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Briefing

Back to Paper: A Case Study

Inside

In the not-too-distant past, American elections got an overhaul. The problems identified in the 2000 presidential election with punch-card voting systems convinced policymakers in state capitals and on Capitol Hill that change was needed – particularly in the method by which ballots were designed, cast and counted.

Bolstered by public discontent and the availability of federal dollars, voter-rich states including Florida, California and Ohio replaced older voting systems with touch-screen or scrolling-wheel electronic voting machines.

The newer machines offered flexibility and features the older systems, mostly punch cards, never could – no more over-votes, the ability to display multiple languages on the same machine, accessibility for a wide range of voters with disabilities and no more ambiguity when determining a voter's intent.

Machines were bought. Millions of dollars were spent. Votes were cast. Controversy ensued.

Not long after their introduction, computer scientists, voter advocacy groups and others called into question the integrity, security and accuracy of the next generation of voting machines. By 2003, the calls of computer scientists for further research had blossomed into a movement.

Problems at polling places strengthened their arguments and lawmakers listened.

Misprogrammed machines in one North Carolina county failed to record votes, throwing a statewide race into confusion. Statistically
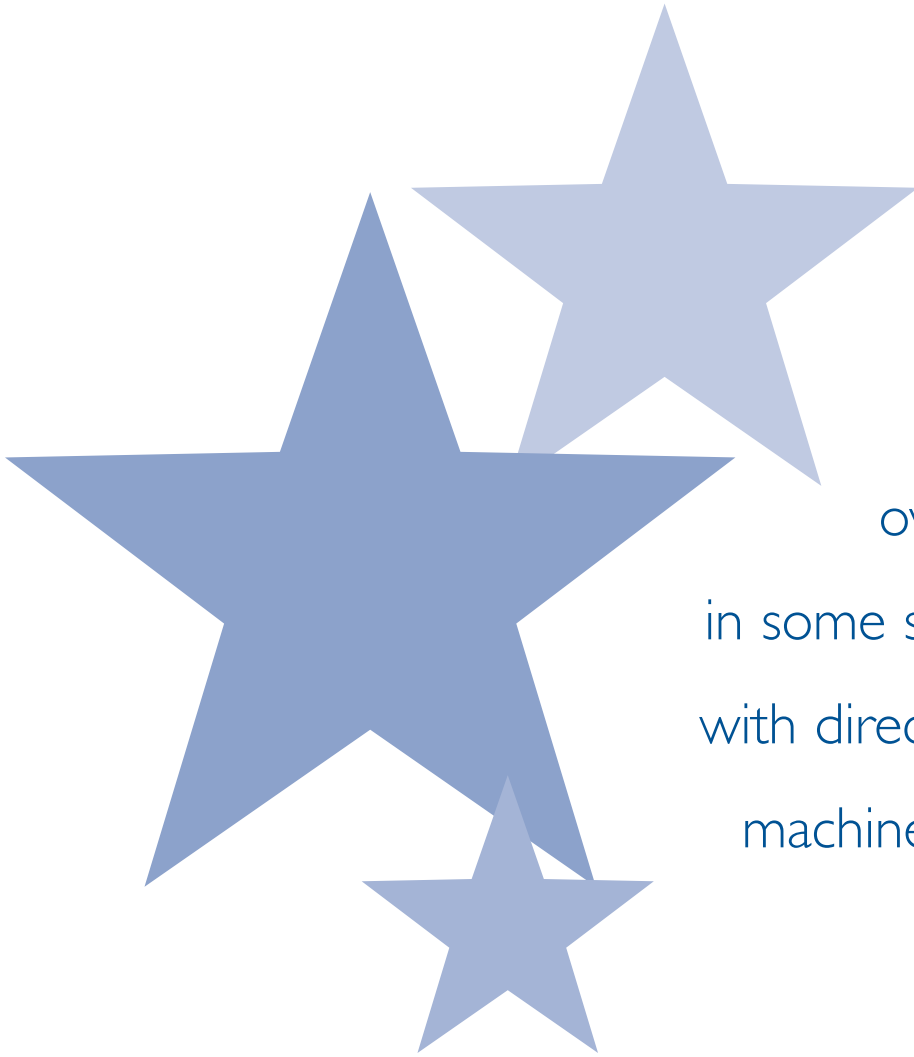
By 2007, a second overhaul was underway in some states. The experiment with direct-recording electronic machines would end abruptly or be phased out.

improbable numbers of under-votes plagued elections in some Florida counties, including a race to replace former Congresswoman and Secretary of State Katherine Harris (R) to represent the 13th District in the U.S. Congress.

Further, the security of systems was called into question in studies conducted by both the private sector and by government agencies.

In a growing list of states, the questions turned to concern. Concern gave way to legislation and legislation led to more changes at polling places. By 2007, a second overhaul was underway in some states. The experiment with direct-recording electronic (DRE) machines would end abruptly or be phased out.

Six years, dozens of elections and millions of dollars after adopting new voting systems, the migration back to paper is not yet a full-blown movement. But high-profile bipartisan action to scrap expensive and recently purchased voting technology could be the leading edge of a national effort to return to paper-based elections. Regardless of how election officials, advocates and voters stand on the issue – many of whom strongly support DRE voting and report excellent experiences using the machines – once the big states have completed the switch, others are sure to follow.

In this, the 21st *Electionline Briefing*, the decisions by five states to adopt DREs only to reverse course are explored. Five states that have adopted DREs only to reverse course are explored. The case study focuses on California, Colorado, Florida, New Mexico and Ohio, states that have or are in the process of moving away from touch-screen voting and back to paper again, all in a relatively short period of time.

Executive Summary

Six years and millions of dollars into a major overhaul of the U.S. election system, a number of states are contemplating returning to paper-based voting systems after failed or troubled experiments with newer voting technology.

Electronic voting machines were considered the ideal solution to the problems of punch-card voting shortly after the troubled 2000 election. Direct-recording electronic (DRE) machines offer accessibility for people with disabilities, prevent over-voting and eliminate the subjectivity of paper-based balloting that plagued the Florida recount.

But DREs also began to raise questions shortly after their deployment in major battleground states, including Florida, Ohio and California as well as in Colorado and New Mexico. These questions, along with problems at the polls, prompted decisions to scrap the recently purchased machines.

More states are primed to follow, including Maryland, which was among the first in the country to purchase a statewide DRE voting system, and New York, which will end more than a century of lever machine usage with the purchase of optical-scan machines and ballot-marking devices in 2009.

Reasons for the return to paper varied in each of the five states that opted to make the switch, but similarities exist as well. In each circumstance, a top-ranking state official – the governor or secretary of state – raised security and accuracy concerns about DRE systems. Advocates were active as well, questioning the integrity and auditability of DRE voting. Lawmakers from both parties eventually embraced change, though frequently concerns about the replacement cost of purchasing yet another voting system came from both sides of the aisle.

New Mexico

The state was the first to go from DREs in some counties and back to paper in 2006, when Gov. Bill Richardson (D) signed a bill to standardize the state's voting to a uniform optical-scan system.

Florida

Many voters in the state will cast ballots on the third voting system in as many presidential elections in November 2008. Again, under votes raised concerns about DREs, and again, a bipartisan response was the result led by a governor. After spending more than $30 million to replace punch-card voting, another $27.8 million would be spent six years later to buy optical-scan machines for the 15 counties – including the state's most populous – that purchased touch-screen voting machines. Gov. Charlie Crist (R) led the charge, motivated largely by more than 18,000 lost votes in Sarasota County in the race for the 13th U.S. House district.

California

The verified-voting movement got its start among the state's computer scientists, and caught on with two secretaries of state after a number of counties experienced problems with DREs, because both of human and machine errors. A "top-to-bottom" review of the state's voting system in 2007 led to the expansion of optical-scan voting and the curtailing of DRE voting, limiting their deployment to one machine per polling place in the vast majority of counties.

Ohio

Widespread punch-card use might have contributed to thousands of invalid ballots in 2000, but the planned purchase of DRE machines led to concerns about security and the ability to audit results. As in California, Ohio's secretary of state conducted a review of voting systems, determining that not only were DREs susceptible to security flaws, but precinct-count optical scanners were vulnerable as well. Optical-scan ballots, which will be centrally counted, will be offered as an alternative in the 2008 primaries in counties that use electronic voting systems, with a permanent DRE ban looming as possible for November.

Colorado

While a final decision on voting systems is pending in the state, a troubled roll-out of DREs and a lawsuit over how the systems were certified led to more stringent testing requirements by incoming Secretary of State Mike Coffman (R) in 2007. A number of voting systems, including both DREs and optical-scan systems were decertified, to the chagrin of some local election officials who said they would seek an all-mail election in November. A bipartisan bill requiring paper ballots appears headed for passage in the legislature.
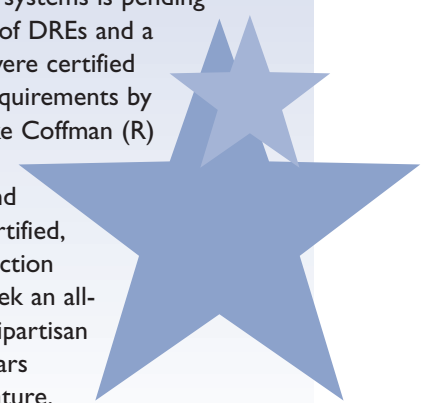
New Mexico: Governor Leads Swift Return to Paper Ballots

New Mexico was the first state to scrap touch-screen voting machines and move to a uniform paper-ballot system, a decision that some say has made the state a pioneer.

Following the contested 2000 presidential election, a study by *The Washington Post* found that 678 voters who cast their ballots early on touch-screen voting machines in Rio Arriba County never had their votes counted. Al Gore won New Mexico by 366 votes.[1]

Although some jurisdictions in the state had been using older-generation direct-recording electronic (DRE) machines for more than 15 years, some were skeptical. Santa Fe County Clerk Valerie Espinoza indicated in 2004 that she would not purchase any voting machines that did not provide a voter-verifiable paper trail.[2]

Concerns over New Mexico's voting systems – a combination of DREs and optical scanners – increased when the 2004 presidential contest had one of the highest rates in the nation of under-votes and over-votes – nearly 20,000 ballots that did not register or had more than one vote for president.[3] The margin of victory for George W. Bush was 5,988 votes.

In 2005, Secretary of State Rebecca Vigil-Giron (D), along with several voting machine vendors and local election officials were sued in federal court (*Lopategui, et. al. v. The State of New Mexico*) over the 2004 election. That year, Gov. Bill Richardson (D) signed legislation requiring all New Mexico voting systems to have a voter-verified paper trail. The legislation also required post-election audits.[4]

Nine months later, in January 2006, Richardson announced plans to standardize the voting systems throughout New Mexico.[5]

The plan would require a standardized, paper-based system in all 33 counties.[6]

At the time, there were six different voting systems being used in the state. But promises of state funding for voting machine purchases softened the blow.

Less than two months later, Richardson signed the "New Mexico Make Every Vote Count" legislation into law.

"Today we are moving New Mexico from a hodge-podge of varied voting systems to one, simple, statewide, all paper-ballot system using optical scanners to count the vote – a system that provides uniform accountability and an absolute paper trail should there be any questions regarding the legitimacy of our vote," Richardson said at the signing. "With this step we will guarantee fair and accurate elections, insure accessibility for voters who are disabled and restore faith in our electoral process."[7]

The bipartisan bill included improved training for poll workers, established statewide standards for provisional ballots, and simplified absentee voting as well as increased tougher enforcement powers for the secretary of state.

In addition to the $11 million appropriated to fund the transition, the state also used $9 million in HAVA funds.

By November 7, 2006, less than a year after requiring paper ballots in all counties, New Mexico voters headed to the polls and cast their ballots on ES&S produced optical-scan machines.

A study by researchers from the University of New Mexico, Caltech and University of Utah about New Mexico's election administration process in 2006 generally lauded the state, including how it handled the switch to all paper ballots.

"The reports show a system that is fundamentally working, where voter problems are infrequent, and where voter and poll worker confidence is generally high," stated the project's authors.[8]
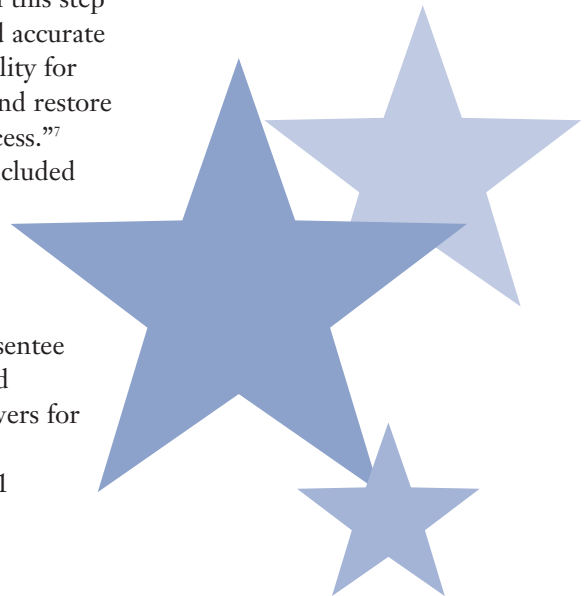
Florida: Seven Years Later, the 'Envy of the Country'?

If a Florida governor declaring his state would have "an election system that is a model for the nation" sounds like déjà vu, it's because it has, in fact, happened before.

Seven years ago, to be exact. Gov. Jeb Bush (R), just months after the chaotic recount was ended by the U.S. Supreme Court and his brother was sworn into office, signed the law that would rid the state of punch-card machines and lead to uniform vote-counting standards.

New electronic voting machines without any paper would have no hanging or pregnant chad. Over-votes would be impossible, ballots would be accessible to voters with a wide array of disabilities and confusion and subjectivity would be relegated to the 20th century.

Gov. Bush declared a turning point in the Sunshine State.

"This measure will restore confidence in our election process and will serve as a model for the rest of the nation...Floridians have a voting system that will be the envy of the country," Bush said, standing at a press conference flanked by then-Secretary of State Katherine Harris (R).[9]

Things didn't turn out quite as planned.

In fact, six years later, Bush's successor would sign related legislation, this time barring the use of the very same electronic voting machines that had frustrated poll workers and voters in their early implementation and later raised serious concerns about their reliability and auditability in light of thousands of unvoted races on ballots.

Nearly six years to the day that Bush signed S.B. 1118, Gov. Charlie Crist (R) and U.S. Rep. Robert Wexler, D-Fla., stood together as H.B. 537 was enacted, effectively ending the state's short and trying experiment with touch-screen voting.[10]

It marked the third time in as many presidential elections that parts of the state changed voting systems. Since 2000, the state that inspired and initiated election reform has gone from paper to electronic machines and back again.

Investment repeated

The move from paper punch cards to touch-screen direct-recording electronic (DRE) machines to optical-scan ballots has been expensive. Florida invested more than $30 million after the 2000 election to replace punch-card voting systems in use in much of the state with touch-screen systems – particularly the populous counties in the southern part of the peninsula. While some counties had existing optical-scan systems in place, the state estimated 65 percent of all voters cast ballots on new machines in the September 2002 primaries.[11]

Less than six years later, the state will pay another $27.8 million to change again, this time to precinct-based optical scanners.[12] Statewide, the change only affects 15 counties since the majority of jurisdictions already use the system. Yet, just as in 2000, the change affects the state's most populous, including Broward, Miami-Dade, Sarasota and Palm Beach.[13]

Under the bill (H.B. 537) enacted by lawmakers in May 2007 and signed by Crist a few days later, DRE machines will continue to be in use for voters with disabilities until 2012. But all-DRE precincts and early vote centers in the 15 counties still using touch-screen systems in 2007 have switched over to optical-scan for the vast majority of voters.[14]

"Every two years, millions of Americans express their opinion without fear of consequence," Crist said in a release. "People around the world yearn for this freedom, and now Floridians will enjoy this freedom with confidence that their vote is counted."[15]

For some, it could mark the first time they do that in a long time.

S.B. 1118 represented a comprehensive overhaul of the troubled procedures and systems that led to the historic breakdown in 2000. Signed into law less than six months after the *Bush v. Gore* decision that ended the state's chaotic recounts, it banned the use of punch cards, created uniform ballot design and recount standards and set up rules to determine voter intent.[16]

Less than a year and a half later, as Florida prepared for its first major election since the 2000 Bush/Gore debacle, touch-screen machines, made by Diebold, ES&S and Sequoia, were implemented in 15 counties for the 2002 primary elections. At stake were statewide

Scattered incidents of DRE voting machine troubles started becoming the norm rather than the exception in the state, and sometimes shortcomings in training and planning could not adequately explain the problems.

offices, including the governorship, as well as federal offices. Former U.S. Attorney General Janet Reno was among those vying for the Democratic nomination for the governorship, and public interest and national attention were both high for a mid-term race.

Some were skeptical of Florida's new paperless system.

"Replacing the punch card machines has potential shortcomings," stated an August 2001 report from the U.S. Commission on Civil Rights. "First, local election officials have a limited choice of voting systems certified by the Division of Elections. Second, there is the possibility that a malfunction or error will not be corrected because there is no paper ballot to provide vote verification."[17]

'Hardly state-of-the-art'

The 2002 primaries made some nostalgic for punch cards almost immediately after polls were supposed to open.

In Broward and Miami-Dade, polls opened late – some not until the early afternoon. Machines broke down throughout the day, with inexperienced poll workers unfamiliar with troubleshooting procedures. Hundreds of voters complained that they were sent

away without voting because machine malfunctions had paralyzed their precincts.[18]

Miami's Office of the Inspector General (OIG) wrote two reports about the September 2002 primary, the first noting that in addition to poll worker training problems and organizational deficiencies, the machines did not have the ability to present three distinct languages as promised in the original contract purchase.[19]

A second report from the OIG further revealed that the ES&S machines used in both Miami-Dade and Broward counties were equipped with 386 EX processors – technology first marketed in home computers in 1986 and by 2002, long since obsolete.

"Including the limited flash memory internal to the [ES&S] iVotronic, the machines the county purchased are hardly state-of-the-art-technology," the report stated.[20]

Ed Kast, the state's election director at the time, said the problems were limited to the two populous South Florida counties. "We didn't see problems in 65 of 67 counties…the logistics, planning and training are the issues that need to be focused on."[21]

Turns out it was a lot more than that, however.

Under-votes doom DREs

The race to represent the 13th Congressional district in 2006 was the galvanizing event.

While previously reported problems with machines, poll-worker training and election administration could, in the views of some, be corrected with better manuals, procedures, testing or software upgrades, the results of the Sarasota County election proved to be the final straw.

An estimated 18,000 votes were not recorded on iVotronic machines, a number that exceeded the margin of victory for Republican Vernon Buchanan, who according to official results, won with fewer than 400 votes in the race to succeed Rep. Katherine Harris, the Republican former Secretary of State who certified the results of the 2000 election.[22]

Reasons for the huge number of under-votes varied. Some suggested that poor ballot design on the county machines – the race was on the same screen as the six-person governor race – could have caused some voters to miss the race altogether.[23] According to Sarasota County Supervisor of Elections Kathy Dent, under-votes were intentional. A bitter, divisive campaign turned off voters in droves.

Fat chance, said Charles

Stewart, an MIT computer science professor and member of the CalTech/MIT Voting Technology Project.

"…The under-vote rates in Sarasota County were substantially higher than in Charlotte [County] for both early voting (by 15.3 percentage points) and Election Day voting (by 11.5 percentage points). These differences are substantial, both in a substantive sense and a statistical sense. These differences are so large that there is one chance in 100 million that a difference this large in under-vote rates among the *early votes* could have happened by chance; there is 1 chance in 5 million that a difference this large in under-vote rates among *Election Day votes* could have happened by chance," Stewart wrote.[24]

Buchanan was eventually declared the winner in the race. But the questions over what happened to 18,000 Sarasota County votes persisted.

The U.S. Government Accountability Office became involved in 2007, issuing a report to a Congressional task force investigating the matter in February 2008 indicated the machines most likely performed as expected. GAO posited that voters skipped the race, either because of poor ballot design, dissatisfaction with both candidates or some other cause.[25]

But Sarasota wasn't the only county having problems with machines.

Press reports indicated that three other counties – Sumter, Lee and Charlotte – had high percentages of under-votes in the attorney general race. Sumter had under-votes in 22 percent of all ballots cast in the race; Lee, 18 percent; in Charlotte, 21 percent. The counties used the same type of ES&S voting system as Sarasota.[26]

Placement of the race on the ballot was again considered a possible culprit, as the race was low on the electronic screen, beneath the governor's race. One election supervisor said she thought voters were missing the race then failing to go back and make a choice after the machine warned them on the review screen that they had not made a selection.[27]

The end of an error?

Causes aside, Florida politicians had seen enough.

Crist, who came into office in the same election as the missing Sarasota ballots, said a second wave of election reform was in order. Seven years after the Bush-Gore debacle led to a voting overhaul in the state, the Sunshine State's election system could hardly be considered the "envy of the country," as Gov. Jeb Bush declared in 2001.

During a February 2007 meeting of the Voters' Coalition in Delray Beach, Crist said he would recommend more than $30 million for the purchase of a "verifiable paper trail of Florida's voting system."[28]

Retrofitting touch-screen machines with printers to provide paper verification was ruled out by the time the legislature passed a bill in early May. The budget to replace DREs was pared down to $28 million that would be covered by the Help America Vote Act.

For the 15 counties still using DREs, changes would have to be made before the federal election in November 2008. Sarasota County, the primary inspiration for the state's second round of election overhauls, would make the switch earlier, having optical scans on hand for the January 29 presidential primary.[29]

Touch-screens would continue to be available for voters with disabilities until 2012, at which point, they too would have to be replaced. "Ballot-on-demand" – which allows the printing of optical-scan ballots tailored to each voter's specific local races – would be deployed at early-voting sites.[30]

And Florida voters, at least in the 15 affected counties, would cast ballots on the third voting system in as many presidential elections after the state decided DREs raised more questions than they offered answers to the state's nagging voting troubles.

The decision was hailed by Republicans and Democrats, as well as voting integrity groups, the League of Women Voters and hosts of others.

"Governor Crist and the state legislature have come together and delivered an election system that is a model for the nation," said Wexler. "One person, one vote – guaranteed – with a paper record to prove it."[31]

California: A Pioneer in Adopting, Questioning and Banning Machines

In March 2002 California voters approved a $200 million bond act allowing counties to update their voting systems.[32]

During the discussions about what voting systems should be considered, some grew concerned that election officials might select paperless DRE voting machines.

"I could not see how it was possible, given the current state of computer science, to make a trustworthy paperless machine," said David Dill, a Stanford University computer science professor. "So, I started asking experts, and no one could explain to me how it was done, either."[33]

Dill conferred with others in the technology field and authored the "Resolution on Electronic Voting."

"Voting machines should not be purchased or used unless they provide a voter-verifiable audit trail," the document stated.[34]

In January 2003, Dill began collecting petition signatures and within a few months had signatures from about 200 prominent computer scientists and security experts. Concerned citizens in fields other than technology wanted to add their signatures as well so Dill opened up the petition to the general public. Ultimately, more than 10,000 people signed.[35]

That February, Santa Clara County became the first in the country to buy a touch-screen voting system that printed a paper record of each voter's ballot.[36] That same month, Secretary of State Kevin Shelley (D) announced the formation of a special task force to study electronic voting[37] and that the state would receive $195 million from the Help America Vote Act to update voting systems.[38]

Paper trail movement and DRE decertification gain momentum

A state-sponsored task force released a report in July 2003. While they could not come to consensus on the need for a voter-verified paper audit trail (VVPAT), the task force agreed that "the creation of the permanent paper record, if it is not a VVPAT, should be done once all ballots are cast."[39]

The findings led Shelley to declare that, as of July 2005, counties and cities could only buy voting systems that included a VVPAT. Touch-screen voting systems without VVPATs could not be used after July 2006. Shelley explained that the lag time was necessary to allow for system certification, poll worker and election official training and voter education.[40]

"As the state progresses with new technology, all Californians must have confidence that every vote cast is a vote counted," Shelley said. "These new requirements will provide this confidence."[41]

The March 2004 presidential preference primary did not inspire confidence.

Poll workers at 20 percent of the polls in Alameda County had difficulties with vote-card encoders and voters were told to use paper ballots, go to a different polling place or return later.[42] Similarly, encoders failed in San Diego. Back-up paper ballots were not available.[43]

In Orange County, poll worker error led to as many as 7,000 voters casting the wrong ballots.[44] Counting software in San Diego gave several thousand of Sen. John Kerry's votes in the Democratic presidential primary to Rep. Dick Gephardt, who had already dropped out of the race.[45]

Following the primary, a state advisory committee recommended that the 10 counties using touch-screens continue using them only in conjunction with paper ballots.[46] Shelley then banned the use of all touch-screen voting systems unless election officials either added a paper trail or met 23 additional security measures for re-certification.[47]

On June 4, Shelley announced the first set of standards for paper trails in the country and called on the U.S. Election Assistance Commission to establish nationwide standards.[48]

"These standards will be used by voting system manufacturers to develop the next generation of California's electronic voting machines," Shelley said. "These will also establish the baseline for testing those systems to determine if they should be state certified."[49]

Shelley's move to decertify angered some county election officials. Conny McCormack, Los Angeles County registrar said, "He put out a report saying that touch screens were 100 percent accurate. And then two days later he decertified them."[50]

Shelley said that Diebold's aggressive marketing drove election officials to purchase voting equipment that had not been tested or certified.

Indeed, Shelley's office found that touch screens were precise in random tests during the primary.[51]

His decision to decertify led to lawsuits but Shelley quickly recertified systems in Merced, Orange, Santa Clara, Shasta, Tehama, and Napa counties once they complied with new security precautions.[52] On August 24, Shelley announced that electronic voting systems in all other counties had been recertified.[53] Gov. Arnold Schwarzenegger (R) signed legislation in September that required all e-voting machines include a paper record by 2006.[54]

Meanwhile, Bill Lockyer, the Democratic state attorney general prepared a lawsuit against Diebold for defrauding the state by making false claims about its products. Shelley said that Diebold's aggressive marketing drove election officials to purchase voting equipment that had not been tested or certified.[55] The suit was settled in December 2004.

In January 2005, Shelley certified the first voting system with VVPAT, the AVC Edge with VeriVote printer by Sequoia Voting Systems.[56]

Bowen brings top-to-bottom review

Election reform slowed down significantly in the state when Shelley's tenure was cut short by scandal. Schwarzenegger appointed Bruce McPherson, a Republican state legislator to replace Shelley in March 2005. Debra Bowen, a former Democratic state senator became secretary of state after she narrowly won the election over McPherson in November 2006.[57]

During her campaign, Bowen promised to scrutinize electronic voting machines.[58]

"California counties have spent hundreds of millions of dollars on new voting equipment but there are reports questioning their accessibility, questions about the reliability of electronic voting systems, questions about the training poll workers get to manage the high-tech equipment," she said."[59]

Bowen appointed Lowell Finley, an attorney who had previously sued voting machine manufacturers, to be deputy secretary of state. Finley led a group that sued McPherson to block his approval of a Diebold voting system.[60]

In March, Bowen's office issued draft criteria of a top-to-bottom review of voting systems focusing on security concerns, accessibility for minority language voters and voters with disabilities and usability for both poll workers and election officials.[61]

However, concerns about the

review's timing arose when Schwarzenegger and the state legislature moved the 2008 presidential primary to February. County election officials warned Bowen that major changes in elections in a short time span could potentially destabilize elections.[62]

State officials in May said they would be working with the University of California to bring together three different teams to study the systems' documents, source code and perform penetration attacks. A separate team would assess the systems' accessibility. Bowen's office expected the review to cost $1.8 million and planned to fund it with money from HAVA and voting system vendors.[63]

Preliminary review results came in July when the teams released their report noting experts were able to break into every voting machine being tested. Matt Bishop, the University of California–Davis computer science professor who led the team assessing vulnerability said that he was surprised by how easy it was to break into the machines, adding that his team would have been able to find more problems if they had had more time.[64]

Steve Weir, Contra Costa County registrar and head of the California Association of Clerks and Election Officials, challenged the relevance of the review. Review team members had operating manuals, source code and software for the machines, as well as unlimited access to them, which Weir said "is like giving a burglar the keys to your house."

The reviewers did not make any judgments about the feasibility of any attacks.[65]

"This was not a security-risk evaluation but an unrealistic, worst-case scenario evaluation," Steven Bennett, Sequoia Voting Systems' spokesman said at a public hearing.

"We're concerned about extreme actions being taken. We urge the secretary to ... refrain from precipitous action until all the relevant information is in," added Deborah Seiler, San Diego County's registrar.[66]

In August, six months until California's February 2008 presidential primary, Bowen decertified then conditionally recertified the systems evaluated by the review.[67] While Bowen allowed the continued use of e-voting machines, she limited them to one per polling place for voters with disabilities and all votes cast on touch-screens must be recounted by hand after the election.[68] One type of system employed in the counties, the eSlate, could still be used as the primary voting system.

Bowen also received criticism from election reform advocates who oppose all electronic voting.

Alan Dechert, Open Voting Consortium president said that Bowen was caving to pressure from voting machine vendors and election officials in allowing some machines to still be used.

"She is not requiring any changes in the software or hardware used. This is not why we elected her," he said.[69]

"When the government finds a

car is unsafe, it orders a recall. Here we're talking about systems used to cast and tally votes, the most basic tool of democracy," Bowen said at a December conference sponsored by *electionline.org*.[70]

Since the top-to-bottom review, San Diego, San Bernardino and Santa Clara Counties have all put thousands of voting machines in storage. In Riverside County, 3,000 electronic voting machines that cost about $25 million have been placed in storage as well. During a November test run of paper ballots through scanners in San Bernardino, election officials found they could handle 10,000 voters per hour, so it may take as long as 17 hours, starting at 10 p.m. on election night, to scan the anticipated 175,000 ballots, Kari Verjil, registrar said.[71]

"It seems like every time we get a new secretary of state there is a new voting system. Who's to say what will happen in four years if we get another secretary of state," Verjil said.[72]
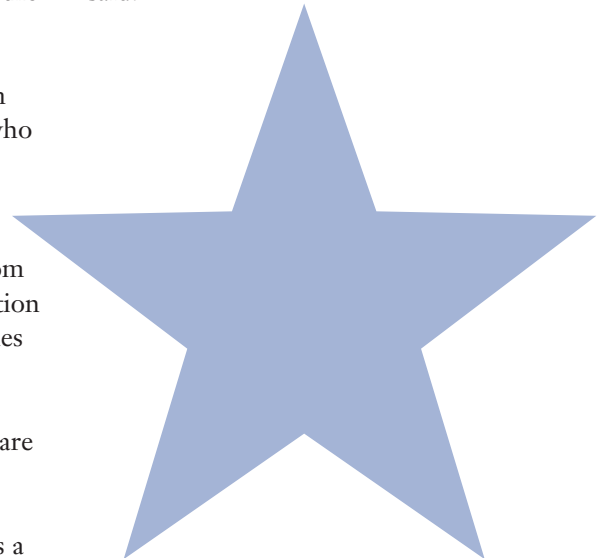
Ohio: Moving Back to Paper, Facing Resistance

"I am committed to helping Ohio deliver its electoral votes to the president next year."[73]

These words, written by then-Diebold Inc. CEO Walden O'Dell in a 2003 fundraising letter to like-minded supporters of President George W. Bush marked a seismic shift in the debate over electronic voting machines in Ohio and across the country.

Existing skepticism about the security and reliability of direct recording electronic (DRE) voting systems crystallized and technology that some saw as the solution to the troubles of the 2000 election became the growing focus of potential problems for future votes.

More than four years, two troubled elections and several voting system risk assessment reports later, Ohio Secretary of State Jennifer Brunner (D) recommended the state scrap both DREs and precinct-count optical scanners (PCOS) that tally paper ballots by November 2008.[74] In the meantime, for the March 2008 primary, counties still using electronic voting machines with voter-verified paper audit trails (VVPATs) are required to provide voters the option of casting their ballots on paper.[75]

For several Ohio counties this will be the third type of voting system in place since 2004. And many of these counties are less than four years removed from the days of punch-card ballots.

Punch cards out, DREs deployed after delays

While Florida withered under the glare of the national spotlight in 2000 with its hanging, dangling and pregnant chad further north, Ohio also had thousands of punch-card ballots that could not be counted, though without much public notice.

With a much larger margin of victory – 165,019 votes – by George W. Bush than in Florida the state did not face the scrutiny the Sunshine State did. However, there were 93,991 ballots cast that were invalid, according to the Ohio secretary of state's office, and many of those were punch cards.[76]

In October 2002 the American Civil Liberties Union (ACLU) of Ohio filed a lawsuit against the state for using punch cards, arguing that the use of the ballots in some counties and not in others violated the Equal Protection Clause of the 14th Amendment.[77]

The state did not wait for the outcome of the lawsuit, which the

> While Florida withered under the glare of the national spotlight in 2000 with its hanging, dangling and pregnant chad, further north, Ohio also quietly had thousands of punch-card ballots that could not be counted.

ACLU eventually won in 2006. In May 2003 the state issued a request for proposal (RFP) for vendors to supply the state with DRE voting systems with the goal of replacing punch cards by March 2004.[78]

However, after qualifying vendors in July 2003, the end of the month saw the first of several delays in the final selection and deployment of any new DREs because the state wanted to perform more in-depth security reviews of the voting systems.[79]

In late 2003, two state-sponsored reports were issued, one of which cited 57 potential security risks with the technology. The findings delayed deployment of the systems until August 2004.[80] By the middle of 2004 a follow-up report was issued and plans to have all counties switch to touch-screen voting systems even by November 2004 were delayed. At the same time, a state law was enacted requiring DRE voting systems to include VVPATs.[81]

The enactment left 69 of Ohio's 88 counties using punch-card ballots in 2004.[82]

The first half of 2005 saw more delays, as well as legal action from a vendor over the selection process.[83] By the November election, 44 counties had touch-screen voting systems in place with paper trails. That number increased to 57 six months later.[84] Their debut in Cuyahoga County during the 2006 primary did nothing to instill confidence in the new systems. While the county experienced numerous election administration

problems, one of the most startling was with the Diebold voting system and its VVPATs.

One study found that 10 percent of the VVPATs were not usable or readable due to printer jams or other problems.[85] It was particularly problematic because in Ohio, like in most states that require VVPATs, the VVPAT is the official ballot of record.[86]

A new secretary of state, a fresh look at voting systems

Secretary of State Jennifer Brunner (D), assumed office after the November 2006 election. A former election lawyer and judge, Brunner replaced J. Kenneth Blackwell (R) who left office in an unsuccessful bid to become governor.

In June 2007, Brunner issued an RFP for outside consultants to perform a risk assessment study of Ohio's voting systems. After selecting the consultants, the testing was performed from October to early December.[87]

During the testing period, November elections took place and again Cuyahoga County had problems, this time tallying the votes. The server that was performing the ballot count crashed several times as the night wore on. And when 10 races needed to be recounted, it was discovered that 20 percent of the machines with these races did not have VVPATs for some of the votes due to paper jams.[88]

In December 2007, Brunner released the report of the risk

assessment titled Evaluation and Validation of Election Related Equipment, Standards and Testing, or EVEREST. The report found "critical security failures" in the voting systems. Brunner recommended eliminating DREs and precinct-count optical scan systems by November 2008 and moving to central-count optical scan (CCOS) voting technology. Soon after she directed all counties using DREs to offer optically scanned paper ballots for the March 2008 primary.[89]

Less than two weeks after the report's release, Brunner cast a tie-breaking vote for the Cuyahoga County Board of Elections to have that jurisdiction move to CCOS voting technology by the March primary.[90]

Central count technology raises concerns

Election officials and observers expressed concerns about the move to a CCOS system – where the paper ballots are not counted at the
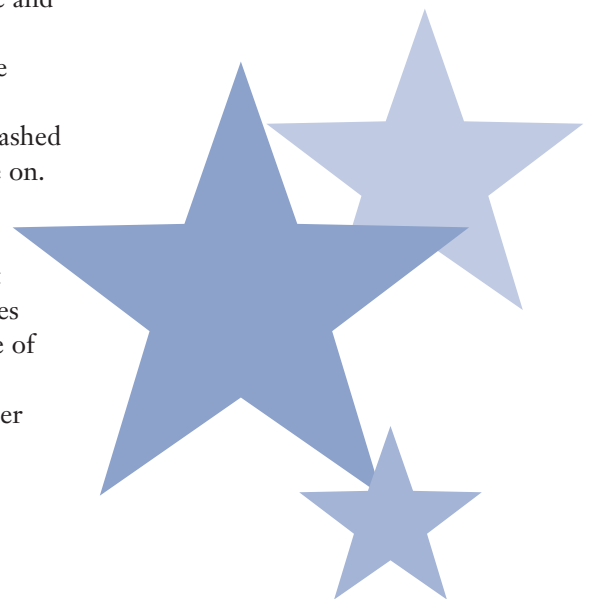
polls and stored on memory cards like with a PCOS system, but rather transported to a central location and counted there. The PCOS system and DREs can alert voters to over and under-votes. Centrally-counted ballots do not afford voters the same opportunity.

The EVEREST report offered the state's justification: "…The elimination from polling locations of vote recording and tabulation machines such as DREs and precinct-based optical scan machines (except to use optical-scan machines for determining over-votes and under-votes to satisfy HAVA 'second chance' requirements) and instead migrating to central counting of ballots, ensures greater stability to the computer-based voting systems, because it eliminates multiple points of entry to a system not adequately secured."[91]

Larry Norden, the director of the Voting Technology Assessment Project at the Brennan Center for Justice at New York University School of Law, praised the report for its focus on the security and reliability flaws of DREs but raised several points of concern about Brunner's plan.

"The exclusive use of central count optical scanners to count votes is likely to cause the disenfranchisement of thousands of voters, and in particular low-income and minority voters. Central count optical scanners do not give voters the notice and opportunity to correct errors. In-precinct DRE and PCOS voting systems have

dramatically decreased the number of uncounted votes, previously caused when voters made errors by inadvertently overvoting in elections. Second, counting all votes in a central location without the benefit of precinct totals is a recipe for massive error, particularly if there is no post-election audit of the central count optical scanner (which is not part of the Secretary's recommendations)."[92]

After hearing similar concerns from voter advocates and election officials, Brunner backed off the central count requirement by November 2008. However, that requirement is still in place in Cuyahoga County.[93]

Cuyahoga County faces challenging timeline

The county, with more than 1 million registered voters, has had less than three months to lease a new central count system, train poll workers, and then educate voters about the system, among other tasks. For the March election, the county is estimating it will have about 60 PCOS systems placed randomly at polling places for voters to check for over and undervotes - not at all polling places.[94]

The ACLU filed suit in Cuyahoga over this issue citing the aforementioned concerns of the Brennan Center and stating, "Every voting system – paper ballot or not – must give voters a chance to fix a mistake. Many votes will go uncounted if voters cannot verify that their ballots have been filled out correctly."[95]

Brunner criticized the ACLU's action.

"They're a bit tardy in filing this lawsuit. The closer we get to the election the tougher it's going to be for a judge to deny the voters of Cleveland the right to vote in a presidential primary," she said.[96] A judge agreed, denying the ACLU's motion.

Candice Hoke of Cleveland State's Center for Election Integrity, which has been the public monitor of Cuyahoga County election reform since 2006, stated that the compressed timeframe for implementing the change is not ideal.

"It's going to be problematic because you can't anticipate everything in this short time. There are still many, many details to be worked out," Hoke said.[97]

Questions about cost, election results and poll workers

Some of these details include cost, reporting election results and training poll workers.

Estimates put the price tag at $31 million statewide for the transition to the new system. Some have suggested using the state's rainy day fund, which has more than $1 billion, but Gov. Ted Strickland (D) has objected. Another possibility is money that will be allocated to states this year through HAVA.[98]

County election officials also said they worry about the cost of adding paper ballots as an option for March.

The 50-plus counties that have DREs will need to have a minimum

"I think you're adding a whole new level of confusion for the poll workers. These people are maxed out," said Portage County Elections Director Lois Enlow (R). "They have so many responsibilities. Over the last several years since 2002, it's been major, major changes at every election."

number of paper ballots amounting to 10 percent of the ballots cast in previous presidential primaries.[99]

Matt Damschroder (R), Franklin County election director stated, though, that he received a legal opinion from the county prosecutor saying state law requires more paper ballots at the polls – enough for all registered voters in each precinct plus one percent. Secretary Brunner disagrees with this position. Damschroder said this could cost his county $200,000.[100]

Potential delays in counting votes if large numbers of voters use paper ballots are also a concern. If some portion of the ballots are not correctly filled out and cannot be read by the scanners, county boards will have to examine them and decide if the ballots should be remade and scanned.[101]

And of course all changes in systems and procedures have to be learned by those on the front lines of election day - the poll workers. "I think you're adding a whole new level of confusion for the poll workers. These people are maxed out," said Portage County Elections Director Lois Enlow (R). "They have so many responsibilities. Over the last several years since 2002, it's been major, major changes at every election."[102]

Supporters acknowledge the new system might not be ideal, but see it as more transparent than the touch-screen technology.

"All of these systems are flawed," Cuyahoga County Commissioner Tim Hagan said. "All of these new technologies are questionable, as is the one we are going to adopt. There's no question about that. I think it's less

questionable. It's not a perfect system."[103]

A majority of county election officials, though, don't have concerns about their current voting systems and don't want to change, according to a survey conducted by the secretary of state's office.[104]

Brunner has stated she is willing to work with election officials, but stands firm on getting rid of touch screens in Ohio.

"While the state's elections officials have important views to consider, the bottom line is that we must do what is best for the voters in this state to ensure that anyone who is eligible and wants to vote may do so without having to wait in long lines to vote on machines that have been shown to be substandard and vulnerable to performance and security problems."[105]

Colorado: A Rocky Road to Paper

To say Colorado's voting system situation was in a state of flux in the first quarter of 2008 would be a monumental understatement.

By the beginning of February, Secretary of State Mike Coffman (R) had decertified the majority of the voting systems used in Colorado, county clerks were demanding an all vote-by-mail election in November 2008, the state legislature was considering legislation to allow Coffman to test and recertify the machines and the governor and legislators were hoping to fast-track legislation that would bring paper ballots statewide in time for the November election.

But before the state got to this point, there was a lot of history surrounding Colorado's voting system tug-of-war.

Shortly after the 2000 presidential election, then-Secretary of State Donetta Davidson formed a task force to review the state's election laws.[106]

By the time the 2004 election season rolled around, a number of jurisdictions were using new voting systems including optical-scan machines and DRE machines.

However, all was not well in Colorado.

A post-election audit of local elections by the Secretary of State's office found that ballots were not counted in some jurisdictions, including Garfield County, where a school levy and district council race were both won by 10 votes or less.[107]

As problems persisted, the state legislature took up a bill in March of 2005 that would require all voting systems approved in Colorado to provide a voter-verified paper trail. The legislation was approved by both bodies in May 2005 and signed by the governor in June.[108]

In early 2006, then-Secretary of State Gigi Dennis (D) certified several different voting systems including those manufactured by Hart InterCivic, Diebold (now Premier) and Sequoia.[109]

A troubled roll out

By November of that year, a majority of Colorado voters used electronic voting machines for the first time. Problems large and small were reported in a number of counties.

In Douglas County, electronic voting machines crashed at vote centers when voters tried to produce hard copies of their completed ballots.[110] The crashes, and inadequate supply of voting machines, had some Douglas County residents waiting in line for up to four hours to cast a ballot.

While the finger-pointing and calls for firings came from all areas, Douglas County Clerk and Recorder Carole Murray was one of the few to shoulder some of the blame.

"There are a lot of angry people out there and I don't blame them. I would be angry too because the voting process is sacred," Murray said. "I offer my apologies and I want you to know I didn't measure up the way I needed to."[111]

In early 2007, Coffman began his tenure as secretary of state and immediately set to work on coming up with new testing requirements for electronic voting machines. He held public hearings to discuss the matter and worked with advocates, citizens and technology experts.

The new testing procedures were adopted under the secretary's rulemaking authority and are known as Rule 45. The rule is comprised of 46 pages of requirements for voting systems certification, including detailed security standards for all voting systems. The rule was adopted by the secretary of state in response to a court order, *Conroy v. Dennis*.[112]

Under the new testing procedures, the certification process involves 437 functional tests that a voting system will need to pass in order to be certified for use in Colorado. During the recertification process, the secretary of state's office produced almost 2,000 pages of documentation in the evaluation of each voting system.[113]

"The recertification process will be tough, but fair," Coffman said at the time. "My focus is on ensuring that the electronic machines used in our elections are secure, are able to accurately count every vote, and that the results can be verified. Electronic voting machines that meet this threshold will be recertified for use in Colorado's elections."[114]

In December 2007, Coffman announced that as a result of vote-system testing he was decertifying Sequoia Edge II and Edge II Plus voting machines as well as the optical-scan devices eScan and

Coffman's decertification,

not only of electronic voting

machines, but also

of certain scanners

used to count optical-scan

ballots, set off a

maelstrom in Colorado.

BallotNow, manufactured by Hart and ES&S as well as the iVotronic electronic-voting machine.[115]

"I had to strictly follow the law along with the court order," said Coffman. "If I'm too lenient in determining what passes then I risk having the state taken to court by activists groups who will ask for an injunction on the use of electronic voting machines for the 2008 election, and if I exceed the requirements of state law and the court order, then I will be sued by the vendors who manufacture and sell the equipment."[116]

Coffman's decertification, not only of electronic voting machines, but also of certain scanners used to count optical-scan ballots, set off a maelstrom in Colorado.

County clerks statewide cried foul and joined forces to petition

Coffman to allow an all vote-by-mail election for the November 2008 general election. The state legislature took up a measure that would allow Coffman to retest and possibly recertify the machines in enough time so that they might be used in November.

And less than 10 days after decertifying the machines Coffman himself publicly made an appeal to the state legislature to move to all paper ballots.

"I have more confidence in having votes cast on paper ballots at the polls rather than relying exclusively on electronic voting machines or in voting by mail. If Douglas County had paper ballots available for voters at their vote centers in the 2006 mid-term election they would not have the distinction of having the last vote

cast in the country sometime after 1 a.m. on the following day." said Coffman.[117]

In late January, bipartisan legislation was introduced that would bring paper ballots to all counties in Colorado.

"Paper ballots are a tried-and-true election method that has worked for decades. They ensure a verifiable paper trail and minimize the possibility of technology failures that have caused Election Day problems in the past," Gov. Bill Ritter (D) said, in support of the legislation. "Our democracy depends not only on the people's ability to vote, but also on their confidence that every vote counts."[118]

At press time, some machines were undergoing testing that could lead to re-certification.

Requirements for Paper Usage in Voting Systems – January 2008

This map details usage of paper as a voter-verified paper audit trail (VVPAT) for use with direct-recording electronic (DRE) voting systems and requirements for paper-based balloting. The map does not intend to show prevalence of voting systems, but rather state requirements concerning verification.
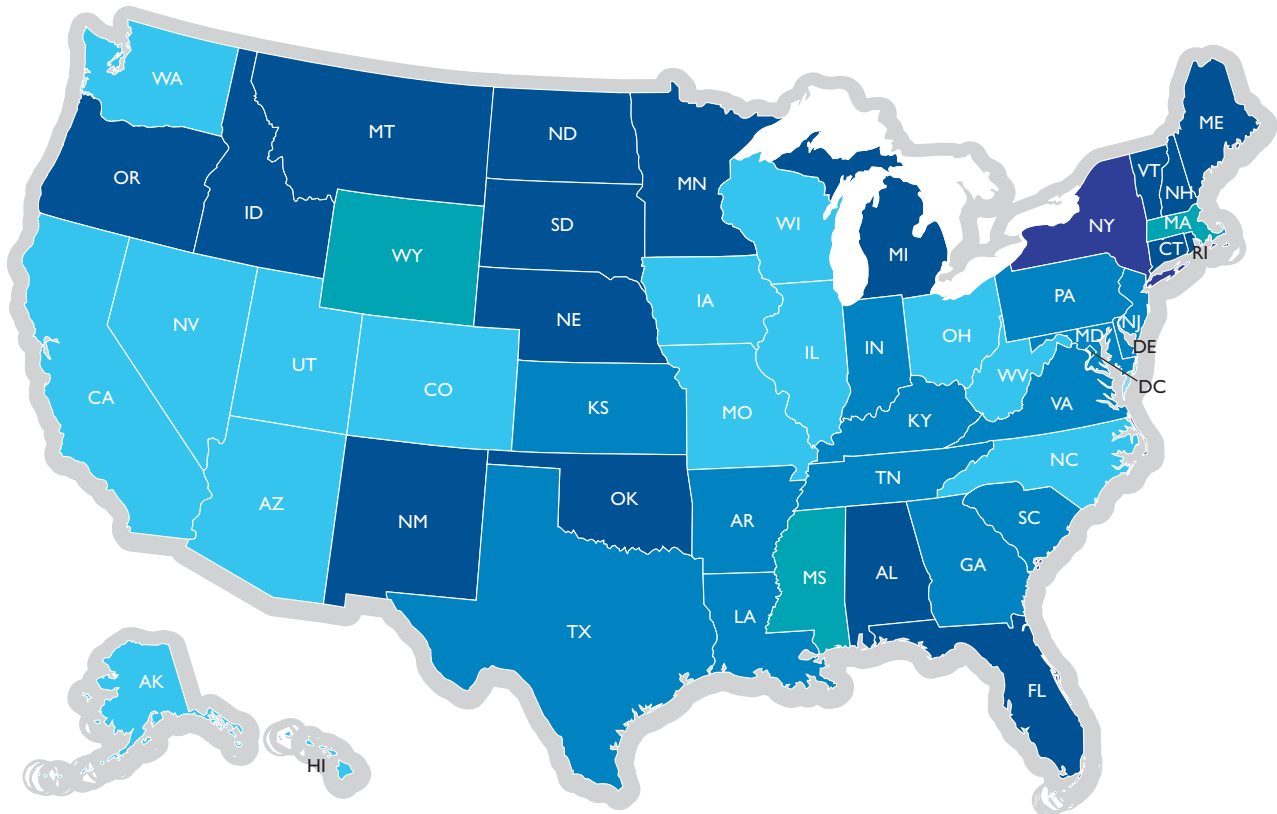
- ● DRE voting systems [15 states]; VVPATs required
- ● DRE voting systems [3 states]; VVPATs employed but not required
- ● DRE voting systems [14 states; District of Columbia]; VVPATs neither required nor employed
- ● Paper-based voting systems [17 states]; primarily optical-scan systems
- ● Lever voting system [1 state]

Notes:
Delaware, Georgia, Louisiana, Maryland and **South Carolina** use DRE systems statewide for all polling place voters. All other states with DREs use them in some, not all jurisdictions.
Arkansas: Uses DREs both with and without VVPATs.
Florida: State law allows voters with disabilities to use touch-screen systems until 2012.
Idaho: Some counties use punch-card voting systems.
Iowa: Some jurisdictions employ DREs without VVPATs. State lawmakers are debating how to meet the paper trail requirement.
Maryland: State law requires voter-verifiable paper records by 2010.
New Jersey: The state's initial deadline for DREs to have VVPATs by January 1, 2008 has been delayed by six months.
New York: The state has a VVPAT requirement but lever voting machines are still in place. Almost all counties plan to adopt paper-based voting systems by 2009.
Oregon: Holds all vote-by-mail elections.
Washington: 37 of 39 counties hold all vote-by-mail elections.

Back to the (Paper) Future: More States Look Ahead to Changes

Now that five states, including two of the nation's most populous, have moved from paper to electronic machines and back again, where will the other dominoes fall? The question of whether the days of paperless voting are ending soon has not definitively been answered.

Plenty of determination, not a lot of cash in Maryland

Maryland, among the first of three states to scrap punch cards in favor of DRE systems after the 2000 vote (Florida and Georgia were the others), could scrap the state's $55 million Diebold AccuVote TS voting system in time for the 2010 gubernatorial election.[119] SB 392/HB 18 was approved by lawmakers and signed in April.[120]

Financial concerns have hampered attempts to meet that time table, however. Budget cuts proposed in late 2007 included hacking more than $3.3 million from the State Board of Elections.[121]

"It would mean no new voting system would be implemented," said Linda Lamone, the state's election director, in a news report.[122]

Not that it would necessarily trouble Lamone or other election officials in the state. Lamone has consistently supported the paperless system at home and on the national stage for the National Association of State Election Directors.

"I think the system is fabulous," Lamone told *The Washington Post*. "It's probably the most secure system in the country."[123]

She even took on former Gov. Robert L. Ehrlich Jr. (R), who despite agreeing to purchase the Diebold DREs early in his term, said they presented "a lot to be concerned about," adding, "we want to make sure this new technology is not used to undermine fairness."[124]

But her support was matched by skepticism and sharp criticism of the system.

A coalition of Maryland organizations pushing for voter-verified paper ballots – including the ACLU, NAACP, the League of Women Voters and others – said the state had "the least secure and least transparent" election system in the country.[125]

At press time, the fate of Maryland's optical scan purchase was not yet settled. Voter integrity groups, including TrueVoteMD and other grassroots organizations were lobbying Gov. Martin O'Malley (D) to leave the funding in place for the optical-scan machines. *The Baltimore Sun* chimed in as well, urging that the $3.3 million needed for the switch be retained in the budget.

O'Malley left money in his 2009 budget, but the fate of the plan was still unclear at press time.

A long goodbye in Virginia

Virginia has banned the future purchases of touch-screen DRE machines as part of plan to phase out the system, now in use as the exclusive system in more than two-thirds of the state's voting jurisdictions.[126]

S.B. 840, introduced in the 2007 legislative session, requires the replacement of DRE systems "as the devices in operation wear out."[127]

According to estimates from some local election officials it could be more than 10 years before the current batch needs to be retired.[128]

The plan has its critics, particularly from the ranks of the state's electoral board and from registrars from across the state. Organizations representing both urged Gov. Timothy Kaine (D) to delay endorsing S.B. 840 until it became clearer what members of Congress would do with outstanding legislation on voter-verified paper audit trails.[129]

A move toward paper in New York

After flirting with choosing a number of different voting systems to replace aged lever machines in use statewide, New York officials announced in January 2008 that they would implement new voting systems in 2009.

New York differs substantially from the other states in the case study, as piecemeal reform in the state – and non-compliance with federal law – has meant the state was the last to make federally-mandated changes to elections.

Further, New York's move might not be considered a move "back to paper." But historians do recall that the state used paper ballots before the phase-in of lever machines in the late 19th century.[130]

County officials will have a choice of one of a number of models of optical scan machines/ballot-marking devices for voters with disabilities this fall. All are paper-based, and, in the words of

There is momentum in some states to go back to paper…there's also an emerging consensus that the current generation of toilet-paper paper trails with DRE systems don't work well.

— Dan Tokaji, associate professor of law,

The Ohio State University Moritz College of Law.

one advocate, "a low-tech solution."[131] A decision on voting systems for the rest of the state should be announced in late February or March.

Momentum building?

New Jersey is working on retrofitting existing DRE machines by the middle of this year. Iowa lawmakes are debating whether to retrofit DRE machines or move to paper-based systems. Other legislatures will almost certainly debate paper trail or paper-based voting systems during this year's sessions.

But not everyone agrees that the dominoes will continue to fall.

Bills to move Georgia from its

paperless DRE system to optical-scan or a paper-trail retrofit have been unsuccessful in the past few years. Seven bills that would have required voter-verified paper audit trails (VVPATs) with the state's DREs were left sitting in legislative limbo in the state since 2005.[132]

Advocates for voters with disabilities and elections officials find plenty to like about paperless systems. Paper, they contend, increases the possibility of error. Paperless machines allow voters with disabilities to vote in the same manner as everyone else. They allow for multiple languages and eliminate over-votes (while, some might contend, increasing under-votes).

"There is momentum in some

states to go back to paper…there's also an emerging consensus that the current generation of toilet-paper paper trails with DRE systems don't work well," said Dan Tokaji, an associate professor of law at The Ohio State University Moritz College of Law. "On the other hand, electronic voting is popular with many election officials, not to mention voters. DREs allow for easier access for disabled and non-English proficient voters. They're also a more attractive option for in-person early voting and vote centers. So I don't think we've seen the death of DREs, though I don't expect we'll see too many places moving to the current DRE with VVPAT systems."[133]

	2000	**2001**	**2002**	**2003**	**2004**	**2005**
CALIFORNIA	**November:** Assembly Speaker Robert Hertzberg (D) proposes a $300 million plan to update voting technology. Secretary of State Bill Jones (R) presents a $230 million plan to replace punch-cards with touch screen voting machines.	**April:** ACLU sues Jones for using "flawed and discriminatory voting systems," alleging punch-card voting systems inaccurately tally votes and are used in counties disproportionately populated by minorities, violating their civil rights. **September:** State lawmakers approve a $200 million matching grant program to assist counties with the purchase of new voting systems. Jones orders nine counties, including Los Angeles, to upgrade their voting systems by 2006.	**March:** California voters approve the Voting Modernization Bond Act, allowing counties to spend $200 million upgrading their voting equipment. **September:** Gov. Gray Davis (R) approves AB 2525, requiring every polling place to have at least one voting machine completely accessible to blind and visually-impaired voters.	**January:** Santa Clara County Board of Supervisors Finance and Government Committee meets to discuss plans to buy a paperless electronic voting system from Sequoia. David Dill, computer science professor from Stanford University and Kim Alexander from the California Voter Foundation both testify about security concerns and the need for a paper trail. The committee postpones their voting-system decision. **February:** Secretary of State Kevin Shelley (D), in response to concerns aired at the hearing in Santa Clara County, creates the Ad Hoc Touch Screen Voting Task Force. Santa Clara County became first in the country to buy VVPAT-equipped touch screens. **May:** More than 100 computer scientists sign a petition circulated by Dill calling for stronger security measures for electronic voting and a voter-verifiable audit trail. **July:** Shelley releases Ad Hoc Touch-screen Task Force Report. **November:** Shelley halts certification of Diebold's latest touch-screen machines. He also announces no voting machines may be purchased after July 2005 without a voter-verifiable paper audit trail (VVPAT) and all voting machines by July 2006 must have a VVPAT.	**March:** More than half of San Diego's polling places failed to open on time because of problems with Diebold voting machines. **April:** A report released by Shelley's office states that Diebold sold counties new voting equipment before it was federally or state approved and installed uncertified software in voting machines. Shelley bans the use of more than 14,000 Diebold electronic voting machines and decertifies more than 28,000 other voting machines unless they are used with extra security precautions. **June:** Shelley issues standards for voting machine vendors developing systems with paper trails, including accessibility and alternate language requirements. **September:** Gov. Arnold Schwarzenegger (R) signs a law requiring that all voting machines produce a VVPAT by 2006.	
COLORADO						**June:** Colorado General Assembly passes legislation requiring that all voting systems in the state print a voter-verified paper trail.
FLORIDA	**November:** Disputed recount begins. Punch-card counting standards vary by county. **December:** Supreme Court offers opinion in Bush v. Gore, ending Florida recount; George W. Bush wins with Florida's electoral votes.	**January:** Gov. Jeb Bush (R) signs "Florida Election Reform Act," ridding the state of punch-card voting systems by 2002. Uniform ballot design and recount standards also included.	September: Counties deploy DRE machines for the first time. Significant problems — including widespread machine and human error — plague the vote in South Florida counties, including Miami-Dade and Broward. **November:** Exhaustive preparations for the general election yield a smoother election.		**November:** Under-votes in the presidential election dropped to 0.4 percent. Over-votes and under-votes in the state accounted for 3 percent of all cast in the 2000 presidential election.	
NEW MEXICO						**April:** Gov. Bill Richardson (D) signs legislation requiring all voting systems in the state to print a voter-verified paper trail. The legislation also requires post-election audits. **November:** Secretary of State Rebecca Vigil-Giron (D), several voting machine vendors and some local elections officials are sued in federal court (*Lopategui et al v. the State of New Mexico*) over the use of electronic voting machines in the November 2004 presidential race.
OHIO	**November:** Most voters cast punch-card ballots in the presidential election.		**October:** ACLU of Ohio sues the state for continued use of punch cards, arguing their use in some counties and not in others violates the Equal Protection Clause of the 14th Amendment.	**May:** The state solicits bids for DRE voting systems to replace punch cards by March 2004. **August:** Vendor selection delayed for in-depth security reviews of voting systems. **December:** State releases full findings of security review performed by Compuware citing 57 potential security concerns. Deployment of new systems is delayed.	**May:** Gov. Robert Taft (R) signs bill requiring DRE systems have VVPATs. **July:** Last counties considering using DRE systems for 2004 general election are blocked from doing so. **November:** Voters in a majority of counties again cast punch-card ballots.	**January:** Secretary of State J. Kenneth Blackwell (R) issues directive ordering counties to select on optical scan voting system. **April:** Blackwell issues new directive allowing counties to select a DRE with VVPAT voting system as well. **May:** ES&S sues state over deadlines and system selection process. **September:** Counties select voting systems from state list. **November:** 44 counties use new DRE voting systems with VVPATs.

2006	2007	2008	
March: A group of 24 state voters sue Secretary of State Bruce McPherson (R) and county election officials to prevent the purchase of Diebold voting equipment.	**July:** Computer scientists hired by the state hack into voting systems in use in California and around the country, demonstrating that they could alter vote totals, according to a report. **August:** California Secretary of State Debra Bowen (D) issues "Top-to-Bottom Review" of voting systems. Some are decertified but their continued use is allowed for the February primary with extra security precautions. **November:** Bowen files a lawsuit against Election Systems and Software for selling uncertified voting machines to five counties in northern California.		**CALIFORNIA**
February/March: Secretary of State Gigi Dennis (D) certifies direct-recording electronic (DRE) voting systems. **June:** Colorado voter group files lawsuit challenging the Dennis' certification of certain DRE voting systems. **September:** Denver District Court orders Dennis to enact security standards for electronic voting machines and to retest the four systems certified by the Secretary of State. **November:** For the first time, a majority of Colorado voters use electronic voting machines.	**January:** Secretary of State Mike Coffman (R) is sworn in. **March:** Coffman adopts new testing requirements for electronic voting machines. **December:** Coffman decertifies Sequoia Edge II and Edge II Plus voting machines as well as the optical-scan devices eScan and BallotNow, manufactured by Hart and ES&S optical-scan devices as well as the ES&S iVotronic electronic-voting machine. Coffman recommends to the state legislature that the 2008 election should be conducted on paper ballots.	**January 3:** County clerks testify at public hearing and call for all vote-by-mail for the November 2008 election. **January 10:** Coffman tells lawmakers that a fix may be possible that would allow him to re-certify voting machines. **January 15:** Legislation is introduced in Colorado House that would allow Coffman to retest decertified machines. **January 16:** Jefferson County joins several other counties in filing a formal request to Coffman to reconsider the decertification of the county's voting system. **January 17:** Coffman tells county clerks that he will support their push for an all-mail election in November 2008. **January 18** — Colorado House gives preliminary approval to legislation that would allow Coffman to retest the decertified machines.	**COLORADO**
November: More than 18,000 under-votes were recorded in Sarasota County in the race to replace Rep. Katherine Harris (R) in the U.S. House of Representatives' 13th Congressional District. Other counties report similar under-vote problems on the same voting system (ES&S iVotronic).	**January:** In response to problems in Sarasota, Gov. Charlie Crist (R) announces his intention to add paper to Florida elections. **May:** Crist signs H.B. 537 into law, effectively ending the use of DREs in the state as of November 2008. The remaining 15 counties using the voting system — including some of the state's most populous — will move to optical-scan systems for the next presidential election. DREs will continue to be available for voters with disabilities until 2012.	**January:** Fourteen Florida counties hold their final primaries using DRE systems. Sarasota County uses optical-scan systems, marking the third voting system in as many presidential cycles.	**FLORIDA**
January: Richardson announces a plan to standardize voting systems that will include paper ballots for optical-scan machines. **March:** Richardson signs legislation requiring uniform voting systems by May. **November:** State has one of the nation's highest under- and over-vote rates in the general election.			**NEW MEXICO**
April: Appeals court rules Ohio's use of punch-card ballots in some counties but not others violates the Equal Protection Clause of the Fourteenth Amendment. **May:** 57 counties use DRE voting systems with VVPATs; Cuyahoga County has a number of election administration problems including with its new voting system. **August:** Election Science Institute releases DRE analysis for Cuyahoga County's May primary. **November:** Jennifer Brunner (D) elected secretary of state.	**June:** Bids solicited by Brunner to perform risk analysis of voting systems. **November:** Cuyahoga County experiences problems with vote tabulation and with VVPATs. **December:** Brunner releases report on voting systems and recommends all counties move to central count optical-scan systems by November 2008. **December:** Brunner casts the tie-breaking vote in Cuyahoga County to mandate that county move to a central count optical-scan system in time for the March 2008 primary.	**January:** Brunner issues directive mandating all counties using DRE systems offer optically-scanned paper ballots for the March 2008 primary. ACLU sues the state and Cuyahoga County to block county from switching to central count optical scan system. Brunner waives requirement for states to use central count systems in November 2008 — requirement remains in place for Cuyahoga County for the March primary. **February:** ACLU motion denied.	**OHIO**

Methodology/Endnotes

Research was compiled through the use of primary and secondary sources including data derived from state law, state election Web sites, news accounts and reports from government and non-governmental organizations.

All sources are cited below in the endnotes.

The opinions expressed by election officials, lawmakers and other interested parties in this document do not reflect the views of nonpartisan, non-advocacy *electionline.org* or The Pew Charitable Trusts.

All questions concerning research should be directed to Sean Greene, project manager, research at *sgreene@electionline.org*.

[1] Keating, Dan. "Lost votes in N.M. a cautionary tale," *The Washington Post*, Aug. 22, 2004.

[2] Grimm, Julie Ann. "S.F. holds off on touch-screen voting," *The New Mexican*, Aug. 1, 2004.

[3] Bronsan, James. "In 2004, New Mexico worst at counting votes," *Scripps Howard News Service*, Dec. 22, 2004.

[4] Richardson, The Hon. Bill. Press release: "New Mexico Governor Signs Sweeping Election Reform Package," Office of Gov. Bill Richardson, April 6, 2005

[5] Richardson, The Hon. Bill. Press release. "Gov. Bill Richardson pledges $11 million for voting machines, urges standard system for all counties," Office of Gov. Bill Richardson, Jan. 12, 2006.

[6] *Ibid.*

[7] Richardson, The Hon. Bill. Press release: "Governor Richardson signs legislation to ensure that every vote is counted," Office of Gov. Bill Richardson, March 2, 2006.

[8] Alvarez, R. Michael, Atkeson, Lonna Rae and Hall, Thad E. "The New Mexico Election Administration Report: The 2006 November General Election," Aug. 2, 2007.

[9] Seligson, Dan. "Florida adopts sweeping voting reforms," *Stateline.org*, May 4, 2001.

[10] Crist, The Honorable Charlie. Press release: "Governor Crist Signs Legislation Creating Paper Trail for Florida Votes," May 21, 2007.

[11] Election Reform Information Project, "What's Changed, What Hasn't and Why: Election Reform Since November 2001," *electionline.org*, October 2002.

[12] *Ibid.*

[13] Decamp, David. "Paper ballots to cost county," *St. Petersburg Times*, May 13, 2007.

[14] *Op.-Cit*, Crist.

[15] *Ibid.*

[16] "2001 Overview of Election Reform Activity in the States," National Conference of State Legislatures," May 9, 2001.

[17] "Voting Rights in Florida 2002: Briefing Summary," *United States Commission on Civil Rights*, August 2002.

[18] *Op.-Cit.*, Election Reform Information Project.

[19] Mazzella, Christopher. "Office of the Inspector General Inquiry into Circumstances Surrounding the Sept. 10, 2002 Election in Miami-Dade County, *Office of the Inspector General, Miami-Dade County*, Sept. 20, 2002.

[20] Mazzella, Christopher. "OIG Final Report: Miami-Dade County Voting Systems, Contract No. 326, *Office of the Inspector General of Miami Dade County*, May 20, 2003.

[21] *Ibid.*

[22] "Barkakati, Dr. Nabajyoti. "Further Testing Could Provide Increased but Not Absolute Assurance That Voting Systems Did Not Cause Undervotes in Florida's 13th Congressional District," *U.S. Government Accountability Office*, Oct. 2, 2007.

[23] Tamman, Maurice and Matthew Doig. "Analysis suggests undervote caused by ballot design," *Herald Tribune*, Nov. 16, 2006.

[24] Stewart, Charles III. "Declaration of Charles Stewart III on Excess Undervotes Cast in Sarasota County, Florida for the 13th Congressional District Race," *www.electionupdates.caltech.edu*, Nov. 20, 2006.

[25] Stacey, Mitch. "Panel Votes to End Fla. Election Probe, *The Associated Press*, Feb. 8, 2008.

[26] Stratton, Jim, Mark K. Matthews and Roger Roy. "Voting problems hit four counties," *The Sun-Sentinel*, Nov. 10, 2006.

[27] *Ibid.*

[28] "Florida to replace touch-screen machines with optical-scan equipment in all precincts statewide," GovTech.com, Feb. 4, 2007.

[29] "Vote Sarasota County: 2008 Voter Guide," Office of the Supervisor of Elections of Sarasota County, *www.srqelections.com*, last visited Jan. 15, 2008.

[30] Crist, The Honorable Charlie. "Testimony of Charlie Crist, Governor of Florida, before the Committee on House Administration Subcommittee on Elections," *U.S. House of Representatives, Committee on House Administration, Subcommittee on Elections*, March 23, 2007.

[31] *Op.-Cit.*, Crist press release.

[32] The Voting Modernization Bond Act of 2002 (Shelley-Hertzberg Act) in "Official Declaration of the Result of the General Election Held on Tuesday, March 5, 2002, throughout the State of California on Statewide Measures Submitted to a Vote of Electors," California Secretary of State.

[33] Via email, Jan. 22, 2008.

[34] *Ibid.*

[35] *Ibid.*

[36] Gathright, Alan. "Santa Clara County OK's touch-screen voting," *San Francisco Chronicle*, Feb. 26, 2003.

[37] Shelley, The Hon. Kevin. Press release: "Secretary of State Kevin Shelley Creates Special Task Force to Review Paper Trails and New Electronic Voting Systems," California Secretary of State, Feb. 19, 2003.

[38] Shelley, The Hon. Kevin. Press release: "Secretary of State Kevin Shelley Outlines Objectives for California's Share of Federal Election Reform Funding," California Secretary of State, Feb. 21, 2003.

[39] Ad Hoc Touch Screen Task Force Report – Section 4, California Secretary of State.

[40] Shelley, The Hon. Kevin. Press release: "Secretary of State Kevin Shelley Announces Directives to Ensure Voter Confidence in Electronic Systems," California Secretary of State, Nov. 21, 2003.

[41] *Ibid.*

[42] Feist, Paul. "Bi-partisan call to scrap voting by touch-screen," *San Francisco Chronicle*, March 12, 2004.

[43] Lucas, Greg. "Electronic voting machines dealt blow," *San Francisco Chronicle*, April 23, 2004.

[44] *Op. Cit.* Feist.

[45] Wildermuth, John. "'Touch' voting a worry," *San Francisco Chronicle*, April 26, 2004.

[46] "National Briefing: West: California: Paper Ballots Recommended," *The New York Times*, April 29, 2004.

[47] Shelley, The Hon. Kevin. Press release: "Secretary of State Kevin Shelley Bans Diebold TSx for Use in November 2004 General Election," California Secretary of State, April 30, 2004.

[48] Shelley, The Hon. Kevin. Press release: "Secretary of State Kevin Shelley Unveils Historic Paper Audit Trail Standards for E-Voting Machines," California Secretary of State, June 15, 2004.

[49] *Ibid.*

[50]

[51] Seelye, Katharine Q. "He Pushed the Hot-Button of Touch Screen Voting," *The New York Times*, June 15, 2004.

[52] 2004 News Releases, California Secretary of State.

[53] Shelley, The Hon. Kevin. Press release: "Secretary of State Kevin Shelley Announces All Remaining E-Voting Counties Have Met Standards for Recertification," California Secretary of State, Aug. 24, 2004.

[54] Murphy, Dean E. "National Briefing: West: California: Governor Approves Election Changes," *The New York Times*, Sept. 29, 2004.

55 "National Briefing: West: California: Suit Threat on Voting Machines," *The New York Times*, Sept. 8, 2004.

56 Shelley, The Hon. Kevin. Press release: "Secretary of State Kevin Shelley Certifies Voting System with Paper Audit Trail," California Secretary of State, Jan. 21, 2005.

57 Doyle, Jim. "Bowen beats McPherson in secretary of state race," *San Francisco Chronicle*, Nov. 8, 2006.

58 *Ibid.*

59 Wildermuth, John. "Election issues beset new secretary of state," *San Francisco Chronicle*, Jan. 29, 2007.

60 Wildermuth, John. "New Secretary of State taps voting machine foe as deputy," *San Francisco Chronicle*, Politics Blog, Jan. 9, 2007.

61 Bowen, The Hon. Debra. Press release: "Secretary of State Debra Bowen Releases Draft Criteria for Top-to-Bottom Voting Machine Review," Secretary of State Debra Bowen, March 22, 2007.

62 Wildermuth, John. "Early primary squeezes review of voting systems," *San Francisco Chronicle*, March 30, 2007.

63 "Secretary of State Debra Bowen Unveils Details on Top-to-Bottom Review of California's Voting Systems Scheduled to Begin Next Week," Secretary of State Debra Bowen, May 9, 2007.

64 Wildermuth, John. "State Vote Machines Lose Test to Hackers," *San Francisco Chronicle*, July 28, 2007.

65 *Ibid.*

66 Wildermuth, John. "Makers of voting machines battle critics over UC study," *San Francisco Chronicle*, July 31, 2007.

67 Wildermuth, John. "Elections chief gives OK to vote machines," *San Francisco Chronicle*, Aug. 4, 2007.

68 Wildermuth, John. "Touch vote machine ban hurts counties," *San Francisco Chronicle*, Aug. 5, 2007.

69 *Ibid.*

70 Wildermuth, John. "Secretary of state casts doubt on future of electronic voting," *San Francisco Chronicle*, Dec. 2, 2007.

71 *Op. Cit.*, Vartabedian, Ralph and Richard C. Paddock.

72 *Ibid.*

73 Warner, Melanie. "Machine Politics in a Digital Age," *The New York Times*, Nov. 9, 2003.

74 "Risk Assessment Study of Ohio Voting Systems," Project EVEREST (Evaluation & Validation of Election-Related Equipment, Standards, & Testing), Dec. 14, 2007.

75 Brunner, The Hon. Jennifer. "Directive 2008-1: Optical-Scan Ballots for Voters in Counties using DREs," The Office of the Ohio Secretary of State, Jan. 2, 2008.

76 Andrews, Cindi. "Punch-card ballots raise new worries," *The Enquirer*, Aug. 14, 2004.

77 Press release: "ACLU Victorious in Challenge to Ohio's Punch-Card Ballots," The American Civil Liberties Union, April 21, 2006.

78 "RFP # SOS0428365: State of Ohio Request for Proposal on Behalf of the Office of J. Kenneth Blackwell, Ohio Secretary of State for Statewide Voting Systems," The Office of the Ohio Secretary of State, May 23, 2003.

79 Welsh, William. "Ohio holds on voting machine purchase," *Washington Technology*, Aug. 15, 2003.

80 Blackwell, The Hon. J. Kenneth. Press release: "Blackwell Seeks Improvements and Additional Security Assurances from Electronic Voting Machine Vendors," The Office of the Ohio Secretary of State, Dec. 2, 2003.

81 Carr Smyth, Julie. "Blackwell blocks use of new voting machines," *The Plain Dealer*, July 17, 2004.

82 "Electronic voting machines nixed," the *Lorain County Morning Journal*, July 17, 2004.

83 Tokaji, Dan. "Voting Machine Vendor Sues Ohio Secretary of State," *Equal Vote Blog*, May 3, 2005.

84 "Election Administration Preview, Ohio Primary Election," *electionline.org*, May 2, 2006.

85 "DRE Analysis for May 2006 Primary, Cuyahoga County, Ohio," *Election Science Institute*, Aug. 2006.

86 Ohio Revised Code 3506.18.

87 *Op. cit.* "Risk Assessment Study of Ohio Voting Systems."

88 Thompson, Clive. "Can You Count on Voting Machines?" *The New York Times*, Jan. 6, 2008.

89 *Op. cit.* "Risk Assessment Study of Ohio Voting Systems."

90 Guillen, Joe. "Cuyahoga County's return to paper ballots still a mystery to some," *Plain Dealer*, Dec. 26, 2007.

91 *Op. cit.* "Risk Assessment Study of Ohio Voting Systems."

92 Norden, Lawrence. "Comment of Lawrence D. Norden, Director of the Voting Technology Assessment Project at the Brennan Center for Justice at New York University School of Law," Hearing on the EVEREST Review of Ohio's Voting Systems and Secretary of State Brunner's Related Recommendations for Cuyahoga County, Dec. 17, 2007.

93 McCarthy, John. "State elections boss backs off centralized vote-counting plan," *The Associated Press* as published in *The Examiner*, Jan. 18, 2008.

94 *Ibid.*

95 Niquette, Mark. "ACLU sues to block switch to paper ballots," *The Columbus Dispatch*, Jan. 17, 2008.

96 Kropko, M.R. "ACLU Challenges New Ohio Voting System," *The Associated Press*, Jan. 18, 2008.

97 Guillen, Joe. "Cuyahoga elections director Platten racing toward March primary," *Plain Dealer*, Jan. 13, 2008.

98 Milica, Joe. "State Mulls Options to Pay for $31M Elections System," The Associated Press, Jan. 9, 2008.

99 *Op. cit.* "Directive 2008-1."

100 Niquette, Mark. "Price tag for ballot directive may rise," *The Columbus Dispatch*, Jan. 9, 2008.

101 Higgins, John. "Paper ballot rule may delay count," *Akron Beacon Journal*, Jan. 5, 2008.

102 *Op. cit.* Higgins.

103 "Cuyanoga County Hurriedly Switching to New Voting System," *The Examiner*, Jan. 11, 2008.

104 Brunner, The Hon. Jennifer. Press release: "Many Ohio Elections Officials' Views Inconsistent with Voters' Concerns," The Office of the Ohio Secretary of State, Jan. 24, 2008.

105 *Ibid.*

106 Staff Reports. "Secretary of State to form task force," *Rocky Mountain News*, Dec. 22, 2000.

107 McKibben, Mike. "Election investigation uncovers many miscalculations," Grand Junction Sentinel, April 27, 2004

108 S.B. 198, Colorado State Legislature, 2009.

109 Dennis, The Hon. Gigi. Press release: Secretary of State Dennis announces certification of a third voting system," March 10, 2006.

110 Staff Reports. "Denver Auditor wants people fired over election snafu," The Denver Channel, Nov. 8, 2006.

111 *Ibid.*

112 Coffman, The Hon. Mike. "Coffman strengthens testing requirements for electronic voting machines," Office of the Colorado Secretary of State, March 20, 2007

113 *Ibid.*

114 *Op. Cit.* Coffman.

115 Colorado Secretary of State's Web site *www.elections.colo.gov.*

116 Coffman, The Hon. Mike. Press release: "Coffman completes electronic voting equipment tests," Office of the Colorado Secretary of State, Dec. 17, 2007.

117 Coffman, The Hon. Mike Press release: "Coffman supports paper ballots at polls for '08 election," Office of the Colorado Secretary of State, Dec. 26, 2007.

118 Staff Reports. "Paper ballots will be used in this year's election," The Denver Channel, Jan 23, 2008.

119 "Overview of Maryland's Voting System," Maryland State Board of Elections, *www.elections.state.md.us*, last visited Jan. 17, 2008.

120 House Bill 18/State Senate Bill 392 (Maryland 2007).

121 Wyatt, Kristen. "Budget cuts put new voting system for Maryland in question," *The Associated Press*, Nov. 6, 2007.

122 *Ibid.*

123 Vogel, Steve. "Touch-screen machines stir election anxiety in Maryland," The Washington Post, Aug. 19, 2006.

124 *Ibid.*

125 Press release: "Maryland moving toward reliable voting system; Caolition for paper ballot increases to 23 statewide organizations," TrueVoteMD, Feb. 8, 2006.

126 "Voting Systems Used in Virginia as of Jan. 3, 2008," Commonwealth of Virginia State Board of Elections, *www.sbe.state.va.us*, last visited Jan. 17, 2008.

127 State Senate Bill 840 (Virginia 2007).

128 Whitley, Tyler. "Voter groups ask Kaine to delay signing of bill," *Richmond Times-Dispatch*, March 8, 2007.

129 *Ibid.*

130 Matthews, Cara. "Back to the future for N.Y. voters," The Ithaca Journal, Jan. 26, 2008.

131 *Ibid.*

132 "Voter-verified paper record legislation," *VerifiedVoting.org*, last visited Jan. 18, 2008.

133 E-mail correspondence with Dan Tokaji, Jan. 16, 2008.

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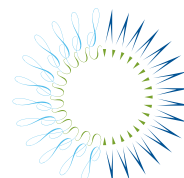
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