



Allegheny County Citizens' Election System Advisory Panel

## Initial Report to Allegheny County Council

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## Executive Summary

Panel members easily reached consensus that one election-system issue is far more important than any other voting issue in Allegheny County today. Therefore, the Panel will focus its efforts on resolving this issue and recommends that County Council, the Board of Elections, and all Allegheny County election personnel also regard resolving this issue as primary.

This issue is the use in Allegheny County of voting machines that do not have a voter-verified paper record, do not meet adequate accessibility guidelines, and are not subject to adequate election-day and post-election audits. These deficiencies put the votes of Allegheny County citizens and the commendable work of Allegheny County election personnel at risk. The lack of a paper record in particular makes it impossible to recount a close election to determine the will of the voters. If elections are determined by the courts rather than by the votes of the people then we are no longer a democracy.

Therefore, the Panel has set a goal of having these voting technology deficiencies corrected by the November 2008 election so that Allegheny County will be assured of both the reality and the perception by citizens that Allegheny County elections are secure, accurate, recountable, and accessible. We urge Allegheny County Council and election officials to do likewise.

We believe that it is possible to find solutions to Allegheny County's voting-technology problem that are efficient and cost effective and also protect the voting rights of Allegheny County voters. At the same time, it is important to remember the words of Governor Charlie Crist of Florida, as quoted in *The New York Times*, "The price of freedom is not cheap. A democratic system of voting that we can trust, that we can have confidence in, is incredibly important."

To begin correcting this voting-technology issue, the Panel recommends that the Elections Division 1) investigate ES&S iVotronic upgrades for auditability and accessibility, and 2) obtain samples of other voting machines that would meet both auditability and accessibility standards. We request that these machines be made available for public review by November 2007.

Panel members also agree that many other voting issues, including voting privacy, poll worker recruitment and training, election-experience and post-election reporting, the availability of pre-election ballot information, and citizen oversight, should be improved. However, the current situation in Allegheny County in regard to voting technology is so urgent and precarious that we believe at this time that primary focus must be given to insuring the integrity of the votes of all Allegheny County citizens through improved voting technology.

These recommendations are discussed in detail in the sections that follow.

## **Background**

On February 6, 2007, Allegheny County Council passed bill 2513-06, establishing the Allegheny County Citizens' Election System Advisory Panel. Panel members were appointed by Council in June and July of 2007. The Panel is charged with recommending to Council measures we believe will identify, anticipate, and remedy issues arising in connection with the implementation of a new voting system in Allegheny County. In particular, the Panel is directed to issue two written reports to Council, of which this is the first.

In the remainder of this document, the Panel introduces its members, describes its election-system criteria, and makes initial recommendations. The Panel then describes its intended future efforts.

Due to the complexity and volume of materials that are needed for a full understanding of the issues that the Panel is charged with addressing, the Panel has attached several appendices containing the most important documents and a list of additional documents that can further help. The Panel is happy to supply further explanation of these documents and contents and additional information upon request.

## **Panel Members**

Suzanne Broughton is the president of the League of Women Voters of Greater Pittsburgh. The League was formed in 1920 by the leaders of the women's suffrage movement, has local organizations nationwide, and has a long history of providing voters with unbiased candidate information and monitoring the conduct of elections. Over a 21-year period from 1977 to 1998, Ms. Broughton wrote and edited technical manuals and marketing literature for computer software for three companies. Recently, she has worked with the County Elections Division to demonstrate the iVotronic voting machines to help citizens become familiar with the new machines.

Dr. David A. Eckhardt is an Associate Teaching Professor in the Department of Computer Science at Carnegie Mellon University. He joined the faculty after completing his doctoral studies in that department in 2002. Dr. Eckhardt's research interests are in the areas of operating systems, wireless networking, and high-performance networking. Dr. Eckhardt has served Allegheny County as a Judge of Elections since 1997. As a member of VoteAllegheny, a non-partisan volunteer voting rights organization, he has observed the testing of election equipment and co-authored election integrity reports. Dr. Eckhardt is an at-large member of the board of the Libertarian Party of Pittsburgh and has served as a Pennsylvania delegate to the Libertarian National Convention.

Janet Jai is a journalist and speaker who has been writing and reporting about voting issues since 2003. Her writing credits include *The Christian Science Monitor*, *altnet.org*, the *Pittsburgh Post-Gazette*, and *Pittsburgh Business Times*, etc. Her TV and radio credits include: *Your Morning* on CN8-TV (covering a nine-state region out of Philadelphia), reporting from the polls for National Public Radio (NPR), and *Life Lounge* (KDKA Radio) among others. She is a former editor of the Institute of Politics newsletter. She serves Allegheny County as a Judge of Elections.

Robert Larko is a Certified Public Accountant who has overseen the finances of businesses with \$3 billion in assets. He is currently employed as a line of business Controller and Assistant Vice President for PNC Bank and is a member of their Finance Diversity Council. He is a member of the Pennsylvania Institute of Certified Public Accountants (PICPA) and their Local Taxation & Government Committee. He has served as Chair of the Penn Hills School District's tax study commission, Relay For Life of Pittsburgh East, and Operation Penn Hills-Helping the Littlest Victims of Katrina.

Collin Lynch is a Ph.D. candidate in Intelligent Systems at the University of Pittsburgh. He has worked as a professional software developer for private- and public-sector entities including the U.S. Navy. On behalf of VoteAllegheny, Mr. Lynch has monitored logic and accuracy testing of Allegheny County's voting system equipment. He contributed to VoteAllegheny reports documenting voting-system irregularities observed in the May 16, 2006 primary election and describing preparation for and tabulation of the November 7, 2006 general election.

Ina Jean Marton is the mayor of White Oak Borough and the founder of the White Oak Animal Safe Haven, a no-kill animal shelter. Before becoming a candidate for public office, she served Allegheny County as a Judge of Elections.

Paul O'Hanlon is a 1979 graduate of the University of Pittsburgh School of Law. He is a Staff Attorney with the Disability Rights Network of Pennsylvania. Mr. O'Hanlon has been a member of the Pennsylvania Developmental Disabilities Council since 1992, and is an appointed member of the Allegheny County/City of Pittsburgh Task Force on Disabilities. He has testified to the Allegheny County Council, the Board of Elections, and the Pennsylvania Election Reform Task Force on the disability-access requirements of the Help America Vote Act. Mr. O'Hanlon is a co-founder of the Pennsylvania Voter Coalition and of the Disability Voting Coalition of Pennsylvania.

Celeste Taylor is the PA Democracy Campaign Coordinator for People For the American Way Foundation. She is the Vice-Chairperson of the Black Political Empowerment Project (B-PEP) where she has coordinated the "Reclaim The Vote" Initiative. She is a volunteer with the Pennsylvania Voter Coalition, PA Center For Civic Participation, Everybody VOTE, Nonprofit Voter Engagement Network, and has worked for the NAACP National Voter Fund, Project Vote and Pennsylvania ACORN. Since 2004 Ms. Taylor has coordinated several non-partisan election protection efforts in Allegheny County. She has produced reports and letters, and has testified before County Council, the Board of Elections, the PA Election Reform Task Force and the Senate State Government Committee. Ms. Taylor was the lead plaintiff in a 2006 lawsuit to delay deployment of new voting-system technology.

## **Voting Machine Policies, Legislation and Election Codes**

### **Pending Federal and State Legislation**

H.R. 811, The Voter Confidence and Increased Accessibility Act of 2007, was introduced in the U.S.

House of Representatives on February 5, 2007. H.R. 811 would amend the Help America Vote Act of 2002 to require a voter-verified permanent paper record. The primary sponsor is Representative Rush Holt from New Jersey. The bill has strong bi-partisan support with 216 cosponsors. On August 13, an editorial in the *Pittsburgh Post-Gazette* strongly supported passage of this bill.

Currently there is a compromise to this Bill that was submitted to Congress on July 27, 2007. Here is how the compromise would affect the “Paperless Direct Recording Electronic (DRE) Precincts” in Allegheny County where 829,916 registered voters use ES&S iVotronic voting machines.

For 2008, all jurisdictions would be required to implement paper records and conduct recounts and audits using those paper records. 23.6% of precincts nationwide, which include Allegheny County, use paperless DRE systems. Because there is not currently a Pennsylvania certified Voter Verified Paper Record (VVPR) DRE attachment, Allegheny County and other counties throughout PA and the entire country will have the option of purchasing either a whole new DRE-VVPR system, or an optical scanner system with Ballot Marker Devices (BMD). Since an optical scan system including a ballot marker device will be much more likely to be upgradeable to be compliant with H.R. 811 in 2012 than a current DRE-VVPR system, and since BMDs will create ballot uniformity, it is likely that most, if not all such jurisdictions, will purchase BMD/Optical Scan voting systems.

Currently in the Pennsylvania General Assembly are House Bill 53 and Senate Bill 247, which call for voter verified paper ballots. For further information on these bills and analysis of changes which would make them stronger and more effective, please refer to **Appendix A** for excerpts from the testimony of Audrey Glickman, Secretary of VoteAllegheny. Appendix A also includes background and the Pittsburgh City Council Resolution supporting VVPB's that was presented to the PA Senate State Government Committee Public Hearing on July 25, 2007.

### **Current Pennsylvania Election Law**

The Pennsylvania Election Code is finally becoming available online. **Appendix B** contains text abstracted from the web site <http://members.aol.com/StatutesP5/25.Ar.2.html> as a reference defining the powers of the various governmental entities with respect to decisions about election procedures. Information on federal guidelines is also included in Appendix B.

### **Allegheny County Election Systems Policy Landscape**

Allegheny County made a decision to shift to new electronic voting machines only five weeks before its May 16, 2006 primary, leaving insufficient time to adequately train poll workers and educate the community. Moreover, the machines the county chose were not the choice of the participants at the voting machine assessment fair held on November 17, 2005. The chosen machines, ES&S iVotronics, had failed in other states (Florida, Ohio, and California, to name a few) on Election Day. In 2002 the Inspector General in Miami found that these machines were not properly prepared; their results could not be audited; poll workers were unable to operate machines; and large numbers of voters simply gave up as a result.

Several organizations, including People For the American Way Foundation (PFAW) and the League of Women Voters of Greater Pittsburgh (LWVGP), conducted surveys about voting problems and submitted written reports to the Board of Elections. The letter submitted by PFAW Foundation can be

found at <http://media.pfaw.org/pdf/PFAWFLettertoPABOE5-31-06.pdf>. The survey results submitted by LWVGP can be found at <http://palwv.org/pittsburgh>.

The Panel is quite disturbed by the decision in 2006 to select a new voting system that is neither compatible with future Federal standards nor capable of meeting the requirements for voters with disabilities. The \$12 million spent for this apparently inadequate voting system could have been used to build a solid foundation without additional burden to the local taxpayers. Note that there were numerous independent voices that opposed this voting system when the County was initially deciding but those voices fell on deaf ears. Therefore, this Panel will consider, analyze and recommend a voting system that will not only meet the current standards but also look to the future to ensure voter as well as taxpayer rights are protected.

### **Important Additional References**

**Appendix C:** California's Department of State recently completed a "top-to-bottom review" of voting systems used in the state. This review included red-team exercises, a source code analysis, and an accessibility review. For the red-team exercise computer experts developed and tested various attack scenarios based upon public documentation. Subsequent to these analyses California's Secretary of State Debra Bowen decertified all of the examined systems. In order to satisfy legal requirements for accessible systems and early voting, a selection of the systems will be usable in the November election for a subset of tasks if and only if the manufacturers satisfy a list of requirements. These requirements include development of hardening plans for the systems, complete disclosure of the systems, and legal assurances of system security. It is not yet clear whether the vendors will meet any of these conditions. In any case the conditional use does not extend beyond this election and new systems will have to be submitted for certification. Secretary Bowen also decertified systems made in part by ES&S due to the manufacturer's failure to comply with the inspections. No conditional use is permitted in this case. Secretary Bowen cited the presence of trivial attacks, hard-coded passwords and other crippling security problems that had gone undetected by state inspections and uncorrected by manufacturers. Three of the systems decertified are used in Pennsylvania, having passed the state inspections. Appendix C summarizes the relevance of the California review to Allegheny County.

**Appendix D:** On February 23, 2007, Florida's department of State completed an analysis of the iVotronic systems deployed during the Buchanan-Jennings U.S. House race in Sarasota, FL, where 18,000 votes were apparently "lost." The analysis consisted of independent source code review by a team of experts. These experts identified a number of threats including the vulnerability of iVotronic systems to viruses and the use of hard-coded easily guessed passwords for critical functions. They also noted that no inspection of this type, however well-funded, could be counted on to identify or prevent software problems. Appendix D contains a summary and analysis of the inspections report.

**Appendix E** is a list of additional references that Council members may wish to consult.

## **Election System Criteria**

The identification of election-system issues should be with reference to agreed-upon criteria of proper system operation. The Panel has identified appropriate criteria, broken down into four areas:

- smooth election-day operation of the system as perceived by voters;
- compliance with the accessibility requirements of the Help America Vote Act of 2002;
- the integrity of the results issued by the system; and
- civic engagement.

Below we will present the criteria in each area and then briefly comment on the extent to which, in our view, the county's present system currently meets the criteria.

### **Smooth Election-day Operation**

The smooth operation of an election is a monumental achievement, requiring the coordinated efforts of many individuals over a span of months. For quite some time, Allegheny County has not experienced a widespread election-day failure or a significant crisis of public faith in the outcome of an election. The Panel has identified the following issues as key parts of smooth operation of an election as perceived by voters.

- Polling places are staffed by trained poll workers in sufficient supply.
- Polls open on time and voters arriving at polling places are able to vote in a timely fashion.
- Voters feel confident that they understand how to use the voting equipment.
- If electronic voting equipment fails, emergency paper ballots are quickly made available.
- The act of voting takes place in an atmosphere of adequate privacy.

### **Compliance with Accessibility Requirements**

Congress passed the Help America Vote Act in 2002 – and gave Allegheny County over 12 million dollars and a deadline of 2006 to have at least one accessible voting device per precinct, which would enable voters with disabilities to cast votes independently and privately. The Help America Vote Act directed that new Voting System Standards be developed which would incorporate these requirements for accessibility. These standards were published in 2005 – months before Allegheny County selected the ES&S iVotronic.

Accessibility features for voters who do not have use of their hands are among the requirements of the 2005 federal voting system standards. “The accessible voting station shall provide a mechanism to enable non-manual input that is functionally equivalent to tactile input” (Section 3.2.3). The ES&S iVotronic does not have this feature, though three Pennsylvania-certified systems do (ES&S M100+AutoMARK; Hart Intercivic+eSlate; AccuPoll AVS 1000; see discussion below).



## Integrity of System Results

Once an election has taken place, there is an immediate general interest in how quickly the results can be made available. The rapid availability of results on the night of an election is part of a time-honored process including press interviews, concession telephone calls, and victory parties. However, more important to enduring and widespread trust in our elections is public confidence in the fairness and accuracy of the results. The Panel has identified the following issues as foundational supports for justifiable voter confidence in election outcomes.

- Software integrity – Due to the demonstrated vulnerability of voting-machine software,<sup>1</sup> it is vital that electronic voting-system equipment undergo regular and thorough inspection to verify that the software controlling them matches what was tested and certified by the appropriate authorities.
- Voter-verified paper ballot records – Because the internal workings of electronic voting machines are not subject to inspection, let alone verification, by voters or election officials, voters have little basis for confidence that a complex software artifact will record their vote without loss or corruption.<sup>2</sup> Paper records viewable by the voter in the polling place provide critical assurance that voter intent is correctly recorded and that a durable, human-readable backup exists if a voting machine malfunctions or is tampered with.
- Routine audits – Once voter-verifiable paper records permit cross-checks of voting-machine operation, a statistically-significant random sample of vote totals should be verified against a hand count of the paper record.
- Chain of custody security – Due to demonstrated security vulnerabilities including the prospect of viruses or other system tampering, the state and county must define rigorous chain of custody guidelines. Said guidelines must be designed to reduce the potential for any tampering with, replacement of or other alterations of the voting systems both before and after elections.
- Citizen oversight – Citizens should have the opportunity to observe all parts of the election process. A genuinely open election process would include documentation of plans, available before each election for public comment; clear and published rules regarding the number and qualifications of citizens able to observe each step of the process; citizen oversight of poll worker training and easy access to poll worker training and reference materials; and a formal post-election report by election officials on problems encountered and projected responses to those problems.

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1 Ariel J. Feldman, J. Alex Halderman, Edward W. Felten, “Security Analysis of the Diebold AccuVote-TS Voting Machine,” available from Princeton University's Center for Information Technology Policy. See also Appendices C and D.

2 Indeed, paperless electronic voting machines have irretrievably lost thousands of votes. In 2004, North Carolina's state-wide election of the Commissioner of Agriculture was spoiled by the loss of 4,000 votes; the contest was resolved only after months of confusion by the gracious withdrawal of one candidate.

## **Civic Engagement Concerns**

Voter registration, voter turnout, and voter engagement are all much lower than desirable. It is incumbent upon Allegheny County to take all appropriate steps to increase civic engagement by voters. Toward that end, the Panel has identified the following areas of concerns with our current election system:

- Voter access to training – History shows that voter turnout is highest in years of Presidential Elections. In preparation for the 2008 Presidential Elections, Allegheny County must develop voter training programs which allow hands-on practice with voting machines and find convenient locations to allow all voters opportunities to practice.
- Assistance available to voters to find the location of their polling place – Good, precise information must be readily available to voters on Election Day. Voters have complex needs for information such as: accessibility features of the polling place, and proximity to handicapped parking spaces. Allegheny County must explore multiple channels to provide this information to voters.
- Availability of sample ballots – Voters need accurate candidate lists or sample ballots well enough in advance of Election Day to identify the races of importance, and to give them time for preparation. Allegheny County must identify effective ways for sample ballots to be made readily available to voters.
- Election experience reporting – Transparency is essential to maintain trust in a democracy. Currently, no regular post-election reports detailing voter issues, polling place problems and survey results from election officials and voters, are made available by the Department of Elections. We recommend that Allegheny County identify best practice models for effective election experience reporting – and have it in place before the 2008 Presidential Primaries.

## **Status Summary**

The initial impression of the Panel is that in the areas of election-day operations and civic engagement the outlook is mixed: mechanisms are in place, which address the identified issues to a reasonable extent, but improvements are possible and desirable. The Panel intends to develop recommendations in these areas.

The situation is worse with respect to the integrity of voting-system results. According to the best information currently available to the Panel, software integrity is not meaningfully tested; County voting systems provide no voter-verifiable paper record (and hence nothing to meaningfully audit or recount); and inadequate advance planning and a near-total absence of outcome reporting hamper citizen oversight of the election process. The Panel is deeply concerned about the state of integrity and hopes to engage the staff of the Elections Division in a detailed and open-ended process of fact-finding, research, and technology experimentation in order to provide the public with greater confidence in the results reported by our elections.

## **Initial Recommendations**

### **Primary Recommendation**

Allegheny County's current voting-technology deficiencies put the votes of Allegheny County citizens and the commendable work of Allegheny County election personnel at risk. Therefore, the Panel recommends that County Council, the Board of Elections, and all Allegheny County election personnel make it their highest priority to provide Allegheny County with voting machines that have a voter-verified paper record, meet the 2005 Voluntary Voting System Guidelines requirements for accessibility, and are subject to public random election-day and post-election audits. We further recommend that these pressing issues be resolved prior to the November 2008 election so that our voting system will be secure, accurate, recountable, and accessible. Further, these requirements that assure the integrity of our elections must be fulfilled by a machine that is reliable so that the election process is smooth for poll workers and voters.

To begin this process, the Panel recommends the following steps:

### **Voting Equipment Changes**

1. The Panel recommends that the Board of Elections contact ES&S to obtain a written description of any progress ES&S is making toward:
  - A. Equipping our current iVotronic voting machines with a Pennsylvania-certified voter-verifiable paper record.
  - B. Expanding the accessibility of our current iVotronic voting machines to comply with the 2005 Voluntary Voting System Guidelines.

If such devices are in development, we also recommend that the Board obtain from ES&S the earliest and latest plausible dates for the submission of these devices to the Secretary of the Commonwealth for certification. In order for the Panel's final report to take into account information received on this topic, we request that we be informed of the result of the inquiry by mid-October 2007.

2. The Panel recommends that County Council obtain samples of voting machines which
  - A. Provide a voter-verifiable paper record,
  - B. Comply with the accessibility provisions of the 2005 Voluntary Voting System Guidelines, and
  - C. Are certified for use in Pennsylvania by the Secretary of the Commonwealth.

The Panel wishes to study these machines to evaluate their ease of use, efficiency, and accessibility.

To the best of our knowledge the machines that may currently meet these three requirements are:

- The ES&S Model 100 Precinct Count Optical Scan Reader used in combination with the ES&S Automark. This voting system is used in Indiana, Huntingdon, Fulton, Franklin, Adams, Juniata, Mifflin, Snyder, and Montour Counties.
- The Hart Intercivic eScan Optical Scan Reader configured for precinct optical scan in combination with the Hart eSlate as it is used in Bedford and Lancaster Counties. However, the California report referenced in Appendix C raised several concerns with respect to the Hart machines.
- If available on the market, the AccuPoll AVS 1000.

In order for the Panel's final report to take into account experience with these machines, we request that these machines be obtained by mid-October.

### **Software Verification**

Without voter-verifiable paper records, the accuracy and integrity of our elections continue to depend entirely on the software running on our voting machines. Therefore, for the November 2007 election, we must be certain our machines are in fact running exactly the software version provided by the vendor and certified by the Secretary of the Commonwealth.

3. The Panel recommends that the Elections Division obtain advice from our voting-system vendor and from the Secretary of the Commonwealth on the best procedure to verify with certainty that a voting machine is running exactly the software authorized by the Secretary of the Commonwealth. The Panel further recommends that the Elections Division presents for public comment a software verification plan including techniques for verifying the contents of a machine and a test plan specifying how many and which machines to test before each election. We recommend that the Board of Elections approve the test plan in time for testing to be part of the November 2007 general election.

### **Citizen Oversight**

4. The Panel also recommends that the Elections Division review available election-process reporting vehicles, such as the Montgomery County, Maryland, Board of Elections report entitled “2004 Presidential General Election Review—Lessons Learned,” available online at [http://www.truevotemd.org/Resources/Lessons\\_Learned.pdf](http://www.truevotemd.org/Resources/Lessons_Learned.pdf); publicize a draft report template for public comment; and obtain the advice and consent of the Board of Elections on its final form. The Panel recommends that the Elections Division issue its first process report about the November 2007 election. Panel members are available and willing to meet with Elections officials to provide advice on this topic.

The first two recommendations are of the highest importance to guarantee election integrity by November 2008. The third, for software verification, will continue to be an important part of the operation of any election system, but has a special urgency as long as our election system lacks voter verifiability and is thus fully software dependent. We need this procedure by the upcoming November 2007 election. We view the fourth recommendation as a best practice, which should become standard practice in Allegheny County as soon as possible. However, in no case should implementation of recommendations 3 and 4 be allowed to substitute for progress on recommendations 1 and 2.

It is imperative that Allegheny County have by November 2008 a voting machine system that provides a voter-verified paper record, meets federal 2005 Voluntary Voting System Guidelines, and is checked by public random audits both on and after election day. This is the only way to insure the integrity of the votes of Allegheny County citizens.

## **Future Recommendations**

Panel members agreed that many other voting issues, including poll worker recruitment and training, the completeness and currency of the voter registration database, improving voting privacy at the polls, cost-effective steps to attract voters and increase overall voter preparation for elections, and citizen oversight should be reviewed and generally enhanced. We expect to issue recommendations in these areas. One specific proposal that we expect to consider is a pilot project to make PDF images of each polling place's ballots available via the Division's web site and/or other possible delivery methods for this information, such as a fax-back service or a way for citizens to request paper mailings of ballot images.

However, we are united in our belief that at present the most urgent threats to voting integrity in Allegheny County are posed by the equipment deficiencies described above. We call on all responsible parties, including County Council, the Board of Elections, and the Elections Division, to immediately begin planning how to address these issues of primary importance.

## **Initial Progress of the Advisory Panel**

Following the induction of a quorum the panel has been meeting regularly. In addition to the findings and schedule reported elsewhere in this report we have also made structural decisions regarding the internal operations of the panel that we will detail here.

### **Decisions Related to Internal Organization and Procedures**

Chairmanship of the panel is handled on a rotating basis. Rather than having a fixed chair the chairmanship rotates on a meeting-by-meeting basis among the several members. Decisions of the group are made by consensus.

### **Decisions Related to Public Access to the Panel**

The panel has been meeting in Conference Room 1 of the County Courthouse. Barring needs for special meeting facilities such as a larger venue for public comment we will continue to meet in this room and will retain it as our default meeting location.

## **Work Plan**

### **Public Hearings**

As part of our information gathering process we intend to hold two public hearings. Said hearings will be targeted toward identifying any relevant election/voting issues and informing the public of the voting/election issues we have identified as of concern. The location and timing of these hearings are yet to be determined. Coupled with these meetings we plan to develop public outreach that will include public surveys of both the general public and elections personnel.

### **Targeted Meetings**

The Panel plans to meet with relevant personnel in elections administration, and looks forward to the cooperation and participation of Mark Wolosik, Tim Johnson and others. We also hope to meet with Secretary of the Commonwealth, Pedro Cortes, and one or more representatives of the Election Assistance Commission. We expect to schedule these meetings for the coming months.

We also plan to solicit the participation of locally-active community groups to assess their elections experience and concerns.

### **Information Requests**

The Panel plans to submit requests for information from Allegheny County departments, and from Commonwealth agencies with the goal of furthering our own information in this area. Some examples of such information are:

- itemization of delays caused by iVotronics,
- descriptions of vote-extraction problems,
- usability survey of voters with disabilities,
- letter to ES&S about iVotronic developments,
- letter to the Secretary of the Commonwealth on software verification, and

- detailed lists of expenditures and future revenue sources

We expect to request this information via letters sent to the appropriate offices as well as prearranged meetings with key personnel. Information received through such requests will better enable us to form a well-informed response to the county's needs.

### **Resources Required**

- The Panel has relied on the support of County Council Chief Clerk John Mascio for scheduling and technical services such as audio recordings of our meetings and the attendance of some panel members via speaker phone. John has been extremely helpful, and we thank him.
- For the purposes of public meetings it might benefit the Panel to use one of the larger meeting rooms or other external venues.
- We request the creation of a web page for the Advisory Panel, which we envision would contain a small amount of relatively static content such as reports issued by the Panel. The Panel will develop the web site content.
- We would like to obtain specific database reports from the County's registration system (e.g. lists of voters registered as requiring assistance) and resources to make a small number of mailings (for polling purposes) to said voters.
- We have requested that the Elections Division obtain one or more pieces of voting equipment on a trial basis. These voting systems will be used for trial comparisons of alternate equipment to our present system. This process will require some county staff support to arrange to obtain the machines, store the equipment in a secure fashion, and assist in setup.

## **Moving Forward**

The Panel members commend the massive and caring work that is being done by Allegheny County election personnel regularly to make our elections happen successfully. We also recognize how exhausting and traumatic the past few years of unprecedented top-down, rapid-fire change have been. We wish for all our sakes that it were possible to rest here. However, the nature of our current election system does not allow us to do that and at the same time know that the votes of everyone in Allegheny County are being cast on a secure, accurate, recountable, and accessible system that guarantees the integrity of our elections, and that the machines used are reliable so that elections are conducted smoothly.

To assist Allegheny County Council, the Board of Elections, and the Elections Division, Panel members are working hard to determine the best way to remedy the current voting machine situation. We are:

1. gathering information,
2. reaching out to inform and involve the public, and
3. meeting with community leaders inside and outside of government.

We will report back to County Council as soon as possible with possible solutions and any assistance that is available in making these solutions work.

In the meantime, the Panel strongly urges County Council, the Board of Elections, and the Elections Division to take a leadership role in correcting our County's voting-technology deficiencies. Allegheny County citizens must have truly accessible machines with a voter-verified paper ballot protected by public random audits by the time of the November 2008 election. Given the current state of voting technology, this is the only way to insure the integrity of the votes of Allegheny County citizens. The Panel stands ready to assist with this in any way desired.

Citizen participation in a healthy democracy depends on the consent of the governed. This consent depends on an election process in which all voters can have well-founded and strong confidence. The aim of the Citizens Advisory Panel is to improve and strengthen that process in Allegheny County.



## Appendices.

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**Executive Officer of VoteAllegheny**

**Excerpted testimony for inclusion in ACCESAP Report**

My name is Audrey Glickman, I live in Pittsburgh, and I am speaking to you on behalf of VoteAllegheny, an Allegheny County multipartisan organization advocating, among other things, voting systems with the highest level technologically available of recountability, accessibility, transparency, security, safety, and voter-verifiability. Our organization comprises individuals from varied walks of life: several computer scientists from CMU and Pitt, elected officials, attorneys, several prominent members of other active organizations, and greatly concerned citizens.

VoteAllegheny remains an early and staunch supporter of the legislation before the Pennsylvania Senate and House, and encourages the immediate passage of **Senator John Pippy's S.B. 247 and Representative Dan Frankel's H.R. 53, regardless of what the federal government is doing.** (A nod to Senator Fontana, a member of this honorable Committee, whose name is also on SB 247.)

We must safeguard the vote for Pennsylvania, with our special rules, special practices, and special circumstances.

We do recommend changing the bills to replace the words "record" and "printout" with the word "ballot" so that it would be eminently clear that the voter-verified paper is the ballot of record. The terms are interspersed through the bills, and uniformity would be clearer. Also a note couldn't hurt that the vehicle upon which the voter's vote is written – whatever the means of writing – must be durable, so that the vote would remain clearly legible over at least 22 months for purposes of recount.

We are not asking you to legislate for or against any particular type of machine, nor any particular brand, only to assure that what we are choosing is good enough – and products slipped through to the voters under HAVA are, by and large, not good enough. Voting machines are meant for (a) expediency of tabulation and retabulation of votes, (b) facility of user interface with the ballot, and (c) accurate calculations. This is really what all computers are designed for. We don't want them to do any more. And this is what should be reflected in our state law and in the federal law. If the voting systems pretend to do these tasks without retaining **recountability, accessibility, transparency, security, safety, and voter-verifiability**, then they are not good enough tools toward our ends.

By the way, we do also believe that Congress should pass HR 811, "amending" the Help America Vote Act, in substantially the form of the markup as reported out of the Committee on House Administration, as soon as possible. This does not obviate the need for state legislation. In fact, the very controversy around the passage of the federal legislation demonstrates our need to protect ourselves without banking on any blanket federal protection.

As I mentioned, there is no need to outlaw certain formats of voting system (touch-screens, for instance): the American free-market system, operating without coercion and without attention to pressure from self-interested third parties, should take care of that issue. If the systems and the results of the employment of the systems meet our legally prescribed standards, format is not an issue.

At the moment, we feel that the most expedient way of getting all of Pennsylvania on a par with recountability, accessibility, and voter-verifiability is by deploying precinct-count optical scan systems statewide. For those counties using other methods, this changeover would ultimately be a less-expensive system to maintain. Money is always an issue, but throwing bad money after good is never the answer.

Some folks feel we should pass sweeping federal legislation *instead* of dealing with this issue at the state level, but we do not really think it is a good idea to cast off our state rules in favor of uniform federal legislation. A few of our state regulations are interestingly antiquated, but most make perfect sense and all have a reason for being. All deserve to be followed. When the federal government scares states into bypassing or setting aside their laws in a scramble to implement ill-conceived legislation, it serves to show how much we need to shore up our state-level safeguards.

We are faced now with complying with HAVA as its levels of stringency increase with coming deadlines. We also must assure voters of the continued security and privacy and recountability of their votes. We are the voters; we are not assured.

At this moment, only the counties which are using optical scan systems with ballot markers for the disabled can boast of complying (very basically) with HAVA and also being able to recount their vote from voter-verified paper. That represents roughly only one-quarter of our Commonwealth. We strongly suggest that the rest of the Commonwealth follows their lead, in short order, rather than simply trusting that their votes are being tabulated accurately. This will not give us necessarily safe and secure machines, but at least the voters' intent will be recountable.

### **A Few Words on HAVA**

HAVA essentially rushed each jurisdiction into purchasing "compliant" voting systems in too short a time – certainly before the public was ready. The federal level of certification of the voting systems engendered only the vendors buying a review (thus the reviewer was being paid by the reviewee – not a good formula for a complete, honest disclosure to the public – in fact, in most cases the public never saw the reports issued). Then the states had to arrange a certification of their own, to verify only that the systems complied with any applicable state laws, no further. No one, by the way, is certifying accessibility.

The different levels of HAVA compliance were to take effect on a rolling basis – a certain level immediately, a certain higher level in two years, and a certain higher level thereafter. The second level is due this year, and most of what was purchased in 2005-2006 does not comply with many provisions of HAVA to come into effect now. Many counties and states did not want to give up their old systems, but were being forced to, under threat of the U.S. Department of Justice coming after them. They purchased under duress.

Had the vendors upgraded their systems toward compliance with the stringent rules coming into play? Had they even modified them at all? We are not certain how much R&D was done by ES&S and Diebold, which got most of our money.

### **Results**

We do need to fix this mess, and rightly that fix should come from the federal level. But again, we cannot rely upon the federal government to pass anything, and we still need to cover our own idiosyncratic methods. We really cannot outlaw bad companies or bad business decisions by counties and states. But we can legislate against their effects. And while we are at it, we must protect the privacy of our vote even though we sign in at the polls. And if we want our voter-verified records to last the 22 months necessary for recount protection, we ought to be certain not to use thermal paper or anything else degradable.

We note that state law says that the voters must be asked before a new electronic system is adopted. We also note that the extant vendors across the state are promising us the moon even while they increase their warranty costs for the coming year.

### **Conclusion**

We need the state legislation, as currently written. Changing "records" to "ballots" and considering the durability of certain types of paper would make us even happier.

We must assure that we employ machines with the **highest level available of recountability, accessibility, transparency, security, safety, and voter-verifiability**. There is no "good enough," no "trust the machine," no "the vendor says it will work." Please pass **S.B. 247**, and help us encourage our honorable representatives to pass **H.R. 53**.

Thank you very much.

### **Background to VoteAllegheny Testimony**

Following are the points encompassed in federal H.R. 811 in its original form and its Committee markup form as of 07/18/07, and the points encompassed in H.B. 53 by Representative Dan Frankel (D-Allegheny), along with its sister bill, S.B. 247 of Senator John Pippy (R-Allegheny and Washington), which are most important to the members of VoteAllegheny and our affiliated regional Pennsylvania organizations:

#### **Accessibility**

Despite HAVA's focus on making the voting process fully accessible to Americans with disabilities, voting machines deployed in most jurisdictions in Pennsylvania and across the nation are not genuinely accessible. For example, voters who lack the use of their hands require a "binary switch" interface (such as a "sip and puff" connector or "gel pad" technology). However, that enabling technology is missing in Allegheny, Westmoreland and more than 50 other counties in Pennsylvania.

Delivering accessibility for Pennsylvanians will require further funding. Most counties will need to add additional interfaces to existing voting machines or replace non-accessible touchscreen machines with devices that help a blind or disabled voter mark and verify a paper ballot.

#### **Verifiability**

As you know, paperless voting machines – especially some touchscreen and push-button machines – provide voters with no assurance that their vote is recorded as cast and leave candidates without recourse to meaningful recounts. Therefore, the National Institute of Standards and Technology has advised the Election Assistance Commission of the need to implement "software independent" recountable voting systems. For the foreseeable future, this means voter-verified paper records.

#### **Auditability**

Paper ballots alone will not safeguard elections. After an election, vote totals produced by either touchscreen voting machines or optical scanners must be cross-checked against a hand count of a sample of the paper records which voters had the opportunity to verify as recording their intent. The paper record should have the legal standing of a ballot and, therefore, priority over the electronic record unless compelling circumstances direct otherwise. In sum, we are urging your support for legislation that regulates and adequately funds:

- 1) Voter-verified paper ballots or records;
- 2) Fully accessible facilities for voting and ballot verification; and
- 3) Routine audits of election results

#### **Other Support**

As an organization, we have garnered the support of many organizations and prominent individuals. Following is a list of those who have co-signed letters to our honorable state legislators: the Disabilities Rights Network, People For the American Way Foundation, The Black Political Empowerment Project, the League of Women Voters of Greater Pittsburgh, the League of Women Voters of Pennsylvania, Common Cause/PA, PA-Verified Voting, the Libertarian Party of Pennsylvania, Republican Committee of Pittsburgh, Allegheny County Republican Party, Constitution Party of Pennsylvania, Democracy for Pittsburgh, Butler County Democrats for Change (D-PAC), VoteAllegheny, Concerned Voters of Centre County, Democracy Rising PA, the Green Party of Allegheny County, the Green Party of Pennsylvania, 14<sup>th</sup> Ward Independent Democratic Club, The Hon. John P. DeFazio (D - Allegheny County Council At-Large Member, Member, Allegheny County Board of Elections, and Director of the United Steelworkers of Pennsylvania), The Hon. James C. Roddey (R - Former Allegheny County Chief Executive), The Hon. Dan Frankel (D - Member, Pennsylvania House of Representatives, 23<sup>rd</sup> District), The Hon. Doug Shields (D - Council President, City of Pittsburgh), The Hon. Jim Ferlo (D - Member, Pennsylvania Senate, 38<sup>th</sup> District), The Hon. David B. Fawcett (R - Member, Allegheny County Council and Member, Allegheny County Board of Elections), The Hon. James Burn (D - Chair, Democratic Committee of Allegheny County and Member, Allegheny County Council), The Hon. Bill Peduto (D - Councilman, City of Pittsburgh), The Hon. Dr. Charles Martoni (D - Vice President, Allegheny County Council), The Hon. Marty B. O'Malley (Borough Council Member, Forest Hills, Pennsylvania), The Hon. William Russell Robinson (D - Member, Allegheny County Council), Michael Churchill, Esq. (Chief Counsel, Public Interest Law Center of Philadelphia), Marian K. Schneider, Esq. (Chester County Coalition for Voting Integrity), the League of Young Voters, and the Pennsylvania Council of Churches.

#### **Corporate Interests of Lesser Concern**

This is the United States of America, the land of free enterprise. If certain corporate interests find that they cannot produce voting systems to meet the optimal specifications outlined in our bills, and therefore lobby against their passage, we are certain that other companies can fill the need, and will spring up to the challenge. Consequently, we ask that you disregard the interests of the corporations which have just taken our four billion HAVA dollars for less than satisfactory voting systems, and move toward mandating the best possible product rather than catering to a rather self-interested lobby which effectively sells out our votes, and to some extent has been influencing local election divisions in their favor.

#### **In Summary**

Because accessible, verifiable, and auditable elections are vitally important to our republic, implementing accessibility and voter verification with routine audits for the May 2008 presidential primary is in the nation's best interest, and should be a priority goal. With your advocacy, guidance and oversight, we can achieve accessible, verifiable, secure, transparent and recountable elections.

## Resolution No. 162

**A Resolution of the Council of the City of Pittsburgh, Pennsylvania, urging the United States Congress to approve House Resolution 811 to amend the Help America Vote Act, 42 U.S.C. § 15301 *et seq.*, to require the creation of voter verified paper ballots (VVPBs) for each voter using an electronic voting machine.**

**WHEREAS**, the Help America Vote Act, 42 U.S.C. § 15301 *et seq.*, made federal funding available to jurisdictions that conduct mandatory modernizations their lever operated voting systems through the purchase of new electronic voting systems; and

**WHEREAS**, under the terms of the Help America Vote Act, Allegheny County was required to replace all lever voting systems in qualifying precincts within the County in time for the first election for federal office held after January 1, 2006, in order to qualify for this funding; and

**WHEREAS**, while the Help America Vote Act does require that new voting systems purchased with the available federal funding generate a paper record that can be used to audit election results, it does not specifically require that a paper summary of individual voting decisions be made available to every voter before they confirm their selections; and

**WHEREAS**, the Commission on Federal Election Reform has issued the following recommendation regarding voting machines: “Congress should pass a law requiring that all voting machines be equipped with a voter verifiable paper audit trail and, consistent with HAVA, be fully accessible to voters with disabilities. This is especially important for direct recording electronic (DRE) machines for four reasons: (a) to increase citizens’ confidence that their vote will be counted accurately, (b) to allow for a recount, (c) to provide a backup in cases of loss of votes due to computer malfunction, and (d) to test - through a random selection of machines - whether the paper result is the same as the electronic result”; and

**WHEREAS**, the Commission on Federal Election Reform advocates retrofitting VVPB capabilities into voting machines that do not currently produce such paper ballots; and

**WHEREAS**, the Report of the Commission on Federal Election Reform, issued in September of 2005, notes that as of August 2005, 25 states had already mandated VVPBs for each voter before they confirm their selections, and another 14 had introduced legislation to do so; and

**WHEREAS**, Allegheny County Council has repeatedly urged the Commonwealth of Pennsylvania to adopt legislation that would require a voter verified paper record for all electronic voting machines, and has also already allocated the funds that would be necessary for retrofitting the County’s system with such a capability; and

**WHEREAS**, United States Representative Rush Holt of New Jersey has introduced HR 811, a bill that would amend HAVA to require machines to produce an individual paper ballot that would allow voters to verify their choices, and at least 200 other Representatives have co-sponsored this bill;

***The Council of the City of Pittsburgh hereby resolves as follows:***

***SECTION 1.***

The Council of the City of Pittsburgh, Pennsylvania, supports the production of voter verified paper ballots for each voter before they confirm their voting choices. The City Council of Pittsburgh accordingly urges the United States Congress to adopt the provisions of HR 811, such that all electronic voting machines must produce such ballots with audits under the terms of the Help America Vote Act.

***SECTION 2.***

The City Council of Pittsburgh further resolves that copies of this Resolution be provided to the Pennsylvania representatives in the United States Congress.

***SECTION 3.***

*If any provision of this Resolution shall be determined to be unlawful, invalid, void or unenforceable, then that provision shall be considered severable from the remaining provisions of this Resolution which shall be in full force and effect.*

***SECTION 4.***

*Any Resolution or Ordinance or part thereof conflicting with the provisions of this Resolution is hereby repealed so far as the same affects this Resolution.*

**Sponsored By Council President Douglas Shields  
In Council April 3, 2007, Read and Adopted.**

/s/ Douglas Shields

President of Council

Attest: \_\_\_\_\_ /s/ \_\_\_\_\_  
Clerk of Council

## **Appendix B: Current Election Law, Advisory and Guidelines**

### **ELECTIONS (Title 25) THE ELECTION CODE**

#### **ARTICLE II. THE SECRETARY OF THE COMMONWEALTH**

§ 2621. Powers and duties of the Secretary of the Commonwealth.

The Secretary of the Commonwealth shall exercise in the manner provided by this act all powers granted to him by this act, and shall perform all the duties imposed upon him by this act, which shall include the following:

(b) To examine and reexamine voting machines, and to approve or disapprove them for use in this State, in accordance with the provisions of this act.

#### **ARTICLE III. COUNTY BOARDS OF ELECTIONS**

##### **§ 2642. Powers and duties of county boards.**

The county boards of elections, within their respective counties, shall exercise, in the manner provided by [this act](#), all powers granted to them by [this act](#), and shall perform all the duties imposed upon them by [this act](#), which shall include the following:

(b) To select and equip polling places.

(c) To purchase, preserve, store and maintain primary and election equipment of all kinds, including voting booths, ballot boxes and voting machines, and to procure ballots and all other supplies for elections.

(d) To appoint their own employees, voting machine custodians, and machine inspectors.

(f) To make and issue such rules, regulations and instructions, not inconsistent with law, as they may deem necessary for the guidance of voting machine custodians, elections officers and electors.

(g) To instruct election officers in their duties, calling them together in meeting whenever deemed advisable, and to inspect systematically and thoroughly the conduct of primaries and elections in the several election districts of the county to the end that primaries and elections may be honestly, efficiently, and uniformly conducted.

(n) To annually prepare and submit to the county commissioners or other appropriating authorities of the county an estimate of the cost of primaries and elections and of the expenses of the board for the ensuing fiscal year.

##### **§ 2648. Records and documents to be open to public inspection; proviso.**

The records of each county board of elections, general and duplicate returns, tally papers, affidavits of voters and others, nomination petitions, certificates and papers, other petitions, appeals, witness lists, accounts, contracts, reports and other documents and records in its custody, except the contents of ballot boxes and voting machines and records of assisted voters, shall be open to public inspection, except as herein provided, and may be inspected and copied by any qualified elector of the county during ordinary business hours, at any time when they are not necessarily being used by the board, or its employees having duties to perform thereto:

Provided, however, That such public inspection thereof shall only be in the presence of a member or authorized employee of the county board, and shall be subject to proper regulation for safekeeping of the records and documents, and subject to the further provisions of this act: And provided further, That general and duplicate returns, tally papers, affidavits of voters and others, and all other papers required to be returned by the election officers to the county board sealed, shall be open to public inspection only after the county board shall, in the course of the computation and canvassing of the returns, have broken such seals and finished, for the time, their use of said papers in connection with such computation and canvassing.

**§ 2649. Preservation of records.**

All documents, papers and records in the office of the county board of elections of each county shall be preserved therein for a period of at least eleven (11) months, and all official ballots and the contents of ballot boxes shall be preserved therein for a period of at least four (4) months; in the event the county board has been notified in writing by the district attorney of the county, or by a judge of a court of record, to preserve said papers or contents of ballot boxes for a longer period of time, for the purposes of pending prosecution or litigation, said records shall be preserved accordingly.

## **The Help America Vote Act of 2002**

On October 29, 2002, President Bush signed the "Help America Vote Act of 2002," (HAVA), Pub. L. No. 107-252, 116 Stat. 1666 (2002) into law. The HAVA is codified at 42 U.S.C. 15301 to 15545. After the House of Representatives, on December 12, 2001, and the Senate on April 11, 2002, passed differing versions of H.R. 3295, joint conferees were named to reconcile the differences and adopted a conference report on October 8, 2002, which was then passed by the House and Senate without amendment.

### [The Help America Vote Act of 2002](#)

The legislation aims to improve the administration of elections in the United States, primarily through three means:

1. creating a new federal agency to serve as a clearinghouse for election administration information;
2. providing funds to states to improve election administration and replace outdated voting systems; and
3. creating minimum standards for states to follow in several key areas of election administration.

**July 20, 2005**

**EAC Advisory 2005-004: How to determine if a voting system is compliant with Section 301(a) – a gap analysis between 2002 Voting System Standards and the requirements of Section 301(a)**

The United States Election Assistance Commission (EAC) has received a number of inquiries from several states as to whether one or more particular voting systems comply with Section 301(a) of the Help America Vote Act of 2002 (HAVA). In addition, in one of its recent public meetings, EAC was asked to conduct an analysis to identify the gaps between the 2002 Voting System Standards adopted by the Federal Election Commission (FEC) and the requirements for voting systems under Section 301(a) of HAVA. EAC is not required by HAVA to preclear or approve voting systems purchased by states and local election jurisdictions. Furthermore, EAC does not believe that it was the intention of Congress or HAVA for EAC to assume this role. However, it is evident that states and local election jurisdictions as well as testing laboratories are in need of information that will help in determining whether a voting system meets the threshold requirements of Section 301(a). Thus, EAC offers the following analysis of Section 301(a) in light of the 2002 Voting System Standards.

Title III of HAVA, entitled "Uniform and Nondiscriminatory Election Technology and Administration Requirements," imposes certain requirements upon states and local jurisdictions conducting federal elections. Section 301(a) sets forth the standards that voting systems must meet after January 1, 2006. Those requirements include functions and features that, among other things: (1) allow the voter to review his or her selections privately and independently prior to casting a ballot; (2) allow the voter to change his or her selections privately and independently prior to casting a ballot; (3) notify the voter when he or she has made more selections in a single race than are permitted (overvote); (4) provide for the production of a permanent paper record suitable to be used in a manual recount; (5) provide voters with disabilities, including visual disabilities, the same opportunity for access and participation (including privacy and independence) as for other voters; (6) provide accessibility in minority languages for voters with limited English proficiency as required by the Voting Rights Act of 1965; and (7) provide for an error rate in operating the voting system that is no greater than the error rate set forth in Section 3.2.1 of the 2002 Voting System Standards adopted by the Federal Election Commission (FEC).

Although the 2002 Voting System Standards set forth measurable standards that predict compliance with some of the Section 301(a) requirements, those standards do not provide sufficient and adequate guidance as to what is required to meet the accessibility requirements of Section 301(a)(3); do not prescribe testable measures for language accessibility required by Section 301(a)(4) of HAVA; and do not prescribe standards that adequately explain the requirements for overvote notification required by Section 301(a)(1) of HAVA. As such, EAC issues the following policy statement to identify the gaps between the 2002 Voting System Standards and the requirements set forth under Section 301(a) of HAVA and to explain what is needed to meet the requirements of Section 301(a) above and beyond the testing requirements established in the 2002 Voting System Standards.

**Section 301(a)(1):**

The requirements of Section 301(a)(1) of HAVA are met if the voting system (1) conforms and



complies with Section 2.4.3.3 of the 2002 Voting System Standards and (2) notifies the voter through a visual and/or audio message prior to casting the ballot when the voter makes more selections than are legally allowed in a single race or contest (overvote):

- (a) that an overvote has occurred and
- (b) the effect of overvoting.

Following that notification, the voting system must allow the voter to change his or her selection(s), if so desired. Voting systems that preclude and prohibit overvoting meet this requirement. Notwithstanding the above, certain paper ballot voting systems may meet the overvote requirements of Section 301(a)(1)(A)(iii) of HAVA by meeting the requirements set forth in Section 301(a)(1)(B).

**Section 301(a)(2):**

The requirements of Section 301(a)(2) of HAVA are met if the voting system conforms and complies with Sections 2.2.5.2.1 and 2.5.3.1 of the 2002 Voting System Standards.

**Section 301(a)(3):**

Section 301(a)(3) of HAVA requires that by January 1, 2006, at least one voting system in each polling place be accessible to persons with disabilities such that the voting system allows an individual with a disability the same access and opportunity to vote privately and independently as is afforded a non-disabled voter. Compliance with Section 301(a)(3) requires that the voting system is accessible to persons with disabilities as defined by the Americans with Disabilities Act, including physical, visual, and cognitive disabilities, such that the disabled individual can privately and independently receive instruction, make selections, and cast a ballot. However, accessibility involves more than the technical features of the voting system. The accessible voting system also must be used in a manner that is consistent with providing access for disabled voters (e.g., the accessible voting system must be set up for use in a space that is accessible to a disabled voter who uses a wheelchair).

Conformance with Section 301(a)(3) is a complex matter, which must take into account the disability of the voter, the advancement of technology and its availability, and the efforts of the elections officials to make the voting process accessible to disabled voters in a private and independent manner. The following are some factors that must be considered in determining accessibility in conformance with Section 301(a)(3) of HAVA:

- (1) Section 2.2.7 of the 2002 Voting System Standards;
- (2) Section 2.4.3.1 (a) of the 2002 Voting System Standards;
- (3) Section 3.4.9 (a-e) of the 2002 Voting System Standards;
- (4) The voting system must afford a disabled voter the ability to perform the same

functions (e.g., receiving and reading the ballot, making selections, reviewing selections, changing selections, and casting the final ballot) as are afforded to a non-disabled voter. These functions may be provided to the disabled voter through features of the voting system that are different than those used by non-disabled voters. The disabled voter need not and in many cases cannot have an identical voting experience as a non-disabled voter (e.g., a voter with a visual disability is afforded the same access to reading the ballot as a sighted voter when the ballot is read to the visually disabled voter using an audio component of the voting system).

(5) Accessibility of the voting system to the voter includes accessibility to all equipment needed to cast and count ballots. Many jurisdictions use a paper ballot voting system that requires the voter to submit his or her own ballot after casting for purposes of ballot counting. Where such voting systems are in use, such jurisdictions must to the extent reasonably and technologically possible afford a disabled voter the same ability to submit his or her own ballot, in a private and independent manner, as is afforded a non-disabled voter. In this example, visually disabled voters must be allowed to submit the ballot independently, as the disability is one that is capable of being accommodated, and technology and practice provide a means that can be used to allow the visually disabled voter to submit a ballot with the same degree of privacy and independence afforded to a sighted voter (e.g., a privacy sleeve).

(6) There may be certain disabled voters whose disabilities prevent them from voting independently (i.e., without assistance from a person of their choosing or a poll worker). While HAVA requires voting systems to allow independence and privacy, it does not preclude a disabled voter from requesting and obtaining the assistance of another person as provided in Section 208 of the Voting Rights Act of 1965

(7) Section 301(a)(3)(B) contemplates that an accessible voting system can include a direct recording electronic (DRE) voting system or other voting system equipped for individuals with disabilities. This advisory should not be read to preclude the innovation and use of accessible voting systems other than DREs for purposes of meeting this requirement.

#### **Section 301(a)(4):**

The minority language requirements of Section 301(a)(4) are met if the voting system complies with the minority language requirements of the Voting Rights Act of 1965 (contained in Section 203 as well as Section 4(f)(4)) and the implementing regulations found at 28 C.F.R. Part 55 and 67 F.R. 48871 (July 26, 2002). The voting system must provide all information, excluding the names of the candidates, that would otherwise be provided by the voting system in English (whether written or oral) in the language(s) that the voting jurisdiction is required to provide materials pursuant to the Voting Rights Act of 1965 and its regulations as referenced above.

**Section 301(a)(5):**

The requirements of Section 301(a)(5) are met if the voting system error rate does not exceed that established in Section 3.2.1 of the 2002 Voting System Standards.

Gracia Hillman, Chair Paul DeGregorio, Vice Chairman

Ray Martinez III , Commissioner

### **Voluntary Voting System Guidelines**

On December 13, 2005, the U.S Election Assistance Commission (EAC) unanimously adopted the 2005 Voluntary Voting System Guidelines, which significantly increase security requirements for voting systems and expand access, including opportunities to vote privately and independently, for individuals with disabilities.

The guidelines will take effect in December 2007 (24 months), at which time voting systems will no longer be tested against the 2002 Voting System Standards (VSS) developed by the Federal Election Commission. All previous versions of national standards will become obsolete at that time.

The voluntary guidelines provide a set of specifications and requirements against which voting systems can be tested to determine if the systems provide all of the basic functionality, accessibility and security capabilities required of these systems. In addition, the guidelines establish evaluation criteria for the national certification of voting systems.

The guidelines update and augment the 2002 VSS, as required by HAVA, to address advancements in election practices and computer technologies. These guidelines are voluntary. States may decide to adopt them entirely or in part prior to the effective date. Currently, at least 39 states use the national guidelines in their voting system certification process.

During the 90-day public comment period, EAC received more than 6,000 comments on the proposed guidelines. Each comment was reviewed and considered by EAC in consultation with the National Institute of Standards and Technology (NIST) in the development of the final version.

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July 31, 2007

**EAC Releases Report on HAVA Spending by States**

**WASHINGTON** – The United States Election Assistance Commission (EAC) has delivered a report to Congress on the expenditure of Help America Vote Act (HAVA) funds by state governments. The report covers election reform payments spent (including obligated funds) by states under HAVA Sections 101 and 102 through December 31, 2006 and under Section 251

through September 30, 2006. The final report, adopted by the Commission at its last public meeting, is available at [www.eac.gov](http://www.eac.gov).

States received approximately \$3 billion under these three sections of HAVA. EAC reported that states have spent 60 percent (\$1,781,943,111) of HAVA funds received – leaving more than \$1.3 billion available for additional improvements in election administration. According to HAVA, most of these funds are not limited to use within a specific fiscal year.

EAC also reported that of the funds expended:

- 76 percent was used to purchase or upgrade voting systems and implement statewide voter registration databases as required by HAVA;
- 16 percent was used to improve the administration of elections for Federal office;
- 8 percent was not classified by the state recipients; and
- less than one-tenth of one percent was used to implement provisional voting and polling place signage requirements.

The funds covered by the report are described below:

- Section 101 Funds - may be used to comply with the requirements of HAVA Title III for uniform and nondiscriminatory election technology and administration requirements; improve the administration of elections for federal office; educate voters; train election officials, poll workers and volunteers; develop a state plan; and toll-free voter information hotlines;
- Section 102 Funds - may be used only to replace punch card and lever voting systems that were in use during the November 2000 general federal election.
- Section 251 Funds - may be used to implement provisional voting; provide information to voters on Election Day; procure voting systems; implement a statewide voter registration database; implement identification requirements for first-time voters who register to vote by mail; and other activities to improve the administration of elections for federal office.

States also received funds under Section 261 of HAVA to address the accessibility of polling places for individuals with disabilities. EAC's report does not include information about the expenditure of these funds because they are administered by the U.S. Department of Health and Human Services.

HAVA instructs EAC to monitor the proper use of HAVA funds. For more information, including state audits, visit [www.eac.gov](http://www.eac.gov).

EAC is an independent bipartisan commission created by HAVA. It is charged with administering payments to states and developing guidance to meet HAVA requirements, adopting voluntary voting system guidelines, and accrediting voting system test laboratories and certifying voting equipment. EAC also serves as a national clearinghouse and resource of information regarding election administration. The four EAC commissioners are Donetta Davidson, chair; Rosemary Rodriguez, vice chair; Caroline Hunter; and Gracia Hillman.

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## --Media Advisory--

For Immediate Release

August 15, 2007

Contact: Jeannie Layson  
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### **EAC Issues Voting System Certification Guide**

**WASHINGTON** – The United States Election Assistance Commission (EAC) has issued the Quick Start Management Guide for Voting System Certification, which covers the process at the federal, state, and local levels. The guide is available at [www.eac.gov](http://www.eac.gov), and it is being distributed to election officials throughout the nation.

“As the federal government takes on the new role of certifying voting equipment, it is important to make sure election officials and the public are informed about the new process, and how it will impact similar efforts at the state and local levels,” said EAC Chair Donetta Davidson.

The new guide covers certification procedures at the federal level and provides information about participating in the program. The guide provides suggestions for implementing effective certification procedures at the local and state level, including verification of non-technical issues such as qualification and ownership. It also includes information about acceptance testing and other security procedures.

The new guide is part of a series of management guides designed to highlight chapters of the EAC’s Election Management Guidelines. Before the end of 2007, EAC will issue Quick Start guides on acceptance, pre-election, and parallel testing, military and overseas voting, absentee voting, contingency and disaster planning, ballot design, developing an audit trail, and polling place/vote center management.

The full set of Election Management Guidelines and Quick Start guides on poll workers, voting system security, ballot preparation and introducing a new voting system are available at [www.eac.gov](http://www.eac.gov). These guides are developed in collaboration with election officials and other election professionals who have firsthand experience in managing elections. To request copies or for more information, election officials should contact EAC at 1-866-747-1471 or send an email to [HAVAinfo@eac.gov](mailto:HAVAinfo@eac.gov).

For information on EAC’s voting system certification program, including test labs, registered voting system manufacturers, voting systems that have been submitted for testing, test plans, notices of clarification, and other program-related information, visit [www.eac.gov](http://www.eac.gov).

EAC is an independent bipartisan commission created by HAVA. It is charged with administering payments to states and developing guidance to meet HAVA requirements, adopting voluntary voting system guidelines, and accrediting voting system test laboratories and certifying voting equipment. EAC also serves as a national clearinghouse and resource of information regarding election administration. The four EAC commissioners are Donetta Davidson, chair; Rosemary Rodriguez, vice chair; Caroline Hunter; and Gracia Hillman.

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## **California's State-Level Red-team Analysis and Its Implications for Pennsylvania**

Collin Lynch

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07/31/07

The California Department of State recently completed a survey of the security and accessibility of almost all of the voting systems used in the state. The study and its results were recently published and are available online.<sup>1</sup> This survey included expert accessibility studies which I will address elsewhere and a security assessment. Said assessment involved an independent red-team exercise in which team members took the role of outside attackers and developed attacks aimed at altering vote totals, denying use of the system to other voters and otherwise undermining the systems integrity. Neither the Federal ITA's nor the State-level carry out such tests. Instead they assume, incorrectly, that elections occur in a cooperative environment with no malevolent agents.

The study included the Diebold-TSX, Hart eSlate and Sequoia Edge. Together these systems are used in 21 Pennsylvania Counties. ES&S failed to submit its equipment for inspection. At present the California Department of State is considering sanctions. All of the systems examined have been certified in multiple states and passed numerous official certifications. All of the systems exhibited numerous security holes and were vulnerable to many low-tech exploits. Said exploits should work as well in Pennsylvania as they did in California.

I will discuss each of the three systems in turn beginning with Diebold. I will then analyze some of the implications of this study for the state of Pennsylvania, and conclude with a discussion of future directions.

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<sup>1</sup> California Secretary of State - Voting Systems Review - [http://www.sos.ca.gov/elections/elections\\_vsr.htm](http://www.sos.ca.gov/elections/elections_vsr.htm)

## Diebold.

Diebold systems examined included the Diebold TSX using the same firmware version (4.6.4) as is certified for use in Pennsylvania. Diebold AccuOS Central Count optical scanner (again same firmware version 2.0.12 as in Pennsylvania). And the GEMS election management system (software version 1.18.24, Pennsylvania uses 1.18.25 which, according to examiner statements differs only in supporting the "Pennsylvania Method" straight-party voting).

The Diebold TSX system is used in Washington, Somerset, Armstrong, Clairon, Warren, Potter, Tioga, Lycoming, Bradford, Sullivan, Union, Northumberland, Schylkill, Carbon, Lehigh, and Pike Counties. At 16 counties it is the second most commonly used system in the commonwealth.

As part of their GEMS inspection they uncovered a number of problems including:

1. Deliberately constructed "back door" accounts that enabled the systems to be entered and results altered without a password.
2. Deliberately disabled or reduced security logging on the Windows systems.
3. Methods to alter or corrupt vote totals on the tabulation system.
4. Untraceable methods for altering vote totals within the GEMS system without producing a record in the security logs.
5. Preprogramming vulnerabilities that allow a machine to be rigged in advance so as to not record a vote.
6. Methods to seize remote control of the GEMS networking components and from them the GEMS tabulation system.
7. Methods to install malicious software without detection via a USB key.

As part of their TSX study the team discovered that:

1. It is possible to circumvent physical security of the systems using commonly available tools. This grants complete access to the machines.
2. Previously discussed security holes including those mentioned in the Princeton Study<sup>2</sup> are still present. These permit the undetected installation of software including viruses and the corruption of vote totals.
3. They discovered particularly that viruses installed on a TSX could spread to the central tabulation computer. Said infection could then spread "downstream" to other TSXs.
4. Successful attacks may be mounted by a comparatively low-skilled voter in the voting booth that will grant them total control over the machine. Said attacks may allow them to corrupt software, alter vote totals or any other malicious task.
5. Specifically crafted inputs to the voter accessible input-fields (e.g. write-in candidates) may be used to corrupt the machine and possibly take further control.
6. "Low-tech" attacks that would corrupt or disable the VVPAT, in some cases without detection until the end of the day.
7. Alteration of vote totals on the close-of-day PCMCIA card was possible.
8. It is possible to obtain security information from the district-level PCMCIA card that would enable further attacks on other TSX machines or the Central Tabulation System.

The authors further identified attack scenarios which would allow electronic ballot box stuffing by any individual voter without the need for prior security information.

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<sup>2</sup> Feldmen, Halderman and Felten (2006) "*Security Analysis of the Diebold AccuVote-TS Voting Machine.*" <http://itpolicy.princeton.edu/voting/>

## **Hart.**

The red-team examined the Hart InterCivic voting system version 6.2.1, Judge's Booth Controller version 4.3.1, eScan version 1.3.14 and eSlate version 4.2.13. All are more recent versions of the system than those certified for use in Pennsylvania.

Hart InterCivic systems are used in four counties: Lancaster, Bedford, Blair and Fayette.

When examining the central tabulation software the team discovered:

1. An undisclosed "back-door" user name and password allowing access to the vote database.
2. Buffer overflow attacks allowing corrupted data to be inserted from a voting system.
3. Mechanisms to compromise the "protected environment in which the system runs.
4. Mechanisms to bypass all device certification allowing bad data to be written into the system.

When examining the Judge's booth controller the team was able to discover mechanisms to cast multiple ballots without special access, alter the vote totals with precinct-level access and violate the local network by introducing untrusted devices.

When examining the eSlate the red-team identified mechanisms to surreptitiously print multiple ballots, cast multiple ballots and record the audio track used for visually-impaired voters. This last attack would allow a surreptitious violation of voter privacy for those voters with visual problems.

Examination of the eScan identified mechanisms to overwrite the system software, access administration commands without a password and alter vote totals or configuration settings. These attacks were comparatively low tech and required no special tools or dedicated skills.

## **Sequoia.**

The red team examined the Sequoia AVC Edge version 2 (Models I and II) with firmware version 5.0.24. This is the same version as is certified for use in Pennsylvania. They also examined WinEDS version 5.1.012 while Pennsylvania employs version 5.2.012.

The Edge is employed in York County. Montgomery County employs the Sequoia Advantage system which also incorporates WinEDS for election reporting.

In examining the Edge the authors found:

1. Previously known attacks allowing for electronic ballot-box stuffing were still possible.
2. Arbitrary code execution is possible allowing for the firmware to be corrupted or replaced.
3. Attacks that replace vote files on the Edge are possible.
4. Mechanisms to violate or void the system checks.
5. Methods to forge or rewrite result cartridges.
6. An absence of result-level security.
7. Easily by passable physical security seals.
8. Mechanisms to author direct attacks using off-the-shelf U3 based USB keys of the type used in Allegheny County's 2002 election by ES&S Staffers.

The authors also confirmed that previously known electronic ballot-box stuffing attacks were still possible.



## Analysis.

In absence of any post-election auditing the security of our elections rests entirely on the advance inspections. The premise has always been that the Federal ITAs and the State Inspectors will filter out any systems exhibiting security holes. As this study and previous studies like it show this premise is false. Indeed far from ruling out all insecure systems the State has willingly certified and deployed systems that are not secure even during the time a voter spends in the booth.

Worse yet the authors of the California Studies noted that they had comparatively little time to test the systems. As they stated on page 6 of the overview:

"The short time allocated to this study has several implications. The key one is that the results presented in this study should be seen as a 'lower bound'; all team members felt that they lacked sufficient time to conduct a thorough examination, and consequently may have missed other serious vulnerabilities. In particular, Abbott's team reported that it believed it was close to finding several other problems, but stopped in order to prepare and deliver the required reports on time. These unexplored avenues are presented in the reports, so that others may pursue them. Vigna's and Kemmerer's team also reported that they were confident further testing would reveal additional security issues."

When system problems were identified in previous years the promise was made that such problems will be found and patched quickly. The presence of known vulnerabilities in still-certified systems belies this and instead points to a lack of updates. Moreover said process still rests on the viability of the advance inspections. Said inspections have not, as is shown here, caught even the most glaring security holes, nor can they be expected to. No advance inspection, however well-funded or well staffed can be relied upon to identify all security holes. Even deliberately constructed holes such as the password-free backdoor account found in the Diebold GEMS system may still go by unnoticed.

This point was echoed by the authors of the SAIT study in Sarasota Florida.<sup>3</sup> Said study examined the iVotronic systems that were used in Sarasota County's recent elections. The study cost an estimated \$300,000, involved hundreds of hours of code review alone, and took several months overall. Despite that the authors, one of whom is Dr. Michael Shamos, examiner for the Commonwealth of Pennsylvania commented:

"There are fundamental limits on the ability of manual source code review to find defects in computer software. Manual code review is an imprecise process, guided by best practices and analyst intuition. It is impossible to check all code paths that might be executed in any nontrivial computer program. Also, in any nontrivial computer program, it is impossible to exhaustively enumerate and analyze the full state space that the code inhabits. Moreover, humans are fallible: just as the original software programmer can miss a defect in the code they write, so too can independent reviewers overlook subtle defects and bugs in the code." (pp. 19)

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3 Yasinac, et al. (2007) *Software Review and Security Analysis of the ES&S iVotronic 8.0.1.2 Voting Machine Firmware* <http://election.dos.state.fl.us/pdf/FinalAudRepSAIT.pdf>

Previous studies of this type such as the aforementioned Princeton study have been dismissed by vendors and examiners on the grounds that attackers would not have full access to the system. As such the operational vulnerabilities of this type would be concealed. However as the authors of the California Study note this premise is dangerously false. Through dumpster diving, use of inside men and other mechanisms determined attackers and not-so-determined ones can always and do always obtain information on their target of choice. Good security practitioners often operate on the assumption that any would-be attacker possesses a complete copy of the target system. And that if any hole exists it will be found, and exploited. One should never base security decisions on the assumption of ignorant or unfunded attackers, especially given the amount of money on offer in any election cycle.

While there is often a tendency to "shoot the messenger" in these situations that urge is wrong. The authors of this and other similar studies are pointing out dangers with a goal of improving our security not impairing it. The ones to fear are the individuals who discover such holes and sell them to the highest bidder, or just alter elections for their own ends.

## **Conclusion.**

This study like others before it illustrates not the vulnerabilities of a particular machine or software package but the vulnerabilities of our election system as a whole. Under our present inspections system crippling security vulnerabilities go unnoticed by the vendors, the Federal ITAs and the States. Said vulnerabilities, though discovered in California apply equally well in Pennsylvania. As such they may be exploited to alter not just a local election but State and Federal elections as well. Moreover we have no reason to believe that they went undiscovered in other competing equipment that was not covered by the California audit.

There is no single improvement or set of improvements to the inspections process that could rule out such vulnerabilities in the future. Even if existing equipment was redeveloped from the ground-up using high-assurance methodologies it would still not be proof-positive that they are safe. Elections are not conducted in cooperative environments and we cannot count on every player to play nice, or for every machine to be deployed cleanly.

Ultimately the only robust solution is the implementation of a reliable audit mechanism coupled with proper and open audit procedures. Said audits may be used to identify and correct, post-hoc, election issues that no amount of advance inspection can prevent. The best present mechanism for this is Voter-Verified Paper Ballots. While such a change may seem costly we must weigh it against the costs of election failure. How much money is in the Commonwealth's Budget? How much is in the federal? How many die in a war? At present our elections are fundamentally insecure and we cannot allow that.

# Analysis of the SAIT Report on the Florida 2006 CD-13 Undervote.

Dr. David Eckhardt - Carnegie Mellon University  
Mr. Collin Lynch - University of Pittsburgh

August 20, 2007

## 1 Background

The outcome of the 2006 general election for Florida's 13th Congressional District was anomalous. According to the certified election results, approximately 18,000 Sarasota County voters came to the polls that day but chose not to cast a vote in the U.S. House race. Because this "undervote rate" of 13% is much higher than typical for this sort of contest and also much higher than the undervote rate in the other counties making up CD-13, it is very likely that the intent of Sarasota County voters was not correctly measured. Because the 18,000-vote uncertainty dwarfs the 364-vote margin in the certified totals, it is unclear that the official outcome reflects the will of the voters.

Ironically the same ballot that carried the Jennings-Buchanan race also carried a countywide initiative calling for the replacement of the paperless iVotronic machines by precinct-counted optical scan, a system which provides voters the ability to verify an anonymous paper record of their vote. This measure won handily but was challenged in court by the County elections director even as she faced questions regarding the inability to recount the CD-13 race.

Subsequent to these events Florida's newly-elected Governor, Charlie Crist, stated his intention to replace all touchscreen DRE voting systems in the state with precinct-counted optical scan in order to obtain a recountable voting system. This measure passed easily in Florida's legislature and is at present being implemented statewide.

The CD-13 undervote anomaly is relevant to Allegheny County for two reasons. First, a genuine recount was not available in Sarasota County because paperless electronic voting machines were used. Because there was no way for the voters to personally verify that the machines were recording their intent, both the reason for the missing votes and the actual winner of the race remain matters of conjecture. Second, the paperless electronic voting machines used in Sarasota County were a version of the ES&S iVotronics we use here. This means that deficiencies in the Florida machines may be present here.

## 2 The SAIT Report

After the election, the Florida Department of State sought expert advice on the cause of the CD-13 undervote. A team, led by the Security and Assurance in Information Laboratory (SAIT) at Florida State University, was asked to review the source code of the iVotronic software. Among the expert members of the team was Dr. Michael Shamos of Carnegie Mellon University. Dr. Shamos examines voting machines as a contractor to Pennsylvania's Secretary of the Commonwealth. The team's report is entitled "Software Review and Security Analysis of the ES&S iVotronic 8.0.1.2 Voting Machine Firmware" and is available online.<sup>1</sup>

The primary conclusion of the report is a belief that the iVotronic firmware was not responsible for the missing votes. However, this conclusion must be tempered by several considerations. While the team came to believe that *identified* flaws in the firmware would not have caused this pattern of vote loss, the implications of as-yet unidentified flaws cannot be known. In addition, the team discovered previously-unknown flaws which could potentially have effected election outcomes.

The Panel wishes to draw attention to the following elements and implications of the SAIT report.

1. The SAIT team discovered inexcusable security design failures in the iVotronic which made the machines needlessly susceptible to tampering.
2. The SAIT team discovered a variety of unintentional security vulnerabilities which also exposed the machines to tampering.

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<sup>1</sup><http://election.dos.state.fl.us/pdf/FinalAudRepSAIT.pdf>

3. Despite an expensive expert investigation, the will of the voters in CD-13 remains a mystery and the cause for the mystery itself remains unknown. The Panel concurs with the opinion of the voters of Sarasota County and Florida Governor Crist that durable, anonymous voter-verifiable records are a necessity.

### 3 Security Design Failures

The SAIT team found that some iVotronic passwords (capable of erasing votes and replacing the iVotronic firmware with malicious code) were unchangeable and shared by all iVotronic terminals in the United States running firmware version 8.0.1.2. These passwords were known to many election officials across the country and could not be changed if they were guessed or stolen. Furthermore, they were very short (three characters) and easy to memorize or guess.

The report characterizes this design flaw as “poor practice,” which is putting it mildly, since hard-coded passwords have not been acceptable in the computer security community for decades.

The SAIT team also determined that *all* iVotronic password security may be bypassed by use of a “factory-test PEB.” This is a specially programmed activation module that sends a single-character command to an iVotronic to bypass all security checks. In situations where the iVotronic would require a password, the insertion of a factory-test PEB skips the password check and, worse yet, makes a security log entry indicating that a valid password was entered. The result of this vulnerability is to make the password system irrelevant to a motivated insider.

It is the understanding of the Panel that Allegheny County iVotronics, which run a different software version than was examined by the SAIT team, do not have the same password vulnerabilities but *do* have the factory-test PEB vulnerability.

### 4 Security Vulnerabilities

The SAIT team found multiple “buffer-overflow” attacks in the iVotronic firmware. These attacks occur when, due to a software bug, information is copied into an area which is too small to hold it, and then overflows into adja-

cent data areas. Buffer overflows may cause systems to overwrite data (such as vote totals) or to crash. Experts can use buffer-overflow vulnerabilities to take control of affected systems by installing new software.

The team found that it would be possible to construct an iVotronic virus which could modify vote totals and, under certain conditions, spread from one machine to another. Furthermore, they found that standard testing procedures would not be likely to detect such malicious software once it had been introduced.

The Panel does not have the information necessary to estimate how many buffer-overflow vulnerabilities are present in the version of the iVotronic software in use in Allegheny County.

## 5 Limits to the Investigation

The SAIT investigation was narrow in scope and focused solely on an investigation of the iVotronic firmware version 8.0.1.2 source code and public documentation. Numerous parts of the complete voting system were not examined for vulnerabilities by the SAIT team, which:

- Did not examine the iVotronics and PEBs used in the election,
- Did not verify that the source code is completely free from defects (as the team noted, this is not possible with today's technology),
- Did not employ formal verification methods or software assurance methods,
- Did not conduct a red-team exercise involving static and dynamic attack testing.
- Did not examining the UNITY election management system, which tabulates votes.
- Did not examine selected portions of the iVotronic system, including the I/O microcontrollers which manage communication, and third-party software that is included in the system.

According to Dr. Shamos the SAIT investigation, despite these scope limitations, took several months and costed approximately \$300,000.

## 6 Conclusions

The best information available to the Panel indicates that our ES&S iV-otronic voting system shares an unknown number of vulnerabilities with the Sarasota County machines – we believe some have been fixed, but it is also possible that others have been introduced. Some of the vulnerabilities observed by the SAIT team indicate a worrisome misunderstanding of computer security principles on the part of ES&S.

To the extent that Allegheny County continues to rely on software-dependent voting systems, it is clear that we will need inspection and verification processes substantially stronger than currently exist. Analysis of current and future systems should be modeled on the recent “Top to Bottom Review” carried out by the State of California.

However, no matter how stringent or well-funded the review process is, it cannot be a substitute for reliable backups and stringent auditing. As the authors of the SAIT Report noted:

There are fundamental limits on the ability of manual source code review to find defects in computer software. Manual code review is an imprecise process, guided by best practices and analyst intuition. It is impossible to check all code paths that might be executed in any nontrivial computer program. (p. 19)

No review of systems or security processes can be guaranteed to find all security holes or eliminate the potential for attacks.

We are deeply concerned by the prospect of the will of the voters being indeterminable after an election. Worse still would be a situation where the cause of such indeterminacy would remain unknown after months of expert investigation and thousands of dollars. In our view systems embodying durable voter-verifiable records of intent dramatically reduce the likelihood of these threats.

## Appendix E: Additional Information

Apart from the documents of immediate relevance that we have included in or appended to the report (appendices A-D) there are additional documents to which we would like to point the county's attention. These documents are available online and furnish additional information that is relevant to the report itself.

### Relevant Elections Data and Public Reports.

Appended below are three reports about the progress of elections both locally and nationwide. Said reports may be informative for those who are interested in the topic.

#### Election Incident Reporting System statistics for Allegheny County.

During the 2004 & 2006 elections data from Allegheny County was collected for inclusion in the Election Incidence Reporting System EIRS. This is a nationwide database that maintains information on election issues in various locales for comparison. Data from Allegheny County is summarized here:

2004 Data:

<https://voteprotect.org/index.php?display=EIRMapState&tab=ALL&state=Pennsylvania>

Documentation from Video the Vote:

<http://www.videothevote.org/display.html?state=PA>

The Election Protection hotline, 1-866-OUR-VOTE received 1088 calls from Pennsylvania, before and on Election Day, November 7, 2006. EIRS has 769 reports from Pennsylvania; 372 inquiries, 397 reports of problems. Information below obtained from the Election Incident Reporting System, VotePA and the December 2006 Report by the Lawyers' Committee For Civil Rights Under The Law. Pennsylvania data is on page 35. Allegheny County voting machine problems are referenced on page 37.

[http://www.lawyerscommittee.org/2005website/home/images/features/FINAL\\_EP%20Boad%20Report.pdf](http://www.lawyerscommittee.org/2005website/home/images/features/FINAL_EP%20Boad%20Report.pdf)

- Voters from 18 counties reported problems with voting machines, accounting for 13% of all problems from Pennsylvania. EIRS includes reports of machine problems in Allegheny, Philadelphia, Bucks, Clearfield, Chester, Columbia, Cumberland, Dauphin, Delaware, Erie, Jefferson, Lawrence, Mercer, Montgomery, Northampton, Pike, Westmoreland, and York counties.
- The hotline received widespread reports of machine problems in Allegheny. Poll workers told voters the polls were closed because machines were broken and many voters were not allowed to vote at all, even by paper ballot.

#### The Machinery of Democracy: Voting System Security Accessibility, Usability and Cost.

A 2006 report from the Brennan Center for justice presents one of the earliest empirical studies of electronic voting systems and the risks posed by them. This is a general study that contains many lessons



applicable to Allegheny County.

[http://www.brennancenter.org/dynamic/subpages/download\\_file\\_38150.pdf](http://www.brennancenter.org/dynamic/subpages/download_file_38150.pdf)

### **Report on HAVA Spending by States.**

On July 31st 2007 the Election Assistance Commission (EAC) released a report summarizing the ways in which HAVA money was spent by the states. The EAC is a federal commission charged with overseeing the implementation of HAVA. This report is available at:

<http://www.eac.gov/docs/Congressional%20Report%20Public%20Release%20Final.pdf>

### **Relevant County Resolutions**

Referenced below are two resolutions from County Council of interest to this report.

#### **Resolution establishing the Panel.**

The Citizen's Advisory Panel on Elections systems was enacted by Ordinance number 03-07-OR. The ordinance itself as well as information regarding its enactment may be found here:

<http://legistar.county.allegheny.pa.us/detailreport/?key=3188>

#### **County Council's Resolution endorsing HR 8.1.1**

The Allegheny County Council has gone on record endorsing HR 8.1.1. This relevant sense of Council is available here:

<http://legistar.county.allegheny.pa.us/detailreport/?key=3834>

## **Reviews and inspections of Voting Systems.**

Appendices C and D reference independent inspections of voting systems. The full inspection reports are detailed below.

### **California's Top to Bottom Review of Electronic Voting systems.**

Appendix A presents an analysis of the Red-Team hacking tests conducted by the State of California. These tests were conducted as part of a top-to-bottom review of voting systems used in the state. This review included separate source code analysis, and accessibility studies. At the culmination of this review the California Secretary of State decertified all the examined systems due to the presence of crippling security holes and a lack of accessibility features. In order to satisfy legal requirements for accessible systems and early voting a selection of the systems will be usable in the November election for a subset of tasks if and only if the manufacturers satisfy a list of requirements. These requirements include development of hardening plans for the systems complete disclosure of the systems and legal assurances of system security. It is not yet clear whether the vendors will meet any of these conditions. In any case the conditional use does not extend beyond this election and new systems will have to be submitted for certification.

Equipment made by ES&S was decertified because the manufacturer failed to comply with the review. This decertification has no conditions. The full results of this study including the decertification orders may be found here:

[http://www.sos.ca.gov/elections/elections\\_vsr.htm](http://www.sos.ca.gov/elections/elections_vsr.htm)

### **Sarasota County Inspection Report**

A full copy of the iVotronic inspection report as made by the Security and Assurance in Information Technology Laboratory at Florida State University (SAIT) is available online. The report itself is discussed in Appendix D. The original copy is located here:

<http://election.dos.state.fl.us/pdf/FinalAudRepSAIT.pdf>