Official Meeting Minutes
Technical Guidelines Development Committee (TGDC) Meeting
January 18-19, 2005
National Institute of Standards and Technology
Gaithersburg, MD 20899

Members in Attendance:
Dr. Hratch Semerjian – Chair
H. Stephen Berger
Anne Caldas
Paul Craft
James Elekes (By Conference Call)
Patrick Gannon
J.R. Harding
Alice Miller (By Conference Call)
Helen Purcell
Whitney Quesenbery
Ronald Rivest
Daniel Schutzer
Sharon Turner-Buie (By Conference Call)
Britain Williams

Absent Member:
Hon. Donetta Davidson (Participated January 19, 2005, by Conference Call)

Committee Support Staff:
Craig Burkhardt, Chief Counsel for Technology, Department of Commerce
Allan Eustis, Information Technology Laboratory (ITL), NIST
Phil Greene, General Counsel Office, Department of Commerce
Mark Skall, Chief, Software Diagnostics and Conformance Testing, ITL, NIST

U.S. Election Assistance Commission (EAC)
Paul DeGregorio, Vice Chair and Federal Officer TGDC
Ray Martinez, Commissioner

<u>January 18, 2005: Morning Session # 1</u>

Dr. Hratch Semerjian, TGDC Chair, called the second plenary session of the Technical Guidelines Development Committee to order at 9:03 a.m. He introduced himself as the Acting Director of the National Institute of Standards and Technology and Chair of the Technical Guidelines Development Committee.

After the pledge of allegiance, Dr. Semerjian recognized Mr. Craig Burkhardt as the TGDC Parliamentarian and requested that he determine if a quorum of the Committee was present. Mr. Burkhardt called the roll (See Table 1.). Fourteen TGDC members answered "present." One TGDC member, Ms. Davidson, was absent. Mr. Burkhardt

notified the chair that a quorum (simple majority) of the Committee was present either in person or via conference call connection.

The Chair thanked Mr. Burkhardt. Dr. Semerjian then thanked the members of the Committee for their active participation to date. The Chair stated that the Committee members' willingness to volunteer significant time and expertise to the voluntary voting standards work of the TGDC was a mark of the highest ideals of citizenship and civic responsibility. Dr. Semerjian noted that every American voter will benefit from the commitment of Committee members.

Dr. Semerjian then asked each Technical Guidelines Development Committee member in attendance to introduce herself/himself and offer a brief background on noteworthy career achievements. Each Committee member in attendance offered a short introduction.

Dr. Semerjian entertained a motion to adopt the January 18 and 19, 2005, Plenary Meeting Agenda for the Technical Guidelines Development Committee provided in the Committee members' workbooks and as public handouts. Mr. Harding moved the motion and Dr. Rivest seconded the motion. A voice vote indicated unanimity and the motion passed.

Dr. Semerjian noted that since the July 9, 2004, plenary meeting, Dr. Arden Bement was formally appointed by the President and confirmed by the Senate as Director of the National Science Foundation. He noted that we have benefited from his leadership at NIST and as the first Chair of the Technical Guidelines Development Committee. Dr. Semerjian assured the members of the Committee and the Election Assistance Commissioners that he shared Dr. Bement's commitment to the vital work of the TGDC.

For the record, Dr Semerjian noted that Public Law 107-252, the Help America Vote Act (HAVA), established the Technical Guidelines Development Committee. HAVA charters the members of this Committee to assist the Election Assistance Commission with the development of voluntary voting system guidelines. This Committee's initial set of recommendations for these guidelines are due to the Executive Director of the Election Assistance Commission in April 2005 in accordance with HAVA's nine-month deadline. In the interim, the 2002 voting system standards adopted by the Federal Election Commission serve as the first set of voluntary voting system guidelines under HAVA.

At this time, the Chair noted that the latest revised version of Robert's Rules of Order was adopted on July 9, 2004, to govern both the Technical Guidelines Development Committee and subcommittee proceedings. Dr. Semerjian called on Mr. Burkhardt, TGDC Parliamentarian, to review the logistics of this second plenary meeting of the TGDC.

Mr. Burkhardt thanked the Chair and welcomed both the public in attendance as well as the public monitoring the TGDC meeting via the live Internet web cast from NIST. Mr. Burkhardt introduced himself to the TGDC Committee as the chief legal counsel on technology matters for the U.S. Department of Commerce. On behalf of the President of

the United States and the Secretary of Commerce, he welcomed everyone in attendance. Mr. Burkhardt expressed the gratitude of the President and the Secretary of Commerce for the voluntary public service of the TGDC members. Mr. Burkhardt introduced Mr. Phil Greene from the Department of Commerce Office of General Counsel as the Assistant Parliamentarian and noted that Mr. Greene would be filling in as Parliamentarian for much of the session on January 19, 2005.

Mr. Burkhardt reviewed some of the acronyms that both the public and the TGDC would hear frequently during the upcoming meeting. NIST, the National Institute for Standards and Technology, is the technical advisory agency to the Technical Guidelines Development Committee (TGDC). The TGDC is a Committee jointly appointed by the U.S. Election Assistance Commission and the NIST Director. The TGDC is the organization that will render an initial recommendation on voluntary voting system standards as required by the HAVA statute. Mr. Burkhardt noted that the U.S. Election Assistance Commission, EAC, is the presidentially appointed commission that will receive the advice of the TGDC through a number of other advisory committees. As well, the EAC will act on adopting and proposing a set of voluntary voting system guidelines to the nation.

Mr. Burkhardt then reviewed the logistics for the two-day meeting of the Technical Guidelines Development Committee. He noted that the proceedings would follow a format similar to a city council meeting. A number of resolutions will be proposed or moved by a member of the Committee. There will be a "second" to the motion in the standard Robert's Rules of Order parliamentary procedure. Then the resolution will be put to discussion.

As a guideline, Mr. Burkhardt, as Parliamentarian, requested that Committee members who present resolutions provide a five-minute explanation. Chair Semerjian would then open discussion of the resolution. The timekeeper will alert the committee when fifteen minutes has elapsed. The subcommittee chairs will have discretion over the order of resolutions to be presented.

Mr. Burkhardt reviewed the procedure for proposing and seconding of motions. Either Mr. Greene or he will conduct a roll call vote at the end of discussion. The ayes and the nays will be recorded (Table 1). Eight TGDC members compose a majority quorum to pass a resolution. Mr. Burkhardt then reviewed the procedure to amend a resolution by offering a motion to the Chair to amend. He requested that committee members refer to specific paragraphs or lines within the written resolutions when offering an amendment. Mr. Greene will be available to assist in drafting new resolution language if requested. New resolutions will be written up, distributed, and displayed on the screen.

Mr. Burkhardt then covered procedures following the passage of a resolution. With respect to resolutions that give instructions to NIST for tasks in the form of technical support, the results of those tasks will be provided back to the committee for review, approval, disapproval, or amendment at a future meeting.

The Chair thanked Mr. Burkhardt and entertained a motion to accept the minutes of the July 9, 2004, meeting of the Technical Guidelines Development Committee. He noted that the minutes were provided in advance as handouts to the public and the Committee. The motion to approve was moved, seconded, and passed unanimously by voice vote.

The Chair thanked Mr. Burkhardt. Dr. Semerjian noted that this second meeting of the TGDC has an ambitious agenda with specific outcomes that are necessary to accomplish in order to move forward with the Committee's HAVA mandates. Specifically, as a Committee, the Chair stated that we will consider resolutions drafted by the three working subcommittees: Human Factors and Privacy, Security and Transparency, and Core Requirements and Testing.

He further noted that the time required to complete the agenda items means that the Committee cannot take public comment at this meeting. However, Dr. Semerjian pointed out that there will continue to be opportunities for the public to comment on relevant issues. Comments and position statements should be sent to voting@nist.gov where they will be posted on the NIST voting web site http://vote.nist.gov. The Chair indicated that the comments received to date have been posted and reviewed by NIST staff and TGDC Committee members.

Dr Semerjian then reviewed the four resolutions adopted at the first plenary session of the TGDC on July 9, 2004, that have guided the Committee's work up to this phase of the guidelines development process mandated by HAVA. Dr. Semerjian read the resolutions.

"(1) RESOLVED: that three subcommittees be established to gather and analyze information. Subcommittees shall be comprised only of TGDC members. Subcommittees shall propose resolutions to the TGDC on best practices, specifications, and standards. Subcommittees shall be named 1) Human Factors and Privacy, 2) Security and Transparency, and 3) Core Requirements and Testing.

(2)RESOLVED: that the Chair survey the interest of TGDC members and thereafter appoint the members and chairs of the subcommittees. The Subcommittee chairs are: Ms Whitney Quesenbery (Human Factors and Privacy), Dr. Ron Rivest (Security and Transparency), and Dr. Dan Schutzer (Core Requirements and Testing).

The members of the subcommittees are as follows:
Human Factors and Privacy: Quesenbery, Turner-Buie, Miller, Davidson, Elekes
Security and Transparency: Rivest, Caldas, Purcell, Gannon
Core Requirements and Testing: Schutzer, Williams, Craft, Berger, Harding.

(3) RESOLVED: that resolutions prepared by subcommittees be considered by the TGDC. Resolutions adopted by the TGDC shall be referred to NIST for technical assistance and editing. Upon return from NIST, the TGDC shall review the resolutions to confirm they conform to its intent.

(4) RESOLVED: that adopted resolutions and appropriate explanatory materials comprise the 'first set of recommendations' mandated by the Help America Vote Act."

Dr. Semerjian then asked the U.S. Election Assistance Commission (EAC) Vice Chair Paul DeGregorio and Commissioner Ray Martinez to address the Committee with any remarks they believe will assist the Committee in accomplishing its HAVA mandates.

Vice Chair DeGregorio welcomed the Committee members "to a very cold day in Washington." He noted, "we want this welcome to be as warm as possible on behalf of our Chair Gracia Hillman and Commissioner Buster Soaries who could not be here this morning. But I am certainly pleased to have my fellow Commissioner Ray Martinez here."

Commissioner DeGregorio then introduced the top staff of the EAC who would be attending and listening carefully to the plenary sessions. Ms. Carol Paquette, Interim Executive Director, will work closely with the TGDC and NIST as they proceed in the development of voluntary voting system guidelines. Ms. Julie Thompson is the legal council for the EAC. Mr. Brian Hancock worked on voting standards development with the Federal Elections Commission for fifteen years and is now with the EAC where he will also follow the guidelines development process closely. Mr. Adam Ambrogi is an attorney and special assistant to Commissioner Martinez. In addition, Commissioner DeGregorio introduced his assistant, Mr. Dan Murphy, who has worked with the Los Angeles County election authority for many years.

Commissioner DeGregorio, as the Federal Officer for the TGDC, thanked the members of the TGDC for the efforts they have put in since July 2004. He acknowledged not only the long distances many have traveled, but also the "selfless commitment" for which the members are not compensated. "I appreciate and thank you on behalf of the Commission for the work you have put into this very important project for the citizens of the United States."

Commissioner DeGregorio recognized the efforts of the subcommittee chairs in guiding the work of their respective groups. "You have come up with some tremendous resolutions. I know that a lot of thought and effort has gone into them that will bring some lively deliberations over the next 48 hours."

Commissioner DeGregorio recognized the close working relationship between NIST and the EAC since the creation of the Commission. He stated his appreciation for the efforts of NIST staff, Mr. Craig Burkhardt, and his staff at the Department of Commerce. In addition, Commissioner DeGregorio thanked the President and Congress for the funding that the Commission has been able to pass on to NIST. "It's a very significant portion of our budget that we have devoted to this effort because we feel the work of NIST and the TGDC is a top priority for the EAC. As you know, in the past in the development of voting system standards by the National Association of State Election Directors

(NASED), there was not much funding nor did NASED have the benefit of the strong technical support that only NIST can give."

Commissioner DeGregorio thanked the members of the public attending the TGDC plenary sessions as well as the individuals who have contributed to the deliberations process in the past few months by providing their thoughtful opinions on the TGDC web site. Recalling the July 2004 remarks of then-Chairman Soaries, Commissioner DeGregorio re-emphasized the bipartisan makeup of the TGDC representing a breadth of philosophical viewpoints. "We want to encourage you to have open minds and an open exchange on the one hand to keep the process open and transparent. On the other hand, we encourage you to keep united sufficiently to gel as a team and foster a sense of team effort. That is what the Chair said last July and those words are still certainly important today as you begin this session of your work."

Commissioner DeGregorio noted the HAVA requirements for the TGDC to provide its initial set of recommendations within nine months of appointment to the EAC Executive Director. The Commissioner emphasized the importance of meeting the April 2005 deadline. "It is imperative that the TGDC strategy adhere to the statutory time frames mandated by HAVA given that the states are expecting guidance this year from the EAC and this Committee in making procurement decisions to replace or upgrade voting systems. Moreover, it is equally important that the initial set of recommendations be as comprehensible as possible and consist of usable concrete draft guidelines which can be fully considered and deliberated on by interested parties."

In closing, Commissioner DeGregorio reiterated the EAC's top priority when it comes to voting systems: the security and reliability of voting systems. "When it comes to the development of voting system guidelines, it is clear that voters, policy makers, and election administrators alike want to ensure that machines cannot predetermine an election through manipulation of the voting technology. Therefore we request that the TGDC dedicate appropriate resources and its vast expertise to address the legitimate concerns on all sides of this important issue. The EAC remains firmly committed to improve the process of election administration in the United States. We are proud to work with the TGDC ensuring that the American public has confidence in the integrity, accuracy, and fairness of elections that it deserves. The EAC is always open to any advice and suggestions you can give us as we improve the election process in the United States of America. Thank you."

Dr. Smerjian thanked Vice Chair DeGregorio for his remarks. He noted that NIST has been working very closely with the EAC and strives to continue to meet the Commission's needs. Everybody has been under pressure to get the job done right the first time: the motto of NIST. The agency appreciates the support of the Commissioners. Dr. Semerjian asked Commissioner Martinez if he wished to make some remarks.

Commissioner Martinez thanked the Chair and complimented his fellow Commissioner, Paul DeGregorio, for the excellent work he has done with the TGDC and NIST to get to where they are today. He expressed his appreciation to all the TGDC members for their

dedicated work on behalf of the American people. “It does not go unnoticed at the EAC that the Help America Vote Act, while calling for this advisory committee to be comprised of experts of each of the respective fields, also requires that your service under TGDC go uncompensated. Yet despite your busy schedules, since the Committee’s inception last July, you have each given generously of your time and experience and in so doing have shown the true essence of public service. For that we are certainly grateful.”

Commissioner Martinez noted that since 1901, NIST has worked to develop standards and technology to improve the quality of life for all Americans. “The EAC is proud to work cooperatively with NIST and to call on the agency’s experience and expertise to help the EAC to improve the process of elections administration.”

Commissioner Martinez expressed thanks to the many important partners who have helped the EAC to achieve a level of success in its first year of operation including the National Association of State Election Directors, whose work produced the first and current set of voluntary voting system standards, and the National Association of Secretaries of State whose leadership and advocacy has improved the process of election administration. In addition, Mr. Martinez thanked The Elections Center and IACREOT as additional partners on the road to better election administration. “To put HAVA in its proper context, Mr. Chair, consider that the very last time Congress contemplated granting a substantial federal role to assist states with election administration was back in 1890, some 115 years ago. The Federal Elections Bill, as it was called, eventually failed in the Senate by one vote. That legislation was the only other major foray other than HAVA into this realm of election administration which traditionally and most appropriately is occupied by state and local governments.”

Commissioner Martinez noted that he too reviewed the remarks of then-Chairman Buster Soaries at the July 2004 meeting of the TGDC. “During his remarks, the Commission Chair correctly noted two important mysteries about election administration that I think bear repeating: first, the commonly held notion among Americans that the federal government is much more involved in the process of election administration than it really is, or at least was until HAVA was created, and the second myth that election procedures go through the same scrutiny and regulation that automobile and household appliances go through. Moreover, it is the heady responsibility of this Committee to turn the second myth into reality and give Americans the confidence that they deserve in the reliability of voting systems by developing comprehensive guidelines by which to judge the integrity and accuracy of the systems. The EAC feels that the TGDC is well on its way to doing just that. It is our hope that come this April, the EAC will be able to share a complete set of draft guidelines with our Board of Advisors and our Standards Board and to put in place a process to ensure that any and all interested parties have an opportunity to further contemplate and deliberate these draft voting system standards. Clearly there is a sense of urgency attached to the work of this Committee. States are looking to the EAC and the work of the TGDC to provide much-needed guidance on the integrity, reliability, and security of voting systems before making decisions on which systems to purchase. We urge the TGDC to stay focused on the key deliverables that were agreed upon during last July’s meeting including producing for the EAC by this April a list of publicly vetted

requirements for voluntary voting system standards. A second principle on which to focus is transparency and inclusion in the guidelines development process. We urge the TGDC to continue its efforts to ensure that the process to develop its first set of recommended guidelines is fully open to public scrutiny and one which ensures that public comment is welcomed, fully heard, and considered. Given the right that all Americans deserve for fairness in our elections and the importance of transparency in the conduct of our elections, I am convinced that adoption of sound guidelines to judge the efficacy of our voting systems is the most important matter that will face the EAC in 2005 and perhaps beyond this calendar year. We must not disappoint those who have placed immense responsibility upon us including policy makers, election administrators, advocates, and most important of all, the American people. The EAC is confident in your ability and we are proud to be a partner in this important endeavor."

Dr. Semerjian thanked Commissioner Martinez for his remarks. The Chair commented that the Committee understands the critical need to provide the EAC with the required technical guidance to allow the Commissioners to meet HAVA mandates on voluntary voting system standards. "From July 2004 until today, the three subcommittees engaged in information gathering, research, and analysis including the taking of public testimony at a two-day hearing in September 2004. In addition, public testimony has been requested, accepted, and posted electronically at the NIST voting web site http://vote.nist.gov. The work product of the subcommittees will be presented at this meeting as a series of resolutions. The resolutions will be debated for potential amendment and adoption. Adopted resolutions will form the basis for the document drafting phase of the guidelines development process."

The Chair noted that it would be his intention to keep to the schedule of this agenda as closely as possible. In some cases, the Committee may not be able to initially consider all of a subcommittee's proposed resolutions in the time allotted. In that instance, we will consider the resolutions at the end of day two, if time permits, or at the next plenary session.

At this time, the Chair called on Mark Skall, Chief of the Software Diagnostics and Conformance Testing Division in NIST's Information Technology Laboratory, to provide a summary of the subcommittee work process and the proposed framework for drafting April 2005 guidelines.

Mr. Skall thanked the Chair. He noted that while the TGDC was familiar with the work process, he would also like to make sure that the public is informed about this very important activity. A copy of the technical presentation was provided to the public in attendance and to the Committee in advance of this meeting.
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Mr. Skall noted that subsequent to the July 2004 meeting of the TGDC, the subcommittee chairs were chosen and TGDC members were assigned to the subcommittees according to their preferences. Several administrative and procedural hurdles remained before the subcommittees could begin their work. In October 2004, subcommittees began meeting at least every two weeks via teleconference. NIST staff participated in each of those

teleconferences. An audio file of the teleconference meetings was posted shortly after each meeting at http://vote.nist.gov. Occasional face-to-face meetings occurred and audio transcriptions were also made available of those meetings at the public web site. NIST respected the valuable volunteer time of the TGDC members as much as possible.

Mr. Skall noted that NIST staff and TGDC members would accomplish action items between each subcommittee biweekly meeting. In addition, NIST staff would also meet and assign internal action items to ensure that work progressed. The action items took the form of research or drafting of preliminary documents. NIST recognized the need to coordinate among the three subcommittees and to develop a common framework to which all the subcommittees would adhere. The Core Requirements and Testing subcommittee took the lead in developing this coordinating framework. The subcommittee chose to organize its work by voting function and then relate these functions to various stages in the voting process. The subcommittee developed a high-level set of organizing principles that encompassed these functions. They also developed a voting process model.

Mr. Skall reviewed the eight high-level organizing principles the subcommittee developed. He noted that these are very broad principles and that they are continually being refined. The first principle deals with the right of all voters to have equal access to the voting system without discrimination. The second principle ensures that each ballot is counted once and only once. The third principle looks at the right of the voter to have a ballot that reasonably accommodates their usability and accessibility requirements. The fourth principle ensures the accurate counting, accumulation, and recording of ballots. The fifth principle ensures the voting system does not reveal how a voter casts his ballot and minimizes the ability to prove how he votes. The sixth principle ensures that the physical characteristics of the voting system are fit for its intended purpose. The seventh principle ensures that the voting system is able to register votes despite disruptions including disruptions for natural disasters, loss of electrical services, and disruptions from cyber security attacks. The eighth principle addresses the verification of the correct operation of the voting process. .

Mr. Skall noted that these principles are being reviewed and revised. He noted that some of the TGDC members expressed reservations about certain principles indicating that some are primarily procedural, rather than resulting in technical requirements. In addition, some subcommittee members felt that specific principles should perhaps be eliminated. One or two of the principles may be distributed across the other principles. Other TGDC members felt that at least one of the principles should be eliminated because it treated election management and not the voting system. Discussion continues and the subcommittees have not come to any formal conclusions. In essence it is a working model so that subcommittees all communicate in the development of requirements.

Mr. Skall then reviewed the strategy for developing requirements that vendors will implement for the voting systems. These requirements need to be of a sufficient level of specificity to determine whether or not the requirement has been implemented correctly.

They must be precise, unambiguous, consistent, and testable. They must use normative language with words such as “shall” or “must.”

Mr. Skall noted that Commissioner Martinez talked about having public confidence in the voting system at the same level as various other systems like automobiles and airplanes. “These types of mission-critical systems typically do use formal methods with precise mathematical specifications to define the requirements. However, with a voting system, these methods are really not practical for many reasons. Number one, it takes much longer to develop standards that are based on formal mathematical methods. In addition, HAVA does not give us the luxury of time. Secondly, standards developed using formal (mathematical) methods are more difficult to explain to the layman. We certainly want the public to be able to understand everything we do. So, like it or not, we are really faced with using the English language. It is a tremendous challenge to use the English language (as opposed to mathematical language) and at the same time to be precise when defining requirements.”

Mr. Skall went on to explain the need for a conformance clause to specify what must conform and how it must conform. A conformance clause also addresses different requirements for different voting systems. Thus, a conformance clause addresses what must be done in different scenarios to claim conformance. A conformance clause also addresses “extensions” when additional features are implemented.

Mr. Skall indicated that NIST will use the 2002 voluntary Voting System Standards (VSS) requirements whenever feasible. If a requirement is not sufficiently specified, NIST will attempt to rewrite it. However, HAVA puts additional emphasis on computer security and human factors issues, including assistive technologies for individuals with disabilities including blindness and varying levels of literacy. Many of these requirements cannot be extracted from the 2002 VSS. In that case, NIST will identify a completely new requirement for review by the TGDC.

Mr. Skall reviewed the need to prioritize the HAVA tasks. The initial April recommendations will necessarily focus on the most important aspects of voting. And where it's most helpful to the election community, each subcommittee will look at one of the eight high-level principles previously mentioned. The Human Factors and Privacy Subcommittee is looking at principle number three: “Each cast ballot shall capture the intent of the voter who cast that ballot.” The Core Requirements and Testing Subcommittee is looking at principle number four: “The voting process shall accurately accumulate, count, and report legitimate votes. The Security and Transparency Subcommittee is looking at principle number eight: “Independent observers shall be able to verify the correct operation of the voting process.”

Dr. Semerjian thanked Mr. Skall for the review of the work process and proposed framework for drafting the April 2005 guidelines.

The Chair then entertained a motion to adopt a general drafting process resolution for consideration by the Technical Guidelines Development Committee. Ms. Quesenbery offered Resolution # 1-05.

Resolution # 1-05, Offered by Ms. Quesenbery

Title: Work Product Instructions to Staff of National Institute for Standards and Technology (NIST)

The TGDC intends to consider and adopt resolutions during its January 18 and 19, 2005, meeting. Each resolution will make certain findings or conclusions. The resolutions will also request specific technical assistance from NIST.

At the conclusion of the meeting, the TGDC Chair will sort the adopted resolutions by priority. Priority is to be given to resolutions and requests for technical support that can result in work product that will form a part of the April initial recommendations of the TGDC.

Generally, NIST staff members with subject matter expertise will be instructed by the TGDC Chair and his designates to conduct further research and inquiry, gather and evaluate existing standards or standards-like materials which apply to the resolution, and revise such materials or draft new standards or standards-like materials. In many cases, there may be few existing standards materials related to a resolution. In those instances, NIST staff is generally instructed to gather, review, revise, or write relevant standards-related materials. The NIST technical assistance work product will be categorized as pre-decisional materials, and should be provided directly to members of the TGDC for their review.

If, in the course of providing technical assistance, NIST staff discovers significant errors in an adopted resolution or otherwise concludes that to continue providing technical assistance is unwise, technical assistance should be temporarily halted. Such reasons to halt technical assistance may also include discovery that a requested task is technically infeasible, or that the scope of the request exceeds the capabilities or legal authorities of NIST. NIST shall immediately bring the matter to the attention to the TGDC Chair, who will consult with the sponsor of the resolution and the Chair of the applicable subcommittee. If the TGDC Chair, subcommittee Chair and resolution sponsor agree that the request for technical assistance to NIST should be revised, they shall have authority to do so. In such cases, a new or revised request for technical assistance shall be issued to NIST in writing, with copies to all TGDC members. In such cases, the sponsor of the relevant adopted resolution shall examine whether the adopted resolution should be reconsidered or revised during a subsequent meeting of the TGDC. If so, the parliamentarian should be consulted to draft the appropriate resolution materials.

If, in the course of providing technical assistance, NIST staff discovers an alternative approach that logically fits into the scope of an adopted resolution, NIST

staff may develop and present the alternate approach. In such cases, NIST staff shall also provide the technical assistance specified in the resolution.

If, in the course of providing technical assistance, NIST staff discovers duplicative or conflicting resolution findings or requests for technical assistance, the TGDC Chair shall be consulted. In such instances, the TGDC Chair shall consult the Chair of the applicable subcommittee and the sponsor of the resolution(s) for clarification. The Chair shall then issue a new written request for technical assistance to NIST and provide copies to TGDC members.

During subsequent meetings of the TGDC, members of the TGDC may consider, amend, and adopt the technical assistance work product. Such adopted technical assistance work product will be appended to the appropriate resolution and will form a portion of the initial recommendations to the Election Assistance Commission.

Mr. Craft seconded the motion for discussion. Dr. Semerjian asked the parliamentarian to walk the Committee though the motion. A point of order was made regarding the explanation of parliamentary procedure. A second point of order noted that the proposed resolutions were delivered on a federal holiday while most of the Committee was on travel. Do federal laws provide guidance on the distribution of the draft on a federal holiday the day before the meeting?

The Chair indicated his understanding is that these resolutions were sent in the middle of last week. There were some last-minute changes and editing. To his knowledge, there is no particular requirement as to the advance notice.

Mr. Williams noted to the Chair that the draft resolutions that went out yesterday that are in the briefing book differ from the ones that were distributed last week. In addition no one sitting on this Committee unless they were involved in yesterday's drafting has that knowledge. “It makes it very difficult to proceed to discuss materials that we frankly have not had an opportunity to evaluate. Placing reliance upon assurances that there are only minor differences between these resolutions distributed yesterday and resolutions distributed last week would be foolish.”

Mr. Burkhardt indicated that the drafts of the resolutions which have been worked on for the last several weeks were distributed by the NIST staff on Wednesday at the request of specific members of the TGDC. Some resolutions were revised by NIST staff at the specific request of the resolution author. Mr. Burkhardt noted that Resolution #1-05 is one that he drafted. He pointed out that there is no change in Resolution # 1-05 from the version you would have received back on Wednesday.

Mr. Williams offered an amendment to Resolution #1-05 to add the following paragraph at the end the resolution:

"All work products to be considered by adoption for the TGDC will be transmitted to the members of the Committee at least five working days prior to the meeting in which they are to be considered."

The amendment was seconded and opened for discussion. Committee members agreed that it was their individual responsibility to ensure receipt of the work product sent to their official e-mail addresses currently on file. Further discussion addressed whether the amendment prevented a member from offering a resolution on the floor during the meeting. The Chair indicated his understanding that the amendment did not prohibit the introduction of new resolutions at the time of the meeting.

A clarification of the amendment to which the sponsor indicated approval stipulated that the five-day notice would apply to all written work product that presumably has been labored over very carefully. The five-day notice will allow the Committee members who are going to make decisions on that work product to spend some time carefully considering its merits before they discuss it and before they make decisions on it.

The amendment to Resolution #1-05 was put to a voice vote and passed unanimously.

The Chair then asked Mr. Burkhardt for comments on Resolution #1-05 as amended.

Mr. Burkhardt indicated that although it is unusual for a parliamentarian to make comments on the substance of a motion, since this is a resolution he drafted, he would provide explanation to speed consideration of this specific motion.

Mr. Burkhardt noted that Resolution #1-05 as amended anticipates that resolutions will be passed today and tomorrow which will make certain findings and which will, in part, provide instructions to NIST staff to provide certain technical support. "What's embraced in Resolution #1-05 is a series of options should, in the course of providing the technical assistance, NIST staff determine that a factual matter or other information has come to their attention, which makes advisable some type of supplemental instructions given to the NIST staff for technical support." Mr. Burkhardt explained that the resolution provides a mechanism for the NIST staff to obtain supplemental instructions from representatives of the TGDC and continue their work without having to wait for the next TGDC meeting to resolve the particular issues. Mr. Burkhardt noted in conclusion that work product presented to the TGDC by NIST staff has no authority until the TGDC says that it is consistent with the intentions of your resolution and with the instructions given to the NIST staff."

There being no further comment or questions, the Chair requested a roll call vote on Resolution #1-05 as amended:

Resolution #01-05 (as amended), Offered by: Ms. Quesenbery

Title: Work Product Instructions to Staff of National Institute for Standards and Technology (NIST)

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At the conclusion of the meeting, the TGDC Chair will sort the adopted resolutions by priority. Priority is to be given to resolutions and requests for technical support that can result in work product that will form a part of the April initial recommendations of the TGDC.

Generally, NIST staff members with subject matter expertise will be instructed by the TGDC Chair and his designates to conduct further research and inquiry, gather and evaluate existing standards or standards-like materials which apply to the resolution, and revise such materials or draft new standards or standards-like materials. In many cases, there may be few existing standards materials related to a resolution. In those instances, NIST staff is generally instructed to gather, review, revise, or write relevant standards-related materials. The NIST technical assistance work product will be categorized as pre-decisional materials, and should be provided directly to members of the TGDC for their review.

If, in the course of providing technical assistance, NIST staff discovers significant errors in an adopted resolution or otherwise concludes that to continue providing technical assistance is unwise, technical assistance should be temporarily halted. Such reasons to halt technical assistance may also include discovery that a requested task is technically infeasible, or that the scope of the request exceeds the capabilities or legal authorities of NIST. NIST shall immediately bring the matter to the attention to the TGDC Chair, who will consult with the sponsor of the resolution and the Chair of the applicable subcommittee. If the TGDC Chair, subcommittee Chair and resolution sponsor agree that the request for technical assistance to NIST should be revised, they shall have authority to do so. In such cases, a new or revised request for technical assistance shall be issued to NIST in writing, with copies to all TGDC members. In such cases, the sponsor of the relevant adopted resolution shall examine whether the adopted resolution should be reconsidered or revised during a subsequent meeting of the TGDC. If so, the parliamentarian should be consulted to draft the appropriate resolution materials.

If, in the course of providing technical assistance, NIST staff discovers an alternative approach that logically fits into the scope of an adopted resolution, NIST staff may develop and present the alternate approach. In such cases, NIST staff shall also provide the technical assistance specified in the resolution.

If, in the course of providing technical assistance, NIST staff discovers duplicative or conflicting resolution findings or requests for technical assistance, the TGDC Chair shall be consulted. In such instances, the TGDC Chair shall consult the Chair of the applicable subcommittee and the sponsor of the resolution(s) for clarification.

The Chair shall then issue a new written request for technical assistance to NIST and provide copies to TGDC members.

During subsequent meetings of the TGDC, members of the TGDC may consider, amend and adopt the technical assistance work product. Such adopted technical assistance work product will be appended to the appropriate resolution, and will form a portion of the initial recommendations to the Election Assistance Commission.

All work products to be considered by NIST shall be received no later than five working days prior to public meetings by members of the TGDC prior to consideration.

Resolution #1-05 was adopted by a vote of 13 to 0 (See Table 1.).

Mr. Harding noted that the sign language interpreter in the corner was in the shadows. People with hearing impairments may find it difficult to see her. Mr. Harding requested that NIST consider using real time captioning for the audience that would assist in capturing items for the accuracy of motions at future meetings.

The chair thanked Mr. Harding and indicated that NIST will take this suggestion under consideration for future meetings.

A TGDC member requested clarification on the number of votes required to pass a resolution or amendment. The parliamentarian indicated that eight votes will be needed to pass a resolution or amendment irrespective of the number of TGDC members in attendance.

The Chair adjourned the meeting for a half-hour break.

January 18, 2005: Morning Session # 2

The Chairman called the meeting back to order and requested that the Human Factors Subcommittee Chair, Ms. Whitney Quesenbery, provide a brief summary on issues relevant to their proposed resolutions. The Chair indicated that Ms. Quesenbery should feel free to call on NIST staff for technical assistance.

Ms. Quesenbery thanked the Chair and the EAC Commissioners. She reviewed the unique challenges facing the Subcommittee on Human Factors and Privacy. The subcommittee is addressing the need to fill gaps in the current voting system standards, not just providing amendments but moving them forward, drawing on proven regulations, research, and practice. She provided a synopsis of standards and regulations relevant to the subcommittee's work, noting that the 2002 Voting System Standards introduced accessibility into voting systems standards for the first time. HAVA added mandates for accessible voting systems to make it possible for 56 million Americans of voting age with disabilities to vote independently and privately.

Ms. Quesenbery noted the recently updated ADA Accessibility guidelines (ADAAG) and new industry consensus work on usability and accessibility standards in the IEEE committees. One of the goals is to bring the voting systems standards up to date with the best current practice in the accessibility and usability communities. “The basic approach is to examine carefully each place where the voter interacts with the voting system and draft requirements that ensure usability, accessibility, and privacy to the best of our ability. We have built on the work of the NIST Human Factors Report, which was delivered to congress by the EAC in May of 2004 as required in HAVA under section 243. This report makes ten recommendations and outlines a road map for developing robust human factor standards. We are following the road map. We have also taken a practical approach in setting our priorities, mindful of what we can achieve in the time frame set forth in the HAVA mandate. Where there are indications that research is needed, I would like to assure everyone this is not open-ended academic research, but the practical work to create the benchmarks needed for Independent testing Authorities testing guidelines. As you will see in the resolutions we propose our top priorities are important aspects of human factors and privacy. Accessibility is critical, not just because it's important to so many Americans, but because it is the law. We will build on existing well-researched regulations, standards, guidelines, and other documentation for these requirements. We will also focus on how to serve a diverse and aging population, with many individual needs.”

Ms. Quesenbery noted that although the subcommittee is presenting ten separate resolutions, the first seven are interrelated. For discussion, the subcommittee broke the resolutions into two areas: one where we can write firm and testable requirements, and the second where we will only be able to suggest guidelines because of the material or state of the art. At this time, Ms. Quesenbery called on Dr. Sharon Laskowski to provide further discussion on some of the issues.

Dr. Laskowski reiterated the goal towards which the subcommittee is moving with the proposed resolutions: more accessible and usable voting systems. “And that means that we have to apply existing standards, guidelines, and best practices. From that, we develop new standards that have objective measures to determine whether voting equipment meets the standards. In addition, the testing must be achievable and not too costly. And we would like the standards to be as technology-independent as possible because that makes for easier definition of the testing and for less complex standards.”

Dr. Laskowski pointed out that you cannot separate out the voting equipment from the entire voting system when taking into account voter interaction. She reviewed one of the recommendations from the NIST Human Factors Report to Congress. The recommendation encourages the creation of high-level performance-based standards to support the qualification process for voting systems. Dr. Laskowski described the difference between performance-based and designed-base standards. A design standard specifies how a product is designed. A performance standard describes how a product functions. She illustrated an example of a performance-based standard. “A system shall be tested for usability to ensure voters cast their votes correctly, and detect errors when

they occur. How would you test for minimal errors? You need a benchmark and then use the benchmark to develop a performance test. We can design the test but we need to develop the benchmarks from experimentation."

Dr. Laskowski noted that at this time, the usability performance of the VSS is not being measured. "Some of the needed research says that if you are going to have usability performance standards, you need to develop a benchmark and test protocol suitable for performance testing of such standards. What we want to do is move to a point on the spectrum where you have reproducible, validated tests for usability performance."

At this time, Ms Queensberry moved that the Committee adopt resolution #2-05.

Resolution # 2-05, Offered by: Ms. Quesenbery

Title: Accessible Voting Systems

The TGDC has examined the issue what is required to ensure accessible voting systems. It has concluded that standards for voting systems should include requirements for accessibility that meet the HAVA requirement for accessible voting by incorporating the latest federal standards for accessibility. The TGDC directs NIST to research and draft standards based on, but not limited to, existing requirements from the VSS2002, IEEE P1583 draft 5.3.2a, ADA Accessibility Guidelines (ADAAG), and other relevant usability and accessibility guidelines and federal laws and regulations.

The motion was seconded for discussion. Mr. Craft offered an amendment to the language of the resolution. The amendment was seconded. Significant discussion ensued on the amendment and the meaning of "accessible technology," audio ballots and the application of the resolution to the 2006 election cycle. The Resolution as amended read:

Resolution # 2-05 (As Amended)

The TGDC has concluded that standards for voting systems should include requirements for accessibility that meet the HAVA requirement for accessible voting by incorporating the latest available accessible technology. Further, the TGDC directs NIST to research and draft standards based on, but not limited to, existing requirements from the VSS 2002, IEEE P1583 draft 5.3.2a, ADA Accessibility Guidelines (ADAAG), 36 CFR Part 1194 (section 508) and other relevant usability and accessibility guidelines and federal laws and regulations in order to develop future accessibility requirements for voting systems.

Upon agreement by the Committee on the intent of the revised language, the Chair called for a roll call vote on the amendment to Resolution #2. Mr. Greene called the roll. The amendment passed by a vote of 12 Yes, 1 No, 1 Abstain.

At this time, Ms. Caldas asked the Chair if she could explain her vote to abstain. The Chair opened the floor to Ms. Caldas.

"Actually, I will be abstaining from all voting on all substantive resolutions and amendments, and that is because I represent the American National Standards Institute (ANSI). As such, I cannot vote on technical contents of documents that may, at some point in the future, come before ANSI for approval as an American National Standard or for consideration by a technical advisory group or for incorporation into a conformity assessment program. My vote will thus be to abstain on technical resolutions at this meeting."

Hearing no further comment, the Chair asked Mr. Greene to call the roll on Resolution #2-05 as amended. Resolution #2-05 passed by a vote of 12 Yes, 1 No, 1 Abstain (See Table 1.).

Ms. Quesenbery then offered Resolution #3-05 for discussion.

Resolution# 3-05, Offered by: Ms. Quesenbery

Title: Accessibility at the Polling Place

The TGDC has examined the issue of what is required to ensure access to the polling place by voters with disabilities. It has concluded that physical accessibility is a function of both the machine used to vote and the environment of the polling place. The TGDC directs NIST to research and draft accessibility guidance on the layout, setup, and administration of polling places. These guidelines should be combined with the accessibility standards described in Resolution # 2-05.

The motion was seconded and opened for discussion. Two straight amendments were offered by Mr. Craft and a third amendment was offered by Mr. Gannon to change the title of the resolution. Discussion centered on whether the motion steps into the area of election administration and the term "accessibility guidance." Since the amendments were considered friendly. At the end of discussion, the amended resolution was read to the Committee by Mr. Greene.

Resolution# 3-05(As Amended), Offered by: Ms. Quesenbery

Title: Accessibility of Voting Systems at the Polling Place

The TGDC has considered the issue of what is required to ensure access to the voting system by voters with disabilities. It has concluded that physical accessibility is a function of both the machine used to vote and the environment of the polling place. The TGDC directs NIST to research and draft accessibility guidance for voting systems which will include the deployment and configuration of equipment in the polling place as a specification for the voting system environment. These

guidelines should be combined with the accessibility standards described in the Resolution # 2-05.

Hearing no further comments or questions, the Chair asked for a roll call vote. Resolution #3-05 (As Amended) was adopted 13 Yes, 0 No, 1 Abstain (See Table 1.).

Ms. Quesenbery then offered Resolution #4-05.

Resolution # 4-05, Offered by: Ms. Quesenbery

Title: Human Factors and Privacy Requirements for Capturing Voter Intent

The TGDC recognized the need for voting system requirements to include human factors and privacy requirements for capturing voter intent based on current research. These requirements should be specified so that systems can be evaluated for meeting the requirements. Unclear specifications, such as "intuitive," "unambiguous," or "meaningful" should be avoided. Further, performance-based standards are preferred over specific design standards because performance standards address the total effectiveness of the system more directly than do design standards and typically they are not technology specific. The TGDC directs NIST to:

1. **Create an outline of the human factors and privacy requirements related to capturing voter intent,**
2. **Write draft human factors and privacy standards based on this outline by using existing requirements from the VSS2002, IEEE P1583 draft 5.3.2a, ADA Accessibility Guidelines (ADAAG), and other relevant usability and accessibility guidelines and regulations,**
3. **Identify areas where further requirements development for capturing user intent is needed, noting when performance-based usability standards are possible, and**
4. **Write all requirements so that they are testable and the tests themselves can be conducted either by inspection by a person with reasonable knowledge of systems, user interface design, and accessibility or by performance-based usability tests with clear, repeatable protocols.**

The Chair requested a second for the motion. Mr. Craft seconded the motion and offered a friendly amendment to change the wording. Mr. Craft moved an amendment striking the words "voter intent" and substituting the language "the indication of the voter's choice" to avoid potential litigation. He noted that there is no way that you can get into the mind of the voter, meaning you can never win the argument as to whether or not you have captured the voter's intent. "What you can do with human factors, is make it easier for the voter to make their choice and, perhaps, allow them to get closer to the choices they make and the choices they intend to make."

An additional friendly amendment was offered by Mr. Harding to insert 1194, Section 508 after the acronym ADAAG.

A question was raised to Ms. Quesenbery whether this resolution as amended is intended to capture the initial voter's choice and also the verifiability of the captured process? Ms. Quesenbery responded that she believed yes.

The original amendment was clarified to replace “voter intent” both in the title of the resolution and wherever else the term appears in the text with “the indication of the voter's choice” and where grammatically appropriate, "for capturing indication of voter choice".

Hearing no further comment or question, the Chair asked Mr. Green to call the roll on the resolution as amended. The Resolution as amended reads:

Resolution # 4-05, Offered by: Ms. Quesenbery

Title: Human Factors and Privacy Requirements for Capturing Indication of a Voter’s Choice

The TGDC recognized the need for voting system requirements to include human factors and privacy requirements for capturing indication of a voter's choice based on current research. These requirements should be specified so that systems can be evaluated for meeting the requirements. Unclear specifications, such as “intuitive,” “unambiguous or meaningful” should be avoided. Further, performance-based standards are preferred over specific design standards because performance standards address the total effectiveness of the system more directly than do design standards and typically they are not technology specific. The TGDC directs NIST to:

1. **Create an outline of the human factors and privacy requirements related to capturing indication of a voter's choice,**
2. **Write draft human factors and privacy standards based on this outline by using existing requirements from the VSS2002, IEEE P1583 draft 5.3.2a, ADA Accessibility Guidelines (ADAAG), 36 CFR Part 1194 (section 508) and other relevant usability and accessibility guidelines and regulations,**
3. **Identify areas where further requirements development for capturing indication of a voter's choice is needed, noting when performance-based usability standards are possible, and**
4. **Write all requirements so that they are testable and the tests themselves can be conducted either by inspection by a person with reasonable knowledge of systems, user interface design, and accessibility or by performance-based usability tests with clear, repeatable protocols.**

Mr. Greene announced the result of the roll call vote. Resolution #4-05 was adopted as amended with a vote or 13 Yes and 1 Abstain (See Table 1.).

The Chair asked Ms. Quesenbery to propose one more resolution before the lunch break. Before reading proposed resolution # 5-05, Ms. Quesenbery offered a point of explanation. “The resolution has been broken up into a number of directives in order to stagger the work so the Committee can deliver parts in April (2005) and complete parts of it in later time frames. This has been an issue that has come up in all of the standard's work I have been associated with, and we have often concluded because it could not be finished fast, we should not begin it. This is an attempt to create a structure in which we can begin the work in an orderly process.”

Ms. Quesenbery read the resolution.

Resolution # 5-05, Offered by: Ms. Quesenbery

Title: Human Performance-Based Standards and Usability Testing

The TGDC has determined that voting systems requirements should be based, wherever possible, on human performance benchmarks for efficiency, accuracy or effectiveness, and voter confidence or satisfaction. This conclusion is based, in part, on the analysis in the NIST Report, *Improving the Usability and Accessibility of Voting Systems and Products* (NIST Special Publication 500-256). Performance requirements should be preferred over design requirements. They should focus on the performance of the interface or interaction, rather than on the implementation details. When it is not possible to specify performance requirements (whether because conformance tests cannot be formulated or because they would be too onerous to implement), testable, implementation-neutral design requirements should be used. Conformance tests for performance requirements should be based on human performance tests conducted with human voters as the test participants. The TGDC also recognizes that this is a new approach to the development of usability standards for voting systems and will require some research to develop the human performance benchmarks and the test protocols. Therefore, the TGDC directs NIST to:

1. **Create a road map for developing performance-based standards, based on the preliminary work done for drafting the standards described in Resolution # 4-05,**
2. **Develop human performance metrics for efficiency, accuracy, and voter satisfaction,**
3. **Develop the performance benchmarks based on human performance data gathered from measuring current state-of-the-art technology,**
4. **Develop a conformance test protocol for usability measurement of the benchmarks,**
5. **Validate the test protocol, and**
6. **Document test protocol and benchmarks so that an independent test laboratory can reproduce the testing.**

The motion was seconded for discussion. Ms. Quesenbery accepted a friendly amendment to change “has considered to “has concluded.”

Committee members asked Ms. Quesenbery for clarification on several points in the proposal including the time frame for the proposed tasks and which of any would be proposed for the 2006 recommendations to the EAC.

Ms. Quesenbery pointed out that the proposed tasks for NIST are broken up so that all of the tasks will not be in the April time frame. “I am not sure any of this will be done in the April time frame. That is my point. I think a road map could certainly be laid out. I think that as guidance where possible, we should be moving towards human performance benchmarks rather then design guidelines.”

Ms. Quesenbery went on to elaborate that the tasks for NIST will be prioritized appropriately. “I think, for instance, item number one- to create a road map so we know where we are going-is something that could be done in a short time frame. I hope the Chair would agree.”

Committee members raised questions concerning the process for comment by the election community and the public in general regarding the tasks in this and other proposals. The parliamentarian, Mr. Burkhardt, indicated that comments have and will be taken from the public during the process. They are posted on the public web site and are available for review by the TGDC and NIST staff.

A Committee member indicated that we could also be more proactive informing stakeholders such as Independent Testing Authorities (ITAs) that these tasks in the resolution are being undertaken. It was noted that a workshop for ITAs was held at NIST in August 2004.

Dr. Williams went on the record as supporting, this resolution with the understanding that this is very important future research that NIST is to do. “And that our expectation is that these items are properly written, are properly developed, and that reasonable research and verification of any theories takes place.” He further noted that the resolution indicates that we are going to get serious about usability research rather than just talking about it.

Another Committee member noted that at the end of this plenary session, we will have to prioritize the tasks assigned to NIST and decide which tasks are immediate and which tasks could be accomplished at a later time.

There being no further questions or comment, the Chair requested a roll call vote on Resolution #5-05 as amended. The Amended Resolution read:

Resolution # 5-05, Offered by: Ms. Quesenbery

Title: Human Performance-Based Standards and Usability Testing

The TGDC has concluded that voting systems requirements should be based, wherever possible, on human performance benchmarks for efficiency, accuracy, or effectiveness, and voter confidence or satisfaction. This conclusion is based, in part, on the analysis in the NIST Report, *Improving the Usability and Accessibility of Voting Systems and Products* (NIST Special Publication 500-256). Performance requirements should be preferred over design requirements. They should focus on the performance of the interface or interaction, rather than on the implementation details. When it is not possible to specify performance requirements (whether because conformance tests cannot be formulated or because they would be too onerous to implement), testable, implementation-neutral design requirements should be used. Conformance tests for performance requirements should be based on human performance tests conducted with human voters as the test participants. The TGDC also recognizes that this is a new approach to the development of usability standards for voting systems and will require some research to develop the human performance benchmarks and the test protocols. Therefore, the TGDC directs NIST to:

1. **Create a road map for developing performance-based standards, based on the preliminary work done for drafting the standards described in Resolution # 4-05,**
2. **Develop human performance metrics for efficiency, accuracy, and voter satisfaction,**
3. **Develop the performance benchmarks based on human performance data gathered from measuring current state-of-the-art technology,**
4. **Develop a conformance test protocol for usability measurement of the benchmarks,**
5. **Validate the test protocol, and**
6. **Document test protocol and benchmarks so that an independent test laboratory can reproduce the testing.**

Mr. Greene announced the result of the roll call vote. Resolution #5-05 was adopted as amended 13 Yes Votes, 0 No Votes, and 1 Abstain (See Table 1.). The Chair adjourned the meeting for a lunch break.

January 18, 2005: Afternoon Session # 1

The Chair called the meeting to order at 1:30 p.m. and opened the floor to Ms. Quesenbery to continue with her subcommittee's resolutions. Ms. Quesenbery announced a change in the order of the resolutions she would propose. She then offered Resolution #11-05 for discussion.

Resolution # 11-05, Offered by: Ms. Quesenbery

Title: **Availability of Voting Machines for Validating Benchmarks and Conformance Test Protocols**

The TGDC is aware that the definition and validation of human performance benchmarks and human performance test protocols as described in the NIST Report, *Improving the Usability and Accessibility of Voting Systems and Products* (Special Publication 500-256) *requires* testing on a set of typical, state-of-the-art voting machines. The TGDC directs NIST to work with the EAC to determine a means to acquire such voting machines and then make them available to enable NIST to perform the work described in Resolution #5-05.

The resolution was seconded and opened for discussion.

A Committee member indicated support for the resolution with the understanding that the voting machines be production models and not prototypes.

Mr. Berger asked the Chair if he could correct comments made earlier in the day. "Both Ms. Quesenbery and I referred to the IEEE as being industry standards. And, in fact, that's an inaccurate term. Under ANSI rules we are required to have all materially affected parties represented and we actually work very hard to make sure that the committees are valid. So I would like to amend my comments to reflect that the IEEE standards are consensus standards."

The Chair noted the comments and asked if there were any more comments.

Mr. Gannon requested of the resolution sponsor whether there was another alternative to having NIST doing the testing of voting machines. Ms. Quesenbery indicated that she did not believe so. "I think that if we agree to have NIST do the research to set benchmarks, then they have to have the machines to not only test their tests, but also to create the benchmarks. They have to have real machines to work on."

There being no further discussion, the Chair called for a roll call vote on Resolution # 11-05 as proposed. Mr. Greene announced that the Resolution was adopted with 13 voting Yes, 0 No and 1 Abstain. (See Table 1.).

Ms. Quesenbery then offered Resolution # 9-05 with two amendments. She read the resolution as amended.

Resolution #09-05 (As Amended), Offered by: Ms. Quesenbery

Title: General Voting System Human Factors and Privacy Considerations

Errors in the voting process are due to human error and the TGDC notes many examples from recent elections to support this statement. While requirements for capturing indication of a voter's choice is the primary area for human factors and privacy standards development, the TGDC recognizes that all proposed requirements that involve human interaction with the voting system should address any possible human factors and privacy implications. Therefore, the TGDC directs NIST to review all proposed requirements, assess which requirements involve user

interaction, and perform the evaluation or research needed to ensure that basic usability, accessibility, and privacy is maintained when these requirements are applied to a voting system.

The motion was seconded and opened for discussion.

Mr. Craft inquired whether the sponsor of the resolution was contemplating the election administrator's interaction with the system.

Ms. Quesenbery answered no. "We were simply contemplating while we are drafting sections that are specifically on human factors and privacy, that the NIST staff monitor other requirements and weigh in on human factors when necessary. My intent with this resolution was not to expand any scope of these requirements but simply to say that as the TGDC as a whole considers requirements, that we remain aware that there are human factors- that is usability and accessibility implications - that may not traditionally fall within the area."

There being no further discussion, the Chair called for a roll call vote. Resolution #9-05 was adopted by a vote of 13 Yes, 0 No, and 1 Abstain (See Table 1.).

Ms. Quesenbery then introduced Resolution #8-05 with minor amendments to reflect word changes adopted in previous resolutions. Ms. Quesenbery read the resolution as amended.

Resolution # 8-05, Offered by: Ms. Quesenbery

Title: Usability Guidance for Instructions, Ballot Design, and Error Messages

The TGDC has considered the issue of what is required to improve usability and reduce errors for capturing indication of a voter's choice. It has concluded that usability is a function of the machine used to vote as well as other characteristics of the voting system such as the instructions for voters and poll workers, ballot design, and machine error and help messages. Research and best practices in the areas of plain language design, form design, and usability are potentially relevant to such voting system characteristics. The TGDC directs NIST to research and draft guidelines and standards where possible to improve the usability of instructions, ballot design, and error and help messages. These guidelines should be combined with the standards described in Resolution # 4-05.

The motion was seconded and opened for discussion.

Mr. Harding offered a friendly amendment to be inclusive of alternative formats and to insert "all formats used" in the next to last sentence.

There being no further discussion, a roll call vote was requested for Resolution #8 as amended.

Resolution # 8-05 (As Amended), Offered by: Ms. Quesenbery

Title: Usability Guidance for Instructions, Ballot Design, and Error Messages

The TGDC has considered the issue of what is required to improve usability and reduce errors for capturing indication of a voter's choice. It has concluded that usability is a function of the machine used to vote as well as other characteristics of the voting system such as the instructions for voters and poll workers, ballot design, and machine error and help messages. Research and best practices in the areas of plain language design, form design, and usability are potentially relevant to such voting system characteristics. The TGDC directs NIST to research and draft guidelines and standards where possible to improve the usability of instructions, ballot design, and error and help messages in all formats used. These guidelines should be combined with the standards described in Resolution # 4-05.

Mr. Greene called the roll. Resolution # 8-05 as amended was adopted by a vote of 13 Yes, 0 No, 1 Abstain (See Table 1.).

Ms Quesenbery then offered Resolution # 10-05 without amendment.

Resolution # 10-05, Offered by: Ms. Quesenbery

Title: Usability of the Standards

The TGDC recognizes the importance of the usability of the voting systems standards. Independent testing laboratories, election officials, and vendors need to understand these standards and also understand how a system is tested for conformance to the standards in order to have confidence in voting systems that pass the conformance tests. Therefore, the voting system standards should be written in plain language understandable by both test experts and by voting officials who are not experts in human factors or design. The TGDC directs NIST to determine how to evaluate the standards for usability and then perform the evaluation on the standards.

Mr. Craft seconded the resolution in support.

Discussion included questions on whether the tasks in this resolution should be broken into short- and long-term goals.

Mr. Berger indicated his support for the resolution in principle. “But I think I agree with the impractical aspect. I had a little experience with this and what it requires is typically for engineers to do their best to get all the technical details right. Then someone comes in in a second phase to rewrite the whole thing so it reads smoothly. That has real-time and budget impacts. So, it's a great thing but I am not sure we have time to do it in this round.”

Two friendly amendments were offered to deal with the above issues. The term “to the extent possible” was added to the second to last sentence. The last sentence was deleted to make this resolution a statement of principle.

There being no further question, the Chair called for a roll call vote on Resolution #10-05 as amended. The resolution reads:

Resolution # 10-05 (As Amended), Offered by: Ms. Quesenbery

Title: Usability of the Standards

The TGDC recognizes the importance of the usability of the voting systems standards. Independent testing laboratories, election officials, and vendors need to understand these standards and also understand how a system is tested for conformance to the standards in order to have confidence in voting systems that pass the conformance tests. Therefore, to the extent possible, the voting system standards should be written in plain language, understandable by both test experts and by voting officials who are not experts in human factors or design.

Mr. Greene announced the adoption of Resolution #10-05 by a vote of 10 Yes, 2 No, 2 Abstain (See Table 1.).

Ms. Quesenbery then offered Resolution # 7-05 for discussion.

Resolution # 7-05, Offered by: Ms. Quesenbery

Title: Usability and Privacy at the Polling Place

The TGDC has examined the issue of what is required to ensure privacy and easy access at the polling place by voters. It has concluded that usability and privacy are functions of both the machine used to vote and the environment of the polling place. The TGDC directs NIST to research and draft usability and privacy guidance on the layout, setup, and administration of polling places. This guidance should be combined with the standards described in Resolution # 4-05.

The motion was seconded for discussion.

Mr. Craft suggested a simplification of the resolutions if we went back to resolution 3-05 and amended it to include usability and privacy. Ms. Quesenbery agreed and since we've already negotiated the words there, it would be a lot easier than starting that over.

The chair suggested that Mr. Craft work with subcommittee chair after this session to re-word the resolution and propose it at a later time.

Ms. Quesenbery agreed and withdrew Resolution # 7-05 from consideration for the time being.

Ms. Quesenbery introduced resolution # 6-05 for discussion.

Resolution # 6-05, Offered by: Ms. Quesenbery

Title: Universal Design Principles

The TGDC recognizes that there is a wide range of voter abilities and that voting machines need to be designed to be usable across this wide range. The voting population is typically viewed as primarily including people who do not have a disability. However, this population includes large numbers of people who do not consider themselves "disabled", but who do have reading and language problems, vision problems not considered blindness, issues with aging, etc. The TGDC is aware that there is an existing research and engineering practice called "universal design" and "universal usability" and has concluded that this merits further investigation. The TGDC directs NIST to:

1. **Assess what universal design principles are relevant to voting systems,**
2. **Determine how these can be used as requirements or guidelines, and**
3. **Develop a plan for creating recommendations and writing standards and guidelines for universal design in voting systems.**

The motion was seconded for discussion.

Committee members expressed considerable concern over the meaning of the term "universal design" and, in general, the wording of the resolution. The resolution sponsor indicated a willingness to withdraw the motion until the Access Board had a chance to provide input into the resolution's language. Ms. Quesenbery withdrew her motion.

The Chair then asked the Security and Transparency Subcommittee Chair, Dr. Rivest, to introduce his resolutions.

A point of order was raised concerning Resolutions #12-05 and #13-05. Some Committee members requested that both resolutions be discussed together since there had not been sufficient opportunity to review these resolutions and they appeared to be related. Dr. Rivest indicated that he planned to provide a quick summary of his subcommittee's resolutions up front. He also agreed to discuss Resolutions #12-05 and #13-05 together.

Dr. Rivest thanked his Security and Transparency subcommittee members for their hard work. "Security issues are pervasive. And the basic premise is that we want votes to be cast privately as intended and counted publicly as cast. The situations are adversarial. We had lots of excellent public testimony at the September hearings, excellent discussion on these topics from experts in the field and we appreciated that. One of the main things to notice about the security area is that there are tradeoffs involved. As you restrict the

design one way, you may restrict the efficiency of the usability of the system as well as the cost of the voting system. So, security resolutions tend to put restrictions on what developers do or what voters need to do. We're in the field of tradeoffs. As a result, lots of hard policy questions need to be made about how to trade off risk and security versus other aspects of the voting system. You never get a perfectly secure system, of course, only degrees of insurance. If you want to have system security there is added cost, which is often a good guideline. But, there are varieties of risks that need to be dealt with. Some are minor. The risk that a voter could unplug the voting machine could affect, at worst, a few votes. On the other hand, if somebody engineered a major rewriting of software in a central place, then you might have a large effect on the integrity of the election. Obviously, there are degrees of risk that we need to compare with other aspects of running an election."

"There are also tradeoffs with writing standards. Certain kinds of risks are more difficult to deal with and to write standards for. Others situations are much easier to deal with. So this subcommittee takes up to the TGDC for consideration here some of the major policy questions that we face in the area of security recommendations. These are not simple questions. I expect lively debate and discussion on these items. There are tradeoffs we need to make for economy. These are not. They are all hard questions. We need to discuss how we want to evaluate them and come up with recommendations for the country on these issues."

A Committee member noted a discrepancy in the numbering of the Security Subcommittee's resolutions in the workbook. After discussion, it was decided to renumber the wireless resolution currently #14-05 to be #34-05. The parliamentarian indicated that the resolution numbering errors would be fixed before the next day's session and new handouts provided at that time.

Dr. Rivest summarized each of his proposed resolutions. He indicated that there might not be sufficient time to discuss all of them. There was much discussion of security experts and verifiable paper audit trails.

The Chair noted that if the reference was to security experts at NIST, that NIST is not promoting one solution over another. NIST's philosophy is that the decisions are really up to the election officials to make, and NIST provides guidance to them depending on which road they may be taking."

Dr. Schutzer indicated that Congress had clearly left up to the states the decision on whether to adopt voter verifiable paper ballots and in addition left up to the states the definition of what a voter verified paper ballot is.

Dr. Williams said for the record that there is no agreement among computer scientists and security experts on what a secure voting system is. "There is a set of very vocal computer science tests/security experts that claim there is no such thing as a secure voting system. But there is an equal or greater number that believes that there is."

Further discussion continued on validating the security of voting systems, security tradeoffs, related security and accessibility issues as well as wireless technology. After an hour of discussion, the Chair cut off the remarks and called for a fifteen-minute break, after which Dr. Rivest will propose the specific resolutions he has summarized for the Committee.

January 18, 2005: Afternoon Session # 2

The Chair called the meeting back to order. Dr. Rivest thanked the Chair for allowing the time for an open-ended discussion of these proposed security resolutions. Dr. Rivest then proposed offering Resolution #13-05.

Resolution #13- 05, Offered by Dr. Rivest

Title: Voter Verifiability II

The TGDC has considered the various means by which a voting system allows a voter to verify that his or her vote was captured as the voter intended. All voting systems must provide such means, by HAVA 2002 section 301(a)(1)(A)(i).

Such voter verification means can be categorized as either "direct," as with op-scan or a machine-generated paper ballot, where the voter can directly examine the representation of his ballot, or "indirect," as with many touch-screen DRE machines, where the voter can only verify his or her ballot through the assistance of intervening hardware and/or software. (For the purpose of this resolution, a voting system accessible by disabled voters will be said to have direct verification if a disabled voter could in principle verify his or her ballot through the use of some human proxy. This is for purposes of definition only, and verification procedures for disabled voters may be subject to additional requirements.)

Some voting systems create more than one representation of the voter's ballot, such as an electronic representation and also a paper representation. One representation might be intended for the initial count, and the other might be intended for a recount as necessary.

In such cases, the TGDC interprets the HAVA language to require that voter verification must apply to the representation (to be called here the "fundamental representation") that is used for the initial vote tabulation.

HAVA, in SEC 301(a)(2) on "audit capacity," requires that a voting system provide a "permanent paper record with manual audit capacity," and require that "the voting system shall provide the voter with the opportunity to change the ballot or correct any error before the permanent paper record is produced." Furthermore, such paper record "shall be available for any recount."

The TGDC has concluded that for the integrity and consistency of election results

that it is important that the permanent paper record required by HAVA be directly verified by the voter, and that any electronic record or other additional record produced be consistent with the paper record.

It is permissible with this requirement, for example, for a touch-screen system to capture the voter's intent, and to have the voter (indirectly) confirm that his intent was properly captured (using a final confirmation screen), as long as the voter is (either simultaneously or later) asked to confirm that the paper record is also correct.

The TGDC has concluded that ensuring consistency between the HAVA-required paper records and any additional or derivative electronic records produced is extremely difficult to guarantee by a priori design review or machine testing, and that statistical methods of comparison should play a more important role.

The TGDC therefore requests NIST to perform research and develop standards documents that:

1. **clarifies the definition of "direct verification" as necessary,**
2. **requires that voting systems request voters to directly verify the (HAVA-required) paper record of their vote (each voter should be asked to confirm that he approves the paper record, and if he does not, appropriate procedures need to be invoked to produce a new paper record with revised choices for voter approval as the permanent paper record of his vote),**
3. **reviews and compares statistical methods (and any other methods not depending on the correctness and integrity of the voting system) for confirming that any additional or derivative records produced in an election are consistent with the HAVA-required permanent paper records produced,**
4. **reviews methods of verification usable by disabled voters and makes recommendations,**
5. **gives a reasonably detailed proposal for a research and monitoring program to assess how well direct verification (as required above) works in actual elections, especially when used with electronic voting systems, and**
6. **gives a reasonably detailed proposal for research to identify (if possible) voting systems architectures that are outside what is permitted above, but which are capable of providing nonetheless comparable degrees of security, and to provide preliminary initial assessments of these architectures in terms of cost, usability, and difficulty of security evaluation and assurance.**

Mr. Harding asked as a point of order whether Resolution # 13-05 was within the scope of the TGDC's mandate. The parliamentarian advised that it was within the scope of the TGDC to discuss Resolution #13-05.

Based on advise of counsel, the Chair declared Resolution # 13-05 within scope of the TGDC to discuss.

The motion was seconded.

An amendment was offered to strike paragraphs 4,5, and suggesting they be brought up under a separate motion. Significant discussion ensued on the definition of a paper trail record. A second amendment recommended striking the last two paragraphs before "The TGDC therefore requests NIST…" The sponsor accepted both amendments as friendly.

A move was made to call the vote on Resolution # 13-05 as amended.

Resolution #13- 05 (As Amended), Offered by Dr. Rivest

Title: Voter Verifiability II

The TGDC has considered the various means by which a voting system allows a voter to verify that his or her vote was captured as the voter intended. All voting systems must provide such means, by HAVA 2002 section 301(a)(1)(A)(i).

Such voter verification means can be categorized as either "direct," as with op-scan or a machine-generated paper ballot, where the voter can directly examine the representation of his ballot, or "indirect," as with many touch-screen DRE machines, where the voter can only verify his or her ballot through the assistance of intervening hardware and/or software. (For the purpose of this resolution, a voting system accessible by disabled voters will be said to have direct verification if a disabled voter could in principle verify his or her ballot through the use of some human proxy. This is for purposes of definition only, and verification procedures for disabled voters may be subject to additional requirements.)

Some voting systems create more than one representation of the voter's ballot, such as an electronic representation and also a paper representation. One representation might be intended for the initial count, and the other might be intended for a recount as necessary.

In such cases, the TGDC interprets the HAVA language to require that voter verification must apply to the representation (to be called here the "fundamental representation") that is used for the initial vote tabulation.

HAVA, in SEC 301(a)(2) on "audit capacity," requires that a voting system provide a "permanent paper record with manual audit capacity," and require that "the voting system shall provide the voter with the opportunity to change the ballot or correct any error before the permanent paper record is produced." Furthermore, such paper record "shall be available for any recount."

The TGDC has concluded that for the integrity and consistency of election results

that it is important that the permanent paper record required by HAVA be directly verified by the voter, and that any electronic record or other additional record produced be consistent with the paper record.

The TGDC therefore requests NIST to perform research and develop standards documents that:

1. **Clarifies the definition of "direct verification" as necessary,**
2. **Requires that voting systems request voters to directly verify the (HAVA-required) paper record of their vote (each voter should be asked to confirm that he approves the paper record, and if he does not, appropriate procedures need to be invoked to produce a new paper record with revised choices for voter approval as the permanent paper record of his vote),**
3. **Reviews and compares statistical methods (and any other methods not depending on the correctness and integrity of the voting system) for confirming that any additional or derivative records produced in an election are consistent with the HAVA-required permanent paper records produced,**

The Chair requested Mr. Greene to take a roll call vote on Resolution # 13-05. Resolution # 13-05 was defeated by vote of 1 Yes, 9 No, and 3 Abstain (See Table 1.).

Dr. Rivest then offered Resolution # 12-05 for discussion.

Resolution #12- 05, Offered by Dr. Rivest

Title: Voter Verifiability I

The TGDC has considered the various means by which a voting system allows a voter to verify that his or her vote was captured as the voter intended. All voting systems must provide such means, as stated in HAVA 2002 section 301(a)(1)(A)(i). Such voter verification means can be categorized as either "direct," as with optical scan or a machine-generated paper ballot, where the voter can directly examine the representation of his ballot, or "indirect," as with many touch-screen Direct Recording Electronic-- DRE machines, where the voter can only verify the "fundamental representation" of his ballot through the assistance of intervening hardware and/or software.

For voting systems that create more than one representation of the voter's ballot (such as one electronic and one on paper), the TGDC interprets the HAVA language to require that such voter verification must apply to the representation (to be called here the "fundamental representation") that is used for the initial vote tabulation.

The TGDC therefore finds it useful to divide voting systems into two categories: those (class DV) where each voter is presented a fundamental representation of his ballot that the voter may directly verify, and those (class IV) not in class DV. For this definition, a voting system accessible by disabled voters is considered to be in

class DV if a disabled voter could in principle verify the fundamental representation of his ballot through the use of some human proxy.

The TGDC has concluded that voting systems in class IV must be held to significantly higher security requirements, including stronger constraints on voting system development, greater requirements for system documentation, and more stringent testing, to mitigate the additional risks associated with class IV voting systems.

The TGDC therefore requests that NIST perform research and develop standards documents that:

1. **Clarifies the distinction between class DV and class IV voting systems as may be necessary,**
2. **Elaborates and defines security requirements to be satisfied by DV voting systems, and**
3. **Elaborates and defines the additional requirements to be satisfied by class IV voting systems.**

The motion was seconded for discussion and various friendly amendments were offered including substituting “indication of the voter's choice” for “voter’s intent”; deleting “stronger,” “greater,” and “more stringent” in paragraph 4, and substituting the word “different”; reword the NIST tasks 1., 2., and 3. The amendments were accepted by the sponsor.

A discussion ensued on further defining direct and indirection verification.

Hearing no further comment or questions, the Chair called the vote on Resolution #12-05 as amended.

Resolution #12- 05 (As Amended), Offered by: Dr. Rivest

Title: Voter Verifiability I

The TGDC has considered the various means by which a voting system allows a voter to verify that his or her vote was captured as the indication of the voter's choice. All voting systems must provide such means, as stated in HAVA 2002 section 301(a)(1)(A)(i). Such voter verification means can be categorized as either "direct,” as with optical scan or a machine-generated paper ballot, where the voter can directly examine the representation of his ballot, or "indirect,” as with many touch-screen Direct Recording Electronic-- DRE machines, where the voter can only verify the “fundamental representation” of his ballot through the assistance of intervening hardware and/or software.

For voting systems that create more than one representation of the voter's ballot (such as one electronic and one on paper), the TGDC interprets the HAVA language

to require that such voter verification must apply to the representation (to be called here the "fundamental representation") that is used for the initial vote tabulation.

The TGDC therefore finds it useful to divide voting systems into two categories: those (class DV) where each voter is presented a fundamental representation of his ballot that the voter may directly verify, and those (class IV) not in class DV. The TGDC has concluded that voting systems in class IV or DV must be held to significantly different security requirements, including different constraints on voting system development, different requirements for system documentation, and different testing to mitigate the different risks associated with each type of voting system.

The TGDC therefore requests that NIST perform research and develop standards documents that:

1. **Clarifies the distinction between class DV and class IV voting systems as may be necessary,**
2. **Elaborates and defines the different requirements to be satisfied by class DV and IV voting systems, and**
4. **Reviews methods of verification accessible by voters with disabilities.**

Mr. Greene called the roll. Resolution #12-05 passed as amended 11 Yes, 1 No, 1 Abstain (See Table 1.).

Dr. Rivest then offered Resolution # 14-05 for discussion.

Resolution # 14-05, Offered by Dr. Rivest

Title: Commercial Off-The-Shelf Software ("COTS Software")

The TGDC has considered the advisability of using Commercial Off-The-Shelf Software ("COTS Software") within voting systems, from a security perspective. It has concluded that, generally speaking, the use of COTS software introduces excessive and unnecessary risk and should be avoided, while specific well-motivated exceptions to this rule may be required upon occasion. The TGDC directs NIST to research and draft standards documents requiring:

1. **That the use of COTS software within voting systems is not allowed unless it meets specific exceptional conditions, and**
2. **That the criteria for exceptions (to be drafted by NIST) generally prohibit:**
    - **(a) COTS software for which the source code is not available for examination and compilation, and**
    - **(b) COTS software lacking sufficient documentation for reasonable evaluation of its security but that COTS software may be allowed if,**
        - **i. it has available source code and sufficient documentation, and passes an appropriate security evaluation, or if**

ii. **its usage in the voting system is such that any output errors caused by corruption of this COTS software are either such that they could in no way compromise any voting system requirements, or such that they are being subject to being caught in an immediately following independent voter verification step, or if**

iii. **(in an extreme case) there is absolutely no alternative, no vulnerabilities are known to exist in this software, the software has been in extensive use in other applications, and an acceptable argument can be made that none of the voting system requirements will be jeopardized by the use of this software.**

The TGDC requests NIST to suggest variations on the above policy, if any, which increase flexibility without sacrificing security.

The motion was seconded for discussion.

Dr. Rivest noted that this resolution was also a difficult issue. "Basically when the voting system is developed, it incorporates software written by the vendor itself, but may also include software images and other components available commercially or otherwise. From a security viewpoint, vulnerability may be introduced with the incorporation of such software that was not written by the vendor and is not available for review by the testing laboratories. This resolution intends to address that."

Discussion ensued on requiring voter vendors to go outside the scope of their expertise with the wording of this resolution as well as the use and meaning of COTS software relative to voting systems. Committee members brought up the issue of non-malicious intent as well as source code availability. "Prior art" with respect to other uses of software also came up for discussion.

An amendment and clarification to the amendment were offered. The sponsor considered these friendly amendments.

Hearing no other questions, the Chair called for a roll call vote.

The Resolution as amended was read to the Committee.

Resolution # 14-05 (As Amended) , Offered by: Dr. Rivest

Title: Commercial Off-The-Shelf Software ("COTS Software")

The TGDC has considered the advisability of using Commercial Off-The-Shelf Software ("COTS Software") within voting systems, from a security perspective. It has concluded that, generally speaking, the use of COTS software introduces excessive and unnecessary risk and should be avoided, while specific well-motivated

exceptions to this rule may be required upon occasion. The TGDC directs NIST to research and draft standards documents requiring:

1. **That the use of COTS software within voting systems is not allowed unless it meets specific exceptional conditions, and**
2. **That the criteria for exceptions shall be drafted by NIST.**

Mr. Greene indicated that Resolution # 14-05 was adopted as amended by a vote of 11 Yes, 0 No, and 2 Abstain (See Table 1.).

The Chair then adjourned the meeting until 9 a.m. on January 19, 2005.

January 19, 2005: Morning Session # 1

The Chair called the meeting to order at 9 a.m. on January 19, 2005.

After the pledge of allegiance, Dr. Semerjian requested that Mr. Burkhardt determine if a quorum was in attendance. Mr. Greene called the roll. With 14 TGDC members answering "Aye," the parliamentarian notified the Chair that a quorum was present.

At this time the Chair noted that the latest revised version of the rules of order was adopted at our July 9, 2004, meeting to cover the technical guidelines committee and subcommittee proceedings.

The Chair noted that yesterday, we started with resolutions put forth by the Human Factors and Privacy subcommittee. Then we moved on to Security and Transparency Subcommittee resolutions. However, there were a couple of Human Factors resolutions that were to be modified. The Chair asked Ms. Quesenbery to walk through the changes.

Ms. Quesenbery offered new language for Resolution #3-05 that is inclusive of the recommendations in Resolution # 7-05 as suggested by Committee Members yesterday. Ms. Quesenbery offered the new resolution for discussion.

Resolution #03-05 (As Modified), Offered by: Ms. Quesenbery

Title: Human Factors and Privacy of Voting Systems at the Polling Place

The TGDC has considered the issue of what is required to ensure both access to the voting system by voters with disabilities, and usability and privacy for all voters. It has concluded that usability, accessibility, and privacy are functions of both the system used to vote and the environment of the polling place. The TGDC directs NIST to research and draft guidance on the deployment and configuration of systems in the polling place to ensure usability, accessibility, and privacy. These guidelines should be combined with the accessibility standards described in Resolution #02-05 or the standards described in Resolution #04-05.

There being no discussion, the roll was called. Resolution #3-05 as modified was adopted by a vote of 13 Yes, 0 No, and 1 Abstain (See Table 1.).

Ms. Quesenbery than offered a re-draft of Resolution # 6-05 as a result of recommendations from the previous session. Ms. Quesenbery read the resolution.

Resolution #06-05, Offered by: Ms. Quesenbery

Title: Accommodating a Wide Range of Human Abilities

The TGDC recognizes that there is a wide range of human abilities. The voting population includes not only people with specifically identified disabilities but also the aging population, language minorities, and people with other special needs. A goal of voting system standards should be to accommodate, as much as possible, this wide range of abilities to ensure the greatest usability and accessibility of those systems. This approach is sometimes called "universal design" or "universal usability." In drafting standards, the TGDC directs NIST to:

1. **Consider what accommodations to voter abilities can be included in the standards for all voting systems, using currently available technology, and**
2. **Develop principles for "universal design" based on existing best practices and other guidelines or standards such as 36 CFR 1194 (Section 508), to guide future standards development to aid in updating the voting system standards.**

There being no questions or discussion, Dr. Semerjian called for a roll call vote. Mr. Greene reported that Resolution # 6-05 was adopted as read by a vote of 13 Yes, 0 No, 1 Abstain (See Table 1.).

In a response to a Committee member's question, the Chair noted that Resolution # 7-05 had been withdrawn and no further action was needed.

Dr. Semerjian opened the floor to Dr. Rivest to continue with resolutions from the Security and Transparency Subcommittee.

Dr. Rivest proposed Resolution #16-05, which deals with setup validation issues.

Resolution # 16-05, Offered by Dr. Rivest

Title: Setup Validation

The TGDC has considered the issue of electronic voting machine setup validation, and has concluded that current standards and practice need substantial improvement in this regard. A setup validation method ensures that a voting system contains the authorized software, contains no unauthorized software, and is in the proper initial state. The TGDC requests NIST to do research and develop standards:

1. **That specify the characteristics of acceptable setup validation methods (such as, for example, that the setup validation method may not modify the state of the system nor require the execution of any software on the system), and**
2. **That requires each voting system submission to specify an acceptable setup validation method.**

The motion was seconded and the floor was opened for debate.

Mr. Williams noted that one of the risks that is being covered in this resolution is the risk that the vendor may have, either, accidentally, or not, supplied faulty software. "So, the point is to be able to trust the set up of the system without trusting the software on the system currently."

A friendly amendment was made to add the word "currently" after the word software. The sponsor accepted the amendment.

Hearing no other questions, the Chair called for a roll call vote on Resolution #16-05 as amended.

Resolution # 16-05 (As Amended), Offered by: Dr. Rivest

Title: Setup Validation

The TGDC has considered the issue of electronic voting machine setup validation and has concluded that current standards and practice need substantial improvement in this regard. A setup validation method ensures that a voting system contains the authorized software, contains no unauthorized software, and is in the proper initial state. The TGDC requests NIST to do research and develop standards:

1. **That specify the characteristics of acceptable setup validation methods (such as, for example, that the setup validation method may not modify the state of the system nor require the execution of any software currently on the system), and**
2. **That require each voting system submission to specify an acceptable setup validation method.**

Mr. Greene called the roll. Resolution #16-05 passed as amended 12 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Rivest then offered resolution #17-05 for consideration.

Resolution # 17-05, Offered by Dr. Rivest

Title: Testing

The TGDC has concluded that voting systems must be subject, in general, to the same tests used for systems of critical importance in the US Federal government. Accordingly, these tests must include a "penetration analysis" of the voting system. Methods for system exploitation change as new software is introduced or as new vulnerabilities are found. Therefore, the penetration analysis must rely on techniques that shall evolve over time.

The TGDC directs NIST to research and draft standards documents requiring testing of voting systems that includes a significant amount of open-ended research for vulnerabilities by an analysis team supplied with complete source code and system documentation and operational voting system hardware. The vulnerabilities sought should not exclude those involving collusion between multiple parties (including vendor insiders) and should not exclude those involving adversaries with significant financial and technical resources.

The motion was seconded. An amendment was offered to strike the first paragraph.

Dr. Williams made the following comments on the resolution. “So far, the standards have directed themselves towards the vendor that produced the system and the independent testing authority that inspects the system for conformance with the standards. If the standards call out a third party, such as an analysis team, we need to define who the analysis team is. That immediately raises such questions as, who pays for it? Who owns the output? This brings in a whole new level of complexity into the standards and qualification process. I think if you want to specifically charge NIST with looking at the issues and practices of voting systems security as those apply to voting systems design, I will support that. But i think this amendment tends to make an assertion about the committee's conclusion.”

Mr. Berger offered the following comments. “Well, I strongly support the concept of rigorous system level testing. I would like to raise an issue that this has implications and is a very difficult issue. That is how changes are handled and what level of testing is required. The issue, of course, is there is a wide range of changes and if the testing required introducing changes is too onerous you can hold off on the changes that are absolutely positive for the system. Typically, this is done through some sort of change review. I think at some point we need to address how we will address that issue.”

Dr. Rivest agreed with Mr. Berger’s comments. Mr. Craft offered a friendly amendment to strike the first paragraph.

Hearing no other questions, the Chair called for a roll call vote on Resolution #17-05 as amended.

Resolution # 17-05 (As Amended), Offered by: Dr. Rivest

Title: Testing

The TGDC directs NIST to research and draft standards documents requiring testing of voting systems that includes a significant amount of open-ended research for vulnerabilities by an analysis team supplied with complete source code and system documentation and operational voting system hardware. The vulnerabilities sought should not exclude those involving collusion between multiple parties (including vendor insiders) and should not exclude those involving adversaries with significant financial and technical resources.

Mr. Greene called the roll. Resolution #17-05 passed as amended 13 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Rivest then offered Resolution # 18-05.

Resolution # 18-05, Offered by Dr. Rivest

Title: Documentation

The TGDC has concluded that it is critical to the security of voting systems that they be documented thoroughly according to a well-specified set of documentation criteria. Proper documentation is an important and essential part of the input for security evaluation. Voting systems that are not well documented may also be typically less secure in that poor specification of features and operation can facilitate incorrect operation and improper responses to error conditions and other unexpected events.

This documentation should address all areas of voting system design, architecture, features, controls, and operational modes, and also include recommended management and maintenance procedures. The documentation should specify exactly the operational context of the voting system and all assumptions made affecting the system and how it is operated. It should include all security requirements for operation of the system, including manual, non-computerized procedures. Particular attention should be paid to processes and procedures that reduce security vulnerabilities throughout the entire voting preparation, balloting, counting and audit phases.

The documentation requirements should be similar to those requirements in Federal Standards related to documentation of security-related protections and procedures. The TGDC directs NIST to research and draft standards documents requiring voting system documentation, to include such items as:

1. **Voting system design information including source code and discussion of built-in or procedural protections from NIST Special Publication 800-53 such as for:**
    - **(a) system and information integrity,**
    - **(b) identification and authentication**

(c) access control,
(d) audit and accountability, and
(e) system and communications protection.

2. **Specifications of compatible software or equipment (i.e., operating systems, utilities),**
3. **Evaluation-related documentation including:**
   (a) risk assessment information,
   (b) results of certification, accreditation, and security assessments,
   (c) contingency planning recommendations.
4. **Operational procedures including:**
   (a) modes and procedures for each mode,
   (b) maintenance procedures,
   (c) media protection and media loading procedures, and
   (d) recount procedures
5. **Awareness and training recommendations,**
6. **Incident response procedures, and**
7. **Other information deemed relevant to a security evaluation of the proposed voting system.**

The issues of [a] redundant representations of ballots created by the voting system and [b] how recounts of these ballots are to be handled are particularly important. Voting systems that store redundant representations of a cast vote must include, as part of their specification, a detailed description of how such representations may be used in counting votes and recounting votes. The description must also specify what procedures, if any, may (or must) be used to detect discrepancies between the various representations, and how such discrepancies may be resolved.

The motion was seconded for discussion.

Mr. Elekes offered the following comment. “This may be a small point, but because I am a member of an election team here in new jersey and totally blind, will the documentation be afforded an alternative format by those members of the voting teams on the state level or on any level, that may have either a physical or sensory disability? This resolution does not address that point and this resolution specified documentation is to be submitted describing the voting system that is to be evaluated. I'm not sure what the standards are for that.”

Discussion followed on this issue and the provision of documentation in machine readable and alternative formats. Mr. Berger indicated that the alternative formats usually include accessible html.

Mr. Elekes responded. “Mr. Berger's comment hits the nail on the head as far as the information I am seeking. If it is in accessible html with adequate narrative for any illustrations, that would, almost, eliminate any road blocks to blind individuals that have to access the documentation.”

An amendment was offered to strike the first sentence of the last paragraph. The sponsor accepted this amendment.

Hearing no other questions, the Chair called for a roll call vote on Resolution #18-05 as amended.

Resolution # 18-05(As Amended), Offered by: Dr. Rivest

Title: Documentation

The TGDC has concluded that it is critical to the security of voting systems that they be documented thoroughly according to a well-specified set of documentation criteria. Proper documentation is an important and essential part of the input for security evaluation. Voting systems that are not well documented may also be less secure in that poor specification of features and operation can facilitate incorrect operation and improper responses to error conditions and other unexpected events.

This documentation should address all areas of voting system design, architecture, features, controls, and operational modes, and also include recommended management and maintenance procedures. The documentation should specify exactly the operational context of the voting system and all assumptions made affecting the system and how it is operated. It should include all security requirements for operation of the system, including manual, noncomputerized procedures. Particular attention should be paid to processes and procedures that reduce security vulnerabilities throughout the entire voting preparation, balloting, counting, and audit phases.

The TGDC directs NIST to research and draft standards documents requiring voting system documentation, to include but not be limited to such items as:

1. **Voting system design information including source code and discussion of built-in or procedural protections from NIST Special Publication 800-53 such as for:**
    - **(a) System and information integrity,**
    - **(b) Identification and authentication,**
    - **(c) Access control,**
    - **(d) Audit and accountability, and**
    - **(e) System and communications protection.**
2. **Specifications of compatible software or equipment (i.e., operating systems, utilities),**
3. **Evaluation-related documentation including:**
    - **(a) Risk assessment information,**
    - **(b) Results of certification, accreditation, and security assessments, and**
    - **(c) Contingency planning recommendations.**
4. **Operational procedures including:**

(a) Modes and procedures for each mode,
(b) Maintenance procedures,
(c) Media protection and media loading procedures, and
(d) Recount procedures.

5. **Awareness and training recommendations,**
6. **Incident response procedures, and**
7. **Other information deemed relevant to a security evaluation of the proposed voting system.**

The issues of [a] redundant representations of ballots created by the voting system and [b] how recounts of these ballots are to be handled are particularly important. Voting systems that store redundant representations of a cast vote must include, as part of their specification, a detailed description of how such representations may be used in counting votes and recounting votes. The description must also specify what procedures, if any, may (or must) be used to detect discrepancies between the various representations, and how such discrepancies may be resolved.

Mr. Greene called the roll. Resolution #18-05 passed as amended 12 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Rivest then offered Resolution # 22-05.

Resolution # 22-05, Offered by Dr. Rivest

Title: Federal Standards

Voting systems, while specialized in their purpose, often have many aspects in common with general information technology (IT) systems. Guidelines, standards, and testing programs have been developed for U.S. Government civilian IT systems, including the Crypto Module Validation Program (CMVP) for analysis and testing of cryptographic software, and the National Voluntary Laboratory Assessment Program (NVLAP) for certification of testing laboratories. NIST is currently creating an information security standard (mandated by the Federal Information Security Management Act, specifically, *Recommended Security Controls for Federal Information Systems,* NIST Special Publication 800-53) affecting all federal government systems. This standard specifies the inclusion and proper use of security-related protections affecting many areas of IT system design and development, management, testing, and operations -- all of which have relevance to voting systems. This and other similar efforts by the U.S. Government have the benefits of having been developed in a public process and having had successful track records with industry.

The TGDC therefore requests that NIST examine existing federal guidelines, standards, and testing programs for security in general information technology systems for their relevance and applicability in standards to voting systems, and to

draft standards documents that follow such prior guidelines, standards, and programs when possible and where appropriate.

The motion was seconded for discussion. "This was a resolution that was intended to encourage us to follow federal standards where appropriate."

Mr. Berger offered an amendment to include the phrase "typically utilizing ANSI approved and other voluntary consensus standards" in the first paragraph and "ANSI approved and other voluntary consensus standards" in the second paragraph. Other friendly amendments included deleting the words "certification" and "assessment" in the first paragraph.

Hearing no other questions, the Chair called for a roll call vote on Resolution #22-05 as amended.

Resolution # 22-05(As Amended), Offered by: Dr. Rivest

Title: Federal Standards

Voting systems, while specialized in their purpose, often have many aspects in common with general information technology (IT) systems. Guidelines, standards, and testing programs have been developed for U.S. Government civilian IT systems, typically utilizing ANSI-approved and other voluntary consensus standards, including the Cryptographic Module Validation Program (CMVP) for analysis and testing of cryptographic modules and software, and the National Voluntary Laboratory Accreditation Program (NVLAP) for accreditation of testing laboratories. NIST is currently creating an information security standard (mandated by the Federal Information Security Management Act, specifically, *Recommended Security Controls for Federal Information Systems*, NIST Special Publication 800-53) affecting all federal government systems. This standard specifies the inclusion and proper use of security-related protections affecting many areas of IT system design and development, management, testing, and operations -- all of which have relevance to voting systems. This and other similar efforts by the U.S. Government have the benefits of having been developed in a public process and having had successful track records with industry.

The TGDC therefore requests that NIST examine existing federal guidelines, standards, and testing programs, and ANSI-approved and other voluntary consensus standards for security in general information technology systems for their relevance and applicability in standards to voting systems, and to draft standards documents that follow such prior guidelines, standards, and programs when possible and where appropriate.

Mr. Greene called the roll. Resolution #22-05 passed as amended 13 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Rivest then offered Resolution # 21-05. “The high level intent here is to have some work by NIST on a situation commonly occurring with electronic voting systems where a single ballot is represented multiple times.”

Resolution # 21-05, Offered by Dr. Rivest

Title: Multiple Representations of Ballots

The Help America Vote Act of 2002, section 15481, subdivision (a)(2)(B), requires that any voting system used in an election for Federal office must produce a paper record of the vote cast by each voter and that this record shall be available as an official record for any recount.

Voting systems may create one or more electronic representations of ballots, in addition to the paper record required for recount. For example, three redundant electronic copies may be made, for reliability purposes. As another example, the scanning of an op-scan ballot may create another, electronic, representation of the ballot. A number of issues are related to the use of multiple representations (both electronic and paper) that are in some case relatively new and not completely identified or understood, and in other cases need uniform terminology and procedures. These issues include:

1. **Detecting disagreements between the representations,**
2. **Handling disagreements between the representations,**
3. **Converting between representations, and ensuring that ballots are not multiply converted and counted,**
4. **Use of multiple representations in fraud analysis,**
5. **Authenticity of the representations,**
6. **Marking of ballot representations with unique identifiers, (if and when possible to do so while preserving voter privacy), and**
7. **Conversion to/from standard formats.**

The TGDC has concluded that further research is advisable in identifying potential problems associated with voting systems that use multiple representations of ballots, and in identifying best approaches for handling such problems. The TGDC thus requests that NIST perform such research and draft standards documents that reflect NIST's determination of the best practices and best approaches for handling these problems.

The motion was seconded for discussion. Dr. Rivest agreed to strike the first paragraph at the outset. Considerable discussion ensued as to whether HAVA mandates a paper record for an election recount. Several amendments dealt with these concerns. The sponsor agreed to change the wording of the first sentence to read “any paper record produced”. In addition issue 1 was reworded to read “Preventing, detecting, and handling disagreements between the representations, in the rare event that they should occur”.

Hearing no other questions, the Chair called for a roll call vote on Resolution #21-05 as amended.

Resolution # 21-05(As Amended), Offered by: Dr. Rivest

Title: Multiple Representations of Ballots

Voting systems may create one or more electronic representations of ballots in addition to any paper record produced. For example, three redundant electronic copies may be made, for reliability purposes. As another example, the scanning of an op-scan ballot may create another, electronic, representation of the ballot. A number of issues are related to the use of multiple representations (both electronic and paper) that are in some cases relatively new and not completely identified or understood, and in other cases need uniform terminology and procedures. These issues include:

1. **Preventing, detecting, and handling disagreements between the representations, in the rare event that they should occur,**
2. **Converting between representations, and ensuring that ballots are not multiply converted and counted,**
3. **Use of multiple representations in fraud analysis,**
4. **Authenticity of the representations,**
5. **Marking of ballot representations with unique identifiers, (if and when possible to do so while preserving voter privacy), and**
6. **Conversion to/from standard formats.**

The TGDC has concluded that further research is advisable in identifying potential problems associated with voting systems that use multiple representations of ballots, and in identifying best approaches for handling such problems. The TGDC thus requests that NIST perform such research and draft standards documents that reflect NIST's determination of the best practices and best approaches for handling these problems.

Mr. Greene called the roll. Resolution #21-05 passed as amended 13 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Rivest then offered Resolution # 23-05 for consideration.

Resolution # 23-05, Offered by Dr. Rivest

Title: Common Ballot Format Specifications

The TGDC has concluded that the adoption of standard formats for election-related information, such as ballots (both blank and filled-in), has many positive benefits, and is worth pursuing. An example of such a standard is EML (Election Markup

Language), which is an XML-based standard. The TGDC therefore requests NIST to do research and develop standards documents:

1. **Specifying what existing election information format standards (or portions thereof, or variations thereof) are acceptable for use in voting systems, and**
2. **Requiring that voting systems use such standards wherever possible.**

NIST's evaluation of existing election information standards shall consider security, ease and cost of implementation, and other factors judged relevant by NIST. If no existing election information format standards (or portions thereof, or variations thereof) are judged by NIST, upon its detailed examination, to be acceptable for current use, then NIST should so recommend, and this resolution will have no net effect at this time.

A second was offered to the motion. Mr. Craft requested whether the intent, in using the word "format" was to address ballot lay-out issues which I would hold are solely in the purview of the state? Or are you speaking of, basically, the various formats of computer code. Dr. Rivest indicated the latter.

Several amendments were accepted by the sponsor. The second sentence was reworded to read “An example of such a standard is OASIS Election Markup Languarge (EML) Version 4.0, which is an XML-based specification.” In the second paragraph, first sentence, the following phrase was inserted “fitness for function under existing election codes”.

Hearing no other questions, the Chair called for a roll call vote on Resolution #23-05 as amended.

Resolution # 23-05(As Amended), Offered by: Dr. Rivest

Title: Common Ballot Format Specifications

The TGDC has concluded that the adoption of standard formats for election-related information, such as ballots (both blank and filled-in), has many positive benefits and is worth pursuing. An example of such a standard is OASIS Election Markup Language (EML) Version 4.0, which is an XML-based specification. The TGDC therefore requests NIST to do research and develop standards documents:

1. **Specifying what existing election information format standards (or portions thereof or variations thereof) are acceptable for use in voting systems, and**
2. **Requiring that voting systems use such standards wherever possible.**

NIST's evaluation of existing election information standards shall consider fitness for function under existing election codes, security, ease and cost of implementation, and other factors judged relevant by NIST. If no existing election information format standards (or portions thereof, or variations thereof) are judged by NIST,

upon its detailed examination, to be acceptable for current use, then NIST should so recommend, and this resolution will have no net effect at this time.

Mr. Greene called the roll. Resolution #23-05 passed as amended 12 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Rivest then offered for consideration Resolution # 35-05.

Resolution #35-05, Offered by Dr. Rivest

Title: Wireless

The TGDC has considered the advisability of using wireless technology within voting systems, from a security perspective. It has concluded that for now the use of wireless technology introduces excessive and unnecessary risk and should be avoided. The TGDC directs NIST to research and draft standards documents requiring that all wireless transmitters and receivers (including infrared transmitters and receivers) be excluded from voting systems.

The motion was seconded for discussion.

Issues that raised concern with this resolution included the effect on hearing aids; security and privacy concerns; as well as the effect of this resolution as worded on the ability of states to conduct the 2006 election.

Several amendments were offered and accepted by the sponsor. The second and thirs sentences were reworded to read "It has concluded that for now the use of wireless technology introduces severe risk and should be approached with extreme caution. The TGDC directs NIST to research and draft standards documents for the use of wireless communications devices in voting systems."

Hearing no other questions or comments, the Chair called for a roll call vote on Resolution #35-05 as amended.

Resolution #35-05(As Amended), Offered by: Dr. Rivest

Title: Wireless

The TGDC has considered the advisability of using wireless technology within voting systems from a security perspective. It has concluded that, for now, the use of wireless technology introduces severe risk and should be approached with extreme caution. The TGDC directs NIST to research and draft standards documents for the use of wireless communications devices in voting systems.

Mr. Greene called the roll. Resolution #35-05 passed as amended 12 Yes, 0 No, 1 Abstain (See Table 1.).

The Chair adjourned the meeting for a fifteen minute break.

January 19, 2005: Morning Session # 2

The Chair called the meeting to order and then called on Dr. Schutzer to present the proposed resolutions from the Core Requirements and Testing Subcommittee.

Dr. Schutzer thanked the chair. He then offered the following preface to the resolutions which would follow. "I will make my remarks brief and get on to the resolutions. I just want to tell you that in the core requirements and testing group, our emphasis has been on providing a good update to the current specifications with some special emphasis on ensuring we have open transparent testing. So accordingly our 11 resolutions deal with the following kinds of things: examining the specifications to make sure nothing important is missing; ensuring the specifications are sufficiently unambiguous and detailed enough for testing; emphasizing the core requirements and common aspects across all election jurisdictions; recognizing that the testing should be done openly and transparently, namely, ensuring all the inputs, outputs, test procedures, and methodology should be available; recognizing that the tests may not just involve pass or fail but also involve performance-oriented measurements for which there could be a minimum acceptable range set; and recognizing in the testing of the equipment only relevant intended operating environments including the appropriate setup, configuration, and maintenance procedures as recommended by the vendor."

Dr Schutzer then offered Resolution # 24-05 for consideration by the Committee.

Resolution # 24-05, Offered by: Dr. Schutzer

Title: Conformance Clause

The conformance clause of a standard provides the answers to the important question: what may conform and how? A conformance clause defines, at a high-level, what is required of implementers of the specification. The clause may specify minimal requirements for certain functions, as well as extensibility, optional features, and alternative approaches and how they are to be handled. The TGDC requests that NIST:

1. **Draft a conformance clause section for the Voting System Standard.**

The motion was seconded for discussion. Minor edits were suggested including adding the word "draft" in the last sentence.

Hearing no other questions, the Chair called for a roll call vote on Resolution #24-05 as edited.

Resolution # 24-05(As Edited), Offered by: Dr. Schutzer

Title: Conformance Clause

The conformance clause of a standard provides the answers to the important question: what may conform and how? A conformance clause defines, at a high level, what is required of implementers of the specification. The clause may specify minimal requirements for certain functions, as well as extensibility, optional features, and alternative approaches and how they are to be handled. The TGDC requests that NIST draft a conformance clause section for the Voting System Standard.

Mr. Greene called the roll. Resolution #24-05 passed as edited 12 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Schutzer then offered Resolution # 25-05 for consideration.

Resolution # 25-05, Offered by Dr. Schutzer

Title: Precise and Testable Requirements

For qualification of voting systems to be consistent, fair, and meaningful, it is necessary to control variability in the conformance assessment system. Both the requirements to be tested and the methods by which they are to be tested must be specified with appropriate precision. The TGDC requests that NIST:

1. **Conduct a review and analysis of the requirements in the 2002 VSS to ensure that they are sufficiently precise to enable meaningful testing,**
2. **Include the requirements from the 2002 VSS that are already precise and testable**
3. **Write testable requirements for those requirements that are not sufficiently precise, and**
4. **Expand the testing standards in the VSS to specify test methods for a subset of those requirements.**

The motion was seconded for discussion. An amendment added two tasks for NIST:

5. Update the requirements where appropriate during the review, such as reliability and accuracy specifications, and
6. Adopt, to the extent that NIST determines it is advisable, commonly used equivalent commercial test methods.

Hearing no other questions, the Chair called for a roll call vote on Resolution #25-05 as amended.

Resolution # 25-05(As Amended), Offered by: Dr. Schutzer

Title: Precise and Testable Requirements

For qualification of voting systems to be consistent, fair, and meaningful, it is necessary to control variability in the conformance assessment system. Both the requirements to be tested and the methods by which they are to be tested must be specified with appropriate precision. The TGDC requests that NIST:

1. **Conduct a review and analysis of the requirements in the 2002 VSS to ensure that they are sufficiently precise to enable meaningful testing,**
2. **Include the requirements from the 2002 VSS that are already precise and testable,**
3. **Write testable requirements for those requirements that are not sufficiently precise,**
4. **Expand the testing standards in the VSS to specify test methods of those requirements,**
5. **Update the requirements where appropriate during the review, such as reliability and accuracy specifications, and**
6. **Adopt, to the extent that NIST determines it is advisable, commonly used equivalent commercial test methods.**

Mr. Greene called the roll. Resolution #25-05 passed as amended 12 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Schutzer then offered Resolution # 26-05 for discussion.

Resolution # 26-05, Offered by Dr. Schutzer

Title: Uniform Testing Materials

For consistency and transparency of voting systems testing, and to increase the public trust and confidence in the testing of voting systems, it is necessary that the same set of testing materials be used by each testing organization. The TGDC requests that NIST:

1. **Draft guidance for how to develop a public set of test materials.**

The motion was seconded for discussion.

An amendment was offered to expand the title of the Resolution to "*Uniform Testing Methods and Procedures"*. In the third and forth sentences the words "methods and procedures" were added.

Hearing no other questions, the Chair called for a roll call vote on Resolution #26-05 as amended.

Resolution # 26-05(As Amended), Offered by: Dr. Schutzer

Title: Uniform Testing Methods and Procedures

For consistency and transparency of voting systems testing, and to increase the public trust and confidence in the testing of voting systems, it is necessary that the same set of testing methods and procedures be used by each testing organization. The TGDC requests that NIST draft guidance for how to develop a public set of test methods and procedures.

Mr. Greene called the roll. Resolution #26-05 passed as amended 12 Yes, 0 No, 2 Abstain (See Table 1.).

Dr. Schutzer then offered Resolution #27-05 for consideration.

Resolution # 27-05, Offered by: Dr. Schutzer

Title: Non-Conformant Voting Systems

A provision in the 2002 VSS allows qualification of voting systems that do not conform to the requirements. [*"Any uncorrected deficiency that does not involve the loss or corruption of voting data shall not necessarily be cause for rejection."*] If there are requirements that are frequently unmet by qualified systems, these requirements should be reviewed for possible elimination. The TGDC requests that NIST review the text of the 2002 VSS to determine if the provision for qualification of voting systems that do not conform to the requirements should be deleted.

The motion was seconded for discussion.

No amendments were offered.

Hearing no other questions, the Chair called for a roll call vote on Resolution #27-05 as is. Mr. Greene called the roll. Resolution #27-05 passed as is 13 Yes, 0 No, 1 Abstain (See Table 1.).

The Chair adjourned the meeting for lunch.

January 19, 2005: Afternoon Session

The Chair called the meeting to order and asked Dr. Schutzer to continue with his resolutions.

Dr. Schutzer then introduced Resolution # 28-05**.**

Resolution # 28-05, Offered by Dr. Schutzer

Title: Publicly Available Qualification Data

The TGDC recognizes that sunshine rules are standard practice in many arenas where public trust and/or safety are at stake. To the extent possible, qualification test reports should be released to the public as evidence that the qualification process was responsibly executed. To handle those cases where release of the entirety of the reports is problematic, the TGDC requests that NIST:

1. **Recommend standards on qualification data to be provided, called a "Public Information Package," that will set out minimum requirements on the information that must be publicly available and published.**

The motion was seconded for discussion. A friendly amendment and some edits were suggested in the wording of the resolution including substituting "public records laws" for the term "sunshine laws".

Hearing no other questions, the Chair called for a roll call vote on Resolution #28-05 as amended.

Resolution # 28-05(As Amended), Offered by: Dr. Schutzer

Title: Publicly Available Qualification Data

The TGDC recognizes that public records laws are standard practice in many arenas where public trust and/or safety are at stake. To the extent possible, qualification test reports should be released to the public as evidence that the qualification process was responsibly executed. To handle those cases where release of the entirety of the reports is problematic, the TGDC requests that NIST recommend standards on qualification data to be provided, called a "Public Information Package," that will set out requirements on the information that must be publicly available and published.

Mr. Greene called the roll. Resolution #28-05 passed as amended 11 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Schutzer then introduced Resolution # 29-05.

Resolution # 29-05, Offered by: Dr. Schutzer

Title: Ensuring Correctness of Software Code

Volume 1, Section 4.2 and Volume 2, Section 5.4 of the 2002 VSS defines coding standards, as well as a source code review to be conducted by Independent Testing Authorities (ITAs) to enforce those coding standards. These coding standards are a means to an end, the end being an ITA evaluation of the code's correctness to a high level of assurance. The TGDC requests that NIST:

1. **Recommend standards to be used in evaluating the correctness of voting system logic, including but not limited to software implementations, and**
2. **Evaluate the 2002 VSS software coding standards with respect to their applicability to the recommended standards, and either revise them, delete them, or recommend new software coding standards, as appropriate.**

The motion was seconded for discussion.

No amendments were offered.

Hearing no other questions, the Chair called for a roll call vote on Resolution #29-05 as is. Mr. Greene called the roll. Resolution #29-05 passed as is 11 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Schutzer then offered Resolution #30-05.

Resolution #30-05, Offered by Dr. Schutzer

Title: Quality Management Standards

Volume 1, Sections 7 and 8 and Volume 2, Section 7 of the 2002 VSS require the vendor to follow certain quality assurance and configuration management practices and require the ITA to conduct several audits and documentation reviews to ensure that they were followed. These are a means to ensure that the vendor is capable of following responsible software engineering practices. The TGDC requests that NIST:

1. **Review and analyze quality management standards, including ISO 9000, to determine their relevance to voting systems, and**
2. **Recommend changes to the VSS quality assurance and configuration management sections based on the findings above.**

The motion was seconded for discussion.

An amendment was offered to include "(and their security)" under 1.

Hearing no other questions, the Chair called for a roll call vote on Resolution #30-05 as amended.

Resolution #30-05(As Amended), Offered by: Dr. Schutzer

Title: Quality Management Standards

Volume 1, Sections 7 and 8 and Volume 2, Section 7 of the 2002 VSS require the vendor to follow certain quality assurance and configuration management practices and require the ITA to conduct several audits and documentation reviews to ensure that they were followed. These are a means to ensure that the vendor is capable of following responsible software engineering practices. The TGDC requests that NIST:

1. **Review and analyze quality management standards to determine their relevance to voting systems (and their security), and**
2. **Recommend changes to the VSS quality assurance and configuration management sections based on the findings above.**

Mr. Greene called the roll. Resolution #30-05 passed as amended 11 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Schutzer then offered Resolution #31-05.

Resolution # 31-05, Offered by: Dr. Schutzer

Title: Maintenance of the VSS

All specifications contain ambiguities that are discovered during testing of implementations. Similarly, all specifications contain requirements that can be subject to multiple, equally defensible interpretations. The TGDC requests that NIST draft a strategy for maintenance of the VSS, which would address the issuance of interpretations of the VSS, the resolution of disputes, and the continuous improvement and revision of the VSS.

The motion was seconded for discussion.

No amendments were offered.

Hearing no other questions, the Chair called for a roll call vote on Resolution #31-05. Mr. Greene called the roll. Resolution #31-05 passed as is 11 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Schutzer then offered Resolution # 32-05.

Resolution #32-05, Offered by Dr. Schutzer

Title: Sharing Information and De-qualification of Voting Systems

The TGDC recognizes that no conformance assessment process is perfect. Systems with nonconformities, even serious ones, can be granted qualification, only to cause problems at the precinct level after they are deployed. When a serious flaw is discovered in one jurisdiction, other affected jurisdictions should be informed. At present, however, there is no process to de-qualify voting systems that are discovered, after qualification has been granted, to have serious problems. The TGDC requests that NIST:

1. **Define a process and specification for sharing information amongst jurisdictions concerning qualified voting systems that have been discovered to have nonconformities, present problems and known vulnerabilities, and**
2. **Develop a strategy for a de-qualification process for voting systems.**

The motion was seconded for discussion.

An amendment was offered to delete 2. The sponsor accepted the amendment.

Hearing no other questions, the Chair called for a roll call vote on Resolution #32-05 as amended.

Resolution #32-05(As Amended), Offered by: Dr. Schutzer

Title: Sharing Information and De-Qualification of Voting Systems

The TGDC recognizes that no conformance assessment process is perfect. Systems with nonconformities, even serious ones, can be granted qualification, only to cause problems at the precinct level after they are deployed. When a serious flaw is discovered in one jurisdiction, other affected jurisdictions should be informed. At present, however, there is no process to de-qualify voting systems that are discovered, after qualification has been granted, to have serious problems. The TGDC requests that NIST define a process and specification for sharing information amongst jurisdictions concerning qualified voting systems that have been discovered to have non-conformities, present problems and known vulnerabilities.

Mr. Greene called the roll. Resolution #32-05 passed as amended 10 Yes, 0 No, 2 Abstain (See Table 1.).

Dr Schutzer then introduced Resolution # 33-05 for consideration.

Resolution #33-05, Offered by Dr. Schutzer

Title: Glossary and Voting Model

The 2002 VSS does not contain a voting model depicting the entire voting process. The current Glossary of Terms needs revision. The TGDC requests that NIST:

1. **Update the 2002 VSS Glossary of Terms and develop a Voting Process Model that incorporates terminology from the revised Glossary.**

The motion was seconded for discussion. Edits and amendment was offered to include adding the phrase "to clearly depict the entire voting process and to determine where a voting system fits into this larger process model" to 1.

Hearing no other questions, the Chair called for a roll call vote on Resolution #33-05 as amended.

Resolution #33-05(As Amended), Offered by: Dr. Schutzer

Title: Glossary and Voting Model

The 2002 VSS does not contain a voting model depicting the entire voting process. The current Glossary of Terms needs revision. The TGDC requests that NIST update the 2002 VSS Glossary of Terms and develop a Voting Process Model that incorporates terminology from the revised Glossary to clearly depict the entire voting process and to determine where a voting system fits into this larger process model.

Mr. Greene called the roll. Resolution #33-05 passed as amended 11 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Schutzer then introduced his subcommittee's final resolution #34-05.

Resolution #34-05, Offered by Dr. Schutzer

Title: Assessment Papers on Recommendations for Future Work

Separate from the immediate work effort to update the 2002 VSS specifications, the TGDC recognizes the need to develop a series of assessment papers that address important issues related to the interrelation of Election Management and VSS systems. These issues are likely to lead to future specifications for VSS systems. The TGDC requests that NIST develop assessment papers that discuss the need for:

1. **Standards and tests to support future systems built to support election day verification of voters,**
2. **Standards for formatting of registration information (possibly using Extensible Markup Language-- XML) to make it easier for states to share information ,**
3. **Tests and standards to validate compensating process, procedures and fixes that address known VSS deficiencies,**
4. **Better ways to integrate the voting registration process with the rest of the voting process,**

5. **Standards and tests to support systems that implement absentee voting,**
6. **Standards and tests to support systems that implement multi-day voting,**
7. **Standards specifying what existing election information format standards (or portions thereof, or variations thereof) are acceptable for use in voting systems.**
8. **Standards supporting voter interactions and issues of correctly capturing voter intent, and**
9. **Standards supporting the inter-relationship of polling place operation with usability, accessibility and privacy.**

The motion was seconded for discussion. An amendment was offered to change "voter intent" in 8. to read "indications of voter choice."

Hearing no other questions, the Chair called for a roll call vote on Resolution #34-05 as amended.

Resolution #34-05 (As Amended), Offered by: Dr. Schutzer

Title: Assessment Papers on Recommendations for Future Work

Separate from the immediate work effort to update the 2002 VSS specifications, the TGDC recognizes the need to develop a series of assessment papers that address important issues related to the interrelation of Election Management and VSS systems. These issues are likely to lead to future specifications for VSS systems. The TGDC requests that NIST develop assessment papers that discuss the need for:

1. **Standards and tests to support future systems built to support election day verification of voters,**
2. **Standards for formatting of registration information (possibly using Extensible Markup Language-- XML) to make it easier for states to share information,**
3. **Tests and standards to validate compensating process, procedures and fixes that address known VSS deficiencies,**
4. **Better ways to integrate the voting registration process with the rest of the voting process,**
5. **Standards and tests to support systems that implement absentee voting,**
6. **Standards and tests to support systems that implement multi-day voting,**
7. **Standards specifying what existing election information format standards (or portions thereof or variations thereof) are acceptable for use in voting systems,**
8. **Standards supporting voter interactions and issues of correctly capturing indications of voter choice, and**
9. **Standards supporting the interrelationship of polling place operation with usability, accessibility and privacy.**

Mr. Greene called the roll. Resolution #34-05 passed as amended 11 Yes, 0 No, 1 Abstain (See Table 1.).

Dr. Rivest then introduced an additional resolution from the Security and Transparency Subcommittee.

Resolution # 15-05 Offered by: Dr. Rivest

Title: Software Distribution

The TGDC has concluded that, generally speaking, the manner in which software is loaded onto voting systems is not governed by existing standards and that it is a significant security issue that warrants more stringent controls. It is important to know which software has been installed on a voting system, when the software has been installed, and from what sources. Without strict controls on these processes, non-certified software could be loaded onto voting systems, with potentially disastrous results. The TGDC directs NIST to research and draft standards documents requiring:

1. **That the distribution of any software to voting systems shall only be performed by means of physically distributed read only media, including software such as:**
    - **(a) operating system required software,**
    - **(b) updates and patches,**
    - **(c) data files, and**
    - **(d) voting system software.**
2. **That the electronic transmission of any software to voting machines via networks or wireless is prohibited,**
3. **That the software will include an integrity check (such as a digital signature that positively authenticates its source) that must be verified as part of the process of loading the software,**
4. **That the record of loading the software will be written permanently to a system audit log kept in write-once memory.**

The motion was seconded for discussion. Several amendments were suggested and accepted by the sponsor. The phrase "write once" was added to 1. "Is prohibited" was deleted from 2. and "introduces extreme risk and should be approached with extreme caution" was substituted.

Hearing no other questions, the Chair called for a roll call vote on Resolution #15-05 as amended.

Resolution # 15-05, Offered by: Dr. Rivest

Title: Software Distribution

The TGDC has concluded that, generally speaking, the manner in which software is loaded onto voting systems is not governed by existing standards, and that it is a significant security issue, that warrants more stringent controls. It is important to know which software has been installed on a voting system, when the software has been installed, and from what sources. Without strict controls on these processes, non-certified software could be loaded onto voting systems, with potentially disastrous results. The TGDC directs NIST to research and draft standards documents requiring:

1. **That the distribution of any software to voting systems shall only be performed by means of physically distributed "read only" or "write once" media, including software such as:**
    (e) Operating system required software,
    (f) Updates and patches,
    (g) Data files, and
    (h) Voting system software.
2. **That the electronic transmission of any software to voting machines via networks or wireless introduces extreme risk and should be approached with extreme caution,**
3. **That the software will include an integrity check (such as a digital signature that positively authenticates its source) that must be verified as part of the process of loading the software, and**
4. **That the record of loading the software will be written permanently to a system audit log kept in write-once memory.**

Mr. Greene called the roll. Resolution #15-05 passed as amended 12 Yes, 0 No, 1 Abstain (See Table 1.).

Before adjourning the meeting, the Chair recognized the Acting Executive Director of the Election Assistance Commission, Ms. Carol Paquette. Mr. Chairman. "Thank you very much for this opportunity. The Vice Chairman and Commissioner Martinez regretted that they had to leave early but, agreed that it was appropriate that I speak on their behalf in terms of the topics to which the Commission feels a strong sense of urgency to proceed. We would certainly focus first and foremost on the security topics. As you are all aware, the 2002 standards are perhaps most deficient in that area with all due respect to the accessibility issues. Security is the area where we believe that the states need the most immediate guidance. So that would be the Commissioners priority regarding their work and we offer that for your consideration. Thank you."

Dr. Semerjian concluded the meeting with the following remarks.

"Resolutions adopted at this plenary meeting instruct NIST staff on the research and drafting of standards recommendations. The adopted motions provide essential policy guidance on relevant voting standards issues. The resolutions will be prioritized to address the immediate requirements for development of the initial recommendations due

in April 2005. Additional resolutions can be considered at the February 24-25, 2005, plenary session.

Provisions of HAVA require the TGDC to submit a "first set of recommendations" to the EAC executive director in April of 2005. The form of the recommendations will vary for each subject matter depending on the existence of current best practices, specifications, or standards. For example, some guidelines will consist of reviewing quality, pretested standards already developed by other organizations. Recommendations related to such projects may consist of suggested standards capable of immediate implementation. NIST staff in cooperation with the TGDC members will make best efforts to accomplish the critical tasks most urgently needed by the election community.

HAVA requires election authorities to be in compliance with certain requirements in January 2006. The TGDC and its subcommittees should give first priority to projects that will be useful to the manufacturing, testing laboratory and election administration communities in satisfying these mandates.

I appreciate the participation today of all the Committee members in attendance and look forward to our work ahead. My contact information is in your meeting notebook. I also want to thank the NIST scientists for their efforts to make this meeting a success.

I adjourn this meeting of the Technical Guidelines Development Committee."

TGDC Resolution Voting | Plenary meeting | January 18-19, 2005

Resolution Number As Amended	Semerjian	Berger	Caldas	Craft	Davidson	Elekes	Gannon	Harding	Miller	Purcell	Quesenbery	Rivest	Schutzer	Turner-Bulie	Williams	Tally Y-N-A
01/18/05 Roll Call	√	√	√	√		√	√	√	√	√	√	√	√	√	√	14
01-05	Y	Y	Y	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14-0-0
02-05	N	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	12-1-1
03-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	12-1-1
04-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
05-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
11-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
09-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
08-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
10-05	Y	Y	A	Y	*	Y	A	Y	Y	N	Y	Y	Y	Y	N	10-2-2
13-05	N	N	A	N	*	N	N	N	*	N	A	Y	A	N	N	1-9-3
12-05	Y	Y	A	N	*	Y	Y	Y	*	Y	Y	Y	Y	Y	Y	11-1-1
14-05	Y	Y	A	Y	*	Y	A	Y	*	Y	Y	Y	Y	Y	Y	11-0-2
01/19/05 Roll Call	√	√	√	√	√ (pm)	√	√	√	√	√	√	√	√	√	√	14
03-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
06-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
16-05	Y	Y	A	Y	*	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	12-0-1
17-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
18-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
22-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
21-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
23-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	12-0-1
35-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	12-0-1
24-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	12-0-1
25-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	12-0-1
26-05	Y	Y	A	Y	A	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	12-0-2
27-05	Y	Y	A	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13-0-1
28-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	*	Y	11-0-1
29-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	*	Y	11-0-1
30-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	*	Y	11-0-1
31-05	Y	Y	A	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	*	Y	11-0-1
32-05	Y	Y	A	Y	*	Y	Y	*	Y	Y	Y	Y	Y	A	Y	10-0-2
33-05	Y	Y	A	Y	*	Y	Y	*	Y	Y	Y	Y	Y	*	Y	11-0-1
34-05	Y	Y	A	Y	*	Y	Y	*	Y	Y	Y	Y	Y	*	Y	11-0-1
15-05	Y	Y	A	Y	*	Y	Y	*	Y	Y	Y	Y	*	*	Y	10-0-1

Table 1

Y=Yes N=No A=Abstain *=Not Present for Vote