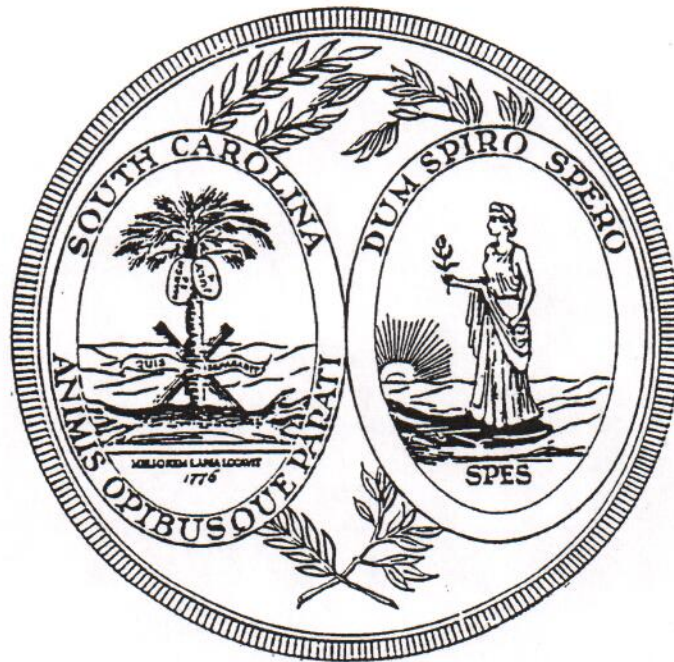


**Report of the  
Joint Voting System Research Committee**

**Submitted to the South Carolina General Assembly**



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**Senator Ronnie Cromer, Co-Chair  
Representative Walt McLeod, Co-Chair**

**March 17, 2016**

### Enabling Legislation and History

The Joint Voting System Research Committee was enabled by Proviso Part 1B 91.30, in the FY 2015-2016 Appropriations Bill. The main task of the Joint Voting System Research Committee, hereinafter referred to as "Committee," is to "identify and evaluate current voting system technologies" that meet South Carolina statutory requirements.

Following is the statutory language which created the Committee:

**91.30.** *(LEG: Voting System Research Committee) There is created a joint legislative committee, entitled the "Joint Voting System Research Committee." This committee shall be comprised of ten members of the General Assembly, as follows:*

- (1) the President Pro Tempore of the Senate, or his designee;*
- (2) the Speaker of the House of Representatives, or his designee;*
- (3) the Chairman of the Senate Finance Committee, or his designee;*
- (4) the Chairman of the House Ways and Means Committee, or his designee;*
- (5) the Chairman of the Senate Judiciary Committee, or his designee;*
- (6) the Chairman of the House Judiciary Committee, or his designee;*
- (7) the Majority Leader of the Senate, or his designee;*
- (8) the Majority Leader of the House of Representatives or his designee;*
- (9) the Minority Leader of the Senate, or his designee; and*
- (10) the Minority Leader of the House of Representatives or his designee.*

*In the event a designee is appointed they must be selected from the membership of the General Assembly.*

*The committee shall identify and evaluate current voting system technologies that meet the standards established by Title 7 of the 1976 Code. The committee shall issue a report which shall include, but is not limited to, the following:*

- (1) an evaluation of each form of voting system technology considered by the committee, including costs, usability, reliability, accessibility, ability to conduct random audits of election results, and security matters related to each, as well as any possible solutions to address any concerns raised;*



(2) *consideration of best practices established by the United States Election Assistance Commission; and*

(3) *an analysis as to which technology should be implemented in South Carolina. This analysis shall include costs to acquire and fully implement the recommended technology for a statewide uniform voting system. The analysis must include proposed milestones and success measures for implementation.*

*The report shall be submitted to the Chairman of the Senate Finance Committee, the Chairman of the House Ways and Means Committee, the Chairman of the Senate Judiciary Committee, and the Chairman of the House Judiciary Committee no later than January 30, 2016, after which the committee shall be dissolved.*

*Staff for the joint committee shall be provided by the Senate Finance Committee, the House Ways and Means Committee, the Senate Judiciary Committee, and the House Judiciary Committee. Members of the study committee shall serve without compensation for per diem, mileage, and subsistence in performance of their duties as is provided by law.*

#### **Committee Members and Appointment**

The following legislators were appointed to the committee:

President Pro Tempore of the Senate or designee	Sen. Floyd Nicholson
Speaker of the House of Representatives or designee	Rep. Alan D. Clemmons
Chair of the Senate Finance Committee or designee	Sen. Ronnie W. Cromer
Chair of the House Ways and Means Committee or designee	Rep. William G. Herbkersman
Chair of the Senate Judiciary Committee or designee	Sen. George E. "Chip" Campsen III
Chair of the House Judiciary Committee or designee	Rep. Rick Quinn
Majority Leader of the Senate or designee	Sen. Sean Bennett
Majority Leader of the House or designee	Rep. Kirkman Finlay III
Minority Leader of the Senate or designee	Sen. John L. Scott, Jr.
Minority Leader of the House or designee	Rep. Walton J. McLeod.

#### **10 October 2015 Meeting Summary**

The committee met on October 10, 2015 and elected as co-chairmen, Senator Ronnie Cromer and Representative Walton J. McLeod. The Committee received testimony from six individuals present at the hearing:

(1) Marci Andino, Executive Director, S.C. State Elections Commission

Ms. Andino gave testimony regarding the history of voting systems in South Carolina, as well as the status of current system in use. The system currently used was purchased in 2004 after the passage of the Help America Vote Act of 2002 (HAVA) which provided federal funds to replace systems nation-wide. The current system is nearing its life expectancy of 12-15 years, and due to its age, replacement parts for this system have become problematic and will eventually become obsolete. Each machine currently



costs \$3,000 to replace. Ms. Andino stated that the State Election Commission (SEC) intends to issue a request for proposal (RFP) by the end of 2015, and expects to receive responses in March or April of 2016. She anticipates holding oral presentations with qualified vendors in the summer of 2016, with a final award by the Fall. She stated that the optimal time to purchase and begin implementation of the new voting system would be January 2017, in order to have the system functioning by the June 2018 primaries. The RFP will be solutions-based, which requires the SEC to define a business problem and the vendors to provide applicable solutions. It is anticipated that this type of RFP will provide the greatest flexibility to review options for South Carolina, as opposed to more conventional procurement vehicles. For example, a solutions-based RFP may offer the option of leasing a voter system as opposed to the outright purchase of one, and bring a variety of responses regarding the spectrum of available technologies. One drawback of solutions-based RFP, however, is it that may be more difficult to predict costs of the new system. Ms. Andino anticipates that a new statewide system will cost approximately \$40 million, based on prior experience. She stressed that a new voting system should be auditable, accurate, able to adapt to and incorporate rapid changes in technology, and secure and accessible to voters.

(2) Katy Hubler, Senior Policy Specialist for Elections, National Conference of State Legislatures (NCSL)

Ms. Hubler provided an overview of the status of voting systems on a national level. Described as a "national crisis" by several leading experts, many states are dealing with aging voting systems simultaneously as the majority of states purchased their voting machines between 2002 and 2008 with federal funds provided with the enactment of HAVA. With the funds for HAVA already expended, states are facing funding challenges in light of other competing budget priorities. Ms. Hubler highlighted the experiences in other states that recently acquired new voting systems. For instance, Georgia mandated a uniform state-wide voting system by statute. This system is maintained at the state level by the Center for Election Systems at Kennesaw State University. By contrast, Maryland recently chose to lease its voting equipment, with costs split between the state and counties. Colorado is instituting smaller pilot programs at the county level which will test various systems. The systems will be evaluated at the conclusion of the pilot programs after which time the state will decide upon a single statewide system. Finally, some states such as Minnesota and Wisconsin, provide funding to local governments to acquire their own systems. Ms. Hubler's testimony demonstrated how states are selecting systems based on their own specific needs, and while South Carolina uses a uniform voting system, this is not necessarily the current standard on a national level.

(3) Matthew Masterson, Commissioner, U.S. Election Assistance Commission (EAC)

Commissioner Masterson testified on the role and function of the Election Assistance Commission (EAC), which is a bipartisan, federal commission. Amongst its duties, the EAC is tasked with testing and certifying voter systems, while serving as a clearinghouse of election information and election administration best practices. The EAC has certified 8 voting systems, and has an affiliation with 13 manufacturers. Commissioner Masterson explained the EAC's rigorous testing standards, and commented that modern voting systems require IT management. Some members of the Committee inquired about the potential of using personal computer devices, or "off the shelf" components, such as a tablet or other device that is commercially available, instead of purchasing equipment from an elections systems vendor. The critical issue with using tablets or personal electronic devices, Commissioner Masterson emphasized, is the threat to security. He cautioned that any component that deals with vote tabulation should never be connected to the internet.



(4) Merle King, Executive Director, The Center for Election Systems, Kennesaw State University

Dr. King testified on the criteria a government entity should consider when selecting and implementing a statewide voting system. He explained that a voting system is not merely a voting machine, but a collection of components that define ballots, cast and count votes, tabulate election results, and produce audit trail information. Important factors for consideration of a new system include reliability, accessibility, accuracy, and availability of replacement units and parts. He commented on the importance of clarifying the definition of a "voting system" for the RFP process. In South Carolina, a voting system, as defined in terms of SC Code § 7-13-1655, includes the mechanical and electronic equipment, including software. Dr. King stressed that each component of a voting system is integral to the system's security. He also commented that South Carolina has a unique challenge in how frequently elections are held in the state.

(5) Duncan Buell, Professor in the Department of Computer Science, Clemson University, who appeared on behalf of the S.C. League of Women Voters

Dr. Buell, who testified on behalf of the League of Women Voters, urged the Committee to examine other jurisdictions which recently acquired voting systems. He advocated for a voting system that is "totally transparent and totally auditable." According to Dr. Buell, some aspects of that type of system, include a simple application, with no complex software intervention, and a paper record of each ballot.

(6) Brett Bursey, Executive Director, South Carolina Progressive Network

Mr. Bursey requested that the Committee consider an "open source system," in which South Carolina would own the information and voters could use their tablets or phones in order to cast a ballot.

#### **19 February 2016 Meeting Summary**

The Committee met on February 19, 2016 and received testimony from Gregory A. Miller, Chief Development Officer of the Open Source Election Technology (OSET) Foundation.

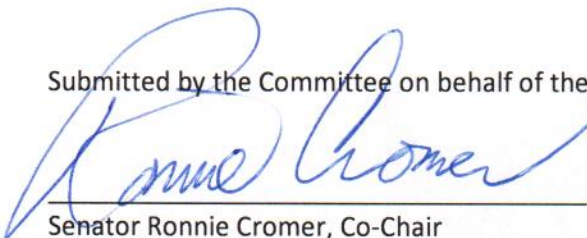
(1) Mr. Miller testified on the efforts in which the OSET foundation is engaged to develop "open source" election technology. He described this technology as being freely available, more verifiable, accurate, secure and transparent than what is currently available in the commercial marketplace. He testified that OSET, which is a non-profit, non-partisan organization funded through philanthropic grants, has channeled most of its efforts through the "Trust the Vote" Project and is creating a framework that addresses all aspects of elections administrations functions and would be publicly-owned and royalty-free. Mr. Miller argued that OSET's final software product could provide substantial savings as compared to traditional systems, as well as provide ownership of the system's source code. Mr. Miller stated that this system is software-based, relies on paper balloting, provides a means of tracking vote processing, and is conducive to auditing. Mr. Miller believes this system would be fully developed within the next two years. This technology has not been certified by the EAC, but Mr. Miller indicated that OSET is waiting for updated EAC standards and plans at that time to commence the certification process.

Attached is the testimony provided by all individuals who provided written remarks.

### Conclusion and Findings

- (1) Proviso 91.30 charged the Committee with evaluating different forms of voting systems and providing a recommendation as to which technology should be implemented in South Carolina.
- (2) The Committee finds that South Carolina's next voting system must be secure, and instill confidence in the citizens that their votes will be counted, as they intended for them to be cast. A new voting system must include some type of audit function, or "paper trail," that would allow the voter to confirm his or her ballot, as it will be tabulated by the SEC. When required, this paper trail could be utilized by the SEC for audit purposes and ensure the accuracy of the election results.
- (3) The Committee became aware that some critical information would not be available until after responses to a RFP were received. In addition, the Committee is cognizant of the constraints of the procurement process, and does not wish to unduly influence or hamper the acquisition of a new system. The Committee believes that a new system must allow the voter to confirm his or her ballot.
- (4) At this time, per Section 7-13-1620, any voting system in South Carolina must be approved by the federal EAC. There are currently eight systems certified by the EAC, with additional manufacturers undergoing the certification process. Information regarding the EAC's review standards, certified voter systems, and systems currently undergoing the certification process, can be found at [www.eac.gov](http://www.eac.gov). Understanding the eventual need to purchase a new system, the General Assembly appropriated \$1 million as seed money during FY 14-15 that is currently held in an account with the Department of Administration.
- (5) Committee members understand that this is a sizeable investment and encourage all options to be considered fully including, but not limited to, acquiring the equipment in stages in order to capture the technological improvements, leasing the equipment, or maintaining the existing equipment in order to purchase a more advanced technology in the future.
- (6) The Committee hopes that this study provides valuable information to be used to during the FY-16-17 budget process and subsequent years in order that a fiscally responsible decision regarding additional funding can be made.

Submitted by the Committee on behalf of the Co-Chairman:



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Senator Ronnie Cromer, Co-Chair



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Representative Walt McLeod, Co-Chair



**Testimony of Marci Andino, Executive Director, State Election Commission**

November 10, 2015 – Voting System Research Committee

There is no more fundamental right in America than the right to vote and to have that vote counted. But to have a healthy and functioning democracy, we have to protect the citizens' right to vote and take actions that ensure they can exercise that right.

People must have confidence in the integrity of the elections process itself, and confidence that our elections are conducted in a fair, open and non-partisan way.

Selecting a voting system must also be approached in a fair, open and non-partisan way. A voting system is an integral part of the election process and is the main interface with the voter. Many factors must be considered when procuring a voting system, but before we discuss the process of selecting a new system, I want to give you a brief history of voting systems previously used in South Carolina and how the voting system industry has changed.

Over the last 30 years or so, South Carolina has used hand-counted paper ballots, lever machines, punch card ballots, optical scan ballots and six different electronic voting systems. During the 1980's, counties used a variety of types of voting systems. The State Election Commission led the charge to replace hand-counted paper ballots with electronic voting machines. The agency's goal was twofold: discontinue the use of hand-counted ballots and have a single voting system used by all counties in the state. In 1986, six counties began using the first electronic voting system certified for use in the state. Over the next decade, other electronic voting systems were certified and 18 additional counties moved to the direct record electronic technology while other counties continued to use punch cards and optical scan voting systems.

The General Election of 2000 changed elections and voting systems in the United States forever. Following the problems experienced in Florida, Congress passed the Help America Vote Act (HAVA) and provided federal dollars to improve election administration and replace punch card voting systems. HAVA required states to have a diverse state planning committee to determine how the funds would be spent. The state planning committee in South Carolina had more than 50 members, including Senator John Scott. This committee decided the state would be better served having a single voting system. In 2003-04, the State Election Commission worked with the Information Technology Management Office (state's procurement office) to purchase a voting system that was most advantageous for the state. The cost of the statewide voting system was approximately \$34M.

The stakes were high and this created a lengthy and highly contentious procurement process. The decision of the HAVA State Planning Committee to have a single system statewide created a winner-take-all situation, and many smaller vendors stood to lose long



time customers in the state. Some counties, who had existing relationships with their vendors, also opposed the statewide system. However, once the procurement process was over and the new system was implemented, counties quickly realized the benefits of having one system.

The voting system industry has changed greatly since 2000. At that time, the voting system industry was made up primarily of a few larger companies but mainly smaller, family owned and operated voting vendors. With the infusion of federal funds, larger companies were attracted to the voting industry and there was a national trend toward statewide systems. Smaller vendors were unable to compete in this environment. Only one of the companies that responded to the state's solicitation in 2004 is still in business today. That one company happens to be the state's current vendor. This is an example of how the procurement process worked to protect the state's investment in the voting system.

Another change since 2004 is that none of the electronic voting systems certified for use at that time had voter-verified paper audit trails. Most people are comfortable with paperless voting in the same way they are comfortable with paperless technologies in day-to-day transactions such as online banking, shopping, bill paying, and electronic tickets. South Carolina has been using electronic voting machines with no paper aspect for nearly 30 years, and voters have been confident in these systems. However, there are some voters and groups that would feel more confident with a system that had a voter-verified paper record. The fact is that today's market is much different than in 2004, and most, if not all, of the systems currently certified for use have an electronic voter interface with some type of paper feature included.

South Carolina is unlike most other states when it comes to managing our relationship with the voting system vendor. South Carolina, like the State of Georgia, has always been vendor independent, meaning we produce our own election definitions and ballots, both electronic and paper, for all elections held in the state. Most states and local jurisdictions rely on vendor support for these services. The SEC saves taxpayers well over \$1M every year by providing these services to counties and cities.

Since 2004, when the statewide voting system was implemented in the first 15 counties (the remaining 31 counties were implemented in early 2005), thousands of elections have been conducted using the system. Have we experienced any issues during these elections? Yes. Were the issues caused by the voting system not functioning properly? No. The system has always performed as it was designed to do. The issues we've experienced can all be attributed to human error. Each issue provided a learning experience for election officials resulting in updated procedures, improved training, and the development of a comprehensive election results audit program to reduce occurrences of similar issues in future elections. Over the past 11 years, election officials across the state have gained a vast



amount of knowledge about our voting system. In addition, the voting system is likely to be blamed for any election issue, whether it's related to the system or not. For example, long lines in Richland County in 2012 had nothing to do with the performance of the voting system and everything to do with not using enough voting machines.

We not only gained the knowledge from our own experiences, but we remain at the forefront of voting system trends on the national level through our work with voting system advisory committees, the Association of State Election Directors, the Presidential Commission on Election Administration, the Election Assistance Commission, the Council of State Governments, the National Conference of State Legislatures, and the PEW Charitable Trusts.

With more than 11 years' experience using the statewide voting system, the state has benefited greatly by having a single system in all counties:

- Training is enhanced since all counties have the same type of equipment
- When voters move from one county to another, the voter doesn't have to learn how to vote on a different system
- When voter guides are produced, instructions for using multiple systems are not needed
- The voting system doesn't allow a voter to over-vote (vote for more candidates than allowed for an office)
- The voting system prompts the voter if they do not make a selection for an office (under votes)
- Counties don't have to determine a voter's intent as is necessary when a paper ballot is marked poorly or incorrectly
- Voters who are blind or have low vision can vote without assistance
- Ability to report election results in a timely manner is improved

As I mentioned earlier, the statewide voting system currently used in SC was implemented in 2004 and the system has been used in more than a thousand elections. Across the state, there are more than 13,000 voting machines. With a life expectancy of approximately 12 to 15 years, the system is approaching end of life. With the age of the voting system, we are beginning to see more voting machine performance issues resulting in an increase in maintenance calls. We also have been told by our vendor that availability of replacement parts will become a problem at some time in the future. To put the age of our voting system into perspective, the voting machine is a special purpose computer with a motherboard that has a 386 processor. This processor was commonly used in PC's during the early 1990s. The type of touch screen technology used in the voting machines is also outdated and no longer used in other devices. On the voting machine, a voter must touch the screen and hold their finger in place to make a selection. This type of touch screen



technology can have drifting or calibration issues. Current touch screen technology, such as that used on smart phones, requires only a quick tap or swipe to make a selection and does not require calibration.

SC Code of Laws Sections 7-13-1620 and 7-13-1655 mandates that the State Election Commission certify and select voting systems and follow state procurement code when purchasing a system. Systems must be tested and certified on the federal and state levels before being used in our state. We take these responsibilities seriously.

So where are we in the process of procuring a new system? We engaged the office of Information Technology Management earlier this year as we started planning for the procurement of a new voting system. In May, we held a voting system fair to educate election officials and others about new voting technologies. Six vendors were invited to participate in the fair. The invited vendors either already had a voting system certified or had a system in the certification process. Today, there are currently five vendors with systems certified at the national level. Four vendors and approximately 200 attendees participated in the fair including Representative McLeod. No decisions were made as a result of the voting system fair and vendors did not have to participate in the fair in order to participate in the procurement process. During the months of June and July, we held requirements gathering meetings with county boards of registration and elections to ensure they had a voice in developing a request for proposals (RFP) – the solicitation document required to purchase a new voting system. Since July, work has been underway on writing the RFP. We anticipate releasing the RFP by the end of the year. Because state and county election officials will be busy planning for and conducting the two Presidential Preference Primaries in February, we anticipate having vendor proposals due in March/April 2016. During this time, state and county election officials will be preparing for the statewide primaries in June so we are building in time for a lengthy evaluation process. Oral presentations will be held so vendors can demonstrate their proposed systems in the summer of 2016. After the evaluation process is over, an intent to award will be announced in the fall of 2016. The optimal date for implementation of the new system to begin is January 2017. Use of the new system will begin later in 2017 for municipal and special elections and the first statewide use will be in June of 2018 for the primaries.

The cost of replacing the statewide voting system is estimated to be approximately \$40M. This estimate was developed from our previous experience implementing a statewide system as well as preliminary pricing from vendors. It is impossible to arrive at an exact dollar amount until proposals are received from vendors. We appreciate this is a significant appropriation being requested and that is why we have been asking for funds for five years so we could spread the cost of replacing the system over a number of years instead of having a sizable request in one fiscal year.



At the recommendation of the Information Technology Management Office, we are using a solutions-based RFP to solicit proposals for a statewide voting system. In a solutions-based RFP, the SEC will define the business problem and ask vendors to provide a solution. An evaluation committee of subject matter experts will review the proposals to determine which solution is most advantageous to the state taking into consideration the technical solution proposed, cost and other evaluation factors.

While I cannot discuss the actual contents to be contained in the RFP, I can share our vision for a new voting system. The new voting system will be:

- The most advantageous to the state as required by Procurement Code
- High quality and durable
- Easy to use and accessible to all voters, including voters with disabilities
- Accurate – the system must accurately record votes cast and tabulate the results
- Auditable – the system must provide a way to confirm the votes have been cast, recorded and counted accurately (such as a paper record of each vote)
- Flexible enough to incorporate future technologies such as new voting devices or legislative changes such as early voting
- Secure – the system must employ methods to protect the integrity of the voting process

Choosing a new voting system to allow voters to make their voices heard is an important, costly, time-consuming and highly technical task that should not be and is not being taken lightly. While we have no way of knowing the exact cost of a new system until vendor proposals are submitted, we anticipate the cost to be in the range of \$40M.

In closing, the State's next voting system must meet or exceed the high standards set by the U.S. Election Assistance Commission and used by independent laboratories to test voting systems. The next voting system must be adaptable to changes in technology as well as legislative changes. Above all, South Carolina's next voting system must be accurate, secure and accessible to all voters.

Testimony to the South Carolina Voting System Research Committee  
By Katy Owens Hubler, on behalf of the National Conference of State Legislatures (NCSL)

Thank you, Mr. Chairman, and members of the committee. I appreciate the invitation to speak to you today on the topic of voting technology in the states. I'm Katy Owens Hubler and I am speaking on behalf of the National Conference of State Legislatures (NCSL), a bipartisan organization headquartered in Denver, Colorado.

NCSL serves the legislators and legislative staff in all 50 states and the territories. We provide non-partisan research and analysis, and link legislators with each other and others. We do not take a position on state policy decisions, I am not advocating for any of the ideas I'll mention today. Instead, I am providing information from across the nation for your consideration. I do recommend that you talk with your state and local election officials to learn what works best for your state.

NCSL's elections team provides research and analysis on a variety of election administration issues. We produce a monthly election administration newsletter – The Canvass – and also write election articles for NCSL's State Legislatures magazine. We have extensive webpages addressing election issues, and if there is something you would like information on that you don't see on our website we are more than happy to do additional research on your behalf.

Today I've been asked to provide a national perspective on the issue of election and voting technology. First, I'll take you through a brief history of voting technology nationwide, and what we've seen over the years. Then I'll highlight a few states that are in a similar situation to South Carolina – looking at buying new voting equipment. Last I'll touch on a few of the funding options being discussed nationwide.

To start my history piece I'll take you back to the founding of the country. Initially voting was done orally on the courthouse steps.

Next came paper ballots, which worked well for a rural nation with small precincts. In small quantities paper ballots are easy to count. As the population grew, this became more and more difficult. The machine on the right is one of the first voting machines designed to automatically tabulate votes. Voters would insert a paper ballot into the slot and activate the lever that released the ballot into the box and create a running count.

With the industrial revolution came an interest in mechanical solutions. With it, cities grew and made it more time consuming to hand count paper ballots. By the early 20<sup>th</sup> century, the new technology was a lever voting machine. Many of you may remember these – they were in use until fairly recently in many jurisdictions. These lever machines were most often used in urban areas, since they sped up the counting process when dealing with a large number of voters, while many rural jurisdictions stuck with paper ballots.

Starting in the 1960's we saw the introduction of punch card voting machines. Lever machines were getting expensive, precincts were growing and it was getting harder to store and transport the big



machines. Punch card machines provided a more mobile solution. You may recognize the model on the right, which gave us hanging chads.

The 1980's and 90's saw the proliferation of many of the technologies that we're familiar with today – direct recording electronic (DRE) voting machines that directly record a voter's choices, and optical scan voting machines that scan a paper ballot in order to tabulate results. Some jurisdictions use optical scan voting machines in precincts, and others bring paper ballots to a central location and use larger, high-speed scanners for counting.

The landscape of voting technology changed drastically after the 2000 election and Florida's controversial "hanging chads." In response, the federal government passed the Help America Vote Act (HAVA). Among other provisions, HAVA made funds available to states to replace their punch card and lever voting machines with DREs or optical scan systems. It also established the Election Assistance Commission (EAC) to develop new standards for voting systems. We'll hear more from EAC Commissioner Masterson later today. States submitted HAVA plans in order to receive funds for new equipment. One of the effects of these statewide plans was to put more responsibility for voting equipment on the state, rather than on local jurisdictions.

To see the changes visually, I have a series of maps that show which voting machines were in use by jurisdiction. These have been provided courtesy of Election Data Services. As you can see, in 1980 there was a patchwork – many different types of machines were being used in states, with concentrations of red (punch cards), blue (lever machines) and orange (paper ballots).

By 2000, this is what the picture looked like – you'll notice much more of the optical scan (neon green) as well as electronic DREs (purple). It is still a patchwork, though. Purchasing was usually county-based, and machines aged and were bought on a rolling basis.

This is the map in 2014, which shows the effects of HAVA and more consolidation at the state level. More states are taking responsibility for negotiating contracts with voting system vendors and buying voting systems in bulk.

So where are we now? Due to the infusion of federal HAVA funds, the majority of jurisdictions across the country bought equipment between 2002 and 2008. The machines that were bought with these funds are expected to last 10 to 15 years, at best. This means that equipment all over the country is either at the end of its expected life cycle, or close to it. In its final report, produced in 2014, the bipartisan Presidential Commission on Election Administration dubbed this situation the "impending crisis in voting technology."

Jurisdictions seeking to buy new equipment need at least two years lead time before a big election so that there is sufficient time to purchase a system, test new equipment and train staff on how to use it. No jurisdiction wants to be testing brand new equipment in a big presidential election year, for example. And there is little hope that we can expect federal funding this time around.

So, states are looking at a variety of funding options. I'll touch on a few "case studies" to highlight what other states are considering.



Georgia is a good example of a state that has a uniform voting system – every county in the state uses the same equipment. This is statutorily mandated in Georgia. Machine testing and maintenance is done at the state level, by the Center for Election Systems at Kennesaw State University. We'll hear from Mr. King from Kennesaw State a bit later today. Georgia estimates that it saves about \$1 million a year by doing its own maintenance, as opposed to paying for a voting system vendor to conduct maintenance. Having a uniform system also helps with contingency planning. If a county has a large-scale problem with its machines (a fire in its warehouse, for example) machines can be borrowed from adjacent counties. Election staff will already be familiar with the borrowed machines since they are the same. Statewide training for election officials can also be done on the state level, and the state can better assist with trouble-shooting technical problems on Election Day.

Maryland also has a uniform system across the state. Maryland recently obtained new equipment, moving from a DRE to an optical scan system accompanied by a ballot marking device. The ballot marking device has a touch screen interface, and is used for early voting and to provide the opportunity for voters with a disability to vote independently. The Maryland General Assembly passed legislation in 2007 that required voting machines with a paper trail, but funding was just made available to purchase a new system this year. The state and counties split the cost of the system 50/50 and Maryland has chosen to lease its new system rather than purchase it outright.

Colorado does not currently have a uniform voting system, but the state is looking to move to one. A working committee has been studying the issue for the last two years, and just last week there were pilots of four different systems conducted across the state. The state plans to decide which of these systems to choose for a statewide purchase by January 1, 2016. If the legislature isn't able to allocate funds, it may be possible for the state to secure a low interest loan to pay for the new machines.

New Mexico is an interesting case study because prior to HAVA it had a voting system revolving fund. The legislature would allocate money to the revolving fund and counties could obtain zero interest loans from the fund for purchasing voting equipment. The counties chose from a menu of options certified by the state. After HAVA, however, the state moved to a statewide system. New machines were purchased statewide last year, with funds allocated by the legislature in two appropriations. The state negotiated the contract with the vendor and machines are maintained at the state level.

The next two states I'll discuss, Minnesota and Wisconsin, provide a contrast to the previous states in that they are highly decentralized. In Minnesota, counties own and purchase voting equipment and many systems are in use. A recent survey of counties showed that almost all of them need to replace equipment by 2020, and almost none know where the funding will come from. Some of the larger counties have made purchases already, but it is the counties with fewer resources that could most benefit from some state assistance. To replace all of the voting equipment in the state, it would take an estimated \$30 million.

In Wisconsin, elections are run at the municipal level, in 1,853 jurisdictions. Within counties, there may be different machines used in different municipalities, making the state a true collage of voting equipment. Many of the smaller jurisdictions hand count paper ballots. Even though elections are run at

the municipal level, counties still play a role and may assist municipalities with purchasing new equipment. The state, however, does not play a role in funding voting equipment.

As we've seen through these case studies, states are discussing a variety of options for funding voting equipment purchases. Some states are discussing a statewide bulk purchase in order to take advantage of economies of scale and potentially get a better deal on new voting equipment. Some are telling the counties that they have to be responsible for funding new equipment, and others are splitting the cost between the state and counties. Some states are looking at leasing equipment vs. purchasing it outright.

With any of these purchasing options the question becomes – where do the funds come from? State are looking at a variety of sources. Among the options being discussed are:

- A direct appropriation for voting equipment statewide.
- Setting up a grant program or a low-interest loan program for counties that need to purchase equipment, with funds appropriated by the legislature and administered by the secretary of state or board of elections.
- Entering into agreements with counties in order to buy equipment in bulk. In this scenario the counties would provide the funds, but the state would negotiate the contract.
- Leaving the purchasing and decision-making in the hands of local jurisdictions, where funding could come from local appropriations or through bonds. Some jurisdictions have a capital expense line item for elections equipment, and therefore funds build up over a few years to make major purchases.
- Dedicated revenue through fees. In states where the secretary of state is the chief election official, this could be through fees administered by the business side of the office.

As states tackle this issue, I'm sure others would be interested in the direction that South Carolina takes as well.

With that, I will conclude my prepared remarks. I'm ready to answer any questions that you may have, and if I don't have answers today, I will do some additional research and get back to the committee. Thank you, Mr. Chairman, for the opportunity to be here with you today.



# VOTING SYSTEMS NATIONWIDE

Presentation to the South Carolina Voting System Research Committee  
By Katy Owens Hubler  
on behalf of the National Conference of State Legislatures (NCSL)

## What Does NCSL Do?

- Serves 7,383 legislators and 25,000 legislative staff
- Provides non-partisan research & analysis
- Links legislators with each other and with experts
- Speaks on behalf of state legislatures in D.C.

## NCSL's Elections Team

### ■ Research and Publications

- The Canvass
- State Legislatures Magazine
- NCSL Website

THE CANVASS  
STATES AND ELECTION REFORM®



- History
- Case Studies
- Potential Funding Options



## A History of Voting Technology

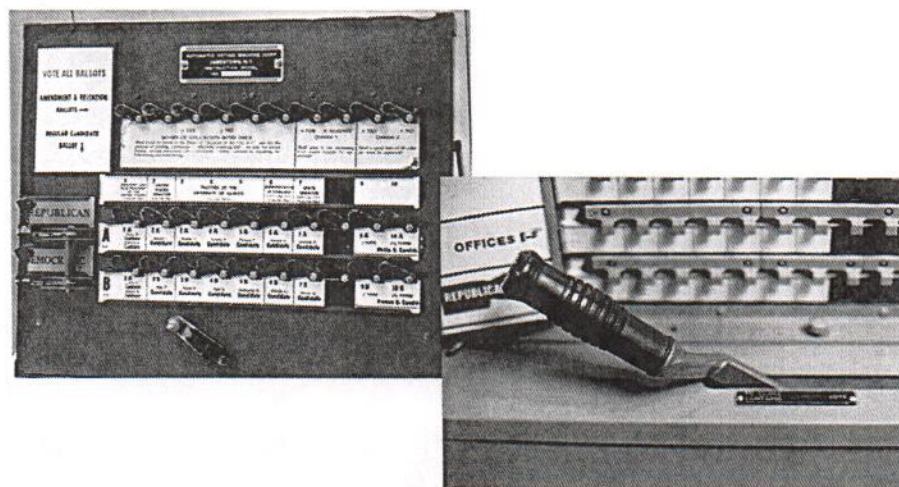


## A History of Voting Technology

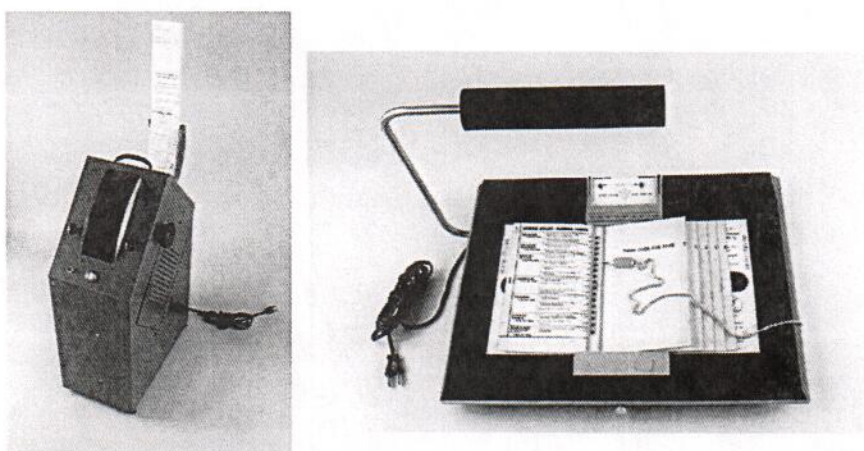
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<input type="checkbox"/> FOR MAYOR, ABRAHAM L. J. JR.	<input type="checkbox"/> FOR MAYOR, CHAS. LEWIS
<input type="checkbox"/> FOR TREASURER, GEORGE W. ROBERTS	<input type="checkbox"/> FOR TREASURER,
<input type="checkbox"/> FOR CITY CLERK, FRANK J. DODD	<input type="checkbox"/> FOR SHERIFF, L. H. FULLER
<input type="checkbox"/> FOR SHERIFF, F. A. HENNING	<input type="checkbox"/> FOR SHERIFF, H. W. LATHROP
FOURTH WARD	
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## A History of Voting Technology

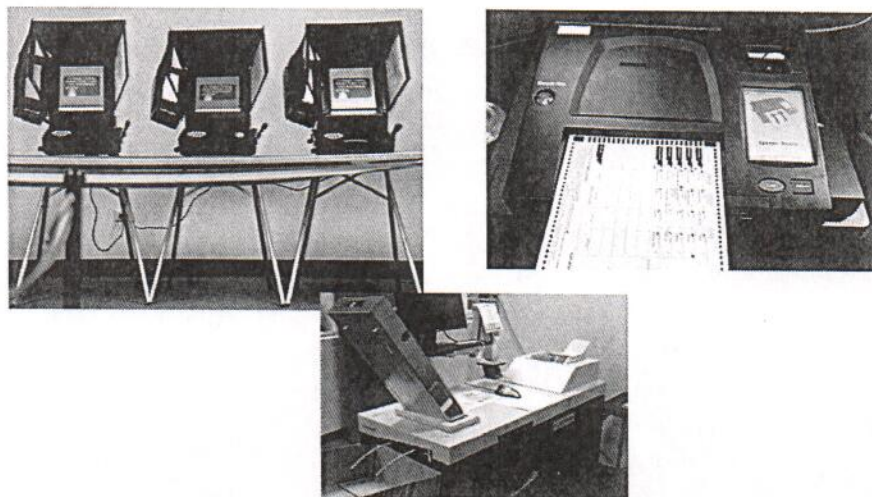


## A History of Voting Technology





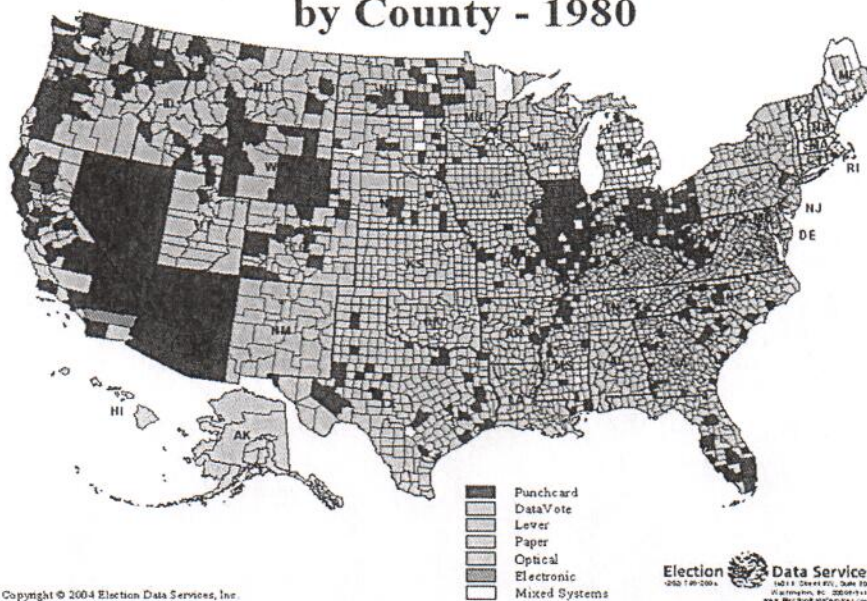
## A History of Voting Technology



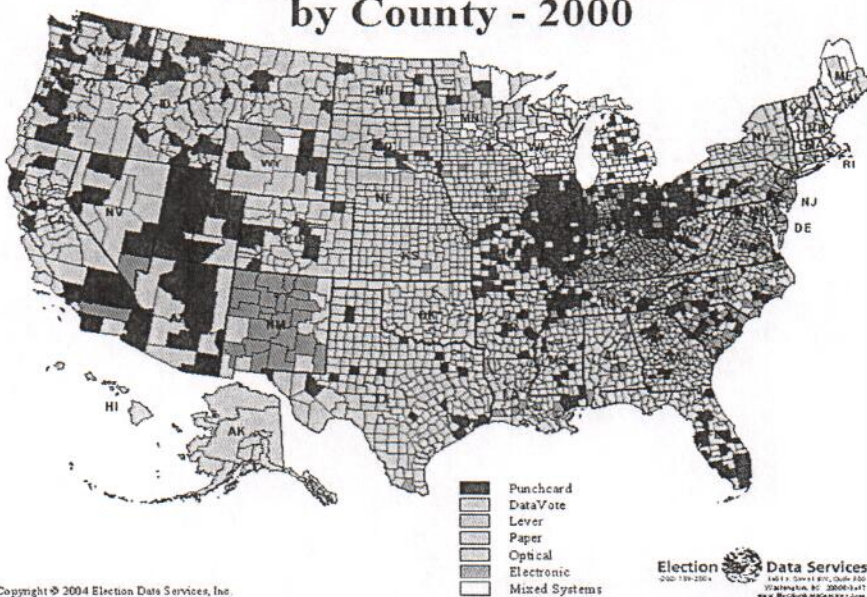
## Help America Vote Act (HAVA) of 2002

- Provided funding to replace punch card and lever machines.
- Established the Election Assistance Commission (EAC) – tasked with developing new voting system standards.
- States submitted plans to receive HAVA funds.
  - Put more of the responsibility for voting equipment purchases on the state, rather than local jurisdictions.

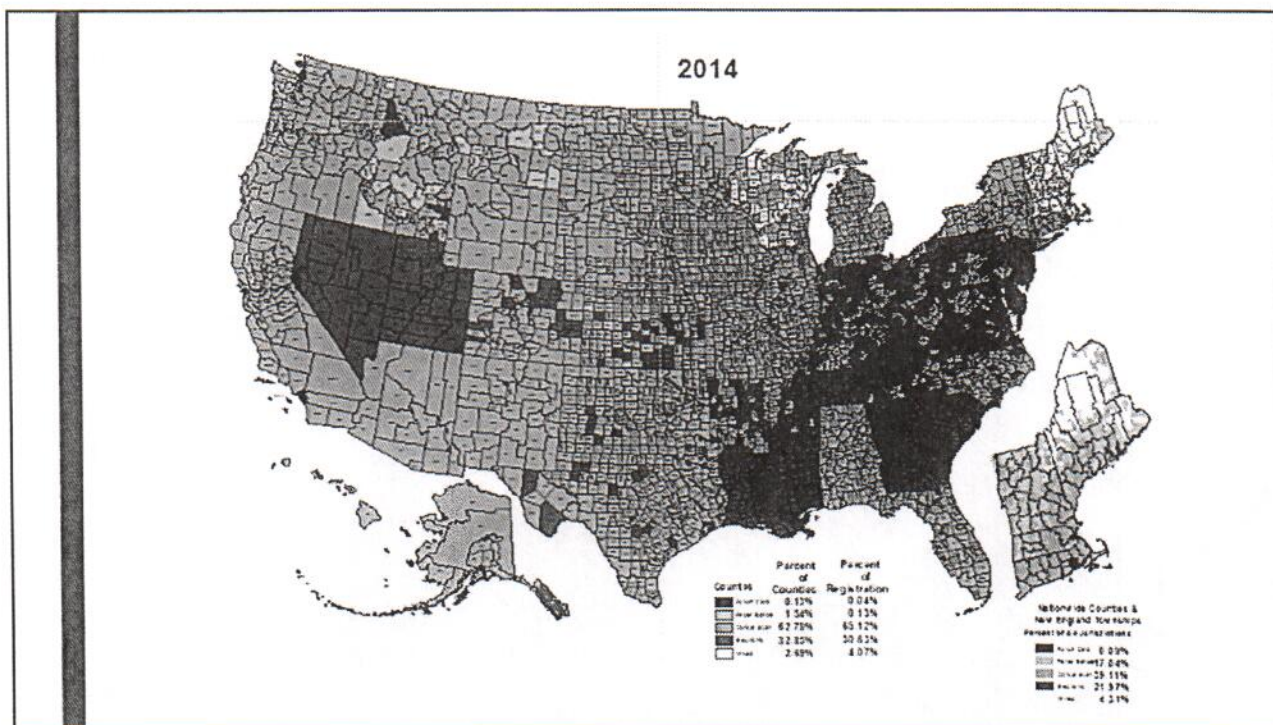
## Type of Voting Equipment by County - 1980



## Type of Voting Equipment by County - 2000







## Where are we now?

- The majority of jurisdictions across the country bought equipment between 2002 and 2008.
- The life expectancy of most types of equipment is estimated at 10 to 15 years.
- Need at least two years lead time before a big election to purchase and test new equipment.
- There will most likely not be federal funds this time.

## Georgia

- Statewide uniform voting system – mandated by statute.
- State level maintenance and machine testing.
  - Done by the Center for Election Systems at Kennesaw State University.
- Save approximately \$1 million/year by doing own maintenance.

## Maryland

- Statewide system – counties and state share costs 50/50.
- Just obtained new equipment – decided to lease.
- Went from DRE to an optical scan system, accompanied by a ballot marking device.





## Colorado

- Working committee studying a uniform voting system for the state.
  - Pilots of different systems took place in several counties on November 3.
  - The state plans to decide which system to choose for its statewide system by January 1, 2016.
- If legislature isn't able to allocate funds, the state may be able to secure a low interest loan.

## New Mexico

- Prior to HAVA each county chose and bought its own equipment, and the state had a voting system revolving fund.
- Now, there's a statewide system – state negotiated contract with vendor.
- The state maintains the machines and oversees storage requirements and upgrades.

## Minnesota

- Counties own and purchase equipment; many vendors have a presence.
- State survey of counties:
  - Almost all counties need to replace equipment by 2020; almost none know where the funding will come from.
  - Some of the larger counties have made purchases already.
- Estimated \$30 million needed to replace all voting equipment.

## Wisconsin

- Elections are run at the municipal level, in 1,853 jurisdictions.
- Within counties, there may be different machines used in different municipalities.
- County clerks sometimes push for uniform voting systems within their counties, and may pay for 50 percent of the cost of the equipment.



## Funding Options Being Discussed in States

- Statewide bulk purchase
- Counties pay
- Funding split 50/50 between state and counties
- Purchasing vs. leasing

## Potential Funding Sources

- Direct appropriation
- Grant programs
- Using county funds to buy in bulk
- Capital request
- Dedicated revenue through fees
- Others?

## Questions?

- Contact NCSL Elections team:
  - 303-364-7700
  - [elections-info@ncsl.org](mailto:elections-info@ncsl.org)
- Katy Owens Hubler:  
[katyowenshubler@democracyresearch.com](mailto:katyowenshubler@democracyresearch.com)





Testimony of Matthew V. Masterson, Commissioner, U.S. Election Assistance Commission  
November 10, 2015 – Voting System Research Committee

This week marks 15 years since the infamous 2000 election and the fallout from it. The 2000 election served as an introduction to election administration for many Americans who watched Florida to see who would be the next president of the United States. In the ensuing 15 years, significant changes occurred in the field of election administration. The increased attention to the process led to increases in transparency, security and accessibility.

The United States Election Assistance Commission (EAC) is a bipartisan federal agency created by the Help America Vote Act (HAVA) of 2002 in the aftermath of the 2000 election. The purpose of the EAC is to serve as a resource for state and local election administrators, as well as legislators, advocates, academics and, most importantly, voters. The EAC accomplishes this mission through five main programs:

1. distribution of more than \$3 billion in HAVA grants;
2. Voting System Testing and Certification Program;
3. Election Administration and Voting Survey;
4. best practices and guidance about election administration; and
5. serving as a clearinghouse for election administration information.

Today, I would like to focus on the Voting System Testing and Certification Program.

Before I discuss the specifics of the Voting System Testing and Certification Program, I think it is important to understand the evolution of voting technology in America. Prior to the 2000 presidential election, people paid little attention to the voting system they used. The most common voting technology being used in America at that time was the punch card system that became the center of the storm in Florida. During this time, traditional lever machine voting systems were in use in a large number of jurisdictions across the country. Some jurisdictions began to implement electronic voting systems in the late 1990s, most commonly in the form of electronic scanners. There was limited use of touch screens, but they were by no means the most common voting system in use. Prior to 2000, the election process and technology used to administer it was largely logistical in nature. The systems were prepared and deployed for one day of use: Election Day. The systems were simple to prepare, simple to set up and simple to



will not receive EAC certification until it meets all applicable VVSG requirements. For instance, every line of code used in a voting system is reviewed by one of the EAC's accredited voting system test laboratories. If the lab review finds one discrepancy in one line of code, the system will not receive certification until that line of code is fixed. The process is rigorous and thorough so election officials have confidence in the EAC-certified systems they use.

The EAC's responsibilities do not end with certification. The commission also operates a quality monitoring program in which the EAC works with state and local jurisdictions that use EAC-certified systems to ensure those systems continue to meet the VVSG requirements. This means the EAC will work with any jurisdiction that experiences an issue with a fielded EAC-certified voting system to understand the nature of the issue; work with the voting system vendor to indentify a solution to the problem; and test and certify the solution, enabling the jurisdiction to field an updated system. In addition, all EAC testing information is publicly available ([http://www.eac.gov/testing\\_and\\_certification/default.aspx](http://www.eac.gov/testing_and_certification/default.aspx)). This means all jurisdictions, regardless of whether they use EAC-certified versions of the systems, can benefit from the EAC's testing and quality monitoring program.

To date, the EAC's testing and certification program has 13 registered manufacturers and three accredited voting system test laboratories. The EAC certified eight new (or full) voting systems from five different vendors. After initial certification of the full system, the commission has certified a total of 20 modifications to those systems. On average, certification of a new voting system takes six to 12 months depending on the complexity of the system and its readiness for testing. Testing of a modification to an already certified system can take 12 days to a few months. If a system or modification is ready for testing, we can turn it around in a reasonable amount of time, ensuring that jurisdictions waiting for the system have plenty of lead time to deploy it. The EAC is constantly evaluating its own testing procedures to ensure the process is efficient while maintaining rigorous standards. To that end, the commissioners recently adopted changes to the testing and certification program to create greater efficiency in the process while ensuring we can test the newest and most innovative technology.

In addition to using portions of the EAC's testing and certification process, most states choose to administer their own certification process. South Carolina is no different; the State Election Commission requires EAC certification for all new purchases, as well as has its own rigorous South Carolina-specific requirements. In fact, the South Carolina State Election Commission has long been a national leader in voting technology assessment and knowledge. South Carolina is one of only a few states that designs the ballots and programs the voting systems at the state level. This allows for consistency and efficiency for the state and counties, while creating significant cost savings.

In April of this year, I had the pleasure of attending the State Election Commission's voting system fair kick-off event for the procurement of a new voting system. Present at the event were county officials from South Carolina and Georgia, as well as legislators and national election experts from a variety of organizations. The fair, as well as the process outlined by the Election Commission staff, represent a model that will be emulated by election officials across the country. I applaud the Election Commission for its independent and thorough plan for procuring



South Carolina's next voting system. The process as outlined at the voting system fair will almost certainly result in the procurement of a voting system that will serve the citizens of South Carolina well for many years.

Thank you for the opportunity to be here today and talk to you about the work the EAC is doing, as well as the future of voting technology—not only here in South Carolina, but across the country. I am happy to take any questions you may have.



United States  
**Election Assistance Commission**

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*Election Systems: Past, Present and  
Future*

*Columbia, SC  
November 10, 2015*

[www.eac.gov](http://www.eac.gov)

1



# Topics

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- About EAC
- Voting Technology
  - Past
  - Present
  - Future
- Voting System Certification
  - EAC Certification
  - State Certification
  - Local Testing
- Conclusion

## About the EAC

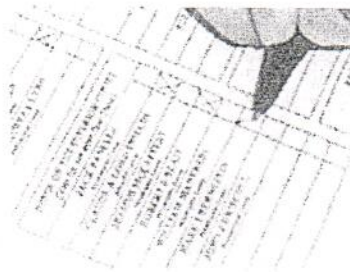
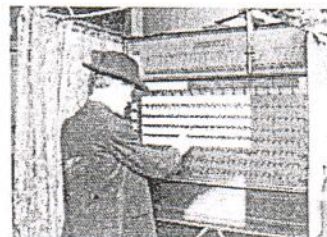
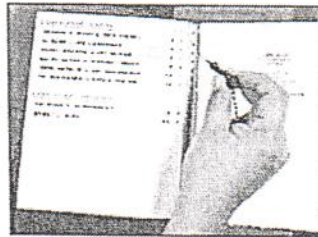
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- Created in the aftermath of 2000 Election by the Help America Vote Act (HAVA)
- Bipartisan Agency (2D's/2R's)
- Tasked with:
  - Distribution of over \$3 billion in HAVA funds
  - Testing and Certification of voting systems
  - EAC Election Day Survey
  - Best Practices and Guidance on election administration
  - Clearinghouse of election information

3



# The Past



## Features of the Past

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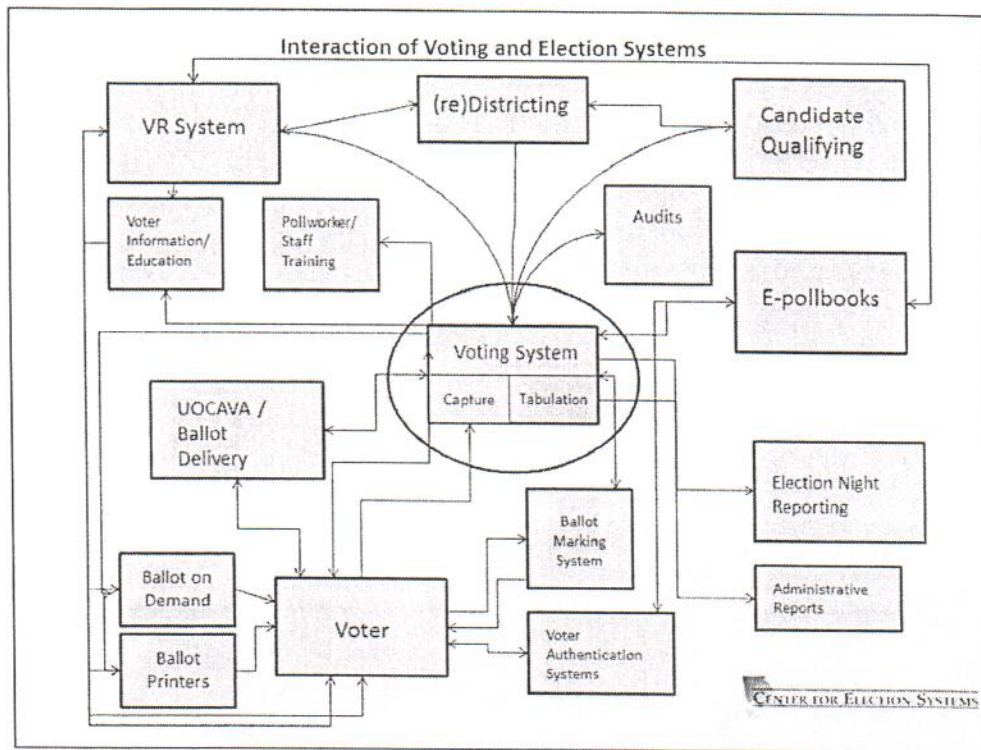
- Largely logistical in nature
- Stable but not flexible
- Election officials were largely process managers/accountants
- Simple & easy to understand for most
- Questions around voter intent and definition of a vote
- Limited accessibility/usability



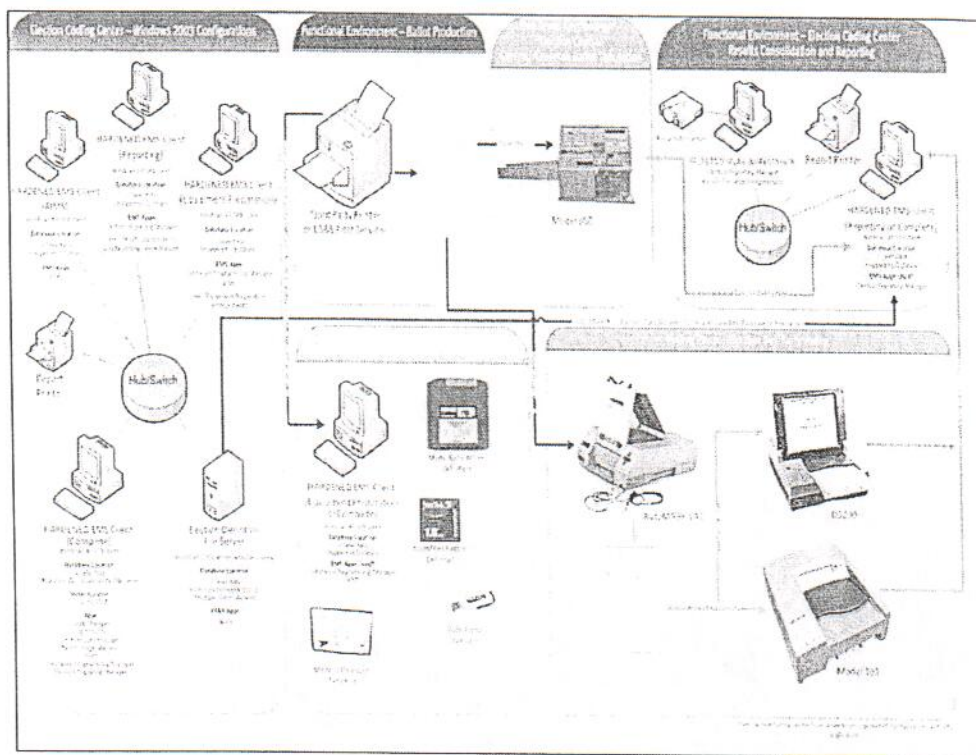
## The Present

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## Features of the Present

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- Equipment is more complex
- Monolithic voting system with custom hardware
- Process has gone from largely logistical to IT used to manage the logistics
- Increased efficiencies with technology
- Increased access/usability
- Ability to innovate around the voting system



## The future is now!

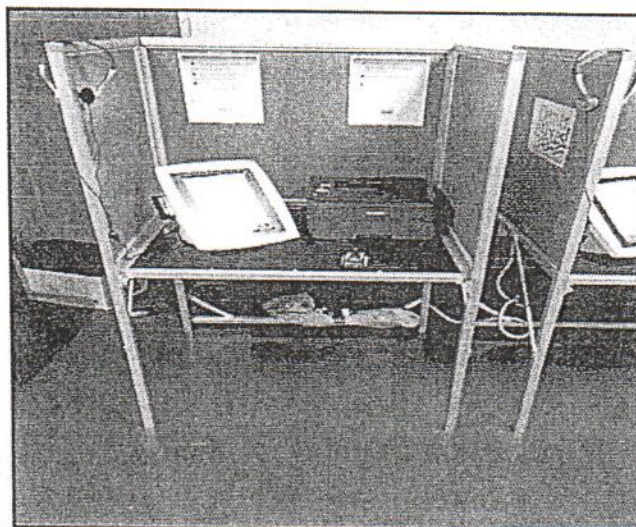
- Stating the Obvious: The equipment is old!
- PCEA called out the oncoming “voting system crisis”
- Voters expect voting to look like their lives
  - People with regular internet access has doubled
  - People with access to cell phones has gone from 68% to over 90%
  - iPhone offered 3 years AFTER purchase of most equipment

## Innovation is Happening

- Modernizing in other areas of elections:
  - Ballot Delivery Systems/COTS Based Systems
  - Online Registration
  - Ballot-on-Demand
  - Election Night Reporting
- Electronic Pollbooks
  - Major area of growth and innovation
  - Not plug-and-play
- States looking at how to evaluate
  - EAC does not test and certify
  - E-pollbook requirements/RFP's
  - Certification

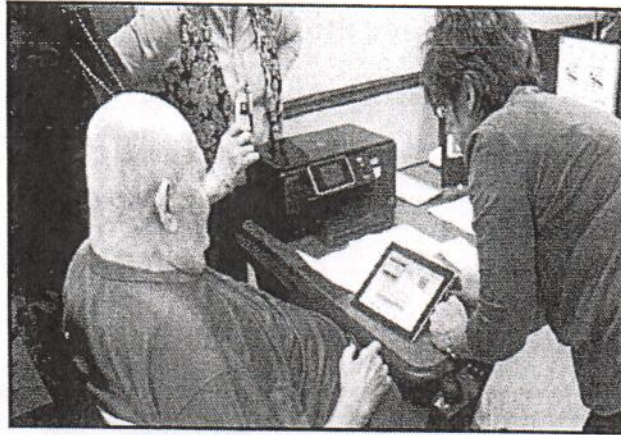


Innovation is happening



12

## Innovation is happening





## Features of the future?

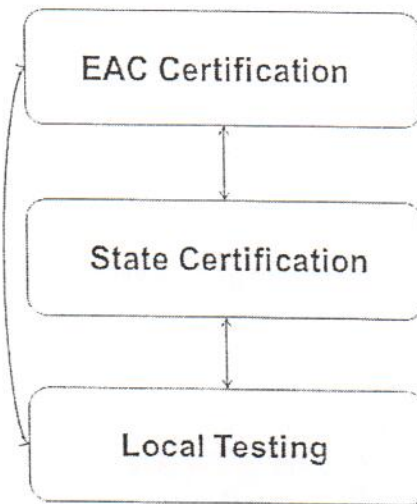
- Flexible configurable systems
- Data compatibility & sharing
- Greater demand on election officials as integrator
- Greater focus on the voting experience
- Universal design for accessibility
- Increased security built in to system

## What does this mean?

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- More and more election officials are being asked to be IT managers:
  - Manage co-dependent IT systems
  - Analyze Risk
  - Evaluate current and future systems for application to operation
  - Educate on challenges and needs
  - Manage and protect the data within the systems
  - Every election is a pilot

## Voting System Certification



16



## EAC Testing & Certification

- Voluntary Program
  - States pick and choose how they use the program
  - 47 of 50 states use some aspect of the program
  - South Carolina requires EAC Certification
- Test and certify voting systems to set of requirements
  - Idea is provide a baseline of performance
  - Helps election officials manage risk by evaluating system prior to purchase

## Federal Certification

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- How does it work?
  - Systems tested to comprehensive set of standards, (VVSG)
    - Usability/Accessibility
    - Security
    - Functionality
    - Reliability
  - Systems MUST meet all requirements
  - Every line of code in the system is reviewed

# VVSG

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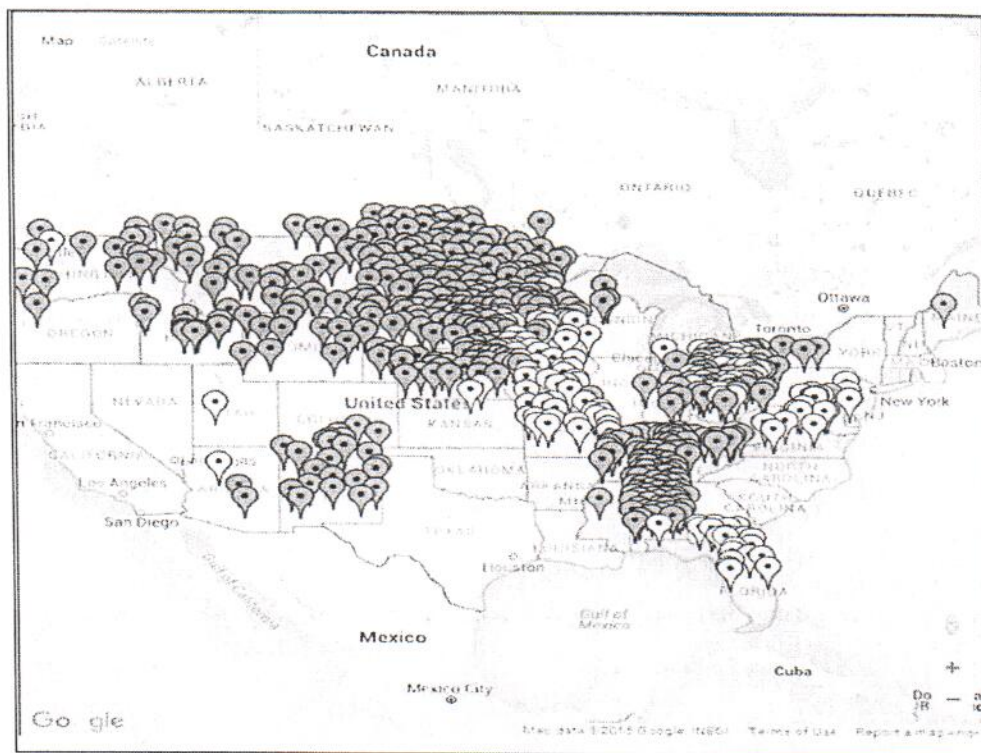
- Voluntary Voting System Guidelines (VVSG)
  - 1990 VSS
  - 2002 VSS
  - 2005 VVSG
  - VVSG 1.1 (2015)
  - Next version...
- Certification program is constantly evolving to meet needs of customers



## Federal Certification

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- 13 registered Manufacturers
- 8 certified systems (from 5 vendors)
  - 20 modifications to those systems
  - Two systems currently in for testing
  - New system = 6-12 months of testing
  - Modification = 12-45 days of testing
- 3 federally accredited voting system test laboratories



## More than just a sticker!

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- Unique knowledge of the systems
- Work with state & local officials to:
  - Monitor Performance
  - Maintain aging equipment
  - Develop RFP's ([rfp@cac.gov](mailto:rfp@cac.gov))
  - Share info regarding issues in the field





## State Certification

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- South Carolina Tests to state specific set of requirements for certification
- State requires EAC certification for a system to be purchased
- RFP requirements serve as another important set of state requirements
- South Carolina has robust set of post-election audit requirements

## Local Testing

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- Acceptance Testing = local election official certification
- Logic & Accuracy testing also important information loop
- Election feedback and performance
- Post election audits

## Final Thoughts

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- South Carolina is a leader in voting system support & knowledge
- SC State Election Commission procurement process is a model for other jurisdictions
- This is a challenge facing states and counties across the country





## Selecting and Implementing a Statewide Voting System

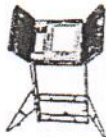
Columbia, South Carolina  
November 10, 2015

Merle S. King  
Executive Director  
Center for Election Systems  
Kennesaw State University  
Kennesaw, Georgia



## What is a Voting System?

What is a Voting Machine? A Voting System?



## What is a Voting System?

A machine is a "device with moving parts that uses power to do work of a particular type".

A system is a "collection of unified components that transform inputs into outputs, interface other systems ( and subsystems) and utilize feedback loops to monitor and control system behaviors".



## What is a Voting System?

SC Code § 7-13-1655 (2013)

A voting system is..." the total combination of mechanical, electromechanical, or electronic equipment, including the software, firmware, and documentation required to program, control, and support the equipment that is used to:

- (a) define ballots;
- (b) cast and count votes;
- (c) report or display election results; and
- (d) maintain and produce audit trail information;"



## What is a Voting System?

Consider each of these components in the context of South Carolina's unique requirements

- a) define ballots;

Voting systems are designed for county-level administration. A voting system that permits and enhances the centralized construction of election databases (ballots) at the state level will be unique.



### When Do We Need a New One?

- In its 2014 report, the Presidential Commission on Election Administration (PCEA) cited the "impending crisis in voting technology" – a reference to the real and potential consequences of aging voting systems across the United States.
- Since the release of the report, many jurisdictions have begun to assess their voting systems to see if their systems have started to manifest behaviors that would indicate that the crisis is less "impending" and more real.
- If your state's voting system manifests some of the following characteristics, it could be time for an in-depth review of the system and the start of a replacement strategy.

THE PRESIDENTIAL COMMISSION ON ELECTION ADMINISTRATION

### When Do We Need a New One?

- Repairs to the voting system cannot be made. Replacement parts are not available and cannot be remanufactured
- Consumables (things like batteries, ribbons, storage media, etc.) are no longer available for your system
- No additional units are available for purchase from the vendor
- Your voting system cannot accommodate functionality required by new legislation or rule
- The voting system's vendor reduces its workforce of technical staff dedicated to supporting the system. Related to this...the voting system vendor goes out of business

THE PRESIDENTIAL COMMISSION ON ELECTION ADMINISTRATION

### When Do We Need a New One?

- Your voting system is incompatible with other election systems in your state: the voter registration system, election night reporting system, electronic pollbooks, etc.
- There is an increase in lawsuits against election jurisdictions related to performance of the voting system – especially in areas like accessibility
- There is an uptick in anomalies or glitches in the performance of the system
- Increase in failure rate of voting system components during acceptance or logic and accuracy testing
- The voting system vendor chooses not to develop and submit engineering change orders (ECOs) to testing authorities that would permit new parts or modifications to extend the life of the system

THE PRESIDENTIAL COMMISSION ON ELECTION ADMINISTRATION

### What Is Out There?

The market for voting systems is episodic and diverse

There will be a small number of systems ( $\geq 0$ ) that may meet SC requirements – whatever those requirements may be

Systems that meet the VVSG 1.0 (2005) requirements are available. No 1.1 (2015) systems are available

THE PRESIDENTIAL COMMISSION ON ELECTION ADMINISTRATION

### What Is Out There?

SC requirements that exceed the 1.0 or 1.1 baseline may require separate testing and certification (ex: enhanced accessibility, online ballot delivery and return, wireless communication with pollbooks, etc.)

Vendors will typically modify a system for a jurisdiction, but will rarely build a one-off system.

THE PRESIDENTIAL COMMISSION ON ELECTION ADMINISTRATION

### What Is Not Out There...Yet

Common Data Format systems

Secure, integrated online ballot delivery and return systems

Enhanced Accessibility systems (full independence, cognitive disability, etc.)

State-centric, centralized systems

Mature COTS architected systems

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## RFPs

The Request for Proposal (and related RFIs) is your first and last, best chance to get the system requirements right

Systems are rarely (never) better than the RFPs used to define the requirements for that system

Put in the time – get it right

Don't be afraid to start over if you have to

RFPs are widely available – ask other states

THE CENTER FOR ELECTION SYSTEMS

## Transitioning

Changing a voting system is like changing tires on the bus...without stopping

South Carolina has an election every Tuesday (or so it seems)

A transition plan may allow the seamless migration from the old system to the new system, with minimum disruption

Vendor role may change once their system is no longer in use

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## Transitioning

Planning for the transition:

- Unfreeze – Change - Freeze – Look for opportunities
- Evaluation of space, security requirement, operating requirements of new system
- Delivery, acceptance testing
- Disposal of equipment, media, consumables
  - Archived election data
  - Salvage value (if any)
  - Concurrent storage of the systems
- Skill sets – especially PM

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## Training and Education

Training and education - May cost more than the purchase price of the system when you factor in voter education, poll workers, election officials, etc.

Consider requisite:

- Attitude – mindset of each stakeholder group
- Knowledge – what they need to be aware of
- Skill – demonstrated abilities

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## Training and Education

Identify:

- Needed learning outcomes and skills for all stakeholders
- Strategy for attaining those outcomes
- Budget
- Plan
- Evaluation process and feedback loop

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## Life Span of System

The selection process should reveal how long the system is expected to last

Is this reasonable? Desirable?

Will the use of Common Off-The-Shelf (COTS) components extend the life?

Identify circumstances that can shorten the life of the system

- Changes in statute and rule
- Supply chain issues
- Under capitalized vendor; inexperienced vendor
- Poorly structured contract
- Rigid architecture

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THE LEAGUE OF WOMEN VOTERS OF SOUTH CAROLINA  
PO BOX 8453, COLUMBIA, SC, 29202, (803) 251-2726, WWW.LWVSC.ORG

## STATEMENT TO THE JOINT VOTING SYSTEM RESEARCH COMMITTEE

Eleanor Hare, Associate Professor Emerita, Department of Computer Science, Clemson University

NOVEMBER 10, 2015

Voting technology is changing rapidly. We hope that there will be an opportunity for full discussion with this committee regarding the wide range of options open to South Carolina. However, my current statement addresses only one crucial aspect of voting technology, one that we believe goes to the basic issue of the integrity of the ballot.

A recent development in ballot design, the use of barcodes to record individual votes on the ballot, presents significant problems.<sup>1</sup> The ability of voters to directly verify his or her vote is a basic requirement of the national League of Women Voters standards for voting technology. Voters cannot read the proprietary barcodes used by voting machine manufacturers and do not know what information is contained in them.<sup>2</sup> Manufacturers tell us that barcodes enable them to count the votes faster, but we believe that this is offset by dangers to the integrity of the vote.

These machines produce a paper ballot that shows both the printed name of the chosen candidate and a barcode. The voter can read only the printed name on the ballot, but the machine tabulating ballots reads only the barcode. The voter cannot actually verify that the machine is recording the intended vote. Either simple malfunction of the system or intentional sabotage could affect election results without the ability of voters to verify their votes.

The use of barcodes also threatens the principle of voting privacy. Ballots in the United States are both secret and anonymous, thus preventing anyone from linking a voter to his ballot. However, barcodes could contain "time stamps," the date and time of day that the ballot is cast. By linking the time stamps to the sign-in register, the ballot can be linked to the individual voter. In systems in which the voter's identification number is available to the voting machine, the identification number could be printed in the barcode.

The League of Women Voters of South Carolina supports systems that employ coding that is fully transparent to the voter.

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<sup>1</sup> A registration mark, which is similar to a barcode and is used only to guide the ballot in the scanner, is acceptable, but barcodes that are not identical on all ballots may contain illegal identifying information or misrepresent the intended vote.

<sup>2</sup> The barcodes used by voting machine manufacturers are proprietary and are not readable using publicly available devices.

*The League of Women Voters, a nonpartisan political organization, encourages informed and active participation in government, works to increase understanding of major public policy issues, and influences public policy through education and advocacy. Membership in the League is open to men and women of all ages.*





THE LEAGUE OF WOMEN VOTERS OF SOUTH CAROLINA  
PO BOX 8453, COLUMBIA, SC, 29202, (803) 251-2726, WWW.LWVSC.ORG

## TESTIMONY TO THE JOINT VOTING SYSTEM RESEARCH COMMITTEE

Duncan Buell, Professor, USC Computer Science & Engineering Department

NOVEMBER 10, 2015

Last March I was general chair of the Election Verification Network's annual conference. The general theme of the conference was exactly the topic you have today – current voting system technology is aging rapidly, and it must be replaced, and the choice of what to replace it with is difficult.

In one sense you (and we) in South Carolina have an advantage in that there are several jurisdictions that have just purchased, or are purchasing, or are developing new voting systems. At one of our sessions this past March we had election officials from Tallahassee (Leon County), Florida, Fairfax, Virginia, and Philadelphia describing their process for acquisition and the reasons for their choices.

There are yet more jurisdictions that have recently acquired systems, and I would encourage you to take advantage of their analysis prior to acquisition.

There are also two large jurisdictions that are developing their own systems. Los Angeles County is developing a system for use there, but it is not clear that a system would be ready for procurement within the time frame asked for in South Carolina. The system being developed in Austin, Texas, however, is likely to be available. The design of that system has been guided by Dana Debeauvoir, clerk of court in Travis County, and has had the input of some of the best industry and academic minds in hardware system design and in security. Importantly, that system provides a single ballot marking device for all voters, using commodity hardware for low cost, and a totally transparent and totally auditable trail to ensure accurate results and thus maintain voter confidence.

I would encourage you not to make decisions without looking at these reports and systems and without consulting those from around the country who have had to make similar decisions in the recent past.

Finally, I would encourage you to consider only those systems that are totally transparent and totally auditable. The marks the voter sees that indicate the voter's choices should be the marks that are used to tally the votes. There should be no software that intervenes, no coding or hidden transformation that is not understandable by the voter. There should be a capability of a genuine recount, not merely the running of the same computer program on the same data. And the system should be simple to operate. In all my analysis of election data from South Carolina, Colorado, Pennsylvania, and Texas, I have not seen fraud. But we have a very complicated system, and I have seen essentially all possible errors that could be made by tired and inexperienced poll workers at the end of a very long day. The system needs to be simple. A complicated system like the one we currently have is guaranteed to result in errors.

*The League of Women Voters, a nonpartisan political organization, encourages informed and active participation in government, works to increase understanding of major public policy issues, and influences public policy through education and advocacy. Membership in the League is open to men and women of all ages.*



# South Carolina's new voting system must be secure

When I cast my first ballot, I voted on a paper ballot for Daniel R. McLeod, who was elected attorney general and served for the next 24 years. At that time, voting machines in South Carolina were limited to several urban counties.

As I recall, election security consisted of a padlocked plywood ballot box, the key to which was attached to a modest chain connected to the padlock. I did not give much thought to the mechanics of elections, or how the poll managers tabulated the election results from the paper ballots cast.

Though no election is perfectly conducted, most of us engage in faith-based voting, meaning that we as voters have faith that, for the most part, our election procedures work properly. We have faith that when we cast our ballots, our votes are recorded as intended. Sometimes, we must stop to examine that faith. Recently, I viewed a documentary film titled "I Voted?" by filmmaker Jason Grant Smith. His film opened my eyes to our systemic voting challenges.

After the failure of the 2000 election in Florida, Congress allocated \$3.5 billion to the states to upgrade election equipment. South Carolina moved quickly and spent \$34.5 million on our current iVotronic touch-tone screens.



Walt McLeod

Guest Columnist

And our election security has been a troubling topic ever since, because of the inability of our state's voting machines to produce a voter-marked paper ballot, which can generate a voter-verified paper audit trail to allow recounts and random audits of election results.

In March of 2013, our state's Legislative Audit Council determined that the iVotronic voting machines "do not allow voters to verify their votes by paper or produce an auditable paper trail as does a voter verified paper audit trail system." The Legislative Audit Council also found that "Problems with iVotronic machines that have been reported in elections in other states include vote flipping, candidates missing from screens, lost votes or too many votes, freezing, and batteries."

South Carolina's flawed and obsolete voting computers produce no paper trail, which makes any meaningful audit or recount an impossibility. Most likely, you are not using the same computer you had in 2004; however, you are voting on antiquated equipment, purchased before the first gener-

ation of the iPhone.

While it is well past time for replacing the iVotronic voting equipment, the specifics of the voting equipment to be used in the future remain in doubt. Consequently, I have sponsored legislation to create a committee to study election equipment. H.4080 passed the House on May 13 and was sent to the Senate Judiciary Committee. (I was unsuccessful in obtaining House approval of H. 4078, which would have required the State Election Commission to inform the General Assembly of its purchase plans by the end of 2015, and required legislative approval for any purchases of election equipment.)

We must stand firm on what we demand from our voting equipment and from our elections in general.

First and foremost, we must have durable records of voter-marked intent. Or, simply put, we must have paper ballots with optical-scan counting. When we began using digitized vote recording, we gave away our ability to effectively audit or recount votes.

In addition, we must make certain that the purchase of new election equipment remains an open and transparent process.

Ensuring election integrity is not a Republican or Democratic issue. It is an issue that impacts every South Carolinian, as well



FILE PHOTO

**How confident can S.C. voters be that their votes are counted correctly?**

as every American. Voting is the constitutional right from which we derive all of our other rights. Democracy will end if we do not protect the integrity of elections by assuring that each ballot is

correctly recorded and correctly tabulated.

*Rep. McLeod is a Little Mountain attorney; contact him at [waltmcLeod@aol.com](mailto:waltmcLeod@aol.com).*



Open Source Election  
Technology Foundation  
530 Lytton Avenue  
2nd Floor  
Palo Alto, CA 94301 USA



11 May, 2015

**Billy Way, Jr., Chair, Mark A. Benson, Marilyn Bowers  
E. Allen Dawson, and Nicole Spain White**

South Carolina State Election Commission  
2221 Devine Street, Suite 105  
Columbia, SC 29205

CC: Brett Bursey

RE: May 11<sup>th</sup> South Carolina Voting Systems Fair & Introducing the OSET Foundation

**Greetings Commissioners:**

Brett Bursey of the South Carolina Progressive Network encouraged us to submit some materials ex-parte for your SC Voting System Fair. We regret being unable to attend, but only learned of it last week. However, this content will provide you with at least an introduction to the OSET Foundation.

We are a 501.c.3 tax-exempt non-profit election technology research, development, and education foundation in the Silicon Valley, established 8-years ago to advance innovation in election administration and voting technology. We do so under an "*open source mandate*" meaning that anything we develop is freely available for any jurisdiction to adopt, adapt, and deploy.

We exist to advance the cause of "*critical democracy infrastructure*" and to catalyze a new model for the important commercial delivery of election technology innovation. We are about increasing confidence in elections and their outcomes in order to preserve our democracy.

Silicon Valley talent hailing from many of the well-known household technology brands such as Apple, Google, Netscape, Oracle, and others have become social entrepreneurs in this effort to substantially innovate the systems on which this nation relies to administer elections. We have no commercial agenda, only to ensure that States like your own are fully informed, in an intellectually honest manner, on the spectrum of innovation underway. To that end, we are a resource and a public benefit project.

With that brief introduction, the contents of this packet include:

1. A Foundation fact sheet
2. A 2-page executive summary
3. A 3-page project overview
4. A 5x7 introductory booklet
5. A brochure on a Knight Foundation-backed project to innovate elections results reporting
6. A 43-slide presentation deck overviewing the OSET Foundation and the TrustTheVote Project.

I hope this material is helpful to your efforts to understand the state of innovation.

Sincerely,

**Gregory Miller**  
Chief Development Officer  
503.703.5150

# OSET FOUNDATION Executive Summary

The OSET Foundation is an 8-year old 501(c)(3) non-profit based in the Silicon Valley. We are a team of social entrepreneurs comprised of veteran technologists with extensive hardware, software, and systems design experience. Our mission is to reinvent voting technology by using open data, open standards, and open source to increase confidence in American elections and help preserve our democracy.

We intend to deliver a freely available open source elections technology framework for any jurisdiction nationwide to adapt and deploy.

This effort is known as the **TrustTheVote™ Project**—an innovative effort that challenges the status quo of:

- Continual lack of budgets for counties to improve voting systems
- A dysfunctional malformed market for elections technology
- Little to no public access to publicly owned data
- Innovation amounting to guarantees of spare parts

## WHY

Today, the systems that support our elections are obsolete—*literally falling apart*. Lines are long, sign-in processes are inefficient, poll workers are under-trained, ballots are badly designed, audit and verification is weak, and technology is very poorly utilized.

The industry has zero incentive to deliver innovation in elections technology because counties having little to no money to pay for it.

When voting is problematic and frustrating, participation declines. Citizens believe it's too hard to vote, or their votes don't matter, or may not even be counted. When the process of voting lacks verifiability, accuracy, or security, elections and their outcomes are questioned and devolve into recounts and litigation.

Add to that, nearly all of America's voting systems will reach the end of their life in the next five years. But there is little money for counties to buy anything new even if there were a market incentive to address more trustworthy solutions.

It's not hyperbolic to suggest the integrity of our democracy is at risk.

There is little real effort to remedy this. To date, tens of millions of dollars have been donated to *thinking* about how to improve elections, end long lines, reduce recounts, minimize contests, and preserve our fundamental right of democracy: trustworthy elections. That's all good, but not enough. It's time to actually do something.

## WHAT

The TrustTheVote Project is focusing on physical results everyone can see, touch, and try. We're re-inventing how America votes in the digital age and reinvigorating the commercial industry to support the resulting technology to do so. We're building an open, adaptable, flexible, and innovative open source technology framework. It supports all aspects of elections administration including voter registration; systems for creating, marking, casting, and counting ballots; and all back-office functions, plus an open data layer to foster innovative apps to make voting easy and convenient and really put an end to those long lines. The result is freely available open source technology for

*Other side please...*



## BACKGROUND

- An established Government Innovation Effort. An 8-year old Silicon Valley based 501(c)(3) tax-exempt non-profit designing and developing an open source, publicly owned, elections technology framework, called the TrustTheVote™ Project.
- To increase confidence in elections and their outcomes. Working directly with elections official stakeholders to develop a publicly owned platform that can be adopted, adapted, and deployed in any jurisdiction across the nation.
- Covering all aspects of elections administration. Includes apps for all aspects such as voter registration and administration, ballot design and distribution, casting and counting, audit and verification, and performance analytics and results reporting.
- Comprised of some of the Tech Sector's best and brightest. Founded by experienced technology executives turned social entrepreneurs from Apple, Facebook, Google, Netscape, Oracle/Sun Microsystems, and other tech firms.

## THE PROBLEM & OPPORTUNITY

- Privatizing voting systems has resulted in a dysfunctional oligopoly. 80% of America's voting systems are provided by 2 vendors in a market where there is no incentive to innovate because counties have little money to pay for it.
- Critical democracy infrastructure teetering on failure. Yet, this is the critical infrastructure on which our Democracy relies to maintain its constitutional operational stability, through public elections where no "do-overs" are allowed.
- All voting machinery is approaching end-of-life. The 2013 Presidential Commission on Elections Administration (PCEA) reported that within 6 years all of America's voting systems will have reached the end of their useful life—technology already so antiquated, that stock-piling spare parts is the only innovative thing being done.
- Ill-advised ad-hoc patches. State legislatures, desperate for improvement, are rapidly turning to any alternative they can find—and these stopgap measures are not addressing the underlying fundamental problems with current infrastructure that relies on black-box proprietary antiquated technology.
- A growing national security risk. America is increasingly risking an election meltdown that would rival what happened in 2000. Digital hacking is the newest tool of criminal enterprise. It's easy to see how vulnerable outdated voting systems, and ad-hoc efforts to route around them, is becoming a national security issue.
- Time is short. In the next 4 years, voting system after system across the nation will either be replaced with similar machinery of no better quality, or worse: simply have their service contracts extended in hopes of available spare parts.





- Consider that Ballots are effectively the “ROI” on Campaign Funding. This investment to innovate America’s elections infrastructure is a small fraction of money raised for campaigns. Billions are poured into political campaigns, but ballots are the return on that investment, and this project is like an insurance policy that ensures a] those ballots will be counted as cast, b] voters will have the kind of experience of ease and convenience that increases their participation, and c] everyone’s confidence will increase in elections and their outcomes.

#### **MOMENTUM IS BUILDING**

- Real results you can see, touch & try. We have 7 years of engineering already invested in this next generation elections and voting technology—now ready to be finished for production; a suite of apps and components garnering interest throughout the U.S., and internationally.
- Our software is already at work. The PCEA featured our voter services tech in the President’s Final Report; our software already powers Virginia’s voter services portal and the majority of 3<sup>rd</sup> party voter registration services; and 16 states will participate in our next version of the VoteStream elections reporting platform.
- Our Board continues to evolve. Several State Secretaries, plus former U.S. CTO Aneesh Chopra, the CSO of Salesforce.com, and a DHS cyber-security director are advising us. Former Facebook exec Chris Kelly joined the Board this year and committed significant financial backing along with others from the Tech Sector.
- Partially backed by the Knight Foundation. The TrustTheVote Project is also supported in part by the Knight Foundation, focusing on one aspect of the election technology framework—innovative services for publishing elections results.
- We’re helping establish national standards. The Project is at the forefront of efforts to set national standards in elections and voting data working closely with standards bearers such as IEEE (Institute for Electrical and Electronic Engineers) and NIST (National Institute of Standards & Technology).
- We’re building a robust IP strategy. The innovations in our elections technology design are so solid and numerous that we’re prosecuting a robust patent portfolio—domestic and international, which we intend to turn over to the public and ensure the sustainability of this technology for the public benefit forever.

#### **WE CAN MAKE SOME HISTORY**

We invite you to become a collaborator in this first of its kind “digital public works” project. Together, we’re going to write some American democracy history. So, let’s stop talking about change and make it happen. **Please join us.**

To learn more, please get in touch with Gregory Miller ([gam@osetfoundation.org](mailto:gam@osetfoundation.org)) or Peter Harter ([peter@osetfoundation.org](mailto:peter@osetfoundation.org)).

Visit [OSETFoundation.org](http://OSETFoundation.org) for more of the story, media coverage, and our blog. And see: [votestream.trustthevote.org](http://votestream.trustthevote.org) for a video demo of our work.



Friday, 12 February 2016

**Honorable Senator Ronnie W. Cromer**  
**South Carolina – District 18**  
Co-Chair, Joint Legislative Voting Systems Research Committee

**Honorable Representative Walton J. McLeod**  
**South Carolina – District 40**  
Co-Chair, Joint Legislative Voting Systems Research Committee

**South Carolina State House**

1100 Gervais Street  
Columbia, SC 29201

VIA EMAIL: Staff Attorney HeatherAnderson@scsenate.gov

CC: **Joint Legislative Voting Systems Research Committee**  
**Marci Andino**, Executive Director, South Carolina State Election Commission

RE: Written Testimony Submission Ahead of February 18<sup>th</sup> 2016 Hearing

**May it please the Co-Chairs,**

My name is Gregory A. Miller, Co-Founder and Chief Development Officer of the Open Source Election Technology (“OSET”) Foundation, a non-partisan, non-profit election technology research institute. On behalf of the Board of Director and all of us at the OSET Foundation, we greatly appreciate the opportunity to participate in your Hearing on the state of voting technology innovation research and opportunities for alternative technology solutions.

On the following 16-pages, we offer our written testimony regarding an emerging alternative path toward election technology innovation with lower costs, outright ownership, and significantly higher quality. This involves work underway in a number of locations around the country including academic, private, and public works projects—all of which can be leveraged by the State of South Carolina in acquisition of new voting technology.

The OSET Foundation ([www.asetfoundation.org](http://www.asetfoundation.org)) (*hereinafter*, “OSET”) is a tax-exempt 501(c)(3) nonprofit research institute focused on election technology innovation. Our flagship effort is the TrustTheVote Project ([www.trustthevote.org](http://www.trustthevote.org)), the objective of which is to develop freely available, more verifiable, accurate, secure and transparent election software technology. OSET exists to assist electoral jurisdictions across the U.S. and around the world in modernizing their elections administration technology.

We are funded by private philanthropic gifts and grants including grant-making Foundations such as the John S. and James L. Knight Foundation and the Democracy Fund. Through the assistance of over 200 elections professionals and officials, we have amassed a considerable amount of expertise in elections administration, processes, and technology.





Our team is sourced from the Silicon Valley and other technology centers in the U.S. and abroad bringing decades of commercial technology product development and life cycle experience. We come from companies such as Apple, Facebook, Mozilla, Netscape, Sun Microsystems, and elsewhere—bringing with us a wealth of digital innovation experience.

The OSET Foundation maintains relationships with dozens of elections experts and organizations. The TrustTheVote Project technology is patent-pending intended for public ownership. Much of the open source Election Technology Framework is in design and development, slated for incremental release over the next 3-years, available for free adoption, adaptation, and deployment.

Respectfully Submitted,

**Gregory A. Miller**

Co-Founder, Chief Development Officer





Before the  
**SOUTH CAROLINA STATE JOINT LEGISLATIVE  
VOTING SYSTEMS RESEARCH COMMITTEE**  
State Capitol, Columbia, SC

In the Matter of	)	INFORMATIONAL HEARING
	)	
VOTING SYSTEMS RESEARCH	)	Thursday, February 18, 2016
	)	
AND TECHNOLOGY EVALUATION	)	8:30 a.m. to 10:00 a.m.
	)	
AND IDENTIFICATION	)	Room 105, Gressette Building

**TESTIMONY SUBMISSION**

**THE OSET FOUNDATION, TRUSTTHEVOTE PROJECT AND  
ELECTIONS TECHNOLOGY INNOVATION**

**Introduction**

The Open Source Election Technology (OSET) Foundation is pleased to provide written testimony on the work of the OSET Foundation as it applies to this Hearing on the aforementioned matter. Our intent is that our remarks hereunder aid and assist the Joint Committee's research on innovations to improve the integrity of elections and their systems and technology.

My name is Gregory A. Miller, and I have been authorized by my Board of Directors to speak on behalf of the OSET Foundation—a nonprofit election technology research institute located in the Silicon Valley, and comprised of social entrepreneurs like myself who have had substantial and significant careers in information technology from brands and companies you probably recognize such as Apple, Facebook, Mozilla, Netscape, Oracle, Sun Microsystems and others.

To provide a bit of context on myself, as that representative presenting before you, I am a trained and experienced computer scientist and software engineer with over 20-years of experience in the design and development of interactive software and network-distributed applications. In addition, I have 15-years of experience between technology product marketing and management and intellectual property and technology law. I have graduate business education, my law degree, and spent a short amount of time in



patent prosecution. Across that 35-year career to date, I've managed several complete technology product life cycles for Fortune 500 and start-up ventures alike, and before coming to this technology domain I was a venture adviser and angel investor in the venture capital ecosystem—the birthplace of this Project. I have dedicated the past nine years to learning the processes of American election administration, and to the architecture and engineering of patent-pending next-generation election technology, as well as developing the 501(c)(3) Foundation that is home to that work—an organization that has grown since its founding in 2006 to over four dozen volunteer and staff technology and business professionals involved today.

Before I delve into our substantive remarks, please allow me to preface those remarks with some background about our organization. The mission of the OSET Foundation is to increase confidence in elections and their outcomes in order to preserve our democracy and because we all deserve a better voting experience. Regardless of whether you are an incumbent or a challenger, holding office depends on the operational continuity of this critical process of our democracy. We all have a vested interest in ensuring the integrity of how we cast and count our votes. The focus of our work is a flagship initiative known as the TrustTheVote Project, which is leveraging our research to develop publicly owned election technology freely available to any election jurisdiction. As a consequence of this social benefit undertaking, a secondary and imperative goal is to rejuvenate the flagging commercial industry to deliver, deploy, service, and support this technology. In fact, it is our deepest conviction that by applying learning from the commercialization of the Internet—which is based on open source technology and has catalyzed a multi-billion dollar industry to deliver and support it, the same cause and effect can bring this imperative aspect of government information technology into the 21<sup>st</sup> century.

To be clear, we are not discussing, proposing or insinuating any kind of Internet-based elections—there is an enormous amount of research and development to be done to provide for the privacy and security to do such. What we are proposing is to simply bring the existing processes of election administration to the leading, not trailing edge of technology used today and the digital user experiences citizens have come to expect of government on par with what is available in the balance of our daily lives. Given the malformed and dysfunctional state of the election technology industry, it is clear to us





that the heavy lifting of research and development required to produce truly user-centric, verifiable, accurate, secure and transparent technology must be taken off the shoulders of the remaining commercial vendors—who for very understandable reasons have no commercial incentive to do such R&D themselves. Contrary to some opinion, this does not suggest we intend the demise of the industry; rather our secondary goal is to see it flourish again by catalyzing its reconstitution. In other words, by making the underlying software technology a publicly owned asset, the industry will shift away from the legacy business model of selling and supporting proprietary, so-called “black-box” machinery, to a business model of systems integration and service-centricity.

Let me conclude this preface by sharing why this Project was formed, and why we are undertaking it, in fact, with some significant sacrifices for some of our team. What brought us to this work is an American problem and we believe, an American solution: the deep vein of tech-sector talent, primarily in the Silicon Valley. Our team includes some of the people who delivered many of the digital innovations all of us have come to take for granted. Is it possible we can create more verifiable, accurate, secure, and transparent election technology? *We know we can.*

Many think of the tech sector as comprised of the excesses of success. But this is about far more than IPOs, Millennial billionaires, extravagant lifestyles, or Google buses. This is about a passion for improvement and innovation and a chance to give something back; to create a different kind legacy if you will. While it may sound lofty—for those of our team, such as myself, whose parents were immigrants and served this nation in our military or related non-military service, this is a once in a lifetime opportunity to be of service in a different but every bit as meaningful way.

While the results of our work is not curing disease, solving world hunger, preserving social justice, or protecting water quality, what we’re building is fundamental to every initiative to do so, because we’re creating new “critical democracy infrastructure” on which every social question and issue can be fairly decided. Accordingly, we take our work with a great sense of responsibility, care, and desire to achieve the greatest possible amount of innovation in usability and integrity assurance of the final work product.

Regarding that work product, in the spirit of fairness and full disclosure our flagship effort, the TrustTheVote™ Project has, in fact, already developed open source election





administration technology—*freely available to any election jurisdiction for adoption, adaptation, and deployment on a royalty-free basis*. A small portion of this technology is already in production deployment in the Commonwealth of Virginia for a range of voter services, and portions or all of this work will also shortly be considered in California, Connecticut, Maine, Rhode Island, West Virginia, Tennessee, and potentially Alabama, Ohio, Oklahoma, and Texas.

With that, I direct the balance of our comments to the agenda of your Hearing, as best we understand it.

### **1. The Situation**

The most fundamental aspect of our democracy — *the process of public elections* — is at risk.

- Voting infrastructure has deteriorated to the point of raising a very real barrier to our civic duty and civil right.
- Voter turnout is dropping to record lows, vulnerable voting systems have resulted in questionable elections outcomes, and
- Existing technology is antiquated to the point of obsolescence.

When voting is problematic and frustrating, participation declines. Citizens believe it's too hard to vote, or their votes don't matter, or may not even be counted as cast. Lines are long, sign-in processes are inefficient, ballots are badly designed, audit and verification is weak, and technology is poorly utilized.

When the process of voting lacks verifiability, accuracy, or security, elections and their outcomes are questioned and devolve into recounts, litigation, or worse. This risks the continuity of our democracy.

These problems manifest in the findings of the President's Commission on Elections Administration: Nearly all of America's voting systems will reach their end of life in the next five years. However, there is little money for counties to buy anything new even if there were a market incentive to deliver solutions, thus there is little motivation for a commercial solution. As former U.S. CTO Aneesh Chopra has observed, it's not hyperbolic to suggest this situation could become a national security risk.

Although hundreds of millions of dollars have been donated in effort to improve the situation, the root problem — *failing equipment with no solution in sight* — has not been addressed. It's critical to focus on the mandatory innovation of voting technology itself.

## 2. Where to From Here?

The choice for elections officials ("EOs") is severely constrained—budgets are tight, and in our professional opinion, voting technology is sorely lagging behind current digital capabilities, without commercial motivation to substantially improve upon what is available. This means EOs either must commit to:

1. Renewing their existing equipment service and support contracts essentially "as is;"
2. Finding the money to purchase a "new" system from one of the existing five vendors, but accepting the reality that the new system will be an incremental variation of current technology without significant improvements, and certainly short of anything that could be considered "innovative;" or
3. Determining a way to have a system built to the EO's exacting specification (*which may require a significant financial commitment or creative financing.*)

If the EO is willing to accept the status quo, which means significant capital only to sustain the same issues, problems and vulnerabilities, then there is little choice, but to let an RFP, hope for the best, and acquire a currently available solution. In a world where elections administration has been reduced to managing downside risk, this may be the "safest" decision from the standpoint of sustaining status quo. However, real leadership historically has required just the opposite.

Thus, we are witnessing growing interest in an alternative path. So far, at least three major jurisdictions are making concerted effort to pursue a custom built solution. To be sure, this past week at the Winter NASS Conference in D.C., we discussed this alternative, based on our Institute's research and development, with representatives from seven different states of which four have asked for meetings to discuss further. Thus, you would not be alone in considering whether to establish a State-specific project to have a system built to your exacting specifications, using commercial off-the-shelf (COTS) hardware and open source software already under development around the country.





To be clear, the domain expertise to designing and developing a high assurance voting system is no longer strictly the domain a three to five vendors who can lock you into a solution with ultra-high switching costs purely on the basis that their incumbency gives you the assurance they will be there for you and know best. It is not clear they do know best, or that they are anything but overly protective of a legacy business model that favors status quo and incumbency at the expense of modernization or improvement for you their customer. This may seem harsh, but having come from the commercial sector we not only understand that perspective, we cannot argue with it; the current vendors have a fiduciary duty to their shareholders to maximize profit.

In fact, it is possible to have a voting system built by some of the most talented technologists available that will out perform anything you've seen to date, and for a fraction of the cost of what has become a practice of monopolistic-like pricing for government I.T. And rest assured there is a very large, stable, and healthy industry for the inevitably required technical and service support.

To make this alternative path workable requires a combination of options 1 and 3. In other words, your current voting system would have to be maintained while the new one is in development. That would mean negotiating a shorter-term contract of 2-3 years rather than accepting a five, seven, or even a 10-year contract. Then you would utilize option #3 to set forth a project to produce your own solution. We note that given the frequency of elections in your State, the transition planning from your legacy system to the new system will be a key consideration regardless of your solution choice, and would require an incremental roll-out once a thorough testing was complete.

### **3. An Emerging Pathway Forward**

We previously submitted materials last May 2015, and again in November 2015 describing this emerging path toward re-thinking election technology as "*infrastructure*" a term Dr. Merle S. King from Kennesaw State University suggested to you in your November Hearing. We believe the concept of "*infrastructure*" should be taken a step further to consider election technology as "*critical democracy infrastructure*." In so doing, that implies election technology actually needs to be publicly owned. Therein lie the principles of "open source" which we presented and discussed in our November 25<sup>th</sup>





conceptual solution proposal, provided to your Committee. We have re-submitted that November 25<sup>th</sup> proposal with this testimony.

We believe that there is a critical mass of effort in the direction of creating publicly owned election technology. Once this technology is developed, a well-established and very healthy information technology services industry will extend its service offerings and step-in to perform the required integration, deployment, service and support of the resulting election technology. Today, Los Angeles County, CA, Travis County, TX, and San Francisco County, CA are all pursuing a pathway to a publicly owned, “open source” system solution. And from what we learned at the NASS Conference last week; more could soon join these three thought-leading innovators. I humbly assert you too have an opportunity to join this movement and assume an innovation leadership role as well.

There are nine considerations in pursuing this innovation path:

1. **Solution Availability.** There is no open source voting system available anywhere today, but there are significant technology initiatives underway with professional and deeply experienced computer and information systems architects, engineers, and developers involved.
2. **Solution Timing.** If, on average, 35-years of technology industry experience has taught the executives of the OSET Foundation anything, we know the pressure is mounting for an alternative to the current voting machine crisis, and it’s only a matter of time now before a new technology solution like this will happen, and as one State Secretary told us last week, *“Its really only a question of whether we can limp along with our current system on an annually renewable contract so we are not left behind for another seven to ten years.”* The TrustTheVote Project is leading that public technology transformation and if we remain on pace, a new voting system alternative is eighteen (18) months away, if not sooner.
3. **Operational Continuity.** Current voting systems must be maintained and utilized while a new system is developed, tested, certified, and rolled out, which means negotiating short-term contract extensions on existing systems must be a priority.
4. **Outright Ownership.** A newly developed voting system would be 100% owned by the State of South Carolina, which would remove on-going software license fees.



5. **Service Support.** There is the question of who will be there to support any such solution. There is a wide-range of systems integrators who do so—technology service vendors who specialize in delivering finished systems based on existing software with commodity hardware, and performing the necessary adaptation work to finalize the deployment. Some larger Firms such as IBM Global Systems or Accenture already have existing master service agreements and significant government I.T business. This represents a new line of business for them, which they are already in discussions with our Project about the prospects. For instance, those elements of elections administration that can benefit from a “zero-footprint data center” or cloud-computing are already becoming available—last week Amazon Web Services, a \$6 billion global leader in the so-called “GovCloud” sector announced it will make the open source elections administration tools of the TrustTheVote Project available. Thus, the emergence of new business models and new technology is building momentum as we discuss this right now.
6. **Acquisition Cost.** The total cost of acquisition would be significantly less than current commercially available systems because [a] South Carolina need not start from the ground up, but can leverage work already underway around the country in academia, private research, and public works projects; [b] that work underway does not have the commercial overhead and required margins that significantly contribute to the price; and [c] a software-based, commodity hardware solution further reduces total cost and avails a range of hardware component choices. However, to be very clear: any software development company can build an open source solution for you if the primary objective is the transparency, verification, and audit-readiness of your system. That cost, given commercial mandates would likely be even more than your current proposed acquisition budget, because [a] the developer is in business and not benevolence; and [b] the open source nature of the work-for-hire would limit their ability to earn more profit from subsequent sales of the software intellectual property, so they would have a one-time opportunity to charge a premium. We note this is why there is one cost to annually license software and a far larger one if you want to buy the source code outright. Therefore, the key to dramatically lowering the costs is not just the open source approach, but acquiring that work through public and philanthropic efforts, where the costs are without commercial markup.



7. **Required Effort.** The resource requirement to finish the work currently underway at a funding-dependent pace (*assuming the balance of development funding is put into place to accelerate development to maximum speed*), will require a core group of 18 senior engineers working at full time effort for about sixteen (16) to eighteen (18) months. This will be a typical Silicon Valley start-up like effort where “full time” is far more than 8AM to 5PM Monday through Friday.
8. **Taxpayer Savings.** Even if for some unforeseen reason the total cost to acquire a South Carolina custom system were to turn out to be twice as much as our projected \$8.3 million for the software plus another estimated \$1.7 million for hardware (*or \$18.3M verses \$10M in total*), South Carolina could still save as much as 54% or \$21.7 million of its current quoted \$40 million price tag (*excluding the cost of continuing the current system on an annual contract basis for 2-years.*) Assuming the requested \$40 million budget covers other associated costs beyond the machinery and software itself, there still would likely be a significant savings of taxpayer money in addition to the fact that South Carolina would outright own 100% of the system and intellectual property in perpetuity.

#### 4. Our Institute’s Solution

The TrustTheVote™ Project, the first of its kind “*digital public works project*,” is developing a comprehensive open, adaptable, and flexible, Election Technology Framework ([bit.ly/OSETosetf](http://bit.ly/OSETosetf)). It addresses all aspects of elections administration including creating, marking, casting, and counting ballots, managing elections, including polling place tools such as poll books, and using an open standard data layer to seamlessly integrate it and foster innovative 3<sup>rd</sup> party apps to make voting easy and convenient. The Framework is a ground up holistic solution for managing the ballot ecosystem. The result is freely available election technology that will be:

- More verifiable, accurate, secure, and transparent than anything of its kind;
- We believe a delight to use for both elections administrators and voters—given its user experience developed by a team of Apple alumni designers; and
- Ultimately, a catalyst for greater confidence in elections and their outcomes.





To be sure, the Framework goes far beyond just a voting system. To do this, we're employing a stakeholder-centric process that can achieve unprecedented integrity in the underlying technology. Early results are already demonstrating:

- A componentized architecture can accommodate every jurisdiction;
- Standards are a catalyst for innovation;
- Innovation can flourish in the absence of commercial mandates; and
- Stakeholder adoption is an outcome of their engagement in the design process

The Project has a 4-point strategy to ensure wide-scale adoption:

1. Putting elections officials needs, not source code, at the center of our work.
2. Driving open data standards to ensure interoperability by working with standards governing bodies, NIST, and the Pew Voter Information Project.
3. Working with NIST on redesign of the Federal voting systems certification model.
4. Collaborating with 200+ election officials (*from 26 States*) on requirements, thereby giving them tacit ownership and incentive to adopt the results.

This work is guided by the following objectives, which we believe are essential to the future of what amounts to “critical democracy infrastructure:”

- **Flexible, highly configurable systems**

The objective is to ensure systems adaptation and deployment costs can be minimized while providing for the greatest configurability in light of differing State or local regulatory requirements.

- **Data standards and compatibility for interoperability**

The objective is to ensure three important outcomes: [1] different systems can rely on the same data without translation or recreation; [2] voting systems can be comprised of different parts from different makers to give EOs maximum choice for the best price; and [3] the mandates of verifiability, accuracy, security, and transparency (*or said differently: high assurance and integrity*), can be achieved or exceeded.

- **Greater focus on the voting experience**

Heretofore, due to manufacturing costs and the commercial challenges in building affordable systems, the concepts of user-centric design and design for usability have often taken a back-seat to cost-effective solution design. However, usability—for voters and elections administrators alike—directly impacts the reliability of the

process and the enfranchisement of the participants. Void of commercial constraints and mandates, academic and nonprofit research is the only practical approach, in our professional opinion. And it is essential in order to engage voters, reduce complexity, lower time to ballot cast, and we believe, engage and improve participation.

▪ **Design for integrity assurance**

This is about addressing security from the ground up and not as an episodic patch strategy, which can be likened to the old game of “whack-a-mole.” Our experience teaches that high assurance computing requires an approach of design for testability and a security-centric design methodology. Similar to the commercial challenges of design for usability, this is often not an affordable methodology for commercial ventures, except for those whose primary business is building high assurance fault tolerant systems, or systems for national security or defense.

The TrustTheVote Project’s voting system in development is guided by the following design principles provided to us by our election official stakeholders:

1. The system is software-based, utilizing commodity hardware; it utilizes a modular architecture providing maximum flexibility in choice of hardware available off the shelf.
2. The system is based on a paper ballot of record although an accessible ballot-marking device is available (*and encouraged*) to accurately capture voter choices in order to generate the printed ballot, which the voter can visibly inspect before surrendering to count.
3. The system provides a means for voters to track the processing of their ballot.
4. The ability to conduct risk-limiting audits is a top priority and the system captures ballot data in four (4) distinct places (*i.e., 1] at the ballot marking device; 2] in paper form of record; 3] a backup image scan and 4] the mark/sense data from optical scan*).
5. Transparency in the entire software source code is a mandate and enables independent code audit, inspection, and review of every aspect of the system to verify integrity throughout the development, certification, and use stages.
6. The system includes a special device manager (*software, firmware, and hardware*) to test and verify the integrity of the machines before they are loaded with any software and put into service for any election.





Beyond the voting system the TrustTheVote Project is also developing an entire suite of complementary election administration tools as part of the overall Framework, including: [A] voter registration and management, [B] ballot design, [C] election manager, [D] digital poll book, [E] analytics services, and [F] election results reporting.

## 5. Weighing the Alternative

While sustaining the status quo would be safe from a pure “decision-standpoint,” it presents increasing risk from an operational standpoint, and is more costly from a taxpayer viewpoint. So, we are honored to have an opportunity to discuss alternative innovation options.

Custom developed systems are not uncommon for large I.T. projects; however, they almost always have risks of running over budget and behind schedule. And all too often, the customer is promised a great deal to win the contract (*either by attractive pricing or apparent capability to exceed requirements*). The unfortunate truth is the vendor’s objective is always to “*win the deal first, then worry about delivery.*” Most of the time the risks are based in requirements and specifications, related engineering challenges, project management, and cost containment. We witnessed all of these elements play out in the development of healthcare.gov, for example.

However, the situation for creating elections technology for the great state of South Carolina is very different than typical custom IT projects and certainly nothing like healthcare.gov or any healthcare exchange project. Here are six differentiators:

1. **Void of Government Action.** First, it took no act of Congress to catalyze the research and development underway to innovate elections technology—work occurring in Texas at Rice University with the StarVOTE project; work occurring in L.A. County; and work at the OSET Foundation with the TrustTheVote project through philanthropic funding.
2. **Eliminated Engineering Risks.** Second, in each of those projects the “engineering risk” (*that is, the risk that a particular technical challenge will arise that alters the time or money required to complete*) has been eliminated and it’s now a question of execution in building.
3. **Unencumbered Management.** Third, these projects are unencumbered by government bureaucracy in management and administration, free of the overhead



and margins of commercial ventures, and void of political agenda.

4. **An Adaptable Solution.** Fourth, the work underway is designed to craft a base solution that can be adopted, adapted, and deployed anywhere and everywhere so that each instance of the solution does not amount to a complete ground up build.
5. **Outright Ownership.** Fifth, the outcome of this work is publicly available (*free*) software, without any royalty or right-to-use fees or proprietary licensing terms and conditions. To be clear this means South Carolina would outright own in perpetuity 100% of the software source code of its voting system solution (*and any election technology acquired as open source*). Of course, open source does not mean completely free source because it requires the processes of integration, adaptation, and deployment. But the total cost of acquisition is generally markedly lower than proprietary solutions. Our experience teaches we can expect upwards of 75% to 80% savings over legacy commercial approaches plus outright possession of the source code.
6. **Up to 75% Savings in Acquisition Cost.** We forecast \$8 million to finish building the open source voting system (*software*) as described earlier. Next, we add a conservative forecast of an additional 3.75% to cover the cost of meeting local requirements because no one solution can fit every jurisdiction (*and South Carolina likely administers elections somewhat differently than other States*), and to cover any existing legacy systems integration. That brings the total cost to acquire a new open source system (*software*) to \$8.3 million. Then we add in an estimated \$1.7 million of off the shelf hardware (*and this could be a generous budget for a bulk purchase of tablets, printers, and tabulating devices*). This brings the total cost of acquisition to \$10 million—an estimated 75% savings over the current (*decision-wise*) “safe” choice of some \$40 million. To be sure, it might not be exactly 75% depending on what the \$40M budget includes. Notwithstanding the profit margins the commercial solution most likely contains, a more conservative analysis than the numbers we’re projecting here would still suggest an enormous tax-payer savings—albeit requiring a more aggressive, innovative leadership decision to take this route. In other words, even if the proposed solution were twice as expensive as projected, the State would still save taxpayers 50% over the current alternative.



In summary, this suggests the South Carolina Joint Legislative Voting Systems Research Committee and the Elections Director needs to consider whether it's worth a \$10 million investment to acquire a complete voting system software solution for a system designed to Election Director Andino's precise specifications and owned outright by the State. There is software already under development, so this is not a ground up project, and momentum is growing for this solution alternative so, Director Andino and the State would be far from alone. Therefore, if it is a potential alternative, then just as other States are doing, energy needs to be shifted to negotiating extensions on the current system contract for two to three years while this technology is finished, and consideration should be given to investing \$8 million to leverage that work toward completing a system that meets or exceeds South Carolina specifications.

The alternative is to make a \$40 million investment in the status quo and accept the consequences of that (*whatever they may be*) for another five, seven or longer number of years. This comes down to how the State wants to best serve its voters, its administrators, and its taxpayers, and how South Carolina wants to fit into the digital innovation of government going forward as a leader, follower, or laggard. We believe South Carolina cannot afford to ignore careful consideration of this option.

In closing, on behalf of the OSET Foundation, I thank the Joint Legislative Voting Systems Research Committee for allowing us to present this information and look forward to continued discussion on a rapidly emerging movement to provide a more verifiable, accurate, secure, and transparent alternative voting software technology platform, public owned, and freely available which will assuredly dramatically reduce the total cost of acquisition for taxpayers.

Respectfully Submitted,

**Gregory A. Miller**

Co-Founder, Chief Development Officer



Prepared For:

**SOUTH CAROLINA**  
ELECTION COMMISSION



# OSET FOUNDATION



TRUST  
THE VOTE

A project of the  
Open Source Election Technology Foundation

We are

A U.S. based non-profit technology research & development institute:

- Founded in November 2006
- By Silicon Valley social entrepreneurs
- From Apple, Facebook, Netscape, Sun, and elsewhere
- Applying open source principles to inject digital innovation into the electoral process
- Funded by philanthropists, individual citizens, and grant-making organizations

TrustTheVote Our Work Get Involved News & Events About Donate

Team  
FAQ  
Contact

### Team

#### Join a committed team.

The TrustTheVote project team is comprised of social entrepreneurs who are also seasoned technologists with extensive hardware, software, and systems design experience.

**JOIN US!**

OSET is not a think tank doing a study. And we're not about lobbying politicians for change. We are change agents. We are building an election technology framework that election officials can adapt and deploy.

The TrustTheVote project is sponsored by the Open Source Technology (OSET) Foundation. OSET is a seven-year-old non-profit public benefits corporation.

Find out more about the OSET mission on the [foundation website](#).

**ANISH CHOPRA**  
Strategic advisor

TrustTheVote A project of the Open Source Election Technology Foundation.

2



We are

48 experienced talented contributors, — with needs for more of them and their time



Open Source

A project of the  
Open Source Election Technology Foundation



We are

challenging the status quo of everything:

- Little Public Data
- Lack of Transparency
- Jurisdiction Budget Constraints
- Certification Processes
- Market Dysfunction
- Spare-Parts Guarantees
- Open Source Project Management





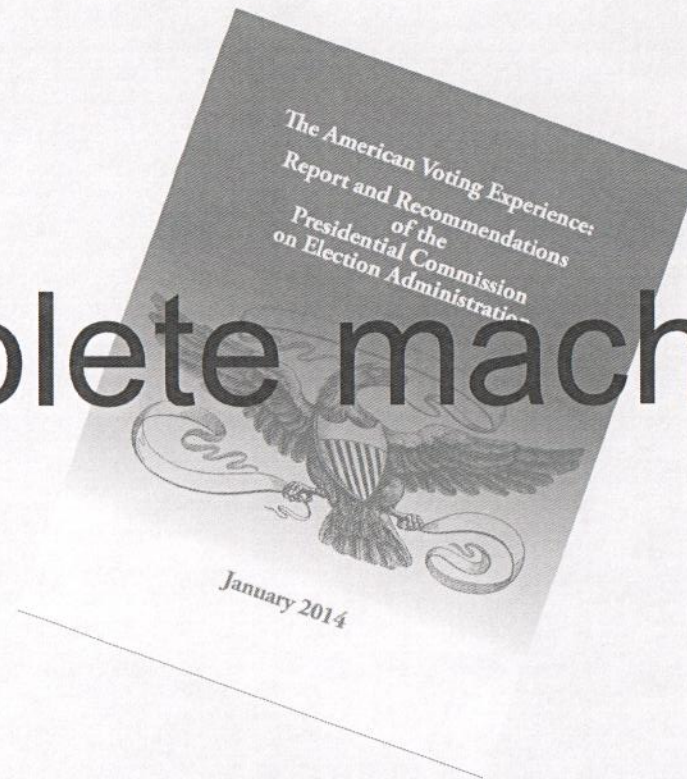
## A crisis in the making

America is facing a great challenge to the preservation of our democracy:

- our voting systems are literally *falling apart* and...
- voter turn-out is diminishing while recounts and litigation are the status quo but...
- there is no commercial incentive to fix that and...
- at some point it will threaten a constitutional crisis, if not our national security

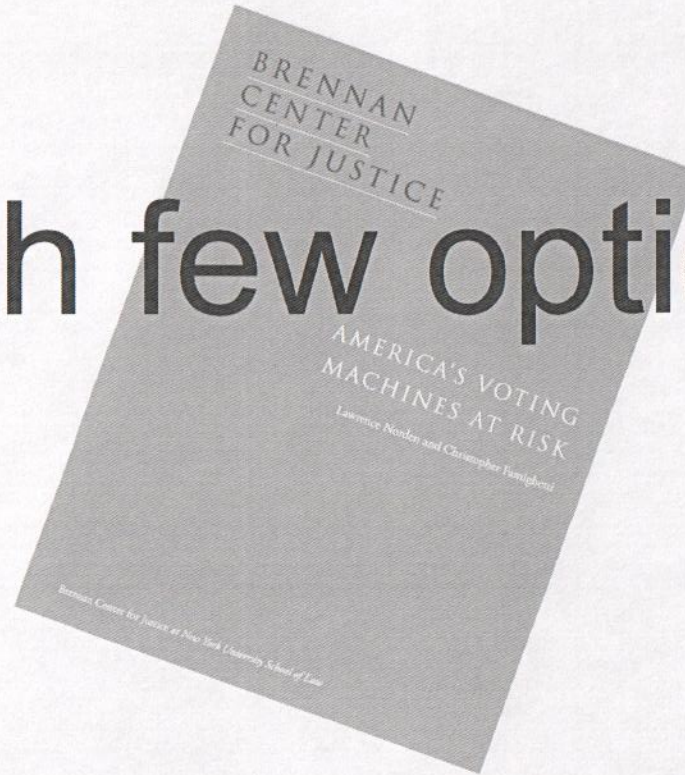


# obsolete machinery





# with few options





we need a better way



# public infrastructure

~~public~~ infrastructure  
critical democracy



## A tech-sector solution to provide “critical democracy infrastructure”

- holistic technology framework
- fully transparent
- publicly owned
- as fundamental to our democracy as the electric grid is to our national security

# open source



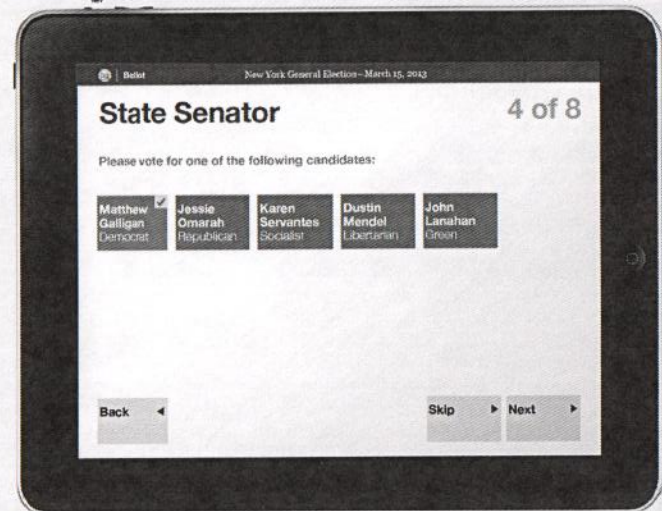


## Our Solution

breakthrough publicly owned election technology  
by and for the people to...

- Lower costs to acquire real innovation,
- shorten long lines,
- ease usability,
- increase reliability,
- reduce recounts,
- eliminate uncertainty, and ...

...increase confidence in elections and their outcomes.



We are

designing and developing a comprehensive  
open source election technology framework:

- to address the *entire* election ecosystem –
- from voter registration through election audit –
- using a modular, duty-specific system with off-the-shelf hardware –
- *freely available* to reduce total cost of ownership –
- to reinvigorate an industry to adapt and deploy resulting systems.



We're doing so because

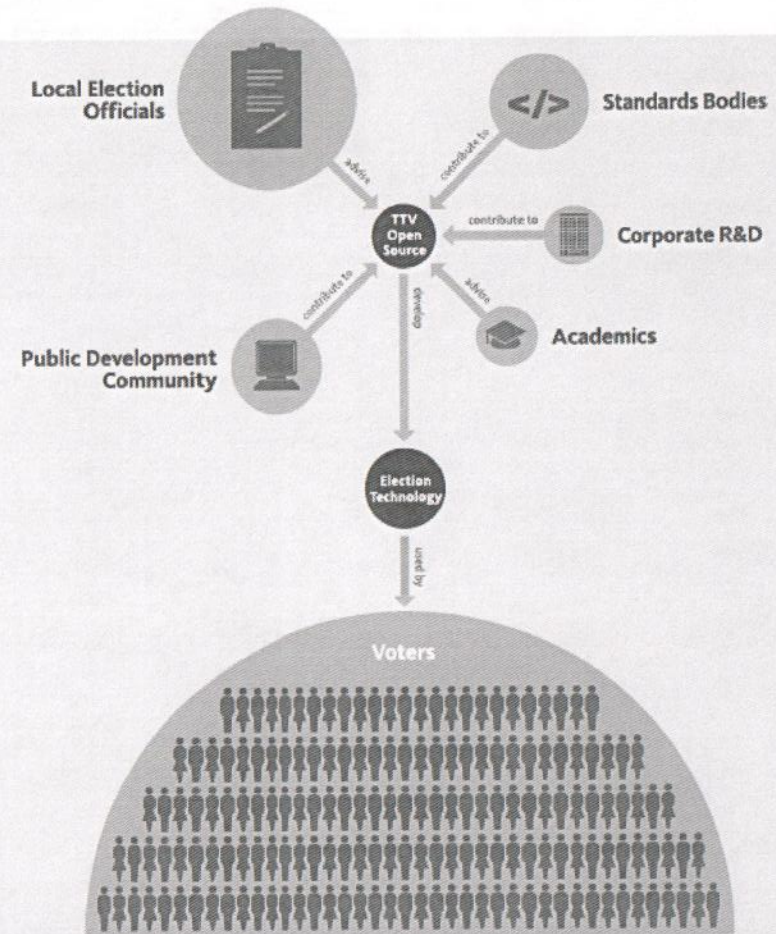
code causes change

How: we are engaging stakeholders to specify what they actually require.

we put elections officials rather than software at the center of our efforts

we have over 200 contributors to date

few of them have ever written a line of software source code



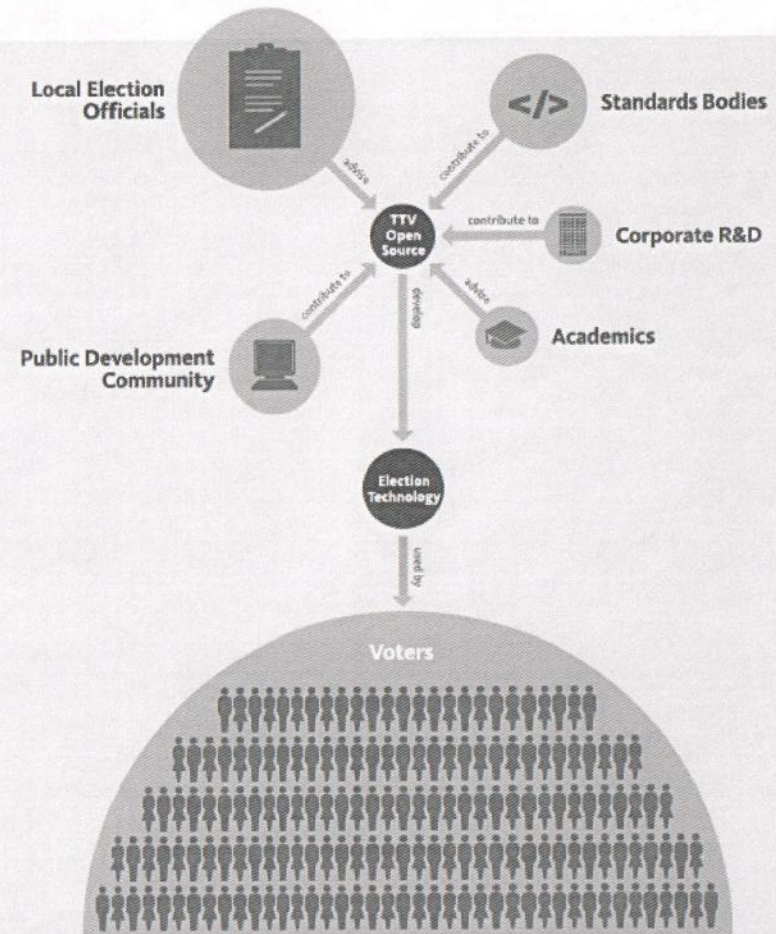


How: we're driving standards to set the pace for innovation.

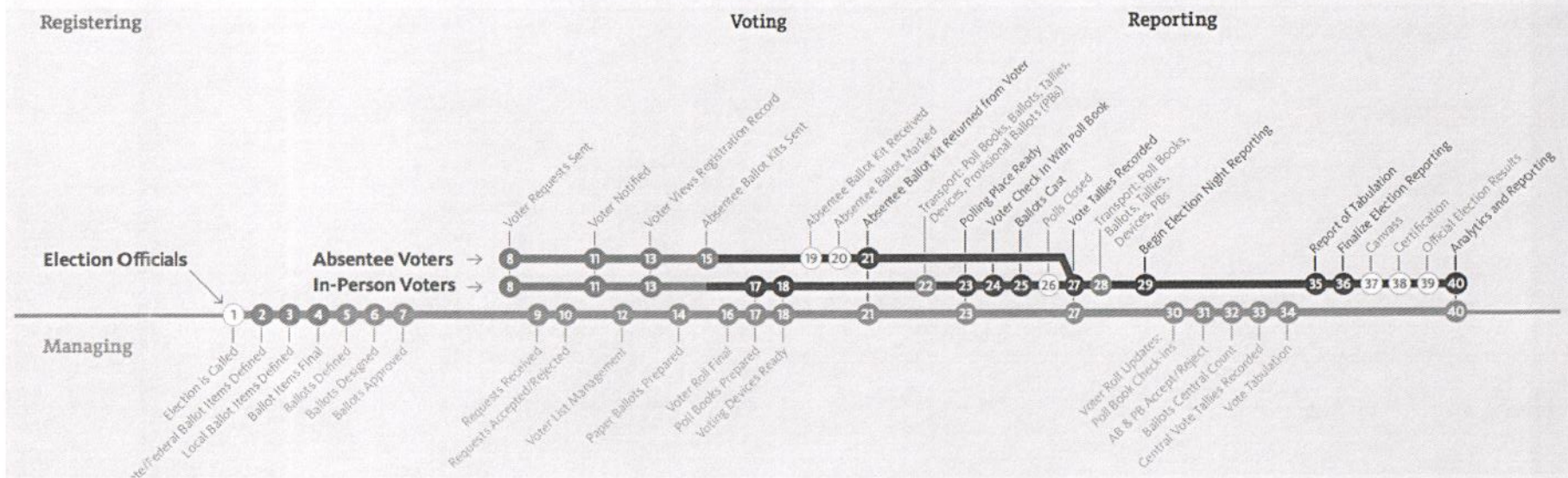
this is key to machines cooperating and transparency



- data
- processes
- certification

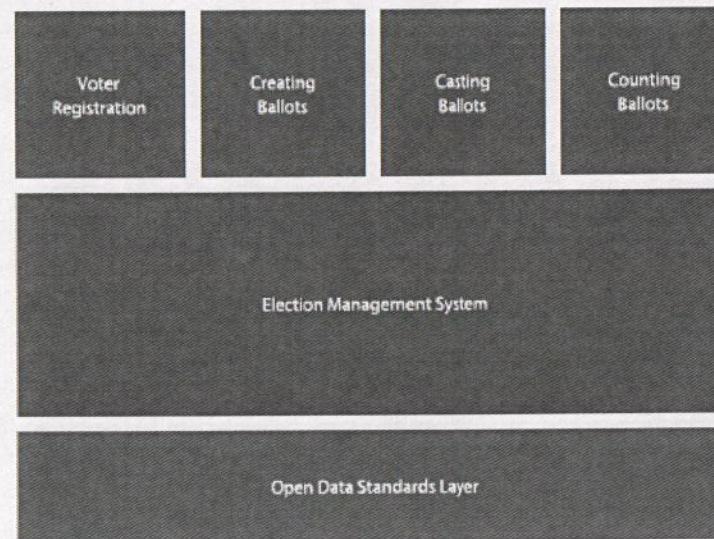


we began by map-reducing U.S. election processes...

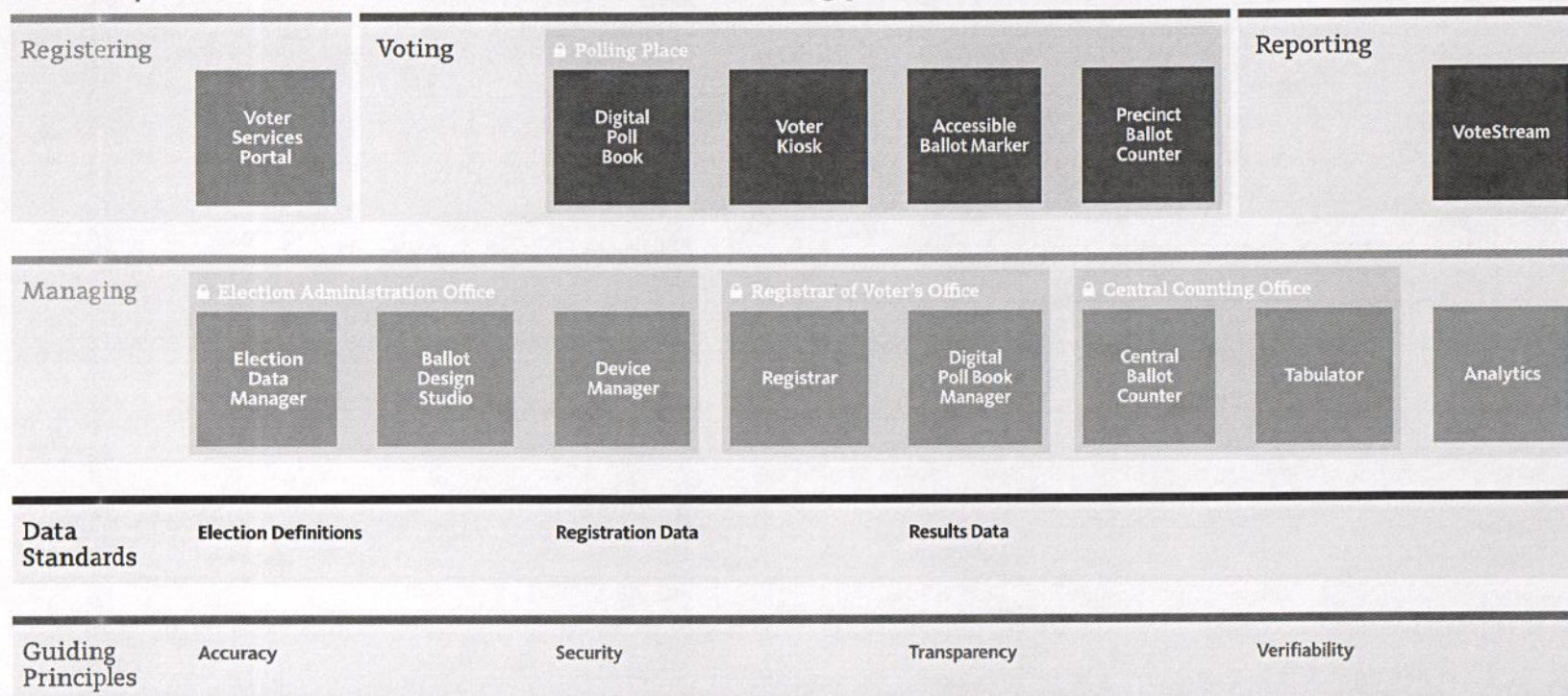




...to produce the TrustTheVote Project  
six main building blocks:



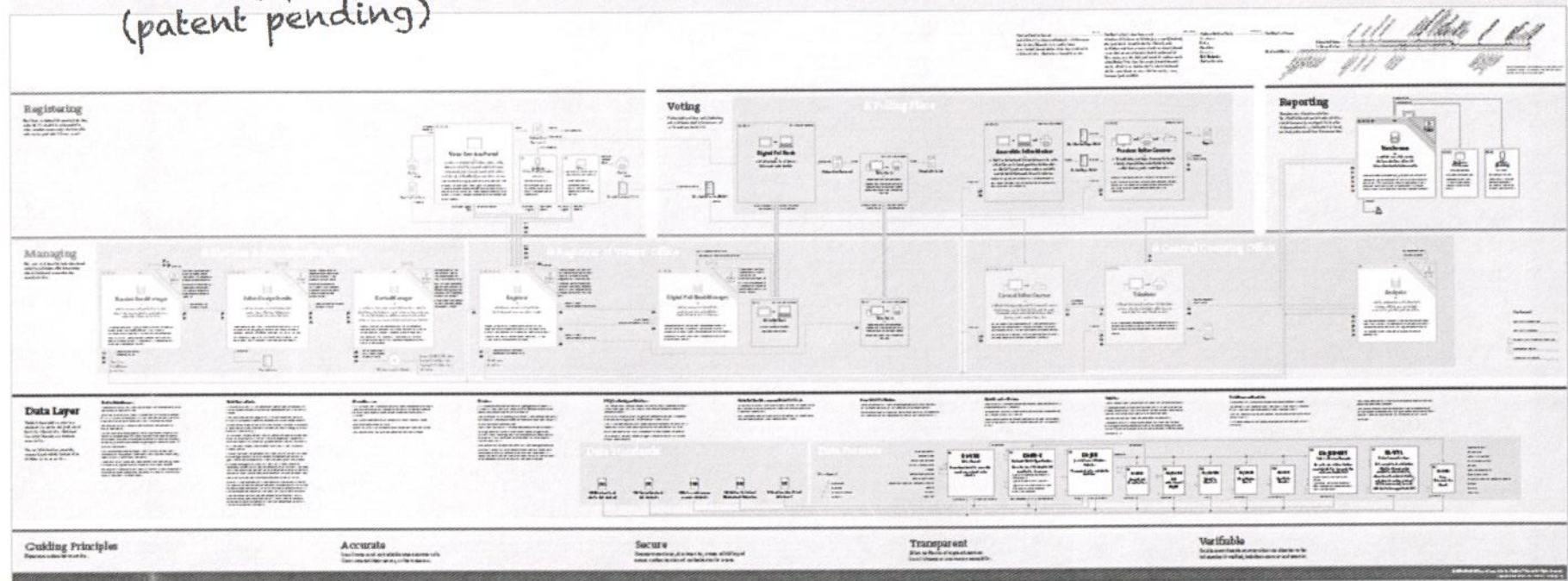
## The six main building blocks comprise the Open Source Election Technology Framework:





bit.ly/OSETosetf

# The Open Source Election Technology Framework represents 7 years of system architecture and engineering (patent pending)



A project of the  
Open Source Election Technology Foundation

here's the kind of innovation we are  
delivering

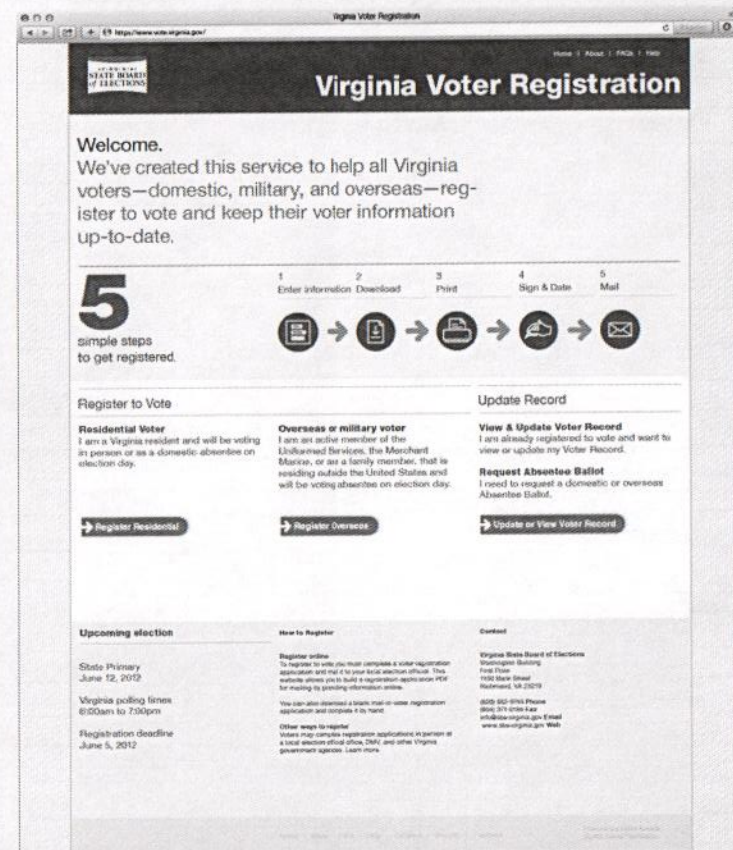


# Online Voter Registration + Services

we started with 3<sup>rd</sup> Party Registrars

then we moved to State services

which led to ballot distribution




## Online Voter Registration + Services

and now is catalyzing innovations throughout the entire voting experience – like “pre-check-in”

not only innovating for election administrators, but

re-thinking ease & convenience for voters and poll-workers alike

# Virginia



## POLL ADMISSION


**DOE, JANICE R.** SEQ: 1939  
205 Lakewood Drive, Richmond, VA 23229

**Polling Location**  
Tuckahoe Elementary School  
701 Forest Ave, Richmond, VA 23229 Tel: 804.282.4645

**Polling Hours**  
6:00AM to 7:00PM

Locality:	HENRICO COUNTY
Mag. Dist.:	TUCKAHOE
Voting Precinct:	417 TUCKAHOE
Contact:	MARK J COAKLEY Tel: 804.501.4347
Accessibility:	YES Type: VISUAL

SBE-796.1(4) REV 9/14





# VoteStream

we saw an opportunity to make  
election data, open data.

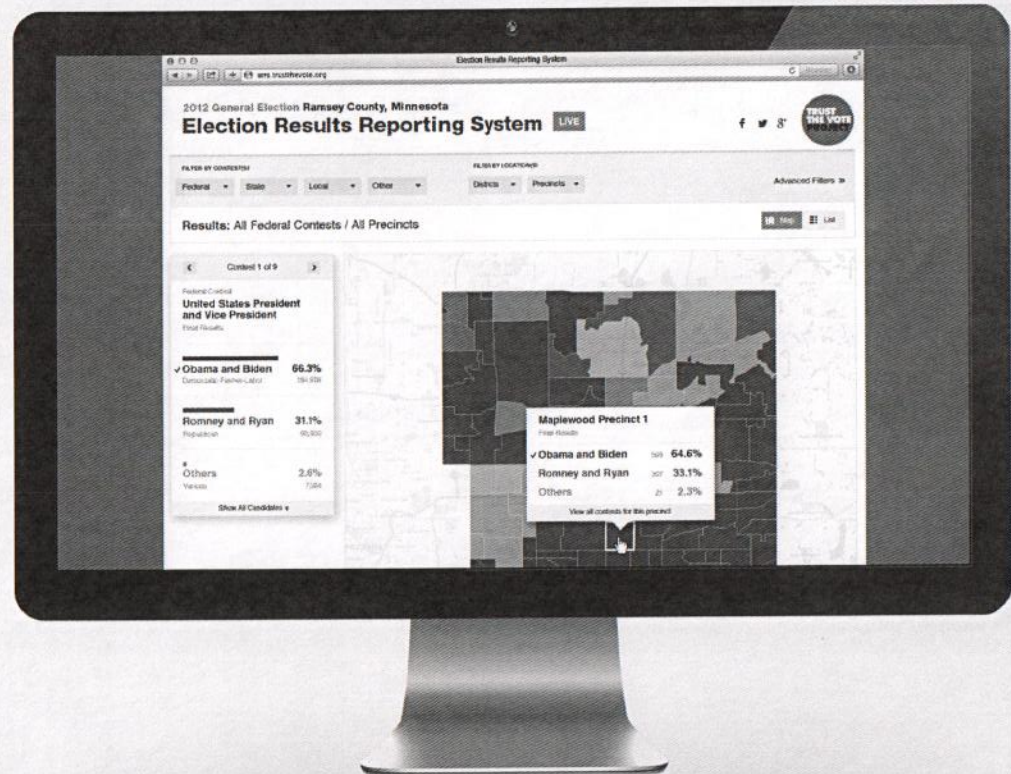
then we made a discovery:  
elections data is more than results.

elections officials regularly compile  
performance and participation data.

public data on the taxpayer's dollar.

for the privileged few (who know to ask).

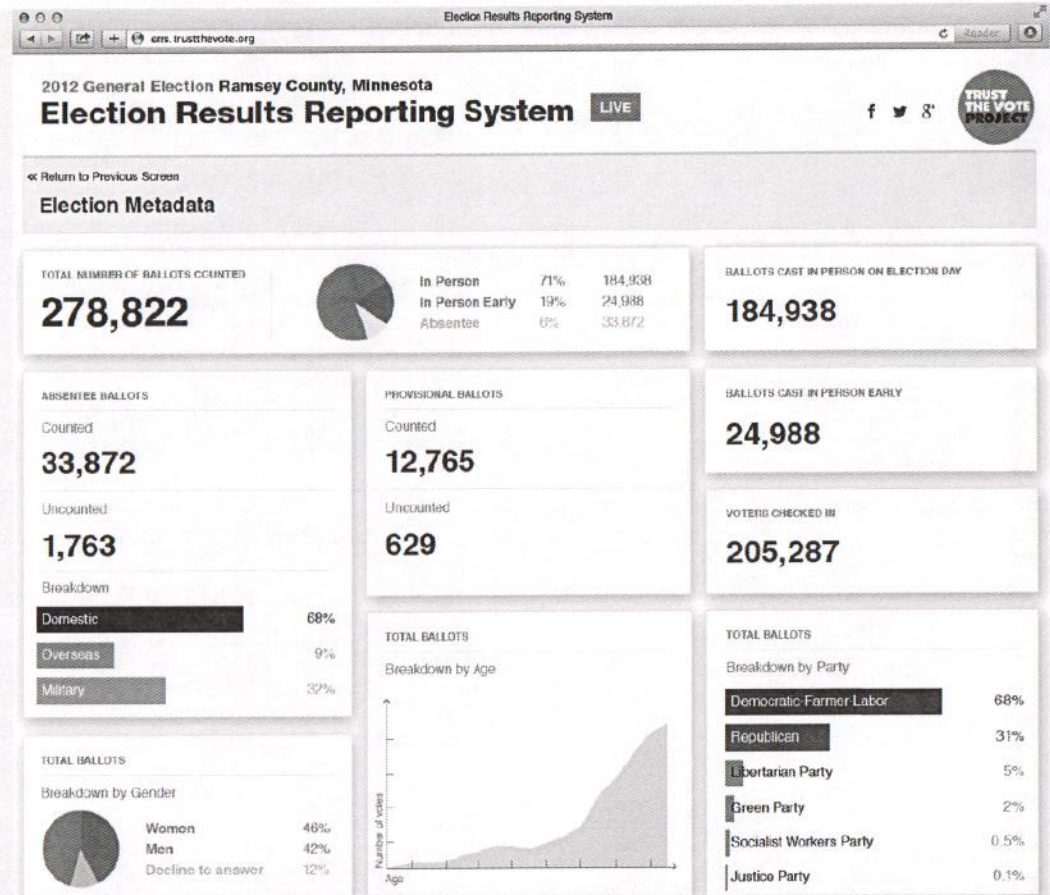
how nice.



# VoteStream

we all should be so privileged.

so, we're working to <sup>^</sup>set it free!





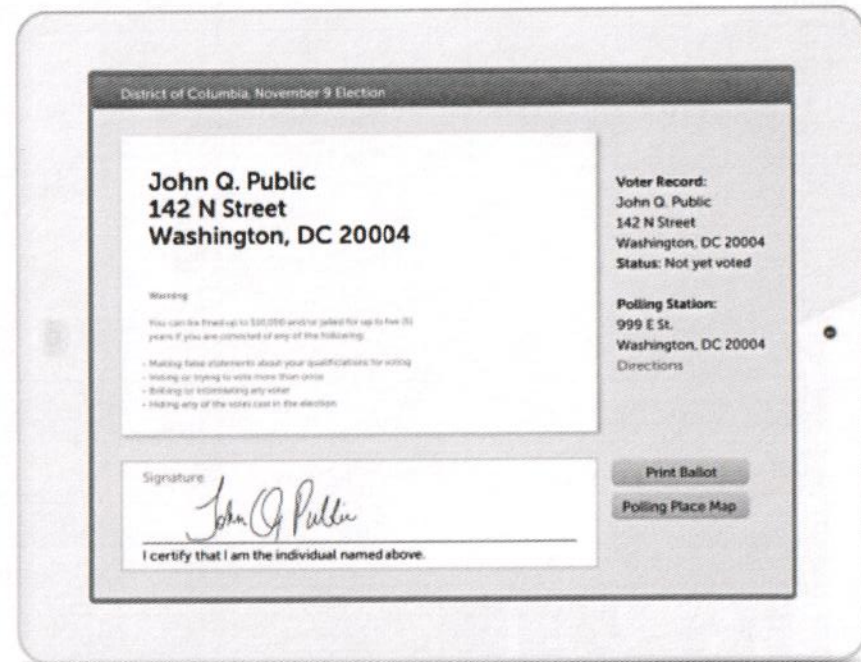
# Digital Poll Book

abandoning the trailing edge

bringing technology up to date

for a fraction of the cost status quo

extending capabilities to the leading edge

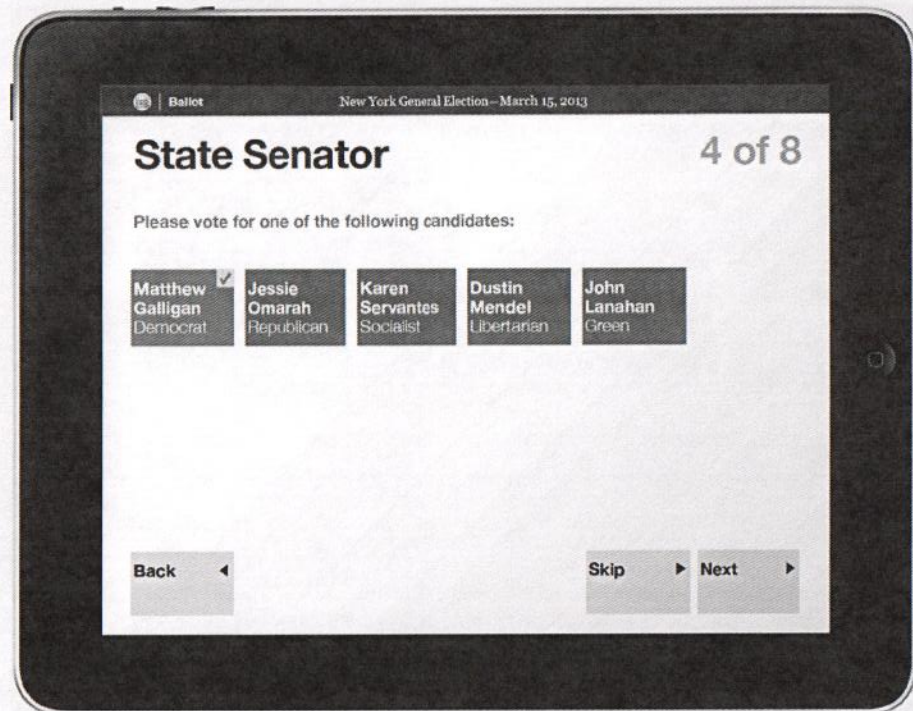


# Ballot Marking Device

usability at the heart of design

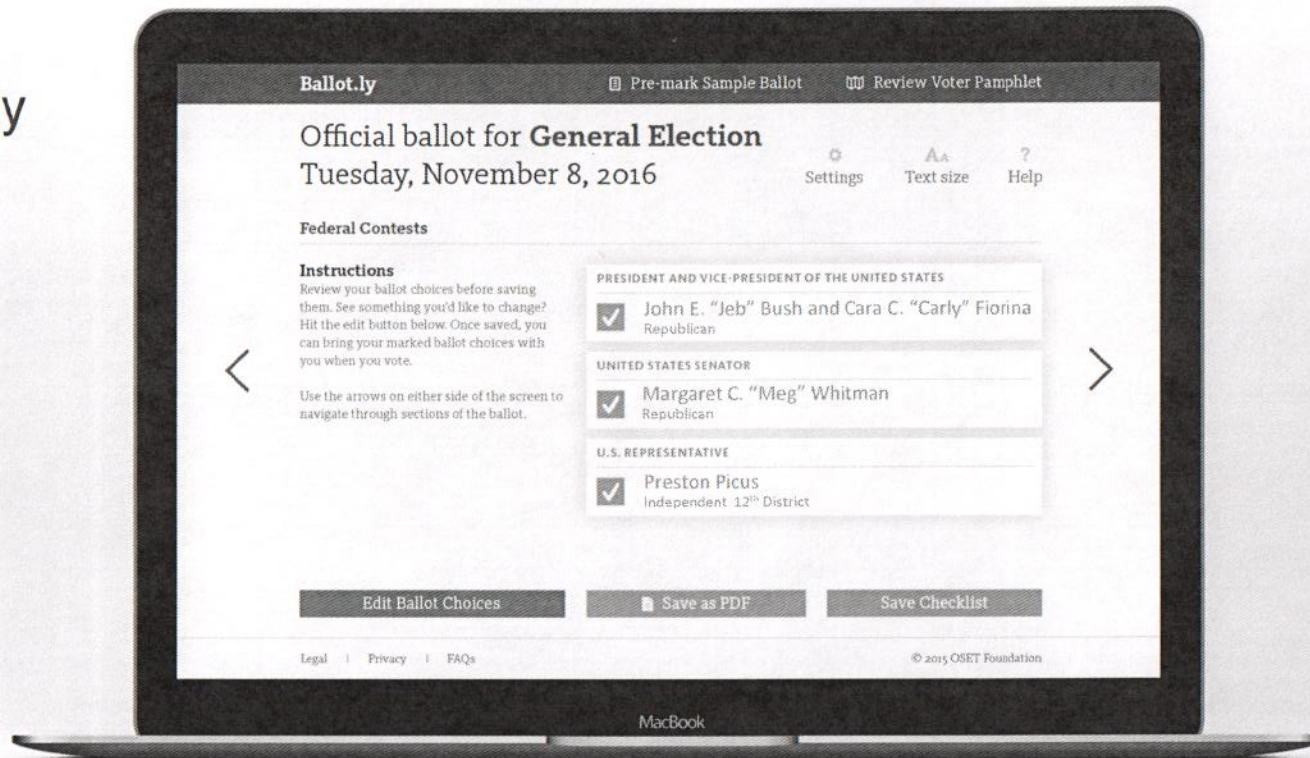
testing new methods of voter interaction

with an emphasis on ease and convenience





Ballot.ly



a sample ballot marking tool to help voters time-shift when they review and make their ballot choices.

# BusyBooth

the power of the framework opens  
new opportunities for innovation

opportunity to genuinely fix long lines

not just challenging the status quo,  
*seriously disrupting it!*







Thank you for your interest!