contemplate these standards is, who do they want to be blamed when that happens? Would they rather have themselves be blamed or would they rather shift that blame, to the extent possible, to the manufacturers? I think it would behoove the government to do the latter.

And this is a theme that sort of comes up in our report, that I put on all your chairs during the break, is, in many ways, it's a plea for minimum standards. The -- such that, the onus is shifted to the companies, which, in the view of most of the people, I think all the people that developed that report, is, where it most properly resides.

DR. KING:

Tim, I think an answer to your first question is, there will be plenty of blame to go around. I don't think anybody will be shorted.

I'll put a suggestion out, on one of the ways in which economies can occur. I think one of the intuitive implications of states that adopt federally certified voting systems is, the notion that federal certification precedes state certifications and state certification precedes any jurisdictional testing of the system. And one of the things that we found in Georgia, is that, if the state certification is concurrent with federal certifications, anomalies that are discovered in the system, would make it non-compliant with state law can be identified and escalated back to the vendor, in time to incorporate it into the federal certification sweep.

So, one of the recommendations that I would make, and this is not so much for the standard but for the certification process itself, is that, states and local jurisdictions don't perceive certification as being interlocked end to end and that they may be overlapping and concurrent in many stages. Brian?

MR. HANCOCK:

Thanks. That's actually a good segue into, kind of, one of the things I was going to talk about and I agree. You know, I think we need to do a better job working with the states and educating both state level and local election officials, just, you know, to how closely related these two processes are.

And just to touch on some of the things that we've been discussing this morning, a lot of the issues we've been discussing actually have already been fleshed out. Whether they're fleshed out correctly or not is one thing but we certainly do have, at least,

our initial answer in our certification manual and it's obvious a lot of people haven't taken the time and this is across the country, a lot of people haven't taken the time to look at that and see how and if that meshes well with the VVSG documents. I think it's probably incumbent upon the EAC to do a better job of going out to the states, to the end users and describing exactly how the federal process works and how it meshes with state certification testing and also to a degree, local acceptance testing, because it's really, you know, it's all one process when it comes down to it, is making sure the machines are robust and work for the voters and local election officials, so, that was something as well.

DR. KING:

Okay. Also, we'd like to recognize a point that Alec has made several times, already today, which is, focusing on process can have many benefits downstream and certainly on acceptance testing, where a jurisdiction is attempting to test the suitability of that system, in preparation for a specific election, any improvements in the process quality will have an immediate positive impact at acceptance testing, which, depending upon the jurisdiction, could be a hidden cost, as opposed to state certification, which, is closer to a known quantity. With acceptance testing, often, it's very much an open ended testing procedure that could be prohibitively expensive. Jim.

MR. DICKSON:

Yeah. Is it in line to ask a question of one of the panelists?

DR. KING:

Certainly, certainly as long as it's something that they can answer.

MR. DICKSON:

I wanted to ask Alec, you have mentioned several times, using the right processes in the manufacturing. What exactly are you talking about and are there -- are these processes used in other industries?

DR. YASINSAC:

Other industries, meaning non-voting system industries. There are many federal systems out there, that I'm aware of, federal systems primarily, that require processes that forum, that are based on some fundamental theoretical structure, software engineering, software development processes. And the most common that I referred to, is the capability and maturity set of processes that are described and managed by the Software Engineering Institute and these processes are well understood, they've been out there for years and years. And what they do is, they don't restrict organizations the way they have to do business. They -- all they say is, that it has to be managed. And the question was raised about, isn't there an overhead to be put on top of, that has to be put on top of the processes, as they are, to be able to generate these, administrative, the day that it occurred. Well, of course there is, but if you're not managing your processes, it's questionable about how successful you can be, in terms of producing quality, anyway.

So, the notion here, is that, these processes simply give you a framework for being able to evolve, to learn from mistakes and to accept and to identify and accept and incorporate improvements to the processes that emerge. Which is, it's a real shame when you, if you come up with an idea, a new idea like Juan and say, hey, I

have this great new idea about how to do components and then you forget about it. But with C & M process, ensures that you don't forget about it when you come up with a very good idea and it gives you a way to incorporate it back into your development scheme. And so, it's really just a different approach to managing the processes that you already have. And hopefully, that's a little bit helpful.

DR. KING:

Okay, thank you. Jim does -- are you satisfied with that?

MR. DICKSON:

Yeah.

DR. KING:

Okay, thank you. Alec, you had your tent up for another reason.

DR. YASINSAC:

I did. I just wanted to mention the comment that I put in my written testimony here and I know that the EAC is already a clearinghouse for information from states. Right now, it's a very loose, I believe responsibility, to provide the information to states and localities but it's, in my view, it's the only place and I'm a -- I don't like pushing any requirements to the federal government. I'm a, you know, a small government -- have no problem at the local, as far local as you can. But in this case and God bless the vendors, but they don't walk into the local supervisor of elections office and say, we want you to buy our systems, but you should know, they failed here, and here, and here, and here and that -- I wouldn't do so either, if it were my product. It's not in their best interest to do that. But when elections officials are looking at buying voting systems, they need

to be able to capture rigorously extracted data about the history of the vendor and the history of the voting systems, because these systems are high assurance. That information needs to be there. And the only place that I can know or see, that can handle that type of a clearinghouse information, is through the EAC. And one of the ways to capture it, is through the certification process, that it be required that vendors submit with their package, with their data package, that we're now building up and more and more, is a description of the maintenance history of those products and of the identified faults that have occurred.

Interestingly enough in Florida, the standards that we set, we're rigorous -- we're actually fairly enforceable standards for our software review process, unlike the Ohio and the California studies were, really, wide open. The Florida studies were not wide open. The Florida studies were identified, were directed to identify previously noted faults that were found in these systems and that made it very easy for us to go in and do our work, because we knew what those faults were. In the past, we dug through the literature, we found the places where those faults had occurred previously, and we went in and we looked at the system. That information needs to be available to Mr. Cunningham and to the folks that work for Mr. Gale and implement elections and select elections equipment, at the lowest level. And having that information available will facilitate the ability to certify these systems and get them into act -- get them into operation at the lower level.

DR. KING:

Okay, thank you. Doug.

MR. LEWIS:

I think, anything that will help us to discover reported anomalies, is really critical, to us being able to improve this process, as we go. Unfortunately, in the systems that we've had in the past, anomalies were known only to the jurisdiction in which the anomaly occurred. And that was never reported up the chain, anywhere else. But I think, at the same time, we've got to recognize that they are anomalies. That is, if they can be fixed, then it's simply an anomaly. If it can't be fixed, then it's a flaw in the process, that it's a flaw in the equipment, that probably needs recertification. And certainly, we need some way of clearinghouse wise, to be able to say to every jurisdiction in America, if you have this unit and this model number, you probably need to have it reviewed for these potential anomalies, once we've discovered this. I think that would help immensely, in being able to get -- so that we don't leave systems out there.

Now, sometimes anomalies are caused, because a state or a local jurisdiction required them to make a change, that suited their look and feel purposes, that then created the anomaly. And we've got to recognize, in those instances, too, what caused this or what led to it.

In terms of, I want to make sure that we don't go so overboard, and Alec, I am a believer in process stuff, but I spent several years as a consultant and trying to work with people, not on computer processes, but other processes and I will say to you, we have to be careful, also, that we don't go so far on the process side

of it, we forget that you really do have to manufacture this stuff, and test this stuff, and move this stuff. And that documentation of the processes, this has been one of the knots in the ISO processes for years, was, that you could have a really well documented process, but still came up with a crappy product, you know. And so, what -- this is always about balance. It's about finding the -- even when I make my comments about, you know, we're not expecting perfection, I'm not saying let's go to the other side of that and just say, well, just ignore all that, but that's where we are in this.

And so, it seems to me, the efficiencies that are here, would be, if we could find a way for state and local jurisdictions to say to the EAC, from the very beginning, here are the things I want this unit to do, once you found out whether or not it counts votes correctly, I need to know, would it do Ohio pure rotation. I need to know, if I'm in New York, will it do crossover voting. I need to know, if I'm at the local jurisdiction, will it allow me to have, vote for five be counted correctly within one area, so that I have my, at-large votes, done.

Those are the kinds of things that we, if we can do those from the very beginning, it makes the process move a whole lot smoother, and certainly, once it's in the lab, for the lab to say, yeah, and does it handle this variation, pretty well, you know. Then we begin to have some economies of scale and some advantages to government. Getting there, however, is the difficult part, you know. It is getting the word out that, A, this can be done and B, at what point does that begin to drag down the slope, you know, the process of getting something certified, with an EAC insignia on it.

And maybe, what the EAC does, is, it does the first level of testing, and so, from that we will issue a certification, beyond that, there will be additional certifications at state and local levels.

DR. KING:

Okay, thank you. I've got Juan and then Brian.

DR. GILBERT:

Yeah, I just have a question directed to Brian and Pam. In 2004, I do recall, for the election, there was a website that listed all of the issues that occurred with the voting machines. Do we have any repository, anywhere, that tracks these things and have them documented at the EAC or Verified Voting? Is there any place that exists like this now? So that's a question for you two.

DR. KING:

I'll let Pam.

MS. SMITH:

I'll go first. Yeah, Verified Voting partnered with a number of organizations in 2004 to build a way to capture reports that were coming into election protection hotlines, about a number of different issues, including accessibility issues, including voters not being given a provisional ballot, and different kinds of voting equipment issues that came up as well. They were -- it was a broad spectrum. There were about 40,000 reports that year, that November. And a percentage of those were on equipment. There were actually hundreds of thousands of reports, but most of them were just, I can't find my polling place and where do I go? That was only one data capture system. It was the first of its kind. It was used again in '05 and '06 and now in '08 it's being -- a new version of it is

developed by Electronic Frontier Foundation, which is quite good and so far is working really well.

I've -- in looking at the recommendation that came out of, if I'm not mistaken the TGDC, I may have that wrong, but there was a recommendation that came out about the EAC being able to capture voting system issues or reports. And I suggested that the folks at Electronic Frontier Foundation get in touch with the EAC, because I think that what they have, which they're designing as open source, is scalable and transferable and the kind of thing that could serve an organization like the EAC, in capturing on a national level. And it doesn't matter whether those come in from the states, from the secretary's of state, from, you know, channeled through their own systems that they may have or from counties or from individual voters.

DR. KING:

Okay, thank you, Pam. Brian?

MR. HANCOCK:

Thanks, Merle. Right now, the clearinghouse function is addressed in kind of two different slightly different ways. The issues with current voting systems, that are fielded out there now, our commissioners passed a policy, last year, whereby, if a state or local jurisdiction submits a report they have commissioned to us, we will post that study. And we have several up on our website right now that -- where you can see that. So, that's with currently fielded systems.

For systems that the EAC certifies, we have several different ways of capturing the information. First of all, all the manufacturers

that are registered with us are required to report to us all the field anomalies that they encounter during an election, okay. A second method is, we have an anonymous sort of form, that election officials can use and it actually doesn't have to be anonymous, but where they can voluntarily submit information that they have encountered, during an election, with a voting system, that kind of, can give us a check and a balance on information we're receiving from the manufacturers. But, you know, certainly we'll use the media, we'll use Verified Voting, and we'll use, you know, other methods, as well, to try to see what's happening out there to the systems that we certify.

DR. KING:

Okay, good. I have to say the Verified Voting System is very cool. It is a really neat application and kudos to the developers. It's very nice. I've got David and then Kevin, I'm going to let you have the last word on this question.

MR. BEIRNE:

Just a couple of things to echo my submitted written remarks, is that, when it comes to cost redundancies, again, I think everyone agrees that the federal model needs to be the standard bearer and the state process comes in afterwards and builds on it, making sure that, as much as possible, the federal process should reduce any type of state driven redundancy in the testing process, that will build in some economies of scale, as well as, efficiency, into the process. I'm not sure how the reporting of specific instances or problems builds in efficiency into the process. I understand where you're

going and the need for it, but I'm not quite sure how that pertains to the economics of it or the efficiency of it.

And one thing, with regards to the election incident reporting system, I know I've looked at that data. That speaks to the larger problem and I know we've already touched on that a little bit, is that, there is no standardized definitions for, what is an equipment malfunction? What is an equipment problem? And that's an important factor, because if you look at that databank, which I have on a number of instances, back in my previous role as an election official, is that, a lot of it is not related to equipment. And if you look it and the question then becomes, okay, what's the process for that to be vetted, either by the election official, to see if it can be replicated, if there's any substance there and then, they would, in turn, report it to, hopefully, the vendor, to see if they can respond to it or clarify what exactly was transpiring at the poling place or within their tabulation software. That's the critical role that needs to be established.

But I think, if we're going to go in the direction of reporting or asking jurisdictions or foundations to report incidences, there needs to be a good vetting, of what that data is, because there can be a lot of damage done, because we are dealing with a perception based industry. I think that we all recognize that, but if we're not careful, there's going to be a lot of damage done, while we're trying to improve the process.

DR. KING:

Okay, David, thank you. Kevin.

MR. CUNNINGHAM:

Keith?

DR. KING:

Keith, I'm sorry, Keith.

MR. CUNNINGHAM:

As a local election guy I've been called a lot of names, but as long as you -- as long as it's a legitimate name it's good. You know, I think Juan, you raised a really important point. We're not absolutely sure of the condition of the patient because I think the information we're getting is filtered through a variety of filters with a variety of intentions. And we probably need to do something to calm down the rather adversarial relationship that exists, perhaps between advocates and election officials and politicians, so that the data that we do collect is -- you know, there's a difference between an incident and a failure. And you're not going to eliminate incidents. They are going to happen. The goal should be to eliminate failures and but we're not going to do that until we're able to bring good information back to the EAC or whatever and analyze it in ways that are not partisan, that are not biased, and that are looking for solutions, not problems.

DR. KING:

Okay. Pam, the last word.

MS. SMITH:

Oh, good. Well, I couldn't agree more with what Keith just said. I think that there's a huge difference between an incident, a malfunction, a failure, a disaster, whatever it might be. And I, you know, in a system like an incident reporting system, of any kind, I think has its value. In particular, in real time, because and that

system was created for election protection efforts, because when something seems like they're getting some reports from a given area, then people on the ground can check it out or someone can make a phone call. And then Keith can say, it's all right, it's fine, we've resolved the problem, no issue here. And, you know, that's part of the function, the best functionality of it is real time, on election day. But you can also find some useful data down the road and it's worth having to look at. That's, you know, I think not having a vacuum, having a place where there can be some official reporting, you know, into a system like that can help everybody and can help with the process David was talking about.

So, I wanted to add one final thought on this, on Question 3, which was about economies, you know, and the testing process, federal, state, and local is something that came up in the roundtable about a year ago, Brian, that you might remember. And I don't know how far that thought went, but some states are already doing things, like some volume testing or similar testing of equipment, locally or within the state and I'm -- I don't know if it's possible for any states that have similar equipment to have kind of a consortium effect of doing that kind of volume testing, so that they amongst themselves can even save costs and other states that may not be part of the consortium can look at it and say, well, they did it, I probably don't have to now because I can see what their report is. So, it was a thought that occurred back then, that may still be valid.

MR. CUNNINGHAM:

Can I add a statement to that, just at the end...

DR. KING:

The final, final...

MR. CUNNINGHAM:

Okay. I used to work in the radio and television business and one of the jokes was, always, when you were sitting there and your station is off the air, people would call and say, hey, do you know you're off the air? Yeah, we're -- that's what we're doing here. The -- to think that an election official doesn't have a real time sense of what's going on on election day and he needs more people calling him or her to advise him of his problems, is part of the problem.

DR. KING:

You need more bandwidth.

MR. CUNNINGHAM:

Yeah, right.

DR. KING:

Okay, thank you so much. Matt, Question 4, please? One of the catch phrases we use in project management is a term borrowed from skydiving, it's called, ground rush. And it's the illusion of falling and the earth doesn't get any closer until you're about 500 feet and then it starts to rush up at you and it's the last 500 feet that take your breath away. We managed, for decades, without a voting system standard in this country and we developed the first one in 1990, then in 2002, another voting standard. So, we went from decades down to twelve years, 2002 to 2005, three years. And so, now the EAC is in a position to either further that tradition of ground rush that is moving us faster or stepping back and taking a more deliberate approach, going forward.

So, the question is, how important is the timing of the passage and implementation of this next iteration of the VVSG? And in an ideal world, which, I guess, distinguishes from the one we live in, when would you choose to have a next iteration of the VVSG become active? Doug.

MR. LEWIS:

The EAC's got a real tough problem in this. You've got have on the one hand, expectations of politicians and support groups, and advocates, and even local elections officials, and local county commissioners and all of that and vendors and there gets to be a clamor and a hue for, you're not moving fast enough. And yet, at the same time, when you look at how we -- have a set standards, right? We have a set of standards that can be tested to, that can be worked through, in terms of the labs and what have you.

This next iteration ought to be right. It ought to be one that we are not scrambling around trying to say, well, we think this is the best answer, let's take a little more time and figure out, is it the best answer? And to create something that is robust enough that we can then build on it, as it continues process improvement instead of continuing to go from major revision, to major revision, to major revision. We've got everybody confused at this point. And nobody knows what the rules are or what they're likely to be. And we've got to get out of that. This next one really needs to be well thought through, so that it becomes the model on which we build and it becomes the one where we then take our lessons learned and make our adjustments from, because it is that critical to how this all works.

And so, as far as I'm concerned, it seems to me, we need to be looking at making this next one really, really robust and correct and then making the adaptations, but to try to rush into that at this moment, seems to me to be to be folly.

DR. KING:

Okay, thank you. I've got Jim and then John.

MR. DICKSON:

I think Doug made a lot of good points. We, clearly, are in a situation where everybody is confused. I guess I want to make, sort of, several points that deal with, sort of, the real world and then I'll address the specific question that you raised.

On one hand, from the point of view of access, we would like to see some standards that address things, like, how long does it take to vote on the system? Because we've got systems out there, you know, the much vaunted AutoMark can take 40 minutes for somebody to vote on. So, that product should not have been rushed into the market, because nobody is going to take 40 minutes to vote. We expect it to take longer, but we don't expect it to be a factor of eight. Without money, the manufacturers have been real clear, they're not going to build anything, never mind what the standards are, unless there's money on the table. And I don't see any money on the table for building new systems.

The -- I think the real serious, underlying questions that have to be addressed are, how long does it take from the time when a legislature passes a law, until that change can be put into effect? I think the EAC needs to do a lot of education for legislatures and Congress, that there's this notion that we pass the law today and it

can be implemented in the next election. That is very harmful and it creates lots of issues, lots of tension, lots of conflict. So, I mentioned this earlier. I think that there needs to be some serious education provided, that these things take time. We don't expect -- we didn't expect to put a man on the moon in two years or eight months. We don't expect medications to go through the FDA's system in a few months.

And then the last point, I've been sitting here, really stunned, with something that Doug said earlier, about a $2.5 million to certify a product. Well, if that -- that being the case, these systems -- this VVSG, is a sort of Potemkin village. I mean, you know, the companies don't have the money to pay for the certification. So, my last point is, we need to somehow, be addressing ways to get more money into the system. I don't think money solves all the problems, but when you have unrealistic expectations about time and no money, you're going to create continuous controversy. So, somehow, those two questions have to be addressed.

DR. KING:

Okay, thank you, Jim. I've got John and then Mark.

MR. GALE:

Thank you, Merle. I guess, as an election official, from my point of view, let's not be in any hurry, let's not be in any rush. The 2006 election, from most secretary of state's point of view, went pretty smoothly. And that hasn't stopped Congress from wanting to interfere and pass new legislation and continue to penalize the process in a lot of different ways, some of which may succeed, some of which my fail. But I think, the success of 2006 made an

enormous difference in the confidence of the public and their interfacing with the election system.

It seemed, to me, sitting at the TGDC, that an awful lot of the focus of what we were doing came out of the DRE's. The DRE's, which was a pretty innocent piece of equipment, when HAVA was passed and an awful lot of states went ahead and adopted DRE's including Georgia and many states who did that, set up election administration processes and seemed to fit well in ensuring best practices with that equipment. But that didn't stop an awful lot of effort to interfere with that and bring it into question. A lot of -- the black box conspiracy and a lot of things and none of which ever proved one instance of malicious interference or intrusion or fraud, as a result of the source codes or the encryption of any of that equipment. It was just the fear was there. The possibility was there. Maybe it might happen.

And so, that fear has driven us and I think, if it worked well in 2006, we have the 2005 standards now that have to be implemented with our election vendors. Apparently, they're willing to stay in business under those standards. Let's let it work for awhile. Let's let it play out and let's see if we started moving toward telephone voting or internet voting and see what the multi-channeling creates, because I think this is an albatross. This is a mastodon. And this kind of equipment is going to die, down the road, as internet voting and telephone voting, mode channeling replaces it. So, let's not rush into a whole new set of standards, until we let the 2005 play out for awhile and until we see what happens in 2008.

DR. KING:

Okay, thank you. Mark and then Juan.

MR. SKALL:

Thank you, Merle. This is an interesting question. When you look at it, if you just read the question, when should the next iteration of the VVSG become effective? Really, involves two completely, almost separate issues. Number one, how much more research should we do, to in essence, get it right? What Doug is actually talking about. Once we have it right or once we think we have it right, how long should it take to become effective? This is a policy decision that the EAC makes. Both of those sequentially, when they're put together will determine when, in fact, this particular standard will actually be implemented and used.

As far as the former, I agree, we want to get this right. Who doesn't want to get it right? As a manager, you know, my paradigm is usually, I get all the information I need to make a decision and as soon as I have all that information, I make the decision. I don't want to delay it anymore. So the question is, how much of this delay and fact gathering is done and how much should be done and when will we have all the information we need to make a decision? I believe, as soon as we have that information, let's do it. You know, we can hypothesize forever. I don't think we have it right right now. I think we're fairly close and I think we need to do some groundwork to get some more information.

As far as the second part, which is equally important, how long should it take once we actually have the standard technically in place to, have it implemented? I look at sort of as a technologist.

And this is really a unique environment. I come from a standards world, where standards are written, they're promulgated, and even before they're finalized clearly, implementers start implementing them and implementation gets on the market in a fairly short time frame.

As a technologist, I don't want to see unnecessary delay. I think until we actually start implementing this, you're not going to get implementations. You're not going to be able to find errors in the standard and in the implementation. Additionally, technology changes, so the longer we delay, after we know what we want to actually have this thing hit the streets, from a technology standpoint, I know there are other considerations, as far as from voting officials, but the longer we delay, the more possibility we have that many of the requirements are no longer valid. Things change.

So, I guess my advice is, do the research we need to do, get it right, but don't delay and iterate forever. After that, have a reasonable time frame for implementation.

DR. KING:

Okay, thank you, Mark. I've got Juan, and then Keith, and then Carolyn. Juan.

DR. GILBERT:

Okay. Real quick for me, I think the VVSG, with respect to being a functional spec, is at a point where, you know, I think it's premature. And I think the next release, going with what Doug was saying, get it out there and let's see what happens to it. I think at some point that, if there's truly a functional specification that by definition

should stand the test of time, because it's not too specific about -- and it doesn't stop innovation. And that's the whole point, is to have a functional spec that provides and accommodates innovation. As such, once that occurs, the next iteration, I think, I don't think we have so much of an iteration, I think we have amendments. And you have amendments to a certain point at which you say, we have enough amendments, now let's look at having an iteration. So, it's almost like that software model of dot releases or point releases, so you can get enough of those and then you say, well now we're ready for a real release, a major release.

So, I think the VVSG is mature enough to a point that we can get it out and see what happens. I think it's functional enough that it allows for innovation. And, as we discover things like what Doug is saying, things are going to happen. We can make amendments and then once that gets to a certain point and I don't know that point, but at that point, then you do an iteration.

DR. KING:

Okay, thank you. Keith and then Carolyn.

MR. CUNNINGHAM:

Doug referred to being confused. That's just an understatement. That's almost a way of life anymore at the local level. And unfortunately, I'm afraid that if we don't stabilize this environment soon, it's going to take a tremendous human toll on the people that do this.

There -- another fact that we talked about earlier is, there is no money. There is no money. There are a few counties here or

there that may have some growth that allows them to spend the type of money that is required to purchase systems, but I would say, by and large, there is no money at the local level across the country and there are very few states with the type of resources.

So, my answer to your question, actually, I have two answers. One is, probably the sooner, sooner than later, because I think it's beginning, as Doug alluded to a minute ago, it's beginning to reach that critical mass where people believe it's taking too long. But more importantly, I believe that the standards should be in place, certainly prior to anymore money being allocated.

I think the largest flub, fumble, whatever you want to call it in election administration in the last 200 years, was when the United States Congress put the money ahead of the standards. I'm sitting in a county with a million dollars worth of election equipment that is less than two years old, that I've got all kinds of -- that I've busted tail with staff and other people, voter education, poll worker education, staffed myself, getting deployed less than two-years-old and now I'm being told that it is no good. It is faulty. It is -- confused? Of course and to think that you can deploy an election system at anything less than eighteen months to two years is just a simple thought.

DR. KING:

Okay. Carolyn, and then Alec, and then David, I'm going to let you have the last word on this question.

MS. COGGINS:

Well, I think one of the things that has been happening is, there has been this, just undulating environment for -- since 2002. I mean, as

far as standards changing, what's -- what are we supposed to be, you know, what should we be testing to. And it's -- everyone is trying to catch up on this moving target. And I don't think we should have any release of standards until we complete one of the key pieces, I guess you brought, a risk assessment. Through all of this process, nobody's ever figured out what are the risks to voting systems. And I know the EAC is putting -- is taking that step. But that to me, is one of the things. Are the systems that you have, are they really working? Is that -- are we good?

DR. YASINSAC:

Yes.

MS. COGGINS:

All right, well okay.

DR. YASINSAC:

Yes.

MS. COGGINS:

I test, I don't know. Whatever the standard is, I will test it. But that's the question that I think everyone down the line wants to say is -- and what is good? You know, I test to, does it meet the standard and is the standard good? I don't judge that. That's for the people who write the standards and the people who use the equipment, all of the stakeholders to judge, are the standards good. I think we -- the practical approach is looking at this and saying, do we have the information that we need for this?

Also, you know, there are things that we have flowed from 1990 to 2002 to 2005 and, you know, I know we're using a military standard that's D. That -- in order for me to get a copy of that, it

was done on a Selectric Typewriter. So it's not something that's out there. Why is the military testing to F, and we're on D? I don't know, but that's an aspect. Why is -- has that question been asked? I don't, you know, I think, I'm sorry, I don't know if that has been part of the process.

In terms -- I do think -- I agree that it needs to be right on this iteration, because it is just an environment of, nobody is sure where we're going forward, in my opinion, in my opinion. As far as, you know, implementation, I -- for a lab, I say, optionally do it six months after we get a standard that we feel is a good performance functional standard, not something that's meeting these minimum federal requirements. Not a design standard, you know, that's where things change and that's where you get lapsed. I mean the VV pack is something that three years ago was the answer to everything and I'm not sure what the opinion is on that anymore, you know. It seems like there was a very clear cut direction.

MR. CUNNINGHAM:

No, some of us were telling them.

MS. COGGINS:

Well and that's -- whatever the standard is to, I'm happy to test to it, but what is good? And, you know, six months for us to be able to get our processes and, you know, what will it take to implement? That's more when it becomes effective of what is realistic. Are -- you know, are we even already there? Do we have good? I don't know. I understand from Keith, yes, we do.

DR. KING:

And Alec, I'm going to let Keith go in front of you, because I think Carolyn asked him a direction question.

DR. YASINSAC:

Sure.

DR. KING:

And he looks -- his feet are tapping. You may be able respond to that question, Keith.

MS. COGGINS:

I'm sorry.

DR. KING:

Keith, go ahead.

MR. CUNNINGHAM:

Well, you know, I don't know if it's a case of, are we there, but are we on our way there? Is it getting better every day? That's sort of like health. You know, you don't wake up one morning and then just become healthy. You have to work at it. All data indicates that more votes are being counted. More people are -- more people's votes are being counted. Votes are being counted more accurately. So yes, I think that, you know, are we -- do we still have problems? We certainly do. But I think we're on the right path. I believe it's getting better. I think we have to, I think we have, to have some degree of intellectual honesty here and some degree of, I guess this is an oxymoron, political honesty, when it comes to dealing with election results.

But risk assessment, to me, is kind of like one of the definitions of insanity, which is doing the same thing over and over and expecting different results. You could never complete risk

assessment. I believe my machines are secure. Now they're not secure against somebody walking into a poll with a bomb under their shirt. They're not secure to somebody actually finding a way around the alarm system in my office, breaking into my office and but, you know, to do risk assessment outside -- we've been saying this in Ohio, arguing about this for sometime now. To do a risk assessment outside of the standard operating procedure or uses of the machine, to do risk assessment in a lab, to me, is just pointless. That's like giving somebody a key when you leave town and daring them to break into your house. That's not difficult. What are the real time issues? What's the real environment this machine is being used in? And what are the real risks? Otherwise, it's just going to be, it just gets to be exponentially expensive to create a machine that can defy all risks.

MS. COGGINS:

Agreed.

MR. CUNNINGHAM:

Yeah.

DR. KING:

Okay. Alec and then David.

DR. YASINSAC:

Okay. And I have a counter thought, to two or three of those things that have been said. First off, I hear this statement that we don't have any recorded attacks proven on these voting systems, but all that means is, we've not proven them, it doesn't mean we don't -- we haven't had them. And, in fact, we can't prove that we haven't had them. I'm not suggesting we have. I don't believe that we

have, but the divide, one of the divides that we have right now, between academia and elections officials, is that elections officials, largely started doing DRE's and electronic voting at HAVA or shortly before that.

Information security folks have been focused on the threat to computers and to computing systems, since we've been in the business. For 25 years, I've been focusing on the threats to information security and the computer systems. And I'm here to tell you that unequivocally, they are out there. There are people that are capable of attacking faults in the software. There are people that are capable of attacking communications that occur with voting systems, if they're allowed to occur. And the threat is imminent.

On September 10, 2001, we would -- we could -- no one would have predicted or thought about, in large numbers anyway, the type of threat that we engaged and not being overly dramatic. I don't equate voting systems to that type of a challenge, but what I'm telling you is, the threat is far different now than it was in 2000. It would now be possible, if an electronic voting system were monolithic across a large constituency, to impact a dramatically large number of votes through this electronic voting system, by one person, that was not possible in the Year 2000. And that's a threat that we have to -- a threat change that we have to recognize and adjust to and we can't wait for a threat assessment to identify that risk, in a formal way, to be able to respond to that threat specifically. If we do, we take -- we can, we can wait until goes wrong, but when it does, it's going to go -- it can go really, really wrong and we may have missed it.

I also mention, not just the threat on computers, but also the changing dynamics in the polling place. I was a poll worker, this past election in Florida in the primary. And I was the old man in the shop. Most folks you'll -- Keith will tell you, most of the elections workers are retirees and they're not going to attack your computers. It's not so anymore. In my precinct, it was -- I was the old man in the shop and I mean, I'm not that old, but I'm old, but it's a younger poll worker that we're seeing today, folks that can pose threats to voting systems.

And let me finish up, by pointing out, that if you won't accept risk analysis and testing in the lab, where are you going to do it? We're not going to go out and have red team testing on an election. It can't happen. You can not do that. The only place where you can do testing for security and risk assessment of computers, is in the lab. And if you reject that, then you reject the only opportunity that you have to be able to test these systems. Certainly, it's not perfect and the tests have to be put in context. And in the reports that we get, it's that lab, we actually had sections that said, here are the prerequisites to an attack. Here's what an attacker would have to do and to lay out what we believe the practical instances of those threats and risks were.

But you can't ignore the vulnerability that's identified and again, I go back to the California and the Ohio studies, along with the Florida studies and the others that have been conducted. Those are legitimate threats. We've demonstrated them to elections officials and the consistent response of the elections

officials is, oh, my God, because they don't understand the risks that these systems have.

DR. KING:

Okay, I want to exercise a privilege of Chair. The question is, in an ideal world when we would do the next iteration? And we've gotten a little bit off topic and a couple of you have raised your tents since David and I'm going to ask you, we're twenty minutes away from lunch and we still have more questions to go through, so remember, after lunch everybody has an opportunity to come back, drill down through the topics that are of interest to them, but David, I'm going to let you have the last word on this, but please make it brief.

MR. BEIRNE:

Well thank you. And yeah, there's so many issues that were discussed and I'll go back to the question. One of the things, regarding the adoption schedule, the EAC can adopt this next iteration of voting systems guidelines whenever they're ready. And I agree exactly with what Carolyn was saying but it comes down to one, making sure the test scripts are ready to go so that VSTL's know how to accomplish their job.

And secondly, threat models are critically important to make sure that they are included because otherwise, there has to be some sort of performance threshold and this dovetails into the OEVT, which I have a slew of issues with. But to keep my comments brief, threat models need to be documented, in some sort of fashion, because as much as these referenced red team testing, there's been no blue team testing to document what

election administration procedures should be used to mitigate the threats.

With regards to, there's so many issues within this next iteration, I'm certainly of the mindset to take a wait and see approach for the next draft, because I want to see how responsive the next draft is to the concerns that have been raised. And I think there's a consensus as to what the concerns are, the question is, what does the next draft look like? That will determine, I think, largely, when it's implemented.

Let me give you a scenario which I fully expect this to occur. We've got the 2005 VVSG sitting out there. I would say, within the industry there's a little bit of a hesitation to pursue 2005 certification because we're already into the next draft and we don't know what improvements or weaknesses, within the 2005 VVSG are going to be documented. So, while that process is still unfolding, we're already considering the next draft, which is not going to be in response to any known inadequacies documented within the 2005 version. To me, I think this, the implementation model or the consideration of an entire rewrite, was probably a little bit too sudden before the implementation of the 2005 version. I would have rather seen an amended process to include the performance and the benchmark requirements that we were all expecting and then if you're dovetailing, to include security requirements.

My chief concern is with issues such as, software independence, you have a voluntary framework in which not all the states that have opted in, currently require software independent systems. So, they're going to be forced to consider either sticking

with the 2005 VVSG or going to the next iteration. And I guarantee or I fully expect that there will be ground swell of movement to push states to go to this next iteration.

And the big caveat that we've always said, is that, whenever you adopt this next iteration, it's not going to be indicative of when research and development is going to occur. And so, it immediately ties in with, the EAC can adopt them when they're ready, but the question of effectiveness is really going to be largely determined based on the states, as well as, what the practical environment is for the industry to develop these products to meet the standard.

The EAC is going to -- in my estimation is going to have to run the 2005 version, as well as, this next version, concurrently because otherwise they're going to run afoul of their limitation of rulemaking on the states, in which the states cannot incur any sort of mandate by the EAC in their adoption of voting system standards. So, they're going to have to have the 2005, as well as, the next iteration running at the same time. But we all know that the 2005 is seen as inadequate and does not include the performance benchmarks and the security requirements that we're seeing within this next iteration.

So, it's going to become even more fluid, I think, in the years to come because we are certainly looking at four years down the road before any sort of products can be brought to the marketplace based on this next draft.

DR. KING:

Okay, thank you, David. Matt, let's go to Question #5. And David, I know that you have a PowerPoint to this...

MR. BEIRNE:

Yes.

DR. KING:

Can you summarize without the PowerPoint, in the interest of us moving forward?

MR. BEIRNE:

Sure. Well let me just -- in my PowerPoint, I just had a few bullet points but I'll try to just keep them...

MR. DICKSON:

What's the question?

MR. BEIRNE:

I'm sorry.

DR. KING:

Let me read the question. I'm sorry, Jim. How necessary is innovation in voting technology? How can the EAC's program and the VVSG address the desired level of innovation? What are the possible sources of capital to reach the desired level of innovation, i.e. from the vendor, from Congress, from private enterprise, from academia?

MR. BEIRNE:

Just to get things started. The question, first becomes, if innovation is being pursued, the obvious question is, what is the innovation or level of innovation that we want? I think, by and large, everyone is looking towards security but my question is, what is the security threshold that must be met, i.e. what is the threat model that we are

responding to? I think that's the first question that has be gathered in some sort of consensus format to determine what level of innovation is going to be driven through the marketplace.

Certainly, representing an industry trade association, my mindset is one in which I allow further markets to dictate the next progression of innovation and have the flexibility built into the voting system standards that allows that type of innovation to naturally occur. And I think the VV path is perhaps a good example of how the market did not naturally evolve, it responded to mandates and then we see what would come about from that. And that's one of the chief concerns I have when we're looking at software independence is, how restrictive is that going to be towards future aspects of voting system innovations.

How can the EAC's program and VVSG address the desired level of innovation? This one left me quite confused, because I'm not quite sure how they can, unless it's a question of just permitting that flexibility within the marketplace to determine, what is the best pursuit, what is the market demanding? And making sure the EAC -- again, I go back to this baseball metaphor of, serving as the umpire to make sure that the players can take the field and can have their competition but making sure that they're not the ones determining who's winning or who's losing. And essentially, do no harm, I guess is the best way to summarize the role of the EAC in pursuing or allowing for innovation to occur.

And when we talk about, also, innovation, there's a number of avenues that we can look at for raising capital to spur investment. And I think this is on a number of issues or this is an

area of concern for a lot of folks is how, you know, in the instance of market failure or if there's no market for someone to pursue or for the industry to sell their products and there's a lack of willingness or direction with regards to innovation, who is going to step up and where can we raise this capital?

I outlined a number of sources for that capital, which can be from public or private sources, public being government technology grants, private sources being investment, capital investment firms, individuals interested in getting some return on their investment for an enterprise solution, as well as stock offerings and things of that nature. And capital is always a concern for the private sector, because that's what spurs innovation and that's also, you know, whether it's taking revenue and re-injecting that into the research and development, that's also a source of capital, things that we're not quite seeing.

I think the biggest parallel we can look at is, the issue of technology transfer and this is something I've brought up with a number of academics but technology transfer, most of the major universities have some sort of technology transfer department. One of the critical components and I think NIST recognizes this as well as, the academic institutions, is that within technology transfer there is an appreciation of the partnership between industry and academics and research.

And basically, the academics pursue the research, drive the innovation or look to achieve some sort of innovative product and then through licensing arrangements, the technology transfer occurs to the marketplace and the role of the private sector remains

the same, in which they are the ones who will incur market risk. They are the ones who are going to support that product in the marketplace and so, if we're looking at issues of technology transfer or if operating in a vacuum and if there's a breakdown or a perceived need, what's the level of innovation that we want to achieve and what's the best avenue to pursue that innovation? But also recognize that a critical component is that, it relies upon a successful partnership between industry, as well as, research institutions and I think that's the fundamental gap that's been lacking from my standpoint and the fact that the industry has been on the outside looking in to this process.

DR. KING:

Okay, thank you. And now if everybody could keep their comments, certainly brief, but to the point, about innovation. Tim and then Juan, I believe in that order, so Tim first.

MR. RYAN:

This is another major theme, maybe the biggest theme of the report that I handed out. The analogy, that I like to call to mind is, you have some planes. You have to think about, if the federal government had set exacting standards for planes in the 1930's, then they have said certain things about how propellers should work and what size they should be and what the best way to build it and how their engine would be. And that would have been great for a couple of years but maybe wouldn't have developed jet engines, as quickly. And I think that's analogous to some of the things in the VVSG.

Something that drives this home for me, is the development of some systems that are currently still in the early stages. They're not ready to be implemented yet, but they would be prevented, they would not be -- fit the requirements, for instance, the software independence requirement. Two specific examples would be the punch scan system, developed at University of Maryland, Baltimore County and the Prime 3 (ph) system developed at Auburn University. The punch scan system would do something. It would allow you to, essententially, go online and look at your ballot after the election, to make sure it got counted, but in a way that you couldn't then prove to others who you voted for, in sort of a clever encryption technology, but it's not software independent. And the Prime 3 system has, sort of, an independent electronic witness that would also serve as, sort of, a verification device, not a pit (ph) based one and so, not one that would be allowed by the software independence requirement.

DR. KING:

Okay, thank you. Actually, Jim Dickson was next.

MR. DICKSON:

Well, I just want to put on the record that, you know, software independence is the code word for paper, paper is not accessible and will not therefore stand the scrutiny of the courts. When we look at the incidents that happen and problems with the equipment, overwhelmingly, the problem is -- happens between the poll worker and the machine. And I'm not sure that there's enough, that enough thought has been put into how to make these machines as

simple, easy, and manageable for poll workers and election officials.

Just the last time I voted, when I voted, I had the same poll worker. She's a lovely. It's a lovely team, but the system requires the audio doesn't turn on automatically, when the system boots up. Well the -- we had to wait 20 minutes for a tech to come out to know what the proper procedures were, so that we could bring up the audio. And, you know, the election judge is a lovely woman. She's done it five or six times. She's done it many times, in many elections but, you know, there was this just, as we all do, you know, her mind went blank.

So, and it isn't just about accessibility, in terms of the ease of the use of the poll workers. It all -- you know, that also has to do with, how quickly they can move people through, if it's crowded. It has to do with getting the right information off the machine, at the end of the day for tallying. And I don't think we've had anything like the amount of discussion and thought put into those problems.

DR. KING:

Okay, thank you, Jim. Doug, and then Juan, and then Keith you're going to get the last say on this question and again we're moving up on lunch, so please be brief. Doug?

MR. LEWIS:

My concern about this question is, that it sort of leads one to believe that innovation and technology are going to rule the day, when in reality, we live in a political world and it's whatever is politically acceptable and quite frankly, we've taken some great steps backward because of what is politically acceptable. And so,

technology, it's great for us to sit here and discuss that but if, as a result of all of our actions and all of our political decisions, we end up forcing everybody in the country to go vote by mail, the rest of the technology issues and the standards issues, kind of, go by the wayside. And so, we've got to recognize, what is the environment that we're in and how to apply the environment that we're in, to give assurances that we can move forward with technology that does not result in one common answer of how to run elections.

DR. KING:

Okay. Juan.

DR. GILBERT:

Okay. I'll go through this as quick as possible. First, I think Tim's point about the airplane that analogy is paramount because innovation I think is critical in this domain.

I think the second question there, is actually out of bounds. Desired level of innovation? I don't think there is such a thing as a desired level of innovation. I don't think you cap innovation. I think the VVSG, as a functional spec, sparks innovation. So I -- looking at that, sort of software independence definition in the VVSG as an example gives a functional spec, but there -- when it was created, the idea for that functional spec that it had in mind was that it was going to paper trails. So then we came out with the innovation which is, a voter verified video audit trail. Now our response to it and the community said, that's not what we had in mind so we don't want to add that. But you can't disprove that it's not an independent observer. It does exactly what the spec says. So you can't say I want innovation and then have innovation in mind,

meaning that I want paper and then someone comes up with an idea and immediately says wait a minute, that's not what we had in mind, so it's not innovation.

I think innovation is important and I think with respect to funding, we've seen some funding in this area, under the guise of innovation, but innovation -- so I take it this way, the functional specs sparks innovation through research. What we have seen, to date, has been, primarily investigative research. And I've classified people, as people who can break things, people who can fix things, and people who actually make things. Investigative research is about breakers and fixers. They go in and they can tell you where to break it and sometimes they can tell you how to fix it, but that's not innovation. The makers are the people who are doing innovation.

So NSF, the National Science Foundation, has this new category called transformative research. That's innovation and that's where we need to be. So I think we've done some funding that's been investigative research, not innovation, that has resulted in some of the things we see in the VVSG. It gives us nice functional specs. The next level is transformative research, to get innovations that go into those specs and go outside the bounds with innovations that you didn't expect and when those things occur you evaluate them with respect to the functional guidelines, not to the idealistic views by which those functions were created.

DR. KING:

Okay, thank you. Keith, the last word.

MR. CUNNINGHAM:

I'll be quick. I certainly don't want to be the guy that held us up from lunch. Secretary Gale has made a few comments today about how things could be different. I just want to share with you, in the interest of innovation, what I hear from people when I speak to them about their voting. Here's the two biggest questions I get. Why can't I vote on the internet? And we haven't even discussed that in all of this discussion that we've been having for several months. The second is, why can't I vote where I work? Out of precinct voting is really, you know, our lifestyles are and gas prices may crush that down a little bit, but we're working and living a long way. And then third is, why do I just have one day?

So, you know, as we look at innovation, those are the things that the customer, if you will, is asking us, the supplier of the service and telling us what they really want. And I don't see that we're even addressing those types of concerns. And we're kind of quantifying election systems the way they currently exist and the system the way it's currently in place. I don't know.

DR. KING:

Okay, very good. Let's go to Question 6. We're now in the lightning round. And at this point, if you have a comment that can't be delivered in 30 seconds, rethink it and edit it down, because we do want to stay on schedule. This question deals with sharing risks in the system. Every voting system stakeholder shares risks with other stakeholders and experience risk unique to their constituents. What risk do you view as being shared? What risks do you view as being unique to your sector? Has there been an adequate assessment of risk? And in the absence of an adequate

assessment, how can those risks be prioritized or mitigated? Some of this we have touched on briefly, but let's go ahead and hit a couple of quick points. Juan.

DR. GILBERT:

My quick point is, I'm initiating a study and will have results by the end of the fall, but according to the Census Bureau, .42 percent of the United States citizens have an IT background, either where they work or where they were trained. If we were to intersect that with the percent of people who are poll workers and then we were to do a threat analysis, getting to what Alec was saying, how many people in the United States have access and capability and looking at the documents you produce, the knowledge, to actually accomplish an attack that would actually be of a threat to a voting system. That analysis, is something I think is necessary.

Now let's contrast that with the percentage of the population that has the ability to manipulate paper and intersect that with the poll workers. So now, all of a sudden the threat of an electronic voting attack by implementing an electronic voting system by itself is miniscule compared to that of paper, because everybody in a voting precinct -- let me clarify that. Actually 99 percent, so I won't say everybody, but 99 percent of the people there, can manipulate paper, whereas, what's the percentage of those that can actually manipulate voting technology in such a way that it would cause an adverse effect? I think that kind of risk is important to be done when we talk about these attacks and things.

DR. KING:

Okay, thank you. John.

MR. GALE:

Well, in terms of, what risk I view as being shared well, I view all risks as shared, to do otherwise, really just results in finger pointing blame game of, well it's your fault, it's your fault, it's my fault. I think it's a shared risk of all of us. As an election administrator, fortunately, I don't have to worry about manufacturing machines or testing them or worrying about parts and supplies, but as a state election official, particularly as an elected election official, I have to be acutely attuned to the feelings and beliefs and attitudes of the voters. They have such a brief moment of interaction, we have to bring all this together and it's like, you can have a lot of generals and you can have a lot of staff planning before you invade Normandy, but it really comes down to those corporals and those majors who are on the front lines and the master sergeants and that's what our poll workers are doing. That brief interaction is with our people on the ground, in the field, on the day of voting, and so we have to be sure that the election equipment that we're using is going to be user friendly for the voter and easily understood by the poll worker who can be trained to make it happen. And so, when those election days are over, the voters are happy. They feel like they've cast their vote, they're confident it was counted, the tabulation is achieved at a reasonable period of time, so people get results.

So, that's where I view things, not in the ivory tower of standards, but on, what's it like when we hit the ground. And yes, we have not had adequate assessment of risk at this point.

DR. KING:

Okay, thank you . Let's look at Question #7 and I'm going to make a suggestion here. Question #7, really, is asking you to personalize to the extent that you can what you perceive as the priorities of features or functionalities of a system. And John, I think I've heard you talk about, flexibility is an important desirable outcome. Alec has mentioned security. Jim certainly has mentioned both accessibility and usability. This question strikes though, as, how do we find a balance in the design of these systems that we're competing for resources, we're competing against timetables. And I want to suggest that we use this as a starting point when we come back after lunch, in our summary statements. If you would like to address this question in the summary statement, that may be a good way to lead that off.

When we come back at 1:00 today, Carolyn, we would start with you and we will move around the table. Each of you will be asked to, kind of sum up and help the EAC and the rest of the roundtable understand what you perceive is the most important issues before us, on the VVSG. If we can kind of focus back towards this particular document, the draft, and with that, I will declare us adjourned until 1:00. This room is not secure. It is not locked when we are out, so, if you have something that you need to take, please do so. See you at 1:00.

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[Luncheon recess from 12:02 p.m. until 1:09 p.m.]

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DR. KING:

Okay. Let's go ahead and get started. There's a couple more folks that are coming in, but in the interest of winding this up at 2:00, I'd like to get started. First, thank you all for the contributions earlier this morning. I think this roundtable discussion has clearly been different than the prior ones, in that, at the other roundtables everybody at the table, kind of, had a shared perspective from whatever their interests were, whether it was the labs or vendors. This roundtable has been different. It's got people from all of the different constituencies and so, the ideas have played off of themselves a little bit differently than we have seen in the prior roundtables, so, I thank you for your preparation and thank you for your participation.

This part is now given over to allowing each roundtable participant to, kind of, summarize their points. And that can be either, reflecting on things that they heard, drilling back down through their testimony. I would ask that if you have submitted testimony, that will go into the record. There's no need to read from it, but you can certainly summarize from it.

So with that, I'd like to start with Carolyn and if I hold up a finger, it means you've got about one minute left and if you would start to head towards the wrap up and then we'll just move around the table. So Carolyn.

MS. COGGINS:

Well, in this last question was, you know, how do you prioritize the features? Well at the lab, we don't really prioritize them in the design and I don't think it's really the priority in this area. The approach has been this tradeoff and really, it's this all or nothing

policy that has been in place. I think that's one aspect. And, you know, I said that before, too, today, that requirements versus policy are -- that's been kind of muddled today, people talking about things that are really policy and that aren't the requirements in the standards.

I think that this, all or nothing policy, in terms of getting through certification, that that has really fostered an overloading of the scope by the manufacturers, is that we're not getting -- things haven't moved as quickly through the process, because this, all or nothing requires them to put huge amounts of, you know, complex configurations of systems together, in order to move through this process. Also, you build quality in -- you need to build quality into the process, you can't test it in and that's been said by a number of people today.

I just, would say that, practicality is lacking at this point. And quite frankly, I don't think we're ready to move onto 2000X. I'd like to see us addressing test methods for 2002 and addressing test methods for 2005. You know at this point, we're going to put something -- we've got an incubator already in process right now, and, you know, who is -- we've got test reports out there, excuse me, test plans out there. Who has looked at the test plans and are the test plans good for other people's needs? Are these fulfilling needs? Are they being used? Am I the only one who's using them or -- you know, are we doing any assessment if these things are good? Are we -- is there a better test plan? Is there a better test report? How could -- how can we use what we're currently doing now, rather than saying, we're going to get it all perfect the next

time? How about if we actually started doing some of this at this point? You know, is it -- if the main issue is security testing, is the concern, if that's a priority or whatever the priorities are, then perhaps the thing is, let's take a bite of that and get security testing for 2002 and 2005 identified in test methods. Got it?

DR. KING:

Okay, thank you Carolyn. Keith.

MR. CUNNINGHAM:

Well. sitting here thinking, wondering how I feel and I think I feel like a tire on an airliner. Above me is a tremendous level of technology, very sophisticated things are going on. There's a whole lot of people in the plane with a whole lot of different opinions and what it all comes down to at the end of the flight is, whether or not this $200 tire holds when we land. It's where the rubber meets the road.

My priority isn't on the board. My priority is honesty. We have to get honest about the election system. More importantly, we have to get politically honest about the election system. We need to stabilize the systems. However we do that, I'm open to anything. But the elections system in this country needs to get back to a stable operating and a stable environment.

I joked at lunch about what we need is a few more experts. I need a few more people telling me poll workers aren't trained properly, as if I didn't know that. We need to be able to quantify data, as Juan spoke of earlier and separate fact from urban folklore, so that we can analyze the health of the patient and get

down to, you know, we can't honestly fix something that we don't, honestly, don't know what's wrong with it.

Standards, I agree, the standards just need to be reasonable. The standards, you know, I don't even know that we're ready for the new standards yet. You know, the best advice I can give anybody, technically, is, you better deal with the equipment that you have in place and you better figure out how to work it efficiently and you better figure out how to work it in a way that is -- you limit the ability to compromise, because I just do not see -- I mean, it just feels sometimes we're having this conversation in a vacuum.

I again, have said it here two or three times today. I just do not see the money on the table that's going to put equipment into play at this point for any new standards. I mean, I think we're -- it's a lofty goal, but if you have standards in place and no market for the equipment to be sold in, thus no market for the equipment to be manufactured in, what's the point? I'm kind of a, be here now. I've got to deal with the equipment that's before me. I've got a huge presidential election just six months away. The equipment isn't going to change and we need to figure that out. I'm with you, I think we need testing of the 2005 standards before we move on and make sure that, you know, our equipment is up to snuff and we've got all the holes plugged and we're using it in the best way that we can, and open the door to new technology.

Again, you know, I'm not hearing -- many of the discussions I have in any election circle, what I'm hearing from the voters. And the voters aren't saying to me, oh, man, that machine can be

penetrated by somebody with malicious software. They're saying to me, when can I vote online? When can I vote across the street from where I work? Why do I have to drive clear home? So I, you know, Secretary Gale has made the comment several times here today, about, you know, these standards may be useless eventually, if the whole way we vote changes.

And I'm saying to you, just quickly, that that's what strikes me. Despite all of these conversations, despite all of our lofty goals, and all of our intelligence, we're basically still voting the same way our great, great, great grandfathers did at the little church down the street or the little, you know, school down the street or whatever. The equipment looks a little different. We're still basically relying on paper, by and large, even when we're using technology, we still want the paper to verify it.

So I, you know, despite all of that, I think we have come a long way. I think more votes are getting counted. More people are being franchised with the vote. And I hope we don't lose sight in these conversations of where we've actually -- the successes we've actually had. And again, in that, all or nothing kind of spirit, you know, we're making progress. We're having successes and we're not without our faults but I think we're headed in the right direction. And again, I hope I added something to the conversation today. Thank you for inviting me.

DR. KING:

Thank you, Keith. Pam.

MS. SMITH:

I know Keith added a lot for me. I really appreciate his straightforwardness. And we were talking earlier about how a lot of us are confused and when I get confused, I basically long for simplicity and look for ways to get back to that. You know, and to talk about the cost of the process and how it's going to break the system and then in the same breath or almost the same breath we're talking about multiple layers of innovation. I think it's contradictory and in a way it can kind of miss the point. I think there are or should be some key goals in the electoral system that everyone can vote and that every vote that gets counted as cast. And if you have those two fundamental goals in mind, then we can direct the discussion of innovation and cost around whether you're innovation accomplishes those in a cost effective manner. And I don't think we can just assume that any innovation should be investigated and pursued and hang the cost. I think, you know, they should go back to the fundamental goals. You know, if things are too expensive to build to test, to buy, or even to understand the risks, then we're meeting this cost hurdle, we're not going to be able to get by.

What the constituents that I represent want is, to have all voters have the ability to cast an effective ballot and by that I mean, it's not only possible to privately mark your selections without being hindered by poor ballot design or malfunctioning equipment or insufficient accessibility or other factors, but also, that they're assured that the ballot is counted as the voter intended. And I think that from our perspective, a system that will allow a way to check the intent of the voters that's independent of the software used for

tallying, is an effective security measure and an effective reliability measure.

So, you know, how do you balance, is in this Question #7, which is no longer up on the board. I don't know that you have to sacrifice one of those factors for another. I think you have to strike a balance where the basics, that you meet a basic criteria for each. You meet a basic minimum level of standard compliance for each of those categories of security and reliability and accessibility and usability and make sure that in doing that, you're not knocking the other one down below some basic minimum standard.

You know, some of the costs that we've had have to do with the excessive complexity in voting systems. You know I had somebody say to me recently, they went to look at the section in the VVSG about software independence and they sent me an email, which was basically the email equivalent of throwing their hands up in the air and saying, I just don't get it, you know, software independence, software dependence, why do we need software at all? Why can't I just mark a paper ballot and you count it? And, you know, frankly that's the -- those are some of the voices we hear along with the person who wants to know why they can't vote on the internet.

But so, I think that a return to simplicity and the basic fundamentals of making sure every vote that is counted is cast and that everyone has the opportunity to cast a vote, is what we're after here. I hope that helps.

DR. KING:

Thank you, Pam. Alec.

DR. YASINSAC:

I've got four quick things and I've had plenty of time, so I won't spend much time. You all know that I believe we need to focus on process first and then product and we're just not doing that.

I also want to correct a couple of things, to make sure that the perceptions are straight. Laboratory testing is all we have. We can't go into an election and challenge somebody to compromise that election, because if they succeed, that puts every election in that race in doubt. We cannot do it on the floor when elections are going on. The laboratory is all we've got. And we need to leverage it and use those resources as best we can.

I also pointed out that, while some think, my colleague who's an Appalachian State Mountaineer, by the way, the reigning football power of the United States, said blue team testing hasn't occurred. It has occurred. The SAYED reports have gone in and listed with flaws that they identified, they listed the prerequisites had to be in place. They included the procedures and the knowledge and the resources required and the mitigations that election officials could take to do that. In one case, there was a directive issued, that allowed elections or that required elections officials to make accommodations for those. And in other case, the vendor, actually went back and made changes to the software to mitigate some of those responsibilities that they relied on in certification. So, the blue team is occurring and has occurred in, at least, some instances, so we can do this and we can make it happen.

And I'll just finish up with this notion of a threat. And I know that folks don't see this, it's hard to see, but I haven't done this for

25 years. I've been in this elections business now for a little while, not as long as a lot, but I'm convinced that it's, when, not if. If we don't fix these processes, yeah, okay, it's okay to say, well, it's never happened, but when it happens, it's going to be ugly. And if we don't take it seriously and we don't step out and do it, it's, when, not if it's going to happen. Thank you.

DR. KING:

Okay, Alec, thank you. Tim.

MR. RYAN:

On Friday, I was speaking with one member of the team that contributed to this report, that I handed out and he asked me what the three things that I would bring up today and when I told him that I was coming today, would be. So here they are.

Number one, innovation and a minimalistic approach, is something that we think is important. Every time that the document gets -- every step it takes to being more specific, is just another -- well I shouldn't be so broad, but has the tendency to shackle innovation, to shackle vendors to a certain way of doing things and that might not be salutary in the long run. Can have unintended consequences, can forestall the development of new systems, can obscure local priorities. We tend to think that the localities are the places that are most capable of locating their resources in the proper manne,r but it might force them to do things in a way that's not most efficient. And when you look at the history of just the last few years of how technology has evolved, it's clear that we are being quickly changing our minds. The answer that we thought was the proper answer just after the 2000 election, no longer is --

seems to be, so apparently, the correct answer. And if we look back in a couple of years, I tend to think that that will be the case again. So that's one.

Number two, this is something that we didn't focus on today but it's very important. The usability standards in the VVSG we find, and you can read more about this in the report, substantial problems in the way they are developed. The laboratory testing, some sort of nitty gritty social scientific things that weren't done properly, in our view and it's an important thing. When you look back at that, at the problems that have arisen in elections in the last couple of years, you see, to our knowledge no definite example of subversion through hacking or anything like that, but you can point to dozens of examples of votes that were lost because of usability issues. Michael Shamos [ph] I know, has one estimate, that puts the number of votes lost, I think in 2006, due to usability this year, is about 10 million. You can think of that what you will.

Number three, other topics. We were disappointed that so much time and effort were dedicated to this, that is a monumental undertaking and less so to other topics that we think are as, if not more important. Again, this is in the report but just one example would be, absentee voting. This is a way through which you sort of skirt around all of this behemoth document and invoke in a way that is sort of outside the scope of its focus and other topics such as poll worker training and things like that.

DR. KING:

Okay, thank you, Tim. Jim.

MR. DICKSON:

First off, thank you for having me, it's been a thought provoking morning. I want to begin first, by citing a recent survey that Info Centuries released. And I don't know if everybody's seen it, but basically, they ask the public, do you feel confident that your vote is going to be counted if you vote on a DRE and 70 percent of the public said, yes. They also asked the public, do you feel confident that your vote is going to be counted if you vote on paper, and guess what, 70 percent of the public said, yes. So what that says to me, is that, you know, in our democracy, getting 70 percent of the people to agree on anything is a pretty substantial achievement. And so, I think that's a credit to the women and men who run our elections.

The VVSG II is way, way, way, too complicated. As currently drafted, it will stifle, maybe eliminate innovation. I agree with what Carolyn said earlier. It doesn't make any sense to me that we're developing a set of standards when we haven't even finished the process on the previous set. We need to see how the testing works on the 2005 VVSG and learn from that experience.

There were several comments made about, sort of, categorizing the certification process and having a minimum, a better, and a best standard. I'm assuming, but I guess I want to state clearly that, you know, the law says, that people with disabilities get to vote privately and independently and in the same time and manner as everybody else. So, if there's going to be some kind of hierarchy, the accessibility features have to be dealt with, in the beginning and not in the end.

Broadly speaking, I think we've got, if we move back a little, back from the standards, there are two big questions that I think the EAC needs to grapple with. One is, the whole question of this market and the money for development, the money for purchase. And this document, a lot of people have put a lot of blood, sweat, and tears in it and there's going to be a lot more, but if the funding questions aren't answered, this is just going to sit on a shelf. And so, I would argue that somehow we have to address the funding questions first.

And then the last point I want to reiterate. You know, I think that we need to be real clear about the length of time that it takes to test, to research, to deploy and, you know, that there's a -- I think, on certain elements in our country, there's an expectation that while, you know, by things are going to be in place by November -- things are going to be in place by 2010, you know. I think 2014 or 2016, based on what I've seen happen so far, is much more realistic. And I think that that -- if that expectation isn't corrected, that anything that gets done is just going to go for naught.

DR. KING:

Okay, Jim, thank you. David.

MR. BEIRNE:

Well, I just wanted to commend the Elections Assistance Commission, Commissioner Davidson and staff for putting on this interdisciplinary roundtable. One of the things that we keep hearing about in recent years is the need for an interdisciplinary study of election administration. And I think what we have here is a good

microcosm of exactly where we need to go and I think this is a definitive step in the right direction for the EAC.

What the council, you know, again, representing the National Trade Association, I'm most concerned with just protecting the playing field itself, as well as, making sure that the barriers that currently exist, whether to current players in the marketplace, as well as, new entries into the marketplace, have an opportunity to bring their product to the market and incur that natural risk associated with doing business. Right now, there are four primary service providers, representing 90 percent of the marketplace. They employ hundreds of employees and I would say, overall the process is working, but we often times lose sight of that, by simply saying, well, it needs to be fixed.

And I think that we would be the first ones to recognize that voting technologies constantly evolve and we are at no time going to think that we have stopped our progression. The key concern we have within the VVSG is, are we restricting that progression through design requirements rather than performance requirements? And Carolyn had a great point, as well, that we share, which is, we need to look to improve the 2002 the test scripts which are currently being used to certify equipment, as well as, look towards the 2005. Only then will we know what the next progression is going to be and how we can best improve the certification process, as a whole, as well as, the voting system standards themselves.

Going to the question of, how to prioritize the features, of course, one component that was missing is accuracy. That's not

listed up there. But accuracy, accessibility, usability, and reliability were the key components that were used to develop the initial generation, as well as, subsequent generations of DRE's. What we're seeing, and again, we must not lose sight of the fact that equipment that is currently deployed is certified. What has changed is, our demand or recognition of demand for increased security and that's something that going back to the laboratory conditions, when you're looking at security, yes, laboratory conditions are important, but just as you have a control, you need to have a control model, as well as, the experimental models.

And I think going back to what I'm saying, although there may have been one red team analysis that did include some aspect of election administration procedures, the model that was applied to DRE's, was the same model that was applied to ballot boxes and things of that nature. And when you look at the security threat models that have been established or recognized within the election administration, those procedures do mitigate the vast majority of risk. And that's something that we think that needs to be looked at and recognized and the election officials need to be much more a part of the process to say, yes, you've identified these risks, can we, one prevent it, and secondly can we detect it.

I equate elections almost to disaster response or disaster management, that once you have mitigating steps and then you've got your response steps, and then you've got your recovery steps. And when you're balancing prevention and detection, because ultimately a paper ballot box can be stuffed, we can recognize that element. The question is, can we detect that it was stuffed? And

that's one of the core, the fundamental issues that we need to look at, is that we're balancing prevention and detection.

And for us to move forward, I think we shouldn't lose sight of that by just requiring an overly restrictive requirement, such as software independence, because it does negate attempts for, if someone wants to go out and do an open source development and bring a product to bear that has the latest techniques and the security requirements built into it, but it may be entirely software driven. And on top of that, software independence is not widely understood to have a common definition, even among academics there's a disagreement as to what is software independence and whether or not, even as it's defined within the VVSG, is that technically a software independent system.

Having said that, I think there are number of -- I don't envy the EAC in its position, because ultimately, there are a lot of policies that have to be adopted or it requires policy leadership on behalf of the Commissioners and the Election Assistance Commission. We certainly look forward to continuing our relationship with them and assisting in whatever way we can. But there are fundamental policy questions that need to be answered. And as Abraham Lincoln said, you cannot please all of the people, all of the time.

Some of these questions I included in my written remarks, but they include, what impact will the requirements within the VVSG have on the current marketplace? I realize cost was a big issue that was discussed today. I probably brought up the vast majority of those concerns, but it's a very real one. Regulatory agencies

have learned lessons the hard way, about allowing market failures to exist or not recognizing potential for market failures when they're on the horizon. Is there a danger of market failure if the current certification process continues to exhibit delays and ever increasing costs? As has been posed before, should perfect be the death of good? And this goes back to the security model. Are we building towards an absolute security threshold or a high level of competence? And that's, I think the big issue that also needs to be dealt with and that's left to the EAC to direct that policy. Is software independence too restrictive for the future of voting system technologies? And is the country best served by having an effective federal certification model with more or fewer participants, although we talk about the next iteration and when it's going to be deployed, the question is, are there going to be any states interested in pursuing or continuing to be part of this voluntary framework?

And lastly, are the needs of the states going to be met with, not only the current certification efforts, but also the new draft of the Voluntary Voting System Guidelines? And again, if they choose to leave the voluntary framework, all this work that we're trying to pursue, is going to be lost. When I go back to market efficiencies and what is important is that, as someone who is bringing a market -- a product to the marketplace, if they look at it and say 45, 40 states to 45 states require federal certification, and I know that if I bring my product to the EAC, I know what my cost is, I can build it into my pricing scheme, and I can potentially market that product to 40 states. I know that there is some sort of return, potential return

on my investment, but if you only have five states that are opting into this voluntary framework, it's going to, I think, decrease how robust those companies are and the quality of the products that you're going to see coming down the road. And so, I think in turn, that will affect the level of innovation that we see. And so the constant dynamic, I guess going back to the balancing of security, accuracy, reliability, usability, and security, often times, are too competing interests.

And I'll leave it with this, which is, within the VVSG, there are strict procedural controls that are recommended, such as user password requirements, based on the operator's position. That right there reflects that the dual or the dynamic between usability and security, in which it reduces the flexibility of the election official to respond to situations in a disaster management scenario, to say, I need to make sure that this person is now doing this function. And I don't have the ability, in a twelve hour window, to make sure that they are going to have their password controls updated or whatever procedure might be recommended. It's going to increase security or procedures are going to potentially reduce the usability of the systems.

DR. KING:

Okay, thank you, David. Doug.

MR. LEWIS:

You know this, I think this question gets down to, it's almost like, if you choke a smurf what color does it turn, you know? We don't know -- we're not sure that we can say that either of these is

independent enough to rank order, that one is more important than the other. Certainly, security is important.

Let's go through what we've already seen that the EAC's been able to do for us. The truth of the matter is, is that ballot design project that they just came out with is tremendous and will have a -- begin to have -- it won't have an immediate impact, but it will have a very long-term impact, on how we design ballots and so, voters have an opportunity to make fewer mistakes. And so, we tend to think that maybe we're not making any progress. And I want to tell you I think from what the EAC has already done with that project alone is going to make an immeasurable impact.

Certainly, this whole discussion that we came up with, over whether or not the voting systems are safe and secure or whether they're not safe and secure, truthfully, has opened everybody eyes to look at this whole process and it's been a wonderful sort of review for all of us. Are we where we need to be? And if we're not where we need to be, how do we get there and how do we do that, in a manner that gives both the feeling of security, actual security, and does so at a price that society can afford.

I think we're not giving credit to the fact that we've raised these issues now, as a community, as a nation where it does have an impact and has had an impact in all of our thinking. Certainly, clearly in standards development and certainly by involving some of the nation's brightest scientists in some of this, we've begun to discover that there are some things here that we need to pay attention to and so, that's been good. That's a progress. Whether we admit that now or not and if we're measuring only that, well, we

don’t have it all place, then I think that’s the wrong milestone or the mile marker to look at this.

What -- the vendors don’t care. I mean they do care and they don’t care, but you tell them what the set of the rules are that they can manufacture systems, that will count votes and they’re going to manufacture whatever you will allow them to be sold in the marketplace. So, you know, it can be, if we want to go back to an abacus, they’d manufacture abacus, maybe something had more features, you know. But that’s what they’d do, because that’s where their money comes from. And so they’re going -- we set the environment and whether that is the EAC or the United States Congress or State Legislature. We set the environment, they’re going to manufacture to that environment. And so, they’re going to make money one way or the other in terms of this. They have to -- all they have to know is, what is politically acceptable and then move on.

From an election official standpoint, there isn’t an election official in America that says, oh, please give me a system that does not count accurately. Gee, that’s the one I want to buy, you know. We want systems that are fair, that are honest, that are straightforward, that are secure, and that we can explain to part-time octogenarians how to operate and so that voters have the best experience possible. That’s where we need to be. We certainly got to get there. But when we look at that, we also have to look at, it is not just today’s environment that we have to look at. I think Keith raised some very valid points, in terms of, we have to look at tomorrow and we’ve got to look at a better way to manage this

process. If we keep shutting down technology, it means that we can't really redesign the process much. And we know that the way we're doing it is probably the worst way of all to do it, is to be operating on the model that we created in 1890, you know, to be able to vote, precinct voting.

And so, here we are, we've made tremendous improvements in society worldwide, and yet we can't seem to get away from our comfort zone of older ideas and older processes. And the voter and democracy itself probably deserve long-term, us to look at this and figure how do we better serve the voter and maybe it's not the way we're doing it now.

In terms of threat analysis, I think the beauty of this is, is if the EAC, truly, is now taking that next step and NIST is taking that next step, of doing threat analysis that is also on paper based systems, not just electronic based systems, then I think we begin to see real world comparisons, then, about what are our advantages and disadvantages of each. We've never been wedded one way or another to any particular mode of voting. All we want is, is we want it to be reasonably secure, so that voters can expect that the election is an accurate reflection on the public voter. That's what we're after. That's what, as a society, what we have to be after. That's what I'm hoping that the EAC allows us to move to, where ideas like Juan's and others that come through, where we can maybe do some innovation and maybe redesign even the process itself.

I am always worried about the insistence on one answer fits all and this particularly for elected political officials to look for simple

solutions. Simple solutions, more often than not, are need plausible and wrong. You know and this is a complex process. My God, the EAC has certainly discovered how complex the process is. The development of standards, with as many stakeholders who are involved in this process, some of whom who understand and some of whom don't, begins to be a nightmare. And so, that's the place we are now.

Let me wrap this up then. It seems to me test sweeps are important and if NIST and the EAC can get test sweeps moving at a fairly rapid pace for the 2002 and 2005 standards, I'm going to guarantee that elections officials will welcome this. You know, particularly if you can show us test sweeps that we can use, in doing acceptance testing, that gets us independent of voters, contractors, I mean, not voters but vendors, contractors, and others, you know, where we can actually apply something that somebody says, this works and this will indeed tell you whether or not your equipment is counting accurately and will continue to do so. That's where we want to be. And so, let's measure our success, not so much by, whether or not the next iteration gets out tomorrow or two years from tomorrow, but whether or not we're actually making progress toward better election systems in America.

My final comment is, but we're going to have to, we're really going to have to back up at some point. It is not enough to say yeah, it's going to be more expensive and you all are just going to have to live with that, because at some point, the expense indicates the answer and the answer then becomes that we all begin to vote

one way and because that answer is far cheaper than any of the others and so those are the things that I think we need to be concentrating on.

DR. KING:

Okay, thank you, Doug. Juan.

MR. LEWIS:

I'm sorry.

DR. GILBERT:

I'm going to begin with a statement that I made at a previous roundtable. This is not rocket science. It's harder. And the reason I say that is, because, at least, in rocket science you deal with phenomenon, materials, and small set of people. We're dealing with all of those things and a large set of people and policy. And when you look at that equation, it complicates everything and I think that we don't really give enough credit to the difficulty of this issue. So I'll begin with that. This is very, very hard.

Getting to that question about security, accessibility, usability, reliability, I'll make a comment about usability. We can build the most secure system in the world, but no one could use it. By definition it's very secure, but at the same time it's useless. The point that I would make is, that usability is extremely important. I'm not saying security is not, but if it's not usable, it's useless.

How do we get around these things? I think collaborative research is the key. Right now we've seen a lot of attempts and problems that have been pointed out by segments of different communities. And I also say, security communities being extremely active in this area. And the security community often does not talk

to the human computer and action community or the political science community and vice versa. So, you have these silos of operation and as such we get silo problems and silo solutions and nothing really works. Again, going back to rocket science, imagine if we built a spaceship that way. Your engineer's really didn't talk to the physicists and things like that. I don't know anybody who would get on a rocket ship then, but that's exactly how we operate in these silos and why should we expect anything good to come out of that?

With respect to the VVSG, I -- one my highpoints of the VVSG that I really like, is software independence. I think in the spirit of how it's written, that can solve a lot of security issues, but there's something else about software independence. It's being interpreted or I should say, misinterpreted, as meaning software exclusive. It does not read that way. I've been challenging people to take the text and then translate to equate it to software exclusive. See, it was written with the intent to mean software exclusive without saying software exclusive, but now we're seeing solutions that come up that adhere to the way it's described. And now the question is being asked, well, that's not what we really meant but that's what you've written and everyone understands that concept of what the intent of software independence means.

With that spirit, I think it's important that innovation is my key point. And Merle, you said, what would we like our final comments, what we leave people with? Innovation is my key point. We got into this place that we are in because of what I have described as a knee jerk reaction to a set of circumstances in 2000. And it was an

opportunity, a window of opportunity to make money and to provide what appeared to be a quick solution to a problem, with no regard for the difficulty of the situation. Now we, in some sense, can see the difficulty of this discipline and the situation and as in every other venture we've had, you approach those things informed. And how do we become informed, through research and innovation.

I think the VVSG, I agree with Doug, in the sense that I don't think it's a big rush to push it out. I understand, you know, the EAC may be under a little pressure to do so, but I think innovation should not be in any way stifled. I think we have to take the cap off for innovation. And when that occurs, I think we need to start talking, because we do have innovations out there. I think it's important that we need to have conversations about, how do you evaluate innovations? What are we going to do? Who's going to evaluate them? I think it needs to be considered that those individuals evaluating innovation are not so much, self serving individuals. But I think we need to set in play or in motion, how to evaluate innovation. We see innovation occurring, how do we evaluate it?

So, I will leave you with my perspective of important items. I think innovation cannot be stopped. I think usability and security need to find a way to become a union that can't be exclusive of each other. And I think that involves breaking down those silos and having people work together from the election administration, and from the academy, and from security, from crypto, from usability. And by doing so, that's the only way we're going to solve this problem. This, as Merle King puts it, this is election science. That's not a discipline defined yet. And we're defining it and we

don't' even know that we are defining it and it's highly interdisciplinary. And so, no one discipline will solve this problem. And I hand it back.

DR. KING:

Okay, thank you, Juan. John.

MR. GALE:

Thank you, Merle. Well, if you read my remarks, my prepared remarks, you'll find that I'm pretty critical of the entire TGDC process. I'm not critical of NIST for their performance. It's an outstanding institution, highly trusted, a tradition of excellence, a federal agency that was at least available to Congress to dump this project on, in the Help America Vote Act. And they rose to the occasion. They have outstanding people, well trained scientists, but it is an academic environment. And their scientists and engineers approached this as an academic project. And why? Well that was Congress's directive. I think Congress thought they were typical with legislation in building a race horse and they built a camel and we had to live with it. It was not any way I would attempt to set up a border commission but it's what Congress did and it was a result of a lot of political compromises, but I will tell you that it was extremely, extremely frustrating for those of us who are election administrators involved in that process.

And our, I guess the bottom hope was amongst us who are in elections, was that this was simply the beginning and not the end. NIST and TGDC were directed to accomplish some virtually impossible things in a very, very short time, pressure deadline and the 2005 standards were accomplished and the 2007

recommendations were accomplished, but accomplished with almost an impossible time pressure set of deadlines. Did all of us on the committee understand the full package of the recommendations? Absolutely not. Did we understand those on our little subcommittees? Maybe to some degree, but the whole process had to be driven by the scientists and the engineers and the experts at NIST and so it was a NIST, in the end product and not really one that was a balanced product, as we have a balanced discussion here today. There wasn't that kind of an opportunity to develop policy alternatives and have these kinds of discussions.

And so, I don't think of this as something that was incredibly thoughtful and reflected upon and given the opportunity to balance policy and cost and assessments. It didn't happen. This is a set of standards guided by the fear of DRE's and what DRE's and source codes and encryption might do to America because of the possibility of a malicious intrusion. And so, this set of standards dealt with all of those inputs from all of those groups that had questions and fears and concerns and so it's done that job.

It was a very thoughtful, a very considered package by the scientists and the computer engineers to answer all of those questions. So, it's not futuristic. It's really regressive, in the sense that it looks back at what happened because of HAVA and the lack of standards and the lack of certification sweeps for the DRE's when all the money was being spent, okay. So Congress made a very big mistake there.

But I think as an election administrator and what's going to happen with every other election administrator is, we're moving

ahead with America to satisfy their need for simplicity and user friendly elections. And that means, if they're getting tired of standing in lines, then we find new ways to split precincts or we eliminate precincts and go to voting centers. Or if that doesn't work, then we go to all mail-in ballots. We've done that in Nebraska with many small counties. We've gone to all mail-in precincts, in counties where we've been requested to do that and the law allows me to do that. It we'll grow. It will grow to counties. It may grow to statewide like Oregon where you have 85 percent turnout, because of all mail-in ballots.

We, as election administrators, really have the reigns to the horses to a large degree in trying to satisfy the spirit of America in having simple, cost effective, and user friendly elections. And whether that means we do more absentee ballots because our goals are voter turnout. We want high voter turnout. We want high voter registration. We want youth participation. And we're going to be involved in all those issues, no matter what happens on the level of standards. The standards are up here, kind of an ivory tower and down here on the grassroots are the people who want to have democracy work.

So, this is just a small part of the pie what we're dealing with. The equipment that will come out of these standards is a small part of how elections will be run in the future. We will move to a lot of other forums that will eliminate the cost and eliminate the complexity, as long as we're certain that America still wants to have grassroots level elections.

Now I know there's been a bill introduced in Congress, where they want to federalize the UOCAVA election process, federal registration, internet voting, all federally governed and directed. I fear that. I fear a federalization of these standards and that they're mandated. I fear a federalization that's unfunded, that we have to be compelled to meet these standards for our elections.

I think HAVA did accomplish a wonderful balance between federal and state and leaves a level of state discretion and state direction and state guidance that I hope we can preserve. And that's going to happen, because we're going to find innovative ways to accommodate the American public that don't involve a whole lot of talks and complexity. At the same time, there are going to be jurisdictions that are going to want this kind of equipment and more power to them if they do and they will have to solve the problems of, where does the money come from and how do they accomplish the training of the people that need to run that kind of equipment.

But I guess bottom line is that, I think what NIST produced was a tremendous package that brought a lot of understanding and resolution to issues that had existed before and where we go in the future is going to be a variety of things, maybe including innovative practices based on what we've learned. Thank you.

DR. KING:

All right, John thank you. Mark.

MR. SKALL:

Thank you. You know after having been to about five or six of these and participated in, I think it's six roundtables, and I got the

invitation for the event today, I just assumed it was a graduation ceremony and that there would be hors d'oeuvres and champagne.

MR. LEWIS:

Expectations.

MR. SKALL:

It was, you know, not quite a graduation ceremony, but very useful. If I couldn't have champagne, I think an interesting debate is at least a second choice. So, I do want to thank all of the participants, Merle, Brian, Matt. I think this was very, very useful.

I had a bunch of things I wanted to say, but Secretary Gale, I think, preempted some of those, so let me respond a little bit to what he said. So, I have to disagree with my friend, Secretary Gale on the NIST involvement. I think like any committee, it was a complex process. And in all committee deliberations, there are going to be compromises. There are going to be some people who have more sway than others. This is part of the process. I don't think it was NIST driven. We were specifically given technical tasks and we were very careful to do the technical research and then give that research back to subgroups and then the subgroups gave it back to the plenary to make policy decisions, based on the technical research.

So, I guess, in summary, I think it was fair process. And I think that one needs to do technical research. That doesn't mean that one needs to make every decision based on the research. There are policy decisions. There are unknown considerations in the election community, but you have to have the technical

research as being an input and let someone else to do the policy decisions.

So, let me get to what I was going to say. Voting is at the center of democracy. I agree, it is harder than rocket science. That's one of the things we learned is, this is really hard stuff. And there's a lot of other areas where hard tasks are tackled in the IT world. There are mission critical systems. There are systems that, essentially, fly your plane for you, ones that are involved with nuclear reactors. Those other mission critical systems and I do consider voting mission critical, in the sense of the loss of life potential, but in the sense of loss of democracy. Those are systems, typically have much larger budgets allowing for many, many more different ways to address those problems, redundant systems, some do formal methods which are -- allow a more specific set of requirements and ways to test those requirements a little bit differently.

But, you know, it is what it is. We're in an environment where we are severely cost restrictive and we have to understand that and we have to work with those limited costs. So what can we do? First of all, we need a good precise standard. The question about reliability versus security, usability, accessibility all of those are very important. We need a secure system. You certainly need one that's accessible, usable, but let me say if it don't work right, none of those matter. So, you know, if I'm conducting a presidential election and the results say that Kevin or his twin brother Keith Cunningham are the new President of the United States rather than Merle King, who is the one who should have

been the president, it doesn't mean anything. So, it must be reliable in the sense that you know it works correctly. It's not nearly as important to make a system, for instance, secure, if what we're securing is something that doesn't work, so reliability is the key.

And that's the things we have to build into the standard. How do we do it? We do it by developing precise, specific, testable requirements. Those have to be done. You need comprehensive tests. We're developing a comprehensive test sweep. Let me just say again, I don't -- I wouldn't advocate delaying the standard once we have all the information that we need to make decisions. We should do a risk assessment, but let's not set our goals too high, it's very subjective and essentially at the end of the way we need to move forward.

Let me just hit one other point, because I know we're behind. Innovation, I think innovation is extremely important. We have this innovation class, which I think is a good way forward. Typically innovation goes on. We need to incorporate new innovative ideas into a standard and there are only two ways to do that. You can create a new standard every three years. No one wants to do that because we have a moving target. Or you can build it into an existing standard and that's what we did with the innovation class. And let me just say that innovation is very important but it can't be done at the expense of testable and correct standards. When I hear this comment about let's not be specific. Let's make things more generalized in order to promote innovation that detracts from a specific testable standard.

I've heard a lot about design versus performance versus functional requirements. It's all well and good to say, we should do performance and functional requirements and that was our goal. Often times, in order to get things specific and testable and you have to drill down however, so a good functional requirement is things should be readable. Voting systems should be readable and usable. When you do that from the drill down to other function requirements, often times you can't get to a lower level without putting in some design requirements. I'm not sure how to enhance readability, unless I say something about the font size, something about placement of icons. So certain times you need to put design requirements in. Does that restrict innovation? Perhaps, but you have to first make sure you have a precise testable standard or we have nothing. Thanks.

DR. KING:

Okay, thank you, Mark. Brian.

MR. HANCOCK:

Thank you, Merle. And once again, I would just like thank all of you for joining us today. As Merle noted earlier, it's sort of a different set of individuals here and I think we got some very good and different input into some of the questions that were presented today.

The tough work for the EAC, as most of you noted, begins now. It's going to take a lot of work to synthesize both the public comments and the comments that we got at the roundtables in some coherent way, so we can put forward a plan that our commissioners can vote on. That will be our task over the next

several months and it's likely we'll tap some or all of you as we go through that and have some additional questions, so hopefully we didn't scare you away and you may still be available for some future questions.

And finally, I would just like to again, formally thank Mr. King. He has generously given his time to us over, I guess, the past five or six months, as we were going through these roundtables and he's done an excellent job moderating and we won't hold it against you that we're late today. I just want to say that. The check will still be in the mail, as well. Thank you.

DR. KING:

Thank you. Well thank you, Brian, and Matt, thank you for your work. And at each one of these, I've taken the opportunity to summarize the things that I heard here today and that's important for me because it lets me communicate back to you the value of what you gave here today. And normally people's reaction is, they don't realize how much ground we've covered until we come back and summarize. So, if you'll give me just a moment to go through and list the things that I heard discussed here today.

Should the VVSG be all inclusive, that is, an absolute conformance standard and perhaps the standard can be stratified in some way to talk about minimal configurations. The organization of the document could improve both readability and perhaps the cost of testing by grouping accessibility specs into its own unit within the document. That we may best be able to fix the problems by fixing the processes that drive the design and the development

of the system. That simplicity is an undervalued attribute in voting systems and in documents, in general.

Component based testing may be an alternative to both, the all or none, as well as the stratified testing. Separate the document into minimum conformance and best practices section. Allow states the option of opting out of specific components of the VVSG, without opting out of the federal certification entirety. The benefits of component testing cannot compromise the integrity of the system and therefore we should ensure that modification of the components does not undo a system. That we should incentivize the quality of development, that is high quality systems will cost less to test and take less time to test. The time horizon for changing systems need to receive attention and public discourse. Outsourcing of component testing to state labs may be a way to shorten the time as well as lower the cost. That there should not be perhaps a single pipeline for the testing.

That we should require or -- I'm sorry, requiring vendors to require the TDP, the Technical Data Package, does it produce savings or does it add cost to the process and that's a part of better understanding of the existing pipeline that we have. That the coding standards should be revisited in the new VVSG. And that high assurance software, although not perfect, is still an attainable goal and should be a part of what we strive for. There should, perhaps be a reporting system that focus on failures and this is nationwide voting and that that system be used to improve the standard over a period of time.

Behavioral standards are needed in the VVSG. For example, how long it takes someone to vote using the system. The standards should be in place, prior to anymore federal funds being allocated by Congress. There may be too much emphasis on innovation and especially innovation as a result of technology. That some of the best practices are still highly stable. Funding needs to follow innovation and that if all we fund is research that investigates how to break systems or to fix broken systems but not to build good systems, we may not be investing our research dollars as best we can. That risk assessment should address paper based systems, as well as, DRE's.

The all or nothing policy, in terms of the standard, perhaps has overloaded the scope of the standard. That practicality is lacking and we need to be addressing test methods for the 2002 and 2005 standards before moving onto the next version of the VVSG. Funding to implement the systems to be built to the new standard must be evaluated concurrently with the development of the standard. Innovation should be directed towards the cost effective ways in which every vote is accurately counted. We need to strike a balance that seeks to establish and meet a minimum for each attribute of a voting system, rather than presuming that some have diminished value over others.

That laboratory testing is an important tool for verifying the correctness of systems. That efforts to increase specificity can, in themselves, improve innovation. That usability standards need to be revisited in the draft of the VVSG. There are perhaps some problems there. That the VVSG is very complicated and that may,

in part, inhibit innovation in the future. That accessibility issues should receive more attention in the VVSG, perhaps a more realistic timetable might be 2014, 2016 for this particular version. That policy issues dealing with the impact of the implementation should be considered and discussed concurrently with the standard. That attributes of voting systems may not be sufficiently independent to evaluate them independently.

Test sweeps to support the standards are critical to the election official's support of the standard. That usability is a critical quality that is derived through collaborative research as opposed to the silo approach. Software independence is a desired goal, especially if it's interpreted to mean software inclusive, as opposed to software exclusive. Innovation must be supported by the VVSG. The nature of the TGDC minimized the collective and reflective contributions of the TGDC as a group and much of the draft reflects the concerns of scientists and computer engineers. That equipment derived from the standard is only a part of the mix that election officials are concerned about into the future. And that the reliability, the property of a system functioning properly is an important key attribute of any voting system.

So, those are the things that I've heard here today. And I think it helps all of us see how much ground was covered in three hours this morning and one hour this afternoon. Again, I thank everybody for their participation. I wish you a safe trip home and with that I adjourn this meeting. Thank you.

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[Whereupon, the roundtable discussion adjourned at 2:15 p.m.]

A review of proposed

Voluntary Voting System Guidelines

A PROJECT OF THE

The AEI-Brookings Election Reform Project

VVSG Task Force

www.electionreformproject.org

Introduction

What is the VVSG?

Although many changes to election administration in the United States receive vigorous scrutiny from an energetic monitoring community, vastly consequential federal involvement in this arena is now quietly proceeding with relatively little attention. In October 2007, the U.S. Election Assistance Commission (EAC) began to consider a new draft of standards – the Voluntary Voting System Guidelines (VVSG) – that future voting systems will have to meet in order to earn federal certification. Much broader in scope than any previous standards, the draft VVSG has potentially far-reaching implications for the future of voting technology and election administration, including controversial topics frequently the subject of spirited public debate.

Put another way, the VVSG,[1] once adopted, will constitute a weighty statement of principle by the federal government on a number of crucial election reform topics. In its current form, the VVSG delves into such important matters as the mandate of physical voting records, accessibility of voting technology, and protection of incentives for innovation. True, the standards are "voluntary" in that states purchase their own voting systems, which are not *required* to be federally certified. Still, in the future, federal funds will only be able to be spent on certified systems, and so even if some states opt out of the requirements, the VVSG's effects on the market, and through it the national landscape, will be immense. The document makes only a small exaggeration, therefore, when it claims that it can be "considered essentially as a mandatory standard" (1.1.2). Prudence tells us that the inconstancy of public opinion makes broad policies, once established, difficult and costly to change.[2] It is for this reason that we believe a thorough review of the draft VVSG before its adoption and implementation is essential.

The AEI-Brookings Task Force

In assembling a team of experts to review and comment on the draft VVSG, the AEI-Brookings Election Reform Project sought to attract distinguished scholars with diverse backgrounds and specializations. We did not consider individual viewpoints on specific policy matters as criteria for selection. Rather, we made a conscious effort to recruit individuals who have thus far kept a "low profile" in the frequently acrimonious sphere of election reform by abstaining from strident advocacy. We resolved to make only such recommendations as could enjoy broad – preferably unanimous – support from the entire group.

Members of the Task Force reviewed the VVSG and prepared extensive memoranda outlining their critiques of the document. The entire task force then met in

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[1] Throughout this report, we use this abbreviation to refer to the *proposed* guidelines that are currently under review, not any past or future documents that might have the same name, unless otherwise noted.
[2] Anthony Downs, "Up and Down with Ecology – the 'Issue-Attention Cycle,'" *Public Interest*, Vol. 28 (Summer, 1972), pp. 38-50.

Washington, DC in December of 2007 to discuss each other's comments and arrive at consensus recommendations. Funding for the meeting was provided by the John S. and James L. Knight Foundation through a grant to the AEI-Brookings Election Reform Project.

Together, the eleven members of our team bring to the public discourse more than 100 years of experience in the academic and applied study of elections. We approach the task at hand from diverse perspectives in technology and the social sciences, including in our numbers two usability experts, a political methodologist, a human-computer interaction expert, and several public policy scholars. It is our hope that the recommendations of such a diverse group, speaking with one voice, will be of considerable value both to the public and the EAC as the nation contemplates how best to ensure the integrity of its electoral institutions.

Format and scope of recommendations

One inherent difficulty in analyzing a large document like the VVSG, a nearly 600-page behemoth, is choosing an appropriate level of scrutiny. We found ourselves torn between "broad stroke," thematic recommendations and line-by-line critiques that address specific provisions of the VVSG. It seemed that the broad stroke recommendations would most naturally take the form of simple prose, a style that held some appeal because it would be relatively easy for a wide audience of stakeholders, many of whom do not hold technical expertise, to digest. However, the EAC conducts its public comment process through a website where reviewers submit point-by-point recommendations germane to specific provisions of the document.

Some comments are suitable to only one style. For instance, we occasionally question the premise upon which a series of VVSG provisions is founded. In such a case, the EAC's public comment mechanism would require us to respond to each provision individually. We feel it more constructive to step back and explain our general concern.

We therefore adopt a two-pronged approach. This review is written in prose and provides general comments and recommendations about the VVSG. Most of its recommendations are not suitable to line-by-line edits. We hope it will be of use both to the EAC as it considers the VVSG and to media and laypersons seeking to increase their familiarity with this complex, but very important, document. In addition to this report, the product of collaboration among the members of our team, some individual members will also submit line-by-line recommendations to the EAC through the review website.

The VVSG in context

Chapter 3 of the VVSG's Introduction provides a full history of voting system standards in the United States. Readers interested in the full background of federal regulation in this area will find this resource useful. For the purposes of our review, we simply explain the genesis of the current draft standards so that a reader unfamiliar with their significance can understand them in context.

In October 2002, President Bush signed into law the Help America Vote Act (HAVA), a comprehensive reform of federal elections in the United States. Whereas previously

the federal government exercised little influence over the U.S. election system – the U.S. Constitution grants states considerable latitude in the conduct of elections – HAVA marked an effort by the federal government to increase oversight and regulation of the process. Largely a response to administrative and technological problems exhibited by Florida's conflict-ridden counting process during the 2000 presidential election, HAVA imposed administrative requirements such as provisional ballots; provided states with funds to update voting technology; required the establishment of computerized statewide registration lists; and created the Election Assistance Commission to review and coordinate election procedures.

Additionally, HAVA created the Technical Guidelines Development Committee, an organization composed of experts from the National Institute of Standards and Technology (NIST) and other bodies. The TGDC, in coordination with and approval from the EAC, was tasked with updating federal standards for certification of voting systems. HAVA mandated a short timeline for the adoption of the first set of standards; the TGDC was required to provide draft standards to the EAC only nine months after its formation. These standards, which are currently in effect, were finalized by the EAC in December 2005.

Because the TGDC undertook the 2005 standards on a short deadline, its members recommended a more comprehensive set of standards be developed in the near future. Whereas the 2005 standards built upon previously existing standards created under the supervision of the Federal Election Commission (FEC) before HAVA shifted authority over voting standards to the EAC, the current draft standards are a full overhaul meant "to meet today's more rigorous needs for electronic voting systems" (Introduction 3.4). In short, the current draft VVSG is the first comprehensive update to federal voting standards since before election administration came to the forefront of public attention in 2000.

A flawed document

Starting from scratch, the VVSG consists of a thorough, top-to-bottom review of voting system functionality that encompasses the diverse fields of computer science, electrical engineering, usability, political science, and others. The TGDC and NIST are to be congratulated for undertaking a monumental project.

At the same time, we fear the VVSG loses sight of what is perhaps its most important goal: to ensure that all vote collection systems accurately record and report voter intent. Although its requirements are extensive, we find significant problems in its treatment of security, usability and accessibility, matters at the very heart of HAVA's purpose. At some junctures, the VVSG would benefit from improved methodology and a greater familiarity with standing research in the social sciences. At other times, the VVSG potentially interferes with local prerogative over election conduct, prescribing solutions – such as physical records – that we do not find to be proper at all times nor in all places. In addition, the document could be made more wieldy, easy-to-use, and defined in its role.

Below, we expand on the reasons we hold these concerns and provide suggestions to improve the VVSG. We recognize that some of our suggestions will be unpalatable to those charged with preparing the final version of the VVSG. For instance, we find the document's treatment of usability standards to require substantial revision. Other points, such as our wariness of a paper trail mandate, run counter to passionate

beliefs held by well-intentioned advocacy groups.[3] The unpalatability or unpopularity of a proposition, however, are weak grounds for rejecting it. We have taken care to clearly explain the reasoning behind each of our recommendations. In return, if the reader finds himself in disagreement with our conclusions, we ask that he take as sincere our desire for a secure, reliable, and inclusive election system.

We especially hope that the EAC, NIST, the TGDC, and the general public will share our belief that the United States is at a crucial juncture with regard to election reform. The echo of the 2000 meltdown in Florida still resonates through the public consciousness, but will not do so forever. Moreover, states' commitment to certain administrative practices and technological options, though once pliable, grow more rigid with each passing day and each dollar spent. In short, it seems that *this* moment in time, more so than any other, is the easiest to undertake the arduous task of "getting it right," or as a notable former president once remarked, "Certainly it is not so easy to pay something as it is to pay nothing; but it is easier to pay a large sum than it is to pay a larger one."

First, Do No Harm

Haste makes waste

We sympathize with those who feel that the numerous election debacles since the presidential election of 2000 call for drastic corrective measures. While perhaps cliché, it is entirely accurate to call fair elections the *sine qua non* of any functional democracy, and so it is fitting to meet any threat to their legitimacy with dogged protectionism. The problems of the past eight years are no trifling matter, for even the suspicion of illegitimacy undermines trust in government and foments partisan rancor.

Nevertheless, it is possible for an improperly administrated cure to be as bad as the disease. The haste with which policymakers have pursued election reforms has already led to a staggering amount of fiscal waste. For instance, election officials throughout the country rushed to replace punch card voting systems with modern touch screen voting computers, but in just a few years, these substitutes evinced their own shortcomings and many are now headed to the scrap pile.[4] Worse than wasted money, we fear that the continuation of a strong interventionist course could entrench ill-conceived solutions to complex problems. Unfortunately, the VVSG exhibits such a continuation in many ways.

Tempting though it may be to apply sweeping reforms to the conduct of elections, we adopt as a guiding principle the notion that states and localities – the entities traditionally entrusted with the conduct of elections – are generally capable and well-intentioned judges of what will and will not work within their borders. To override

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[3] For a study of public opinion that reflects general ambivalence, however, see M. Glenn Newkirk, "Trends in American Trust in Voting Technology," InfoSENTRY Service, Inc., 17 March, 2008, available online at <http://www.infosentry.com/InfoSENTRY_Trends_Trust_VoteTech_2004-2008.pdf> (accessed 23 April, 2008).

[4] Gary Fineout, "Voting Change Irks Supervisors," *The Miami Herald,* 24 May, 2007, p. 20.

their authority is to assert that they would enact an ill-conceived policy choice if left to their own devices. It not only demonstrates an implausible degree of confidence in whatever reform is mandated, but also suggests that one policy size fits all. On the other hand, to encourage state and local prerogative is to allow for future innovations that exceed the boundaries for which imagination has heretofore provided. It is also to acknowledge the possibility that, just as touch-screen balloting has quickly fallen from grace as a cure to election quagmires, so might the apparent solution of today join the plentiful detritus with which the path to reform is littered.

Almost all public policies come with unanticipated consequences. This is one reason why Justice Louis Brandeis's entreaty that a locality can serve as a "laboratory; and try novel social and economic experiments without risk to the rest of the country,"[5] continues to resonate more than seventy years after he wrote it. We do not reject the notion that certain circumstances call for federal regulation. But we do feel that any intervention by the federal government into the sphere of election administration should be accompanied by a compelling explanation of why local authorities are incapable of tailoring their own policy. All things being equal, we believe the public interest in this area is best served when the federal government takes a minimalist approach.

Design vs. performance standards

At many junctures, in an effort to ensure voting system functionality, the TGDC, the committee that authored the draft VVSG, faced a choice between the prescription of design standards and performance standards. Design standards are precise specifications for the workings of a voting system while performance standards remain agnostic to process and only specify benchmarks for an acceptable level of functionality.[6]

We generally support well-conceived performance standards over design standards. As a matter of principle, the federal government should leave to vendors as much discretion as possible over how to design their products. Such meddling can stifle innovation and may bear partial responsibility for the paucity of new voting equipment brought to market in recent history.

A metaphor is illustrative. If, in 1935, the government wanted to ensure the safety of commercial aviation, it could have specified exacting design standards – measurements, position, composition, etc. – for plane engines. Such specifications might have achieved the short-term goal of ensuring that manufacturers adhered to the best practices of the day. But narrow constraints could also have forestalled the innovation of better alternatives that would have breeched old specifications, such as jet engines. A better alternative is to specify performance standards – the acceptable failure rate, etc. – and invite vendors to fulfill the requirements in whatever fashion they feel is most likely to satisfy consumer demand.

In a number of instances, the VVSG prescribes design standards that we feel are unnecessary. To cite two examples, Part 1 includes specifications for how

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[5] *New State Ice Co. v. Liebmann* 285 U.S. 262 (1932).

[6] Maureen A. Breitenberg, "The ABC's of Standards-Related Activities in the United States," *National Institute of Standards and Technology* (May, 1987), available online at <http://ts.nist.gov/Standards/Conformity/stdpmr.cfm#Types> (accessed 24 March 2008).

manufacturers must design voting machine locks (Chapter 5.8.5) and ballot boxes (Chapter 6.1). While neither of the requirements seems unreasonable in and of itself, we worry that such extensive prescription could inhibit future innovation. Instead, it seems that the VVSG could simply require that voting machines and ballot boxes be resistant to tampering.

In other places, the problem is that the recommended design standards are not empirically connected to performance standards. There are few clear links between the goals for voting systems and the possible designs for achieving those goals. For example, it might be natural to expect that voter confidence will be enhanced with a physical voting record, but research in several venues shows this not to be the case.[7]

All things being equal, we recommend that the VVSG err on the side of self-restraint in the prescription of design standards so as to avoid "technology locks," whereby certain flawed approaches can become enshrined on account of regulatory inertia. In our view, the science of election administration and voting technology is insufficiently advanced to develop worthy design standards. Design standards should be reserved for instances in which there are clear and unambiguous empirical links between the goals for voting systems and the designs recommended, or in which it is essential to establish uniformity and interoperability across the industry. In this, we concur with a recent draft report from the NIST Security and Transparency Subcommittee.[8]

Of course, the substitution of performance standards for design standards would not prevent the VVSG from pointing to *examples* of technology worthy of emulation. Such examples could serve as role models and establish a conceptual benchmark for manufacturers to emulate while still making it easier for the voting technology industry to mature over time.

Mandating process

At its surface, the VVSG deals only with vote collection systems, the physical machinery of elections. The TGDC emphasizes at several points that the document is agnostic to process, calling administrative rules and procedures "outside the scope of the VVSG" (Part 1, Chapter 3.1.1). Such agnosticism is fitting, as the document is not meant to be a federal treatise on how to conduct an election, but rather a list of certification requirements for voting technology. The undertaking is daunting as it is.

Unfortunately, equipment and process do not exist in vacuums, but are inextricably linked. The VVSG could no more address technology while ignoring process than the Boston Red Sox could recruit hitters while ignoring their capabilities as fielders. Again, the VVSG should take a minimalist approach, considering as far as possible the process implications of its provisions and reserving for localities as much discretion as possible.

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[7] Paul S. Herrnson, et al., *Voting Technology: The Not-So-Simple Act of Casting a Ballot* (Washington, D.C.: Brookings Institution Press, 2008); Robert Stein and Greg Vonnahme, "Voting Technology, election administration, and voter behavior," presented at the 2007 Midwest Political Science Association Meeting, Chicago, Il, April 1-3.

[8] NIST Security and Transparency Subcommittee, "Voting Systems Innovations Class," draft 10 March, 2007, available online at <http://vote.nist.gov/meeting-08172007/InnovationClass06262007.pdf> (accessed 22 January, 2008).

Consider a few ways in which some of the changes proposed by the VVSG – even marginal changes – can have a substantial effect on process:

- The VVSG requires voting systems to produce an "independent voter-verifiable record" (Part 1, Chapter 4.4). For all intents and purposes, this term is synonymous with a paper record, as we explain below. We also consider the general wisdom of a paper mandate below. Here, we simply point out that a paper mandate would have substantial effects on process. It would require the retraining of poll workers; the hiring of technicians with requisite expertise in the printer technology; the development of processes for validating the reliability of the paper trail; and the incorporation of procedures for transporting, storing, and securing paper records after an election. This is not all. Because paper trails lead to more time per vote, a paper mandate might require more machines to accommodate the long lines that develop in an important election and, in turn, more polling places to provide enough space for the new machines.

- The VVSG requires vote tabulators to be scanned for malicious software every 24 hours during operation (Part 1, Chapter 5.5). On its surface, the suggestion seems prudent, or at least innocuous, but we view it as an example of a decision best left to local authorities, who will have the best knowledge of their human resources, capabilities, and priorities.

- The VVSG's paper trail requirement could provide a disincentive for jurisdictions to employ vote centers, the consolidation of polling places that has been shown to lower costs, facilitate administration, and increase turnout, especially among groups that are typically politically unengaged.[9] Because the paper trails created by DREs in such a context will intermix ballots associated with different jurisdictions, the conduct of a meaningful recount would be a monumental undertaking that would require extensive sorting in order to filter out the pertinent ballots.

Software independence and paper records

Perhaps the most tangible change to come from the VVSG would be from its provision of "software independence" (Part 1, Chapter 2.7). On its surface, the software independence requirement is a provision designed to guard against the subversion of voting system software. It is, in effect, a requirement that voting systems produce a paper record such that digital records can be compared with something more tangible and, seemingly, trustworthy. While we strongly sympathize with the sentiments that have given rise to this proposal and recognize that software independence may indeed be a desirable feature in certain circumstances, we believe that a software independence *requirement* – or, indeed, a paper trail *requirement* –

[9] Robert M. Stein and Greg Vonnahme, "Engaging the unengaged voter: Vote centers and voter turnout," *Journal of Politics* (forthcoming, April, 2008); Robert M. Stein and Greg Vonnahme, "Voting place and its impact on voter participation," paper prepared for presentation at the annual meeting of the Midwest Political Science Association, Chicago, Illinois, April 3-5, 2008.

will be a long-run hindrance for voting technology. Because this position runs counter to some measures of popular opinion,[10] we take care to explain our reasoning.

Although seemingly an elusive concept, the VVSG's software independence requirement is in fact quite simple. The requirement states that

> Voting systems *SHALL* be software independent, that is, an undetected error or fault in the voting system's software *SHALL NOT* be capable of causing an undetectable change in election results (Part 1, Chapter 2.7-A, emphasis in original).

This statement can be simplified for a layperson. It calls for some sort of double check of any vote data stored by a computer. Voting machines should be designed such that it would be impossible to subvert an election through computer hacking because any alteration of computerized data would be revealed by an audit of whatever record served as a double check.

It is easy to see why the public and experts alike are suspicious of voting technology. In the years since the implementation of HAVA, newspapers have been replete with accounts of equipment faults and incompetence on the part of equipment manufacturers. Some reports have even left readers with concern over political infiltration in the upper levels of voting system manufacturers.[11] Since 2000, computer scientists have exposed numerous vulnerabilities in electronic voting machines.[12] Some of the companies that produce the machines have ineptly stumbled into one public relations disaster after another, such as when Diebold, Inc. inadvertently posted vulnerable computer code for its tabulation software to a public website.[13] Other revelations have come from experts who have vividly documented how a self-replicating virus might be installed in a Diebold AccuVote machine.[14] Similar vulnerabilities have been noted in other contexts.[15] Among the glaring shortcomings that have been documented is that the access ports on certain Diebold

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[10] Tempress Nichols, "UGA Survey Finds Voters Favor Paper Trails From Electronic Voting," *NBC Augusta*, 16 August, 2007, available online at <http://www.nbcaugusta.com/news/local/4762281.html> (accessed 15 January 2008).

[11] Paul Krugman, "Hack the Vote," *The New York Times*, 2 December, 2003, available online at <http://query.nytimes.com/gst/fullpage.html?res=940CE2DF1E3AF931A35751C1A9659C8B63> (accessed 15 January, 2008).

[12] Tadayoshi Kohno, Adam Stubblefield, Aviel D. Rubin, and Dan Wallach, "Analysis of an Electronic Voting System," *IEEE Symposium on Security and Privacy 2004*, IEEE Computer Society Press, May 2004, available online at <http://avirubin.com/vote.pdf> (accessed 15 January, 2008); Aviel Rubin, *Brave New Ballot* (Random House, 2006); Matt Bishop, "Overview of Red Team Reports," report prepared for the California Top-to-Bottom Review of Voting Machines, July, 2007, available online at <http://www.sos.ca.gov/elections/voting_systems/ttbr/red_overview.pdf> (accessed 15 January, 2008).

[13] John Schwartz, "Sharing Pits Copyright Against Free Speech," *The New York Times*, 3 November, 2003, p. C1.

[14] Ariel J. Feldman, J. Alex Halderman, and Edward W. Felten, "Security Analysis of the Diebold AccuVote-TS Voting Machine," Center for Information Technology Policy and Dept. of Computer Science, and Woodrow Wilson School of Public and International Affairs, Princeton University, draft 13 September, 2006, available online at <http://itpolicy.princeton.edu/voting/ts-paper.pdf> (accessed 15 January, 2008).

[15] University of California Red Team Reports, "Diebold Elections Systems, Inc.," available online at <http://www.sos.ca.gov/elections/voting_systems/ttbr/red_diebold.pdf> (accessed 11 April, 2008).

machines could be unlocked with the same keys used in hotel mini-bars, standardized keys that can be purchased cheaply on the Internet.[16]

We applaud the watchdog organizations such as Verified Voting, which has called for a high level of scrutiny for equipment manufacturers. This being said, we feel that public discourse on the topic of voting security suffers from a number of deeply rooted misunderstandings. First, while the security vulnerabilities that have been discovered thus far are serious, we believe the likelihood of a hacker actually subverting an election is very small. And while *security* measures should continue to be refined, the most serious liability for election administration – the challenge most likely to flummox an election and most deserving of attention – continues to be *usability*. Second, while many proponents seem to hold up a paper trail as a panacea capable of securing elections and ensuring public confidence in results, we see several ways in which the paper trails of today could plausibly harm election facility and perhaps even *undermine* confidence in the results. Third, the mandate of a paper trail is likely to stifle the development of better voting systems that could improve elections in ways that heretofore have not been considered.

While the public is right to take alarm at the numerous security vulnerabilities that researchers working in laboratories have discovered in the design and software of voting machines, both optical scan and Direct-Recording Electronic (DRE) machines, it is easy to overstate the facility with which a machine could be subverted under real-world circumstances. Many of the vulnerabilities that have been exposed could only be exploited by an "omniscient hacker" who had full knowledge of a system's vulnerabilities and could tamper with a machine without the constraints of other safeguards, such as a locked room or a watchful supervisor.[17] To our knowledge, there has not been a single case of even *attempted* criminal machine subversion in the United States.[18]

The paucity of real-world examples of machine tampering must be weighed against numerous examples of elections that have been flummoxed by *usability* issues.

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[16] Dan Kaplan, "Princeton prof says mini-bar keys open Diebold voting machines," *SC Magazine*, 18 September 2006, available online at <http://www.scmagazineus.com/Princeton-prof-says-mini-bar-keys-open-Diebold-voting-machines/article/33915/> (accessed 15 January, 2008).

[17] Michael Ian Shamos, "Paper v. Electronic Voting Records – An Assessment," working paper, draft April, 2004, available online at <http://euro.ecom.cmu.edu/people/faculty/mshamos/paper.htm> (accessed 16 January, 2008).

[18] Technology skeptics are most likely to point to the election results of Florida's Sarasota County in the 2006 midterm elections as a possible example of tampering. In this case, voting machines reported an abnormally high number of undervotes for a congressional race between Christine Jennings and Vern Buchanan. Widespread disagreement about the reason for this discrepancy remains. It is the unanimous consensus of our task force that the most likely cause was a poorly designed ballot. This is also the conclusion of a recent analysis by the Government Accountability Office, Nabajyoti Barkakati, "Results of GAO's Testing of Voting Systems Used in Sarasota County in Florida's 13th Congressional District," *GAO Reports*, 8 February, 2008, available online at <http://www.gao.gov/new.items/d08425t.pdf> (accessed 11 February, 2008). Also see Lauren Frisina, Michael C. Herron, James Honaker, and Jeffrey B. Lewis, "Ballot Formats, Touchscreens, and Undervotes: A Study of the 2006 Midterm Elections in Florida," working paper, draft 23 November, 2006, available online at <http://www.dartmouth.edu/~herron/> (accessed 16 January, 2008). But in disagreement, see Walter Mebane and David Dill, "Factors Associated with the Excessive CD-13 Undervote in the 2006 General Election in Sarasota County, Florida," working paper, draft 18 January, 2007, available online at <http://www.umich.edu/~wmebane/smachines1.pdf> (accessed 16 January, 2008).

Consider the following instances, which include the most significant election debacles of the last decade:

- The 2000 presidential election in Florida drew attention to the difficulty some voters have with certain ballot formats. The confusing butterfly ballot in Palm Beach County led a number of Al Gore's supporters to accidentally vote for Pat Buchanan, as well as a number of accidental "overvotes," sinking the contest into a dramatic month-long legal battle.[19]

- In Cuyahoga County's 2006 primary, Ohio election officials dealt with a variety of printing problems, including failure of printers to print, paper jams, and paper spooling issues. Since Ohio law requires that the paper printout be considered the official ballot, such incidents could threaten reliability and accuracy of votes.[20]

- In the 2006 midterm elections, the vote totals for Florida's Sarasota County reported an implausible 13% undervote rate in a congressional election between Christine Jennings and Vern Buchanan. The most likely explanation for this discrepancy is a poorly designed ballot, where Florida's gubernatorial race was displayed more prominently on the same screen as the congressional race.[21]

- In a 2006 primary, voters in Montgomery County, Maryland, including one of our authors, arrived at certain polling locations to discover that the voting machines had been delivered that morning without requisite access cards. Other polling sites had insufficient numbers of paper ballots for Democratic or Republican elections, forcing voters to either return later or not vote at all.[22]

- In California's 2008 presidential primary, an unclear ballot design and insufficient poll worker training led approximately 49,500 voters to unknowingly spoil their ballots. The voters did not realize that it was necessary to complete a circle indicating in which party's primary election they wanted their ballot to count.[23]

Of course, there is not a zero-sum relationship between usability and security. We certainly hope to achieve both, and indeed can imagine many ways in which they might support each other. However, the VVSG's software independence requirement

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[19] Jonathan Wand, Kenneth Shotts, Walter R. Mebane, Jasjeet S. Sekhon, Michael Herron, and Henry E. Brady, "The Butterfly Did It: The Aberrant Vote for Buchanan in Palm Beach County, Florida," *American Political Science Review*, Vol. 95, No, 4 (Dec., 2001), pp. 793-810.

[20] "DRE Analysis for May 2006 Primary, Cuyahoga County, Ohio," Election Science Institute, August 2006, available online at <http://bocc.cuyahogacounty.us/GSC/pdf/esi_cuyahoga_final.pdf> (accessed 23 January, 2008).

[21] See f.n. 16.

[22] Olivia Doherty and C. Benjamin Ford, "Card snafu fixed by late morning, but voters angry," *The Gazette*, 13 September, 2006, available online at <http://www.gazette.net/stories/091306/montcou173827_31942.shtml> (accessed 15 January, 2008).

[23] Richard C. Paddock, "Some independent votes won't count in L.A. County," February 12, 2008, available online at <http://www.latimes.com/news/local/la-me-vote12feb12,0,6970893.story> (accessed 14 April, 2008).

would, as we continue to explain below, trade *real* sacrifices in usability for mere *perceived* gains in security.

The objective of the VVSG's software independence requirement is a double check for the electronic tallies that have become the subject of so much scrutiny. Optical scan systems, where voters receive a paper ballot and darken circles to select candidates, much like on a standardized test, have such a double check built in. Ballots are counted by electronic tabulators, either in the polling place or at some central location, but the original ballots are retained and can always be counted again – by hand if necessary – to confirm that the machine's count is accurate.

On the other hand, DREs – voting machines for which the voter directly manipulates a computer, usually with a touch screen – offer some advantages over optical scan systems. Whereas punch card and optical scan ballots are prone to ambiguity – dimpled and hanging chads for punch cards; stray marks and partially darkened ovals for optical scan – DREs provide election administrators with uniformly clean and unambiguous records. DREs can also include more mechanisms to catch common voter errors, such as overvotes and undervotes, as well as selecting a wrong candidate listed nearby on the ballot.[24] DREs can include interfaces to assist disabled voters, such as an audio interface for the blind or a sip-and-puff tube for individuals who cannot use their hands. Also, DREs can simplify the logistics involved in providing ballots in multiple formats or languages, which many jurisdictions must do in order to comply with the 1965 Voting Rights Act, and as is required for vote centers, the advantages of which we discuss above.

Today's DREs do not, however, leave a way for administrators to double check electronic tallies, as optical scan systems do. They can be fitted with printers designed to fulfill this purpose and, as the VVSG notes, *this is the only way to bring DREs into compliance with the VVSG using today's technology* (Introduction, Chapter 2.4.1). The software independence requirement can therefore be read, with the exception of the "innovations class" provision, which we discuss below, as a paper requirement.

It seems to us that, of the reasons offered by paper trail advocates, the most compelling reason to require DREs to produce a paper record is the argument that such records will guard against election tampering. However, we believe that paper records could encumber elections and obscure the legitimacy of results, and therefore should not be mandated.

Election fraud far predates the advent of mechanical and electronic balloting. Indeed America's storied history of vote tampering extends nearly two hundred years before lever machines came into popular use in the 1960s. One scholar finds strong evidence that the statewide vote to ratify the Massachusetts state constitution in 1780 fell far short of the required two thirds majority, a problem that the constitutional convention may have resolved by fabricating the necessary ballots.[25] Few will be surprised that this tradition continued with ballot boxes robbed at

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[24] On the "proximity" effect, see R. Michael Alvarez, Melanie Goodrich, Thad E. Hall, D. Roderick Kiewiet, and Sarah M. Sled, "The Complexity of the California Recall Election," *PS: Political Science and Politics*, Vol. 34, No. 1 (Jan., 2004), pp. 23-26.

[25] Tracy Campbell, *Deliver the Vote: A History of Election Fraud, An American Political Tradition, 1742-2004* (New York: Carroll & Graf Publishers, 2006), p. 9.

gunpoint,[26] flagrantly stuffed,[27] and mysteriously "found" months after an election, [28] to name but a handful of myriad anecdotes.[29]

The common theme is that paper is an inherently vulnerable medium with which to conduct elections. More easily than electronic records, paper can easily be modified, forged, lost, or destroyed, casting doubt on election results. This trend has not been escaped in modern times, as is evinced by the controversial discovery, several days after an excruciatingly close Washington state gubernatorial election in 2004, of 150 misplaced ballots at a polling site.[30]

Of course, even if it is more difficult to secure and back-up paper records than electronic ones, perhaps they are still necessary as an audit mechanism with which to reinforce an electronic tally. "Two records are better than one," some are sure to argue. The pertinent question seems to be, "Does the addition of a paper trail to the voting system increase the security and accuracy of that system?" We answer this question in the negative. We fear that the addition of a paper trail may afflict election results with uncertainty that is different in nature, but no less severe, than the uncertainty that currently exists.

Consider one hypothetical way in which the addition of a paper trail could facilitate corruption. Suppose a Republican partisan sought to steal an election from a popular candidate he disliked. Whereas the subversion of a purely electronic vote count would presumably require both substantial expertise in computer science and knowledge of the voting system software, the addition of a paper trail opens up new avenues. Our thief could simply steal one or more boxes of ballots from a Democratic-leaning precinct, the sort of theft that has occurred numerous times in the past.[31] Alternatively, he might seek to replicate a number of counterfeit ballots and mix them in with the genuine ones. In many states, existing laws designate the paper ballots as the ballot of record in the event of any discrepancy between paper and electronic totals. One popular bill introduced by Representative Rush Holt (D-NJ) seeks to nationalize this policy.[32] In any case, even if the discrepancy were resolved in favor of the genuine winner, the thief would have succeeded in casting doubt on election's legitimacy.

The proposal to add paper trail to DREs calls to mind the metaphor of a fortress. What design would best provide for the fortress's safety: To have one gate heavily fortified with a full complement of soldiers, or to incorporate a second gate and divide the defenders between the two? It seems to us that just as the addition of a second gate lends no additional protection, so too might the creation of parallel vote tallies – especially those that are hastily conceived – increase the opportunities for a successful attack.

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[26] *Ibid.*, p. 123.
[27] *Ibid.*, p. 176.
[28] *Ibid.*, p. 218.
[29] For a current commentary on the prevalence and character of election fraud, see R. Michael Alvarez, Thad E. Hall, and Susan D. Hyde, *Election Fraud: Detecting and Deterring Electoral Manipulation* (Washington, D.C.: Brookings Institution Press, forthcoming in 2008).
[30] *Ibid.*, p. 329.
[31] Campbell; Andrew Gumbel, *Steal This Vote* (New York: Nation Books, 2005).
[32] Voter Confidence and Increased Accessibility Act of 2007, HR 811, 110th Cong., 1st Sess. (2007).

A consideration of some of the exciting systems that would be *prohibited* by the software independence requirement further illustrates how it is an inferior course by which to secure elections. Punchscan, a system developed by David Chaum and researchers at the University of Maryland, Baltimore County, lets voters confirm not only that their votes were *cast* correctly – in other words, that one medium captured a correct vote at one instant in time – but also that their votes were in fact *counted* correctly; after the election, voters can use the Internet to view a partial image of their individual ballots as they were tabulated.[33] (Only part of the ballot is displayed, so that voters cannot prove for whom they voted, which could lead to vote buying.) Another system called Prime III, developed by researchers at Auburn University, would employ a separate electronic "witness" in each voting booth. The witness, which would operate independently of the DRE machine, could more efficiently double-check the DRE's tally of votes while safeguarding privacy and being more accessible to the disabled.[34] Although clearly very secure – far more secure than a DRE with a simple paper trail – neither of these systems satisfies the requirements of software independence because, although unlikely, they could theoretically be undetectably subverted by a computer hacker. It seems to us that the best way to ensure the long-term effectiveness of U.S. elections is to encourage systems like Punchscan, Prime III, improved forms of physical records, and others that have not even been imagined.

The VVSG does make one attempt to allow for new innovations. Chapter 2.7.2 of Part 1 describes a process by which a voting system manufacturer might earn certification for a system that does not use independent voter verified records – in a reasonable expectation, paper records. However, according to the current draft, *even systems seeking certification through this* "innovation class," *must still be software independent*, and so even with the innovation provision in mind, the VVSG offers no relief for systems like Punchscan and Prime III, which do not fit the definition of software independence. *It remains unclear to us what the purpose of the innovation class provision is, if not to offer some relief from the constraints of software independence.* The next draft of the VVSG should discard this provision or substantially reconsider its structure.

One possible alternative to the software independence provision would be a less restrictive requirement for *single agent* independence. This measure would preserve the "double check" principle, with redundant mechanisms that corroborate tallies, but leaves vendors the freedom to design double checks that rely on software. It should be noted, however, that developers might find even this standard to be restrictive. It would prohibit, for instance, the Punchscan system described above, as the system relies on a single cryptographic agent to decode votes.

Our beliefs that software independence would decrease election security and stifle innovation are the root of our concern about the proposition. However, we also call the reader's attention to a number of other factors to consider when deciding whether to fit DREs with a Voter Verified Paper Audit Trail (VVPAT):

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[33] Stefan Popoveniuc and Ben Hosp, "An Introduction to Punchscan," George Washington University Computer Science Department, 15 October, 2006, available online at <http://punchscan.org/papers/popoveniuc_hosp_punchscan_introduction.pdf> (accessed 25 March, 2008).

[34] Philicity Williams, et al, "Prime III: Where Usable Security and Electronic Voting Meet," Auburn University Department of Computer Science and Software Engineering, available online at <http://www.usablesecurity.org/papers/primeIII.pdf> (accessed 25 March 2008).

- VVPATs greatly increase the logistical complexity of elections. VVPAT printers are prone to jamming – many fail on Election Day[35] – and frequently run out of their consumable supplies, ink and paper.[36] In addition, more voters ask for help when confronted with a VVPAT than when they use a paperless DRE.[37] As such, the average time per vote is increased, and election administrators using VVPATs should expect to purchase additional machines and hire additional poll workers in order to keep up with high turnout.

- At the same time, VVPATs do not necessarily increase voter accuracy. In several laboratory trials, voters made *more* mistakes when using a DRE with a VVPAT than a paperless DRE.[38] Numerous voters reported a mismatch between the votes recorded on the voting system and on the contemporaneous paper trail. It is almost certain that these perceived mismatches were due to misremembered votes or incorrect selections.[39] But most voters don't scrutinize the VVPAT at all.[40]

- The vast majority of VVPATs record ballots on continuous paper rolls, and so the cast ballots remain in the precise order in which they were cast, a characteristic that may present problems for voter privacy. While it would be difficult for a poll worker to match his or her neighbors with their votes in a large urban precinct, it would be much easier in a rural area where only a few dozen people arrive at the polling place on Election Day. In either location, without proper supervision and handling procedures, it would be comparatively easy to match the first and last voters to arrive, as their ballots would be easy to identify on the paper roll.

- Like optical scan ballots, VVPATs cannot treat blind voters in an identical manner as sighted voters. A blind voter would have to ask for assistance in order to read his or her VVPAT receipt.

These points are not to suggest that VVPAT systems are beyond reasonable implementation or that alternative approaches are without shortcomings, but rather to remind that there are problems with paper audit trails, as there are with all systems. Perhaps paper verification for DREs should be preserved as an *option* for places that are especially concerned about the specific kind of subversion that paper may prevent. *Mandating* a paper record would do little or nothing to improve election security, but it may do much to encumber election facility. Past experience tells us that the latter concern should take precedence.

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[35] Paul S. Herrnson, et al., *Voting Technology,* chapter 6; Ted Selker, "Processes Can Improve Electronic Voting: A Case Study of an Election," Caltech/MIT Voting Technology Project, working paper (October, 2004), available online at <http://www.votingtechnologyproject.org/media/documents/vtp_wp17.pdf> (accessed 14 April, 2008).

[36] "DRE Analysis for May 2006 Primary..."

[37] Paul S. Herrnson, et al. *Voting Technology.*

[38] *Ibid.*, p. 134.

[39] *Ibid.*, p. 127.

[40] Ted Selker, "An Active Approach to Voter Verification," Caltech/MIT Voting Technology Project, working paper #28 (May, 2005), available online at <http://vote.caltech.edu/media/documents/wps/vtp_wp28.pdf> (accessed 18 January, 2008).

The VVSG takes an "anti-DRE" approach

It is worth recalling that the rush to adopt DRE modes of balloting was largely the result of federal initiatives and legislation in the aftermath of the 2000 election. The offer of federal funding prompted many election administrators to move from paper and punch card balloting systems to electronic voting machines. The adoption of DRE systems was made before the technology and operational procedures for these new balloting systems were sufficiently refined to avoid what are now seen as significant obstacles to their secure and efficient operation. In the whirlwind of bad press that has ensued, it is easy to forget some of the advantages that DRE voting can offer, such as an interactive environment; greatly increased accessibility for the disabled; clean, easy-to-tabulate ballots; error-checking mechanisms; and, we would argue, greater security.

In at least some ways, the VVSG takes an anti-DRE approach, holding electronic voting to a much higher security standard than paper records. The VVSG goes to great lengths to make its consideration of DRE vulnerabilities comprehensive, but does not note the substantial vulnerabilities that exist in alternative approaches. It is essential to understand that *all* approaches to voting are highly vulnerable without the more fundamental protections of chain-of-custody and monitoring; *any* voting system becomes highly vulnerable if left unattended, yet the VVSG does not scrutinize optical scan systems through the same lens.

Consider the standards that the VVSG applies to vulnerability testing. Standards, according to the usual definition, specify requirements for an object, based either on how the object is supposed to perform or regarding how it is to be designed. But the "open-ended" vulnerability testing required by the VVSG does not seem to fall into either category of standard, as they are by definition "open-ended." The intention of the "open-ended" testing priorities (because they really cannot be called standards in the typical use of the term) is to find security vulnerabilities, based on the expert opinion of the "open ended vulnerability testing team."

The provisions for vulnerability testing should clearly specify whether to use design or performance standards, and should be done to determine whether a voting system either meets or does not meet these standards. Otherwise, it will not be possible to judge whether or not a particular voting system has been tested adequately for vulnerabilities, because the current model relies mainly on the "experience" of the vulnerability testing team. As these teams have considerable discretion in the "open-ended" model, it will not be clear that any two voting systems have been tested to the same degree. For example, a vulnerability testing team in this "open-ended" model might concentrate on a certain set of tests for one voting system, and a different set of tests for another voting system; these inconsistencies will almost certainly arise for vulnerability testing teams in different testing laboratories.

A Time to wait

In May of 2007, Florida's Governor Charlie Crist (R) signed a bill requiring all election jurisdictions throughout the state to scrap touch-screen voting machines, and replace them with optical scan systems.[41] It is but one poignant example of waste,

[41] Fineout, "Voting Change Irks Supervisors."

considering that the systems being discarded were purchased since 2002 using $11.6 million federal tax dollars.[42] We strongly sympathize with the frustration of George Gilbert, Director of the Board of Elections of Guilford County, North Carolina, who remarked about his own state, "The problem for the future will not be technical obsolescence, but statutory obsolescence. I have about $3 million worth of equipment that still works, and I am trying to decide which landfill to take it to."[43]

Given time and sufficient liberties, American ingenuity will rise to the new challenges of democracy. But it is clear that much work has to be done before we fully understand the intricacies of the options before us. In the meantime, we are tired of the waste and headache that inevitably come with hasty reactions and partial solutions.

Addressing Voting System Usability

An essential topic

Although the lion's share of attention paid to election reform in recent years has focused on election security, the most serious shortcomings of recent elections have come from simple human error, whether it was the product of administrative or technological shortcomings. As we note above, the quagmires of Florida in 2000; Montgomery, Cuyahoga, and Sarasota Counties in 2006; and others, were all attributable to human mistakes. Standing political science research also suggests that a significant portion of the errors and failures in the outcome of elections originates with administrative behavior.[44]

It is easy for usability errors, such as a poorly arranged ballot, a voting machine with unclear instructions, or a poorly-calibrated touch screen to escape notice until after an election has been held. Yet because such errors are often replicated across a number of jurisdictions, they have the potential to affect many votes. As we saw in 2000, even a small ambiguity, such as which hole in a punch card ballot corresponds to which candidate, can lead to a large number of spoiled or improperly cast ballots. Additional errors may be the result of challenges faced by poll workers, including setting up, maintaining, and properly closing down voting equipment.

It is fitting, therefore, that the VVSG dedicates significant attention to voting system usability. Unfortunately, the pertinent section (Part 1, Chapter 3) and the literature on which it is based appear to be ill conceived. The VVSG's treatment of usability overlooks standard practices of social science and, as a result, arrives at usability measures that are almost entirely arbitrary. Unfortunately, we find this section to be beyond the remedy of marginal changes. A thorough rewrite is in order.

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[42] "Report to Congress on State Governments' Expenditures of Help American Vote Act Funds," United States Election Assistance Commission, July 2007, available online at <http://www.eac.gov/clearinghouse/reports-on-state-expenditures-of-hava-funds-1/clearinghouse/docs/eac-report-to-congress-on-state-expenditures-of-hava-funds-july-2007/> (accessed 16 January 2008).

[43] Remarks delivered at "Research on the U.S. Voting System: Matching Needs with Knowledge," *American Association for the Advancement of Science*, Washington, D.C., November 27-28, 2006.

[44] Stephen Ansolabehere and Charles Stewart III, "Residual Votes Attributable to Technology," *Journal of Politics*, Vol. 67, No. 2 (May, 2005), pp. 365-389.

We begin by discussing some of the shortcomings of the VVSG's usability section, and then move on to suggestions for how it might be rewritten.

Deriving usability benchmarks

The heart of the VVSG's usability requirements relies on a separate document, "Usability Performance Benchmarks for the VVSG," which lays out the methodology through which the VVSG's benchmarks were derived.[45] For instance, the VVSG calls for 98% of a given machine's test users to be able to successfully complete a ballot, stating that this number allows "better systems to pass the test, while preventing certification of poorer systems" (Part 1, Chapter 3).

Unfortunately, the laboratory trials through which the VVSG's usability benchmarks are derived were poorly conceived. We begin with the method by which voting systems were selected for trial. It seems that the VVSG's usability benchmarks are entirely based on trials with fewer than 200 people and only four voting systems which, in order to protect manufacturer anonymity, are never named. Not only is this a disturbingly small window into the wide spectrum of available systems, but it appears that the four machines were used simply because they are the machines that manufacturers decided to make available. We are left wondering whether manufacturers had any incentive to skew the test results by providing especially high quality machines, especially low quality machines, or to opt out of the testing altogether, and are wholly unconvinced that these four machines are in any way representative of the market in general.

The next step in the TGDC's tests to develop usability benchmarks was to ask voting system manufacturers to design a ballot for a mock election. The manufacturers were given lists of fictitious candidates and asked to design a ballot so as to maximize usability. Here our concerns are twofold. First, by inviting system manufacturers to design the ballot, the TGDC introduces an unnecessary variable into the analysis. Usability scores will be influenced not only by system design, but also the designers' competence in ballot design. As such, it is more difficult to isolate the causes of any performance differences between any two machines. A better approach would be to have the *same* ballot design expert construct all the ballots, so that this variable is held constant across trials, or to randomly assign real election officials to design each ballot.[46]

Second, while we understand that the use of fictitious candidate and party names was intended to remove visceral reactions from behavior in a mock election, this step away from reality should be supplemented with other approaches. For instance, the TGDC should conduct some additional tests where subjects are asked to read a voting booklet with short descriptions of people (perhaps even real candidates), to write down their choices, and then to "go to the polls" and enter their votes. We also recommend asking people to include some information about the intensity they attach to prospective votes. Then researchers could compare the choices written in the voting booklet with the choices on the voting systems. The disconnect from

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[45] "Usability Performance Benchmarks For the Voluntary Voting Systems Guidelines," prepared at the direction of the Human Factors and Privacy (HFP) Subcommittee of the Technical Guidelines Development Committee of the Election Assistance Commission, 17 August, 2007, available online at <http://vote.nist.gov/meeting-08172007/Usability-Benchmarks-081707.pdf> (accessed 22 January 2008).

[46] See, for example, Herrnson, et al., *Voting Technology*.

reality exhibited in the TGDC's narrow approach seems to ignore decades of political science and survey research on how to measure and think about voting choices.

Also problematic is the selection of test subjects. At no point does the "Usability Performance Benchmarks" document describe how test participants were recruited, other than to say that they were from certain areas and met certain demographic characteristics. Were the subjects recruited through an advertising campaign, through a website, through the National Institute for Standards and Technology, or through some other means? It is important to provide this information to allay concerns that the recruitment procedure could lead to a biased subject pool.

More transparently problematic is the conscious decision to eliminate certain demographic groups from the test pool. Specifically, the TGDC's tests included only young (under 54) and college-educated individuals, the sorts of people *least* prone to be affected by usability issues because of their general familiarity with technology. To justify this decision, the "Usability Performance Benchmarks" document says

> These [demographic] requirements were selected in part because if the test could detect usability differences and all the expected errors with this population, it would detect differences and errors with older and less educated populations as well.[47]

In other words, it seems that the TGDC sees the constriction of the subject pool as a way to set a high bar for excellence; if problems emerge among a well-educated and young testing pool, then surely they would among a less-educated, older population. There might be some truth to this assertion, but it falls before a serious concern. Voting system research has shown that there is often an interaction between voting system type and individual characteristics, such as education, such that those with lower education experience problems when those with higher education do not. One could imagine, therefore, that this testing procedure would give a pass to two systems – and even rate them equally in terms of performance – but that one of the two systems would exhibit an interaction with education such that those with lower education would do very poorly with it. Hence, one of the voting systems would clearly be better than the other.

To evoke a metaphor, the VVSG is calibrating the bar for a team of Olympic pole vaulters. Of course the athletes can consistently succeed even at a challenging level, but the average individual will consistently fail at the same level. It seems obvious to us that the best way to design systems so as to be usable by the disabled, less educated, or other disadvantaged populations is to make these groups, if anything, the *focus*, rather than the exclusion of study.

Perhaps the most serious problem with the TGDC's derivation of usability benchmarks is the lack of an experimental control. In the "experiments" that were done to test usability, there is absolutely no indication that the human subjects who tested the machines were randomly assigned to different voting system types – a step that could have provided the justification for the statistical tests that are used to measure differences in performance. Instead, it seems that separate pools of test subjects were recruited to test each machine. While there was an effort to balance certain characteristics of these groups (e.g. the male/female ratio), there is no way to eliminate the possibility of *unobserved* preexisting differences between them. In

[47] "Usability Performance Benchmarks," p. 5.

contrast, random assignment can ensure that there are no systematic differences between the groups assigned to each type of machine. (We should note that perhaps random assignment was used, but if so, the absence of any mention is in itself a serious omission.) We understand the complexities of using random assignment in a testing procedure that would serially test systems, but there is no excuse for not using this method in the development of standards.

The VVSG would also be well served to consider additional metrics for usability. There are a number of meaningful metrics that can be used to assess voter confidence that go beyond what VVSG's employs. Two such metrics are 1) being able to vote independently without feeling the need for help and 2) being able to vote without actually receiving help from a poll worker. These metrics are extremely important from the standpoints of both voters and election officials. For voters, needing help is related to voter confidence and trust in the voting system and could suggest the voter is experiencing confusion or frustration with several aspects of the voting process. Beyond that, voters who need help take longer to vote than others and give up a measure of privacy when making their selections.[48]

In addition, the TGDC could put the results of its tests in a more meaningful context by including tests of systems that are "known quantities." We wish the "Usability" report had compared the results of the DREs and optical scan systems tested with punch-card systems, which almost everybody (perhaps even everybody) can agree are flawed. Moreover, some thought should be given to how to link one set of tests (using one subject pool) with another set of tests (using another subject pool). Linkages could be made by having at least some of the same machines tested twice. Some input from social science statisticians could significantly improve the results.

Finally, the reasoning through which the "Usability" document interprets test results is entirely arbitrary. The standard employed is to choose benchmarks "so that they are achievable by some systems, but not so low as to be trivially easy to meet with any of the current voting system implementations."[49] It is comforting that the document then expresses considerable willingness to revise the benchmarks, because the approach used is misguided. There is little sense in setting benchmarks relative to the performance of existing machines, especially through the use of a tiny sample of convenience, as the TGDC does. The pertinent question for policymakers is not, "How many systems will fail?" but rather, "Remembering values of inclusiveness and egality, what level of performance do we find acceptable?"[50] The TGDC should more fully and transparently consider the effect of its benchmarks on real life ballots and clearly state what level of performance – how few miscast ballots, etc. – it strives to achieve.

Incorporating additional approaches

Although informative to some degree, laboratory experiments, such as those conducted by the TGDC, offer an incomplete view voting system usability. This is because the transparently artificial environment of a test laboratory may affect test subjects' behavior. One alternative approach that we hope will be adopted with

[48] Paul Herrnson, et al., *Voting Technology*.
[49] "Usability Performance Benchmarks," p. 21.
[50] Of course the answer to this question should also take account of groups that approach voting differently, such as individuals with disabilities.

greater frequency in the future is a field experiment, where voters are studied under real voting conditions.[51] There are several examples of very successful collaborations between university-based researchers and voting administrators, some of which have been funded by the National Science Foundation and the Carnegie Corporation of New York; others have been documented by the Pew Charitable Trusts.[52] One author of this report undertook such a collaboration just last year.[53] The difficulty of conducting a field experiment on a topic in election administration will vary by location, but some states have well-established laws enshrining municipal control over local elections, providing fertile ground for such experimentation.[54]

One means of obtaining a critical mass of field experiments on issues pertaining to voter satisfaction, confidence, and performance is to establish an industry-financed research fund managed by an independent third party. For example, industry representatives might endow a research fund to which qualified researchers seeking to study metrics related to the performance of various balloting devices would apply. Proposals would be peer reviewed for funding on relevant topics. All applicants would be required to have a "community-based" partner who agrees to allow researchers to assess polling places to observe, interview, and measure voting behavior. This approach, reminiscent of that used by the National Science Foundation's Digital Government Division, would assure that local election officials obtained answers to those issues and questions most critical to their needs.

It is discouraging and worrisome to see that the VVSG document places so much emphasis on the problems of computer hacking and voter verified ballots and so little on usability when the research on actual elections has found virtually no evidence of the former and abundant and serious evidence of the latter. It is especially discouraging when there are social science tools readily available that would make it possible to significantly improve the usability testing of voting systems. Unfortunately, the VVSG document and the "Usability Performance Benchmarks" do not use these methods.

The Proper Role of the VVSG

All things to all people

A landmark document like the VVSG fulfills many roles, and it is clear that one of the challenges its authors faced was designing a document that would have many different uses for many different people. The first paragraph states that the language was written so as to be usable not only by voting system manufacturers and test

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[51] On this point, see Caltech MIT Voting Technology Project, "Voting: What is, What Could Be" (July, 2001), available online at <http://www.vote.caltech.edu/media/documents/july01/July01_VTP_Voting_Report_Entire.pdf> (accessed 15 April, 2008). On the advantages of field experimentation in general, see James N. Druckman, et al., "The Growth and Development of Experimental Research in Political Science," *American Political Science Review*, Vol. 100, No. 4 (Nov., 2006), pp. 627-636.

[52] "Case Study: Election Partnerships," *Electionline.org Briefing*, June, 2007, available online at <http://www.pewcenteronthestates.org/uploadedFiles/EB18.pdf> (accessed 8 February, 2008).

[53] Robert Stein and Greg Vonnahme, "Voting technology, election administration, and voter behavior," presented at the 2007 Midwest Political Science Association Conference, Chicago, IL, April 1-3.

[54] See, for example, Article XX, Section 6 of the Colorado State Constitution.

laboratories, but also "election officials, legislators, voting system procurement officials, various voting interest organizations and researchers, and the public at large" (Introduction, Chapter 1). Although this effort is laudable, it may be untenable. We are unconvinced that the nearly 600 page draft behemoth that currently exists is of much use to those who lack great familiarity with election reform issues; its language and requirements are far too complex for this purpose.

Rather than trying to be all things to all people, we recommend that the VVSG focus on the primary stakeholders, namely voting system manufacturers and test laboratories. In addition, the TGDC or the EAC might prepare shorter interpretive companion documents that could be more useful to individuals and groups that will be deterred by extreme detail. There is another concern, as well. In its current form, the document's impenetrability will likely lessen its effect. The VVSG is so formidable in its scope that it is easy for states to ignore its requirements which, after all, are voluntary. In some places, it may be difficult for a state to determine whether or not it is meeting a certain standard. Interpretive documents would serve to ameliorate this shortcoming.

Neglected topics

The VVSG attempts to focus solely on voting technology, considering issues of process and administration outside of its scope. (We have discussed above how this supposed agnosticism is, to an extent, illusory, since technology and process are inextricably linked.) It is disappointing that the federal government would conduct such a thorough review of voting technology – the VVSG truly is a monumental undertaking – without a similarly comprehensive effort to address election administration, which we consider to be a much more vulnerable component of US democracy. As such, even a much improved VVSG will be only a small step toward the basic goal of HAVA and the EAC – to provide for inclusive elections that accurately record and report all votes that are cast. The EAC should consider sponsoring a thorough scientific review of some of the following topics:

- **Ballot Design** – Although the VVSG does address some elements of ballot design (Part 1, Chapter 3), the standards need to go much farther. No mention is made, for example, of the problems associated with "banner effects," the difficulty that we believe is at fault for the recent election dispute in Sarasota County, Florida, discussed above. We hope that the next draft will give much more attention to the voluminous literature that exists for this important topic,[55] if not in the form of requirements, then at least in the form of "best practices."

- **Voter Registration** – Voter registration systems are clearly critical for the conduct of elections. Section 221(e)(2)(A) of HAVA requires the TGDC to develop standards the statewide voter registration databases. Since the VVSG

[55] Frisina, et al.; David C. Kimball and Martha Kropf, "Dos and Don'ts of Ballot Design," *AEI-Brookings Election Reform Project Newsletter*, 3 October, 2007, available online at <http://www.electionreformproject.org>; David C. Kimball and Martha Kropf, "Ballot Design and Unrecorded Votes on Paper-Based Ballots," *Public Opinion Quarterly*, Vol. 69, No. 4 (Winter, 2005), pp. 508-529. Also see numerous studies conducted by the Center for American Politics and Citizenship at the University of Maryland, which one of the authors directs, at <http://www.capc.umd.edu/rpts/votingtech_par.html>.

does not address registration systems, it is essential that a separate effort do so in the near future.

- **Absentee Voting** – The VVSG primarily conceives of elections in a traditional fashion. That is to say that its focus is on elections conducted in polling places and on a uniform election day. By placing new restrictions on the way in which "traditional" elections are conducted, it may hasten the trend towards non-traditional voting, such as large-scale voting by absentee ballot. In 2004, 15% of the ballots counted nationally were absentee votes, with states like California and Arizona collecting more than 30% of their ballots through the mail.[56] Oregon conducts all-mail elections. The EAC and the TGDC should consider minimum standards for the usability and security of absentee ballots in tandem with new voting system standards. Absentee voting should not serve as a mechanism through which states sidestep the effort to make voting more friendly and secure.

- **Accessibility** – The VVSG provides accessibility requirements by developing standards not for all voting systems, but for what it calls an "Accessible voting station" (Part 1, Chapter 3). Thus, instead of working to develop voting systems that are universally accessible, the VVSG assumes that voters with disabilities may generally be relegated to use a voting system that differs from the voting system used by non-disabled voters. Such a system may in practice be expensive and complex to implement. The EAC and TGDC should develop universal accessibility standards that apply to all voting systems, and not just relegate accessibility standards to the "Accessible voting station." The EAC and TGDC should also include in testing of voting systems subjects who are vision impaired and blind, who have physical or cognitive disabilities, and for whom English is not their primary language.

- **Poll Worker Recruitment and Training** – The tradeoffs between different technologies may be influenced by how elections are administered and where they are held. There is evidence that the performance of different voting technologies is dependent on the quantity and quality of Election Day poll workers.[57] The number of adequately trained Election Day workers may have a direct impact on voter usability, satisfaction, and confidence with different voting technologies. Poll worker training should be an essential component of any recommendation to enhance our voting systems.

Conclusion

Since 2000, election conduct in the United States has undergone a revolution. The consistent theme of this report is that the revolution is still very much under way. It

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[56] John C. Fortier, *Absentee and Early Voting: Trends, Promises, and Perils* (Washington, DC: AEI Press, 2004).

[57] R. Michael Alvarez and Thad E. Hall, "Controlling Democracy: The Principal-agent Problems in Election Administration," *Policy Studies Journal*, Vol. 34, No. 4 (Nov., 2006), pp. 491-510; Joseph Quin Monson, Ryan Claassen, and Kelly D. Patterson, "Confidence in Poll Workers: The Voter-Poll Worker Interaction," presented at the 2007 meeting of the American Political Science Association, Chicago IL, August 30th – September 2nd.

remains to be seen whether new technology and improved practices can live up to their promise to deliver results that are more reliable and worthy of public trust. Tempting though it may be to respond to the numerous problems and false starts that have occurred with strict regulation, we fear that such rigidity would substantially delay the arrival of a more efficacious election system. Now is the time for a slow, sober reflection on the changes that have been made thus far. Only with such a reflection will we have the understanding necessary to enact effective reform.

The fair conduct of elections is and always has been a vexing and controversial endeavor. This reality is unlikely to change dramatically in the near future, even as the conduct of elections continues to improve; it often takes years to realize the fruits of such improvements. Of course, this is hardly an excuse not to try. We look forward to playing an active role in this exciting process.

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WRITTEN TESTIMONY OF ALEC YASINSAC, PH.D.
DEPARTMENT OF COMPUTER SCIENCE
FLORIDA STATE UNIVERSITY
BEFORE THE
U. S. ELECTION ASSISTANCE COMMISSION
INTERDISCIPLINARY ROUNDTABLE
MAY 5, 2008

Thank you for the opportunity to participate in this roundtable today. My name is Alec Yasinsac. I am an associate professor of computer science, having joined the faculty at Florida State University in 1999 after serving twenty years in the United States Marine Corps. I am co-director and co-founder of the Security and Assurance in Information Technology (SAIT) Laboratory where I led several voting system security reviews for the state of Florida. I was recently appointed to become Professor and Dean of the School of Computer and Information Sciences at the University of South Alabama, a position that I will assume on June 1st, 2008.

My comments today relate primarily to the 2007 Voluntary Voting Systems Guide (VVSG) components associated with system and software security issues. Before I address the posted questions, there are three critical points relative to this roundtable that I believe must be addressed before VVSG adoption.

- Accuracy in the first count is pivotal to fair elections. Many involved in voting integrity issues advocate focusing predominantly upon strong audit mechanisms in the voting process, even at the expense of first count accuracy. Citizens deserve to have their votes counted accurately and reliably the first time. We must reject any paradigm that sacrifices first count accuracy for timeliness, auditability, efficiency, or any other real or perceived expediency.
- With all of their positive properties, audits add complexity to the voting process and present diverse opportunities for fraud in elections that are not well understood. It is critical that we carefully examine and mitigate the election threats during audits and recounts for every voting system.
- If voting system software development practices do not embrace high assurance techniques, it is a matter of when, not if, election faults will occur due to errant or malicious software faults.

1. **What specifically can be done with the proposed VVSG standards and with the certification testing procedures and infrastructure, to reduce the cost of the voting systems, without compromising core functions of the voting system?**

The single most important contribution that the VVSG can make to electronic voting systems is to require that voting system vendors employ mature system and software development processes. Open Ended Vulnerability Testing (OEVT) is only necessary because present voting systems are not currently engineered with sufficient rigor to reduce or mitigate the present and emerging threats. Requiring vendors to pass through nationally recognized process qualifications can maximize quality expectations while stabilizing, or minimizing, requisite development costs. Some CMMI[1]-qualified developers see CMMI practices as cost-saving in addition to its having a positive impact on product quality and consistency.

A second important characteristic of process maturity requirement is that it may reduce the risk of untimely vendor dissolution. While process maturity is not a guarantee of market share, like all types of maturity, process maturity takes time and commitment to develop. While not definitive, those two characteristics (time in business and commitment to quality) tend to be good success indicators.

2. **What specifically can be done with the proposed VVSG standards and certification testing procedures and infrastructure to reduce time-in-process of candidate systems?**

Incentivize quality development processes. While it is possible for poorly engineered systems to meet functional and security requirements, analyzing well-engineered systems is always easier and more efficient than doing so for their poorly engineered counterparts. Additionally, well-engineered systems will reduce both the necessity and the effort required for re-submission due to unacceptable faults or failure.

While these represent significant detailed improvements, possibly the greatest value is that requiring development process certification shifts much of the voting system quality assurance burden from the government onto the private sector where process maturity certification occurs.

Specifically, the VVSG should:

- Provide streamlined certification procedures for systems that were developed using development processes that are certified as being mature.

[1] Capability Maturity Model Integrated, see http://www.sei.cmu.edu/cmmi/

- Make the certification process for non-mature process development systems onerous and expensive. It should be clear to a developer that it is not in their best interest to submit a system for certification that has a low chance of success.
- Make re-examination expensive. If there is no, or low, developer resubmission cost, vendors will utilize the certification process as a beta test, thus driving up certification costs, extending the length of the certification pipeline, and essentially circumventing the total quality standard that the certification process aims to provide.
- Track vendor performance in the certification process and use previous performance to gauge rigor and cost for present-future certification requests.

Focusing on the product is the least effective and least efficient certification approach. Mature development processes produce effective systems. Certainly, it takes time to shift from a product approach to a process approach, but the VVSG can and should dictate the pace of that transition by considering the recommendations above and other associated approaches.

3. What specifically can be done to increase the efficiency and economy of efforts within the testing process at the federal, state, and local levels?

At the federal level, we recommended requiring that every vendor that submits voting systems for certification meet process maturity requirements. As we described earlier, we contend that this approach will reduce federal certification time and costs.

At state and local levels, decisions are now being made without critical information. It is essential that states have access to accurate, current data about voting systems performance history, known failures or faults, and whether remediation occurred. Full disclosure must be the gold standard in supporting elections official decisions in selecting voting system. Elections officials must know about previous failures in considered systems and also to see past vendor reliability and security performance.

Maybe more importantly, elections officials must receive timely "information-push" when faults are detected in operational voting systems. Voting system accuracy, reliability, and security are only accomplished through a strong combination of system features complemented by carefully controlled elections procedures. When systems vary from their expected properties, elections officials are best able to determine the associated risk and whether to abandon the faulty system or to correspondingly adjust Election Day procedures. State officials must have timely reports that allow them to act promptly and decisively to withdraw or suspend certification, execute correcting procedural directives, or circulate appropriate cautionary advisories.

The EAC presently acts as a voting system information clearinghouse, offering significant opportunity to meet the information needs at state and local levels, but the present effort does not go far enough. The voting infrastructure is critical to our nation's health. While we do not foresee the need for an expansive, controlling program, such as the Federal Aviation Administration's Airworthiness Directives[2], we believe the notification and documentation facilities in that program can serve as a model for voting system data.

To facilitate the voting system information flow we describe, we recommend that the VVSG be modified to require vendors to submit complete fault disclosure processes along with system certification requests. This plan should include fault reporting channels to the EAC and historical records of how they have exercised and modified their described process.

4. How important is the timing of the passage and implementation of the next iteration of the VVSG?

From a risk assessment standpoint, time is of the essence. The struggle to secure our elections infrastructure is not a conventional struggle and the enemy is not a conventional enemy. Rather, this enemy blends into the population[3], operates as independent cells, requires no special equipment or supplies, and needs very little funding or other support. Most importantly, they control the time and place of battle. Their prospects for success depend on surprise and unpredictability. They never act randomly, but they go to great lengths to ensure that their preliminary actions are uncorrelated with their intent.

For this reason, we cannot predict when an electronic attack on a major election will occur. However, it is my opinion that the question is when, not if, an attack on an electronic voting system will occur. The signals are clear: the attack surface is wide, the potential impact is great, and there are many capable foes that could benefit from such an attack.

The time to fix this critical infrastructure is now.

a. In an ideal world when would you choose to have the next iteration of the VVSG become effective?

Elections officials are best positioned to identify and exercise precedence operations for elections schedules, so we defer to them relative to operational considerations.

While time is of the essence, we must get this VVSG right. We applaud the EAC's efforts to systematically capture extensive, diverse feedback and to rigorously analyze collected input. The

[2] See http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAD.nsf/MainFrame?OpenFrameSet

[3] Inside the United States or abroad

only hope that we have of recognizing and planning for unstated outcomes or side-effects of these unprecedented policies is through rigorous debate, as is occurring in the present vetting process.

We also know that the need for rigor can be a tool for delay by groups with competing interests. We are confident that the EAC will recognize unnecessary delaying actions and ensure that the pace of the VVSG approval process will remain appropriately high to meet this critical need.

5. **How necessary is innovation in voting technology?**
    a. **How can the EAC's program and the VVSG address the desired level of innovation?**

Electoral accuracy in the United States is patently insufficient. Technological innovation is our only hope of overcoming the many pitfalls to capturing, tabulating, and reporting valid vote to the necessary accuracy level. In that sense, innovation is critical to the electoral process.

The innovation question is evident in the proposed related concepts of Software Independence (SI) and the Innovation Class. The VVSG mandates relying on software independent systems as the pivotal guide in ensuring election integrity, and there is a strong case that SI can facilitate elections security. Unfortunately, the VVSG only codifies one pathway to SI certification. That pathway is only suitable for systems founded on a physical vote record, known as the Independent Voter Verifiable Record (IVVR) systems.

Some would argue that the proposed Innovation Class is a second VVSG codified pathway to SI certification. However, there are no "requirements" in the VVSG that would allow any non-IVVR system to achieve SI certification through the Innovation Class.

Rather than being a pathway to SI certification, the Innovation Class is, in a sense, a license to develop a new SI certification pathway, with a complex and expensive licensing process. On one hand, this is a reasonable way to allow alternate certification paths without requiring modification to the VVSG for each new approach.

On the other hand, providing only one certification path limits flexibility. If IVVR is the only presently available technology that <u>can</u> provide the necessary voting system security, then the limitation may be justified, but it does not promote, and may stifle, innovation.

    b. **What are the possible sources of capital to reach the desired level of innovation i.e. from the vendor? From Congress? From private enterprise? From academia?**

6. **Every voting systems stakeholder shares risks with other stakeholders and experience risks unique to their constituents.**
    a. **What risks do you view as being shared?**
    b. **What risks do you view as being unique to your sector?**

c. **Has there been an adequate assessment of those risks?**

d. **In the absence of an adequate assessment of those risks, how can those risks be prioritized and mitigated?**

7. **How do you prioritize the features (i.e. security, accessibility, usability, reliability) of a voting system? .**

   a. **What are the best ways to strike a balance between these sometimes competing features?**

ELECTION TECHNOLOGY COUNCIL

Working Together for Secure and Accurate Elections

Written Remarks Submitted by David Beirne, Executive Director, to the United States Election Assistance Commission Interdisciplinary Roundtable Discussion on the Proposed Voluntary Voting System Guidelines
May 5, 2008

On behalf of the Election Technology Council and its members, I would like to thank the Election Assistance Commission for inviting us to be a part of this important discussion. I would also like to point out the importance of this interdisciplinary panel as it is indicative of the varying stakeholders that need to be brought together in one forum. This roundtable reflects a definitive move in the right direction for the Election Assistance Commission and we applaud the EAC Commissioners and staff for putting this unique roundtable together.

Before embarking upon each of the discussion questions, I would like to first clarify a recurrent misconception. It is often portrayed that the next iteration of VVSG refers to the next generation of voting systems. This is simply not accurate. Due to the voluntary nature and the force of law granted to VVSG compliance by the states, this next draft of the VVSG may very well be the standard-bearer when it comes to voting system requirements. With the inclusion of clear performance benchmarks and security requirements it is likely that more states will incur pressure to require certification to the newest draft when it is finally adopted. In light of this likely scenario, I think it is important to determine the potential market effects of the new VVSG and how best to make sure that the certification process and system requirements are not so prescriptive and costly that the country is forced to take steps backward in regards to innovation.

1. *What specifically can be done with the proposed VVSG standards and with the certification testing procedures and infrastructure, to reduce the cost of the voting systems, without compromising core functions of the voting system?*

First and foremost, the success of the EAC's efforts in both certification and the adoption of the VVSG are contingent upon the support of the states that currently require adherence to the federal standards. The ETC strongly supports the EAC's efforts, but they must incorporate models of efficiency and attempt, wherever possible, to set a clear set of fixed costs and clear instructions for voting system compliance. The current certification process is not currently adequate for the needs of the industry or its customers. We are witnessing a current certification process that has yet, after a year and a half of effort, to yield a certified voting system and a process that continues to have its costs undefined. As of right now, voting system providers are experiencing a 300-400% increase in certification cost without a certified product delivered. These cost increases will likely be passed onto the customers in some form. The benefit of a clearly defined certification process is that it permits proper planning on the part of both voting system providers and the state and local governments who intend to use the products. Fixed costs do not refer to the establishment of a fixed rate, but rather the need for the *Voting System Test Laboratory* to propose a fixed rate for the entire certification effort which will permit a voting

system provider to plan accordingly for the cost and establish a fee schedule that works best for them and the end user. To put it simply, no one will agree to the construction of a home without a clear understanding of the entire cost.

The ETC recognizes that the EAC does not possess the authority to establish certification rates or to establish a fee schedule for Voting System Test Laboratories (VSTL). One avenue that could be approached is the use of a bid submittal process by the VSTL as part of the accreditation process to assist in establishing a fixed cost for certification. It is our understanding that the EAC is working on test scripts with the intent of standardizing the methodologies for voting system certification. Once these scripts are established and all of the current products before the VSTLs are either certified, decertified or withdrawn, only then should the EAC properly investigate where greater efficiencies can be found. This would be the optimum time to conduct forums involving industry providers and VSTL representatives to discuss appropriate changes to the certification program. The subject of cost efficiencies, as posed in this question, implies that a cost/benefit analysis may be accomplished within the VVSG or its pursuits; however, this does not appear to be the case as the current draft of the VVSG speaks to design standards, not performance standards.

2. *What specifically can be done with the proposed VVSG standards and certification testing procedures and infrastructure to reduce time-in-process of a candidate system?*

While we realize the current certification process is new, it is important for election officials to understand the current timelines for certification and how the timeliness of certification is likely to affect the future ability for voting system providers to deploy future product enhancements. In addition, if the certification costs continue to rise or remain as an unknown total cost, it is likely that voting system providers will limit the frequency of product upgrades submitted for certification in an effort to maximize product investment.

Rising certification costs and timeliness of certification are real problems confronting the industry, its customers, and the voters they serve today, not tomorrow. It is impossible at this time to determine what specific steps can be done to speed up the process as we are in the midst of the effort. We must endeavor to balance the practical needs of the voting public with any reluctance, or perceived reluctance, to certify a product.

3. *What specifically can be done to increase the efficiency and economy of efforts within the testing process at the federal, state, and local levels?*

From a market perspective, a strong certification process along with an effective set of VVSG, if properly implemented, will build efficiencies into the marketplace. If the vast majority of the states remain committed to the voluntary framework for VVSG compliance, voting system providers recognize that submitting a product for federal certification will provide the opportunity to market their products in most states; thereby, creating an efficiency. This efficiency is contingent upon a strong certification

process which embraces the importance of voting system providers, recognizes the underlying economic principles and efficiently certifies products. In addition, if the EAC certification is truly effective it will successfully eliminate the need for states to conduct their own certification process and reduce any redundancies. This will not only reduce costs, but it will also speed up the deployment phase for new products.

4. *How important is the timing of the passage and implementation of the next iteration of the VVSG?*
    a. *In an ideal world when would you choose to have the next iteration of the VVSG become effective?*

From an industry perspective, the adoption schedule proposed by the EAC for the next iteration of the VVSG appears adequate for its own purposes. However, it is also likely, given the robust nature of the requirements for voting systems, that research and development is not likely to occur in advance of the VVSG's adoption. While some voting system providers may attempt to plan future developments to merge with the requirements currently being discussed within the new VVSG, doing so reflects the natural risk associated with anticipating future directions for voting systems. Another issue related to the timing and implementation of the next VVSG is the fact that its mere presence and development is likely to stifle future growth opportunities for the market until such time that the new VVSG is adopted. States may determine it to be more advantageous to wait for products certified to the newest VVSG.

Given the mandated requirements within the VVSG, it is likely that the EAC will have to operate both the 2005 VVSG and this newer version concurrently. If not, the EAC will run into conflict with its restriction upon rule making on state and local governments as stipulated within the Help America Vote Act (HAVA). Provided the 2005 VVSG and the newest draft operate in tandem, the Council sees no problem with the current proposed timeline for its adoption; however, it should be noted that adoption is not an indicator of product development or certification. Ultimately, the new iteration of the VVSG can be adopted at any time provided the VSTLs are prepared to begin testing to this standard which is the key issue to a successful implementation.

5. *How necessary is innovation in voting technology?*
    a. *How can the EAC's program and the VVSG address the desired level of innovation?*
    b. *What are the possible sources of capitol to reach the desired level of innovation i.e. from the vendor? From Congress? From private enterprise? From academia?*

The best forms of innovation are those that originate out of the natural forces of the market rather than through legislation. This is primarily due to the need for the avoidance of unintended consequences and to allow the market to dictate winners and losers while permitting consumers to benefit from clear differences in the products offered. In this market example, the consumer is best equipped to determine the product that best meets their needs.

The best method to open up the opportunity for innovation is to provide the most flexible pursuits for voting technologies. The requirement for software independence is one of the most restrictive requirements as it eliminates the opportunity for a completely software driven platform that is developed using the latest series of security requirements and coding conventions. The very notion of software independence, to my knowledge, is not present within any other industry. While the act of voting is unique, should we embark upon technical requirements that are not present in any other industry? Should we embark upon technical requirements that lack a consensus definition? What is the likelihood that substantial product investment will be used to develop a product under the innovation class?

In order to provide the greatest flexibility and to permit the market to choose, the VVSG should continue to embrace the notion of software dependence and independence. Separate requirements should be written for each. This is especially true since the current voting system certification framework is voluntary. Great care should be exercised to make sure that the interests of states are maintained and to permit states to operate successfully without the use of a "voter verifiable paper audit trail" if they choose to do so.

Although innovation is discussed as a pursuit of the new VVSG, it is difficult to determine what level of consensus has developed regarding voting systems. Security is obviously the key component to this perceived consensus, but no threat model has been developed for the proper security performance of voting systems. The absence of a discussion on procedural controls typically associated with both paper based and electronic voting systems begs the question, "What is the security level we wish to achieve?" We applaud the EAC's efforts to develop a clear threat model, but stress that this effort needs to be completed prior to the final public comment period for the new VVSG as it directly relates to the security performance requirements of voting systems. In the absence of a clear threat model, it is difficult to determine the level of consensus or how this translates into performance standards. The very notion of OEVT appears to contradict these efforts to develop a consensus for voting systems as it indicates a subjective threshold that operates independently from performance and design requirements discussed in the VVSG. The current draft of the VVSG allows an OEVT team to change the threat model, from the one under which the system is designed. This course of action will cause any system to fail certification.

The United States has witnessed successful cooperative ventures between academia and industry leaders in order to spur greater innovation. These efforts have been codified under federal law most recently with the National Technology Transfer and Advancement Act (1996) and the Federal Technology Transfer Act of 1986 (Bayh-Dole Act). These two pieces of legislation embraced the notion that research conducted by federal laboratories, federal agencies, or academic institutions can be brought to the marketplace quickly. These efforts for research and development depend upon funding for the research and a cooperative venture with private companies who will use the resulting innovations through licensing arrangements. Of course, this cooperative effort spurs research, but it does not speak to the need for capital. As recognized within these two acts, the private sector retains

its role for taking the resulting invention and incorporating it into future designs while incurring the normal risks associated with the performance of industry.

So when it comes to the actual development of a marketable product and raising the necessary capital, these are financial risks typically left to the private sector. In today's market environment with voting systems, it is difficult to raise capital since there are so many outstanding questions regarding the future of voting technology and the potential for innovation and growth. It is possible that the final adoption of the VVSG combined with a clearly developed threat model and continued successful performance of the current voting systems will lead to market stability and an infusion of new capital, but this is only speculative. In the short term, the available sources of capital are difficult to find and that will limit the potential for immediate research and development opportunities.

6. *Every voting systems stakeholder shares risks with other stakeholders and experience risks unique to their constituents.*
    a. *What risks do you view as being shared?*
    b. *What risks do you view as being unique to your sector?*
    c. *Has there been an adequate assessment of those risks?*
    d. *In the absence of an adequate assessment of those risks, how can those risks be prioritized and mitigated?*

Unfortunately, the voting industry has been one of the stakeholders not recognized for its role in the successful conduct of elections. From a risk standpoint, the industry is constantly confronted with market externalities such as increasing certification costs, the lack of an operating marketplace and cyclical revenue streams. To date, no adequate assessment has been made on the current industry trends or the clear risks that must be incurred by those providers who intend to remain in the marketplace. The economics of the industry must be taken into consideration since the decisions made by the EAC today significantly impact its health.

The EAC should reach out to other agencies such as the Federal Communications Commission (FCC) and the Federal Aviation Administration (FAA) to learn more about the need to recognize market trends and realities. After all, we have already seen companies regulated out of the marketplace due to rising certification costs. While companies go out of business all of the time, the danger is when this condition is born from an external pressure on the market (i.e., increased certification costs). These external pressures are referred to as market externalities and if they are not properly considered for their negative impacts, they may very well lead to market failures. A market failure occurs when a product ceases to be profitable for the private sector; thereby, creating the potential for consideration of a government provided enterprise.

The EAC, prior to adopting the next iteration of the VVSG, should meet with other agencies who regulate industries and educate themselves on the need to accomplish their given task of developing clear standards for voting systems while recognizing the voluntary nature of state compliance and the need to avoid market failures. Of course, the Election Technology Council would be happy to assist in any way

we can and we do not presume to have the answers, but feel that this is an avenue that has not been explored.

The private sector has a long history of supporting election administrators in the United States within a finite marketplace. The constant struggle for any industry is to maintain a viable revenue stream to support its current payroll requirements and have reasonable profits which can be reinvested for product research and development. With four leading providers and hundreds of employees, the performance track record of the leading voting system manufacturers should be recognized for their successes and overall commitment to the successful conduct of elections in the United States.

7. *How do you prioritize the features (i.e. security, accessibility, usability, reliability) of a voting system?*
    a. *What are the best ways to strike a balance between these sometimes competing features?*

The previous development of voting systems has focused primarily on accessibility, usability, reliability and accuracy. This was done in recognition of the traditional election administration practices which are used to protect the integrity of an election and the demands at that time of the marketplace. It is apparent that security is also a critical component and must also be incorporated, through greater depth in the design; however, but often usability, security, and costs find themselves as competing forces. The most secure platforms are less likely to be the most usable for both the user and the voter and more likely to be costly to produce and procure. Election officials often enjoy as much flexibility as possible when administering their voting systems at the local level, but proposed requirements within the VVSG attempt to limit much of this flexibility. As recommended within the VVSG, the use of strict security procedural controls such as user password requirements reflecting each assigned operator's role will impact an election administrator's ability to creatively respond to problems as they arise. This example is used only to illustrate the competing nature between usability and security.

Given the nature of paper based voting methods and their history in the United States, security was only as good as the procedures established around a voting system's operation. The evolution of the DRE systems focused on the principles of accessibility for minority language and disability access while also providing greater reliability and accuracy through the elimination of overvoting and the electronic uploading of election results to eliminate transposition errors common with manual entries and tallies. Multiple studies have been conducted which have shown that the usability of DRE systems should not be dismissed for the sake of placing security as the primary concern. The one competing feature among these four requirements is security. As we consider this feature, we must consider our objective which leads to a series of questions. Are we striving toward a higher confidence level with security or an absolute model? If we focus too much on security, are we sacrificing usability and generating more costly systems?

Summary

It is incumbent upon the EAC to exert policy leadership when it comes to establishing effective controls on the development of the VVSG and the administration of the certification process. Doing so will enable the EAC to serve the industry it regulates, the state and local election officials who must use the equipment, and the voters who rely upon the equipment to exercise their right to vote. Unfortunately, many of the policy decisions are difficult ones and as Abraham Lincoln said, "You cannot please all of the people all of the time." So the final policy questions that must be asked when considering the adoption of the VVSG include:

1. What impact will these requirements have on the current marketplace?
2. Is there a danger of market failure if the current certification process continues to exhibit delays and ever-increasing costs? This question has also been posed as "Should perfect be the death of good?"
3. Is software independence too restrictive for the future of voting system technology?
4. Is the country best served by having an effective federal certification model with more or fewer participants (i.e., states)?
5. Are the needs of the states currently being met with the current certification efforts?

The answers to these policy questions are entrusted to the EAC as part of its responsibility for overseeing the federal certification process. The Council remains committed as a partner during the EAC's deliberations and looks forward to future opportunities to share our viewpoints.

iBeta

Interdisciplinary Roundtable Monday, May 5, 2008
EAC Offices 1225 New York Ave, Suite 150 Washington, DC 20005

Discussion Questions

- Response to questions is provided by Carolyn Coggins QA Director - Voting and Gail Audette Quality Manager

1. **What specifically can be done with the proposed VVSG standards and with the certification testing procedures and infrastructure, to reduce the cost of the voting systems, without compromising core functions of the voting system?**

    - Revise the proposed VVSG to provide clear, correct, unambiguous, concise, and verifiable functional and performance requirements. Requirements must be well-defined with a purpose that is clearly tied to valid and testable criteria. All requirements must have pass/fail criteria with an identified test method. In the current document there are a large number of requirements that are not testable; rather they are assessments that do not contain pass/fail criteria. Additionally complete definition of important functions, such as, voting variations has been side stepped.

    - Abandon the proposed VVSG class structure format. It adds unnecessary complexity and repetition. As written, any difference in a voting system incorporates a new class and functions are treated as classes. This structure does not lend itself to a nimble or easily understood test process.

    - The standards should not be released without all applicable test methods identified and documented.

    - The approach to the VVSG should be from a practical, holistic, and cohesive perspective. The document appears to have been designed to manage the writing of the standard and not to facilitate it's use by manufacturers, state certification reviewers, jurisdictions, test labs, EAC reviewers, and interested members of the public. Not only should the testing of voting systems be standardized but the output of the testing should be standardized so test cases, test plans and test reports look alike for ready comparison. In the proposed VVSG the sections are written as separate pieces which do not interrelate. If the construction of the standard could be formatted so it seamlessly lends itself to identification of required tests, design of the test method, traces for the test plans, cases and report this would be a major time savings to all stakeholders. Manufacturers could use this to design internal pre-certification tests; VSTLs could use this throughout their process (review manufacturer testing, prepare test plans, test cases and test reports); EAC reviewers would have a uniform trace, regardless of lab or voting system, to confirm if test plans are acceptable; test plans and test report could be more readily compared and reviewed by EAC reviewers, state certification reviewers and members of the public.

    - Ensure the VVSG, NIST and EAC standards and processes don't conflict with one another; ideally have a single entity empowered to synchronize both processes.

    - Limit the VVSG to functional and performance requirements; put policy in the EAC program manuals.

    - Ensure that the EAC has policies that address all aspects of the VVSG and NIST standards.

2. **What specifically can be done with the proposed VVSG standards and certification testing procedures and infrastructure to reduce time-in-process of a candidate systems?**

    - Apply Dr. W. Edwards Deming's[1] quality theory that improvements in quality lead to lower costs and higher productivity because they result in less rework, fewer mistakes, fewer delays, and better use of time and materials. Each requirement must represent a well-defined need or condition that is driven by the needs of all stakeholders. Test methods must be incorporated into the VVSG prior to release of the standard, so that the manufacturer can use them to design their systems. The VVSG must permit the manufacturer to efficiently design to quality. Deming's third point (of his Fourteen Points to cure the quality crisis) is to cease dependence on testing and instead design and build in quality. Quality has to be designed and built into a product. Reliance only on inspection of a final product does not 'assure' quality and adds expense. Rather than a manufacturer throwing a production system over the wall to the test lab for inspection, the requirements

of the VVSG must provide unambiguous and vetted functional and performance requirements that allow for incorporation into the design phase. Manufacturers need to be able to perform their own internal pre-certification testing so that they know when a system is ready to submit for independent verification and validation by a test lab.

- The entire approach to source code review should be overhauled from a line by line qualitative assessment of +/-35 requirements to quantitative metrics.
- The purpose of the Technical Data Package is to provide information needed by the jurisdiction and the test lab. The manufacturers always say the jurisdictions don't want most of this material. These documentation requirements should be revisited to determine what jurisdictions and test labs really need to perform their functions. If it isn't needed to perform an election or test a voting system, it should be removed.

3. **What specifically can be done to increase the efficiency and economy of efforts within the testing process at the federal, state, and local levels?**

- See #2;
- Harmonization federal, state and local requirements where possible; identify and group state and local requirements.
- Define state/locality approved test methods for optional voting variations and performance criteria so that manufacturers can coordinate with states/localities to incorporate the testing as part of their federal certification.

4. **How important is the timing of the passage and implementation of the next iteration of the VVSG?**

   a. **In an ideal world when would you choose to have the next iteration of the VVSG become effective?**

It is only appropriate that the VVSG is released when it is a complete document. We would define this as:

- Containing functional and performance requirements that have gone through a process to determine that they are essential to the federal minimum requirements of a voting system, such that they fulfill the needs of all stakeholders.
- Identification of benchmarks and test processes which are appropriate to the realistic voting environment and not appropriated from other programs unless it has been proven to be appropriate to the voting environment.
- Containing test methods for all requirements.

Optional implementation of the VVSG should occur:

- Six months after standard test methods have been defined and approved.

Required implementation of the VVSG should occur:

- At a time that addresses the appropriate engineering design and testing cycles.

5. **How necessary is innovation in voting technology?**

We do not believe that innovation should be treated as a separate class. Innovation cannot be mandated nor discouraged. Innovation is the product of meeting functional and performance requirements in new ways. The assistive paper ballot marking devices was an innovation but required no innovative testing. They just required interpreting the standard appropriately.

   a. **How can the EAC's program and the VVSG address the desired level of innovation?**

- Innovation can occur if the program and VVSG shy away from design requirements in favor of practical functional and performance requirements. Requirement VVSG 2005 v.1: 2.4.1.c, *The voting system shall provide the means for incorporating a visible indication of system status,* is a practical requirement. Innovation may occur in how the designer chooses to provide the indicator

   b. **What are the possible sources of capitol to reach the desired level of innovation i.e. from the vendor? From Congress? From private enterprise? From academia?**

- No response

6. **Every voting systems stakeholder shares risks with other stakeholders and experience risks unique to their constituents.**

   a. What risks do you view as being shared?

- All stakeholders (government, voters, manufacturers, advocates, and test organizations) are sharing the undulating environment of the direction of voting systems today. Each entity is trying to react to the continued onslaught of changes. As there is no clear direction, there is no opportunity to be proactive.
- All stakeholders are financially strained and yet they are facing either increasing costs or diminishing markets.
- Most stakeholders are in fear of their reputation. There is a potential to draw possibly unfounded criticism due to a lack of knowledge or passion of opinion.

   b. What risks do you view as being unique to your sector?

- Accreditation is costly and it is no guarantee of work. The market is small and unhealthy. Two of the four accredited labs do not have any VSTL projects.
- The accreditation process requires a lab to prepare a complete set of test processes for testing voting system because test methods expected for the 2002 and 2005 standards have never been delivered. Each lab has had to go through a separate expensive custom created process and test method development. The VVSG draft is such a drastic change from the other standards that it is likely to require a complete reworking of the lab's test processes. To my knowledge no consideration is being given to incorporating any of the labs' methodologies into the promised test methods, or a the practical conversion for the methods of 2002/2005 to 200X.
- There is a substantial demand to participate in non-revenue generating projects, reviews and forums. This can impact the progress of certification testing.
- The training and qualifications demanded of staff does not match the actual work required such that retention of staff or staff qualifications can be an issue. (CISSP can't keep their certification by testing voting systems.) The unique knowledge and training required for the testing of voting systems will be made much more difficult if the approach of the proposed VVSG is not radically changed.

   c. Has there been an adequate assessment of those risks?

- I don't think so.

   d. In the absence of an adequate assessment of those risks, how can those risks be prioritized and mitigated?

- As an ISO/IEC 17025 accredited lab I can't recommend setting priorities without assessment. It contravenes my Quality Policy and Quality Management System.

7. **How do you prioritize the features (i.e. security, accessibility, usability, reliability) of a voting system?**

   a. What are the best ways to strike a balance between these sometimes competing features?

- VSTLs are prohibited from participating in the design of a voting system. Hence setting priorities is out of our scope.
- Practicality is lacking in the program.
- It's not the priorities, it's the approach that there must be trade-offs. Get rid of the "all or nothing" policy, but make sure the stakeholders involved understand the policy before going forward. Identify a multi-tiered approach based upon who needs what requirements met and how can we get it in an efficient manner. Define level 1, 2 and 3 voting systems and what each level must have and allow certification to a specific level.

1: http://www.referenceforbusiness.com/management/Pr-Sa/Quality-Gurus.html