IS BUYING OPTICAL MARKSENSE VOTING SYSTEM A GOOD IDEA WHILE DRE IS UNDER SCRUTINY?

AVANTE International Technology, Inc @ 2004

There is some tendency of the election official to retreat to buying optical mark-sense voting system while paperless direct recording electronic voting systems under intensive scrutiny. This trend are particular promoted by the more established voting system vendors that have the optical mark-sense systems as well as the paperless DRE voting system. The rationale in the marketing sense is that at least the potential customers will not be buying DRE voting systems from vendors that may have the accessible voter verified paper audit trail.

This strategy is certainly good for the vendor concern. But is it a good strategy for the jurisdictions to pursue? Would buying systems based on 1990 voting system eventually back-fired. Will these systems based on the older discrete sensor technology ever able to meet the more stringent 2002 FEC voting system to qualify for the HAVA funding?

In order to really evaluate if this is a good strategy, we must examine what has changed since 2000 and HAVA in 2002.

HAVA FUNDING CRITERIA:

As all of us in the election services knows "Help America Vote Act of 2002" was enacted into law in October 2002.

Under HAVA requirement (Title III, (a)(5):
> "Error rates—The error rate of the voting system in counting ballots (determined by taking into account only those errors which are attributable to the voting system and not attributable to an act of the voter) shall **comply with the error rate standards established under section 3.2.1 of the voting systems standards issued by the Federal Election Commission which are in effect on the date of the enactment of this Act."**

The FEC 2002 voting system standards were adopted by NASED and FEC in April 2002. Thus, instead of 1990 voting system standard, systems that are qualified for HAVA funding (at least Title III money) must meet and certified based on 2002 FEC voting system standard.

Are there substantial differences in the 2002 voting system standard in comparison to the 1990 standard for optical voting systems?

The answer is obviously yes. The following is a tabulation of some of these differences based on the central count optical ballot systems.

Table 1: COMPARATIVE ANALYSIS BETWEEN HAVA & 2002 FEC VOTING SYSTEM STANDARD REQUIREMENT PRECINCT-BASED OPTICAL BALLOT

		HAVA REQUIREMENT	2002 FEC voting system standard
1.	**Permitting Voter to Verify their Ballot**	**TITLE III section 301 (a)(1)(A)(iii) if the voters selects more than one candidates for a single office--** (i) Notify the voter that the voter has selected more than one candidate for a single office on the ballot; (ii) Notify the voter before the ballot is cast and counted of the **effect of casting multiple votes for the office**; and (iii) Provide the voter with the opportunity to correct the ballot before the ballot is cast and counted. There is no requirement in notifying voter of under-voting and blank ballot.	2.4.3.1.a Provides text that is at least 3 mm high and provide the capability to adjust or magnify the text to an apparent size of 6.3 mm. 2.4.3.2.2.a **Provides feedback to the voter that identifies specific contests or ballot issues for which an overvote or undervote is detected.** All of the precinct-based optical scan system passed based on 1990 voting standard only provides indication there is over-vote or under-vote but not individual contest. Thus all of the older 1990 precinct-based optical scan systems as is must be retrofitted with suitable display much like the DRE voter interfaces. **This retrofitting (if possible) may cost as much as a new DRE voting unit.**
2.	**Accessibility for individuals with disabilities**	TITLE III section 301 (a)(3)(A) be accessible for individuals with disabilities, including non-visual accessibility for the blind and visually impaired, in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters; (B) satisfy the requirement of subparagraph (A) through the use of at least one direct recording electronic voting system or other voting system equipped for individual with disabilities at each polling place; and (C) if purchased with funds made available under title II on or after January 1, 2007, meet the voting system standards for disability access (as outlined in this paragraph)	In principle, the requirements for the precinct-based optical scanning system interfaces should be upheld to the same requirements of the DRE voting system. It was made clear in the overview section of the 2002 FEC voting system on "accessibility". "**The requirements** (developed by the Access Board, a federal agency responsible for developing accessibility standards to implement Section 508 of the Rehabilitation Act Amendments of 1998) **provide common standards that must be met by all voting devices claiming accessibility** and specific standards related to various types of DRE voting systems". That is, *not meeting the FEC 2002 voting system to provide accessibility is not meeting Section 508 and thus not in compliant with the law.*
3.	**Alternate language accessibility**	TITLE III section 301 (a)(4)—The voting system shall provide alternate language accessibility pursuant to the requirements of section 203 of the Voting Rights Act of 1965 (41 U.S.C. 1973aa-1a).	For the alternate language voters that are blind and visually impaired or with other disabilities, the same requirements as above must be met with alternate language capabilities. **At the very least, the feedback of over-voted and under-voted contests must be in the alternate languages and adjustable font size from 3mm to 6.3 mm. (2.4.3.2.2.a)**
4.	**Error Rate**	Based on FEC 2002 voting system standard	Please refer to separate table below.

It is quite clear from the Table 1 above that precinct-based optical voting system must provide feedback to the voters in much the same way as the DRE voting systems. The cost of retrofitting such older systems could easily cost the same as another DRE voting unit when all of the other accessibility factors are included.

TABLE 2: COMPARATIVE ANALYSIS FOR ACCURAY BETWEEN 1990 & 2002 FEC VOTING SYSTEM STANDARD ON OPTICAL BALLOT			
	1990 FEC voting system standard	**Accuracy commonly achieved**	**2002 FEC voting system standard**
1. **Multiple Feed Prevention**	3.2.5.1.2 (P.32) The frequency of multiple feeds with ballots intended for use the system shall not exceed **1 in 5000**		3.2.5.1.4b (P. 3-16) The frequency of multiple feeds with ballots intended for use with the system shall not exceed **1 in 10,000**.
2. **Reading Accuracy**	3.2.5.2.1 (P.33) Conversion testing shall be performed using all potential ballot positions as active positions. For systems without pre-designated ballot positions, ballots with active position density shall be used. The error rate measured by this criterion **shall not exceed one part in one million.**	*From the testing reports by Doug Jones [1] and reported results quoted by the actual users, it will be lucky for all of the current certified systems to pass 1 in 50,000 in actual use environment.*	3.2.1 (P. 3-4) For each of the processing function indicated above, the system shall achieve a target error rate of no more than one in 10,000,000 ballot positions, with a maximum acceptable error rate in the test process of **one in 500,000.**
3. **Reading Reliability**	3.2.5.2.2 (P.33) The rate of rejection of voted ballots **shall not exceed 3 percent.**		3.2.5.2 c. (P. 3-17) Reject ballots that meet all vendor specifications at a rate **not to exceed 2 percent.**
4. **Processing Accuracy**	3.2.6.1.1 (P.33) For all P&M systems, the Maximum Acceptable Value (MAV) for this error rate shall be 1 part in 1,000,000 and the Nominal Specification Value (NSV) shall be 1 part in 10,000,000.	*All of the existing systems will be lucky to pass 1 in 50,000 in actual use environment.* The 1990 may have never been enforced.	3.2.1 (P. 3-4) For each of the processing function indicated above, the system shall achieve a target error rate of no more than one in 10,000,000 ballot positions, with a maximum acceptable error rate in the test process of **one in 500,000.**

Notes for central count mark-sense optical voting systems:
- There is a stark realization that all of the optical mark-sense system produces dramatically more errors than the 1990 standard required. The lowering of the practical limit may help some of the older systems to make the specification. **Even then, it will be very difficult for the discrete sensor based optical mark-sense systems to improve 10-50 times to meet this requirement.**
- The specification does not specification address any means to prevent "double reading" of ballots.
- The specification also does not address the means to trace ballot box stuffing and other potential ballot tampering problems with the use of paper ballots.
- The problems may need to be addressed by automatic means rather than purely handle by administrative means.
- In the current 2002 FEC voting system testing, slightly over 1,500,000 ballot positions are used to test the accuracy of the system.

Note for precinct-based mark-sense optical voting systems:
- **All of the above accuracy requirements still apply. Almost all of the precinct-based systems based on discrete sensor technology may never meet such stringent accuracy requirements based on all of the data known in the actual use**.
- In addition, the accessibility requirements and other more traditionally DRE voting system type of requirements must also be satisfied.

Is there any optical mark-sense voting system that can meet the 2002 FEC voting system requirements?

So far, only AVANTE OPTICAL VOTE-TRAKKER (V.1.5.0) has been tested and qualified under this more stringent requirement with NASED certification number (N-1-

12-22-22-002 (2002)). The reason why this optical mark-sense voting system can meet these requirements to have tested reading accuracy of zero errors in more than 1,500,000 ballot positions roots on its use of the pixel-based technology rather than discrete-sensor based technology.

Instead of being sensitive to paper feeding, paper sizes, smudge, wrinkle, and other defects, the accuracy of this advanced technology even surprises the testing laboratories. For more details on this technology *[2]*, please refer to www.vote-trakker.com.

The precinct-based OPTICAL VOTE-TRAKKER is also the only system that can actually display for the voters individual and all under-voted and over-voted contests for the voters. Not only that it can provide such function, it also provides accessibility in terms of expanding the display to 6.3 mm in height and different contrasts in accordance to the commonly available DRE features. The interface uses the same DRE touch-screen from its DRE voting unit so that all accessibility can be achieved.

In fact, AVANTE OPTICAL VOTE-TRAKKER also has an option to enable the blind and other voters with physical disability to navigate the voting process just like the DRE voting system. Instead of direct recording of such the actual votes like the direct recording electronic voting systems, the output is a printed paper ballots with marked ovals as indicated by the touch-screen interface. Some computer experts even believe that this is the best approach to voting.

With the use of unique randomly generated voting session identifiers, the traditional ballot box stuff and tampering are also eliminated with the use of AVANTE OPTICAL VOTE-TRAKKER.

IS THERE A REAL ADVANTAGE FOR DRE VOTING SYSTEMS:

Even with all these advanced features to meet all of the precinct-based and central count optical scanning voting systems, AVANTE still believes that DRE voting systems with the accessible voter verified paper audit trail is the best technology for use in voting.

When properly programmed and constructed, they can help voters in eliminating errors and guide the voters through the election process to ensure that their voter intents are properly and completely accurately recorded.

When incorporated with a suitable voter verified paper audit trail with tamper-resistant encryption and physical constructions, they are the most secured voting system possible.

So, can all of the currently available DRE voting systems be upgraded to meet the 2002 voting system requirements?

TABLE 3: COMPARATIVE ANALYSIS FOR ACCESSIBILITY & ACCURAY BETWEEN 1990 & 2002 FEC VOTING SYSTEM STANDARD ON DRE

		1990 FEC voting system standard	2002 FEC voting system standard	Can the traditional systems meet them?
1.	**Font Size Control by Voters During the Voting Process**	There were no specific requirements beyond exceeding size 14 font.	2.2.7.2.e.3) Adjust the size of the text so that the height of capital letters varies over the range of 3 to 6.3 mm.	**Impossible for those full-face touch-button DRE systems to meet this requirement.** Most paging type DRE systems may be able to do it for English. It will be tougher for those that use graphic images for alternate language presentation.
2.	**Contrast Adjustment by Voters During the Voting Process**	There were no specific requirements.	2.2.7.2.e.1) Adjust the contrast settings 2.2.7.2.e.2) Adjust the color settings, when color is used;	*Those systems used PC based hardware may be able to meet the requirements easier than those use proprietary hardware and operating system or lower than Windows based systems.*
3.	**Alternate Language Adjustment by Voters During the Voting Process**	There were no specific requirements.	2002 FEC voting system standard did not address the alternate language requirement. The only guideline is then based on HAVA	Impossible for those full-face touch-button DRE systems to meet this requirement. *Those systems used PC based hardware may be able to meet the requirements easier than those use proprietary hardware and operating system or lower than Windows based systems.*
4.	**Automatic Voice Assistance Volume Control Return**	There were no specific requirements.	2.2.7.2.b.8) Provides a volume control with an adjustable amplification up to a maximum of 105 dB that automatically resets to the default for each voter;	*Those systems used PC based hardware may be able to meet the requirements easier than those use proprietary hardware and operating system or lower than Windows based systems.*
5.	**Error Rate in Processing and Recording to Consolidation**	There were no specific requirements.	The new specs do not address the human factors yet. They induce voters to make as much as over 12.3% of voters not voting on important races such as US Senate.	*Almost all DRE systems should be able to meet these requirements.*
6.	**Blind and Other Accessibility Needs such as Sip-and-puff, etc.**	There were no specific requirements.	2.2.7 Accessibility: includes several pages of requirement. While not totally adequate is huge improvement.	*Almost all DRE systems should be able to meet these requirements.* *Some do better than others. In some cases, a lot better.* *Some systems using older hardware platforms may have difficulties.*
7.	**Software Coding Control, System Security, Configuration Management and Documentation**	There were very little specific requirements.	Dramatically more details in documentation. Security system is not defined. Mostly vendors' specific policy only. Configuration management is much more detailed.	*Almost all DRE systems should be able to meet these requirements.* Very extensive. A lot of sweat and efforts. Most vendors and systems should be able to make it somehow.
8.	**After Hour Provisional Voting**	There were no requirements.	This is a HAVA requirement that can be potentially met with pre-printed paper ballots.	*Most systems should be able to configure to meet this new HAVA requirement. Some Sate may specifically dictate the use of paper ballot only.*

IRRESPECTIVE OF HAVA FUNDING, ALL JURISDICTIONS MUST MEET THE REQUIREMENTS OF ACCESSIBILITIES:

TITLE III UNIFORM AND NONDISCRIMINATORY ELECTION TECHNOLOGY AND ADMINISTRATION REQUIREMENTS spell out the requirements that must be met by January 1, 2006.

With the exceptions made under (1)(B) for "A State or jurisdiction that use a paper ballot voting system, a punch card voting system, or a central count voting system (including mail-in absentee ballots and mail-in ballots), may meet the requirements of subparagraph (A) (iii) by—" *voter educations and proper instructions to voters (paraphrasing the content)*.

Otherwise, "(A) Except as provided in subparagraph (B), the voting system (including any lever voting system, **optical scanning voting system**, or direct recording electronic voting system) shall—

(iv)   permit the voter to verify (in a private) and independent manner) the votes selected by the voter on the ballot before the ballot is cast and counted.
(v)   provide the voter with the opportunity (in private and independent manner) to change the ballot or correct any error before the ballot is cast and counted (including the opportunity to correct the error through the issuance of a replacement ballot if the voter was otherwise unable to change the ballot or correct any error); and
(vi)   if the voter selects votes for more than one candidate for a single office—
   a. notify the voter that the voter has **selected more than one candidate for a single office on the ballot;**
   b. notify the voter before the ballot is cast and counted of the **effect of casting multiple votes for the office**; and
   c. provide the voter with the opportunity to correct the ballot before the ballot is cast and counted.

One may interpret the requirement as depicted in this section to require that PRECINCT-COUNT optical ballot to provide similar interfaces of warning of over-voting to the voters in much the same way as the DRE voting system. It is relatively straightforward for all DRE systems to meet this requirement by simply not allowing the over-voting to happen. In the case of almost all today's precinct-based optical scanning voting system, to provide such warning today, the system simply tells the voters with a small LCD display that the ballot has over-voted contests.

The precinct-based optical scanner today does not and cannot provide for direct indication of which specific contest(s) that the voter has over-voted. **Thus the "effect of casting multiple votes for the office (if interpreted to mean specific office or contest)" cannot be really conveyed to the voter. This requirement is clearly stated for the 2002 voting system standard for precinct-based optical mark-sense voting system.**

Also if notification to the voters is to be interpreted as voter interface, it must also have the ability to present in enlarged font, high contrast, and multiple languages for the voters as well as required by the FEC 2002 voting system or simply to satisfy the accessibility requirement of TITLE III (3) and (4). The current precinct-based optical scanning voting systems that have been modeled after the 1990 FEC voting system standard again cannot satisfy these requirements.

Under TITLE III, there were total of six requirements that included (1) general requirement of allowing the voter to verify their ballot before casting; (2) audit capacity; (3) accessibility for individuals with disabilities; (4) Alternate language accessibility; (5) error rates and (6) uniform definition of what constitutes a vote.

We have so far examined requirement (1). The (2) requirements of permanent paper record are now under public discourse and may be eventually ruled by a court of law or supplemental governing laws. The requirement (6) was made obvious and clear by the Federal Supreme Court ruling based on 2000 General Election.

The requirements of (3) and (4) for accessibility for individuals with disabilities and needs for alternate languages are made much more clearer and specific in the 2002 FEC voting system that the EAC has now put into effect as voluntary standard. However, the only legal basis for requiring compliant still must refer to the section of the now Public Law 107-252 or HAVA.

HAVA suggests that to satisfy the requirement of "be accessible for individuals with disabilities, including nonvisual accessibility for the blind and visually impaired, in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters;" "through the use of at least one direct recording electronic voting system or other voting system equipped for individuals with disabilities at each polling place"

While there are quite detailed outlined on how to make the DRE accessible to the blind and disabled voters based on 2002 FEC voting system standards. It is not as clear to the use of optical precinct based voting system that are marked by a machine similar to the DRE with the only difference being not directly recording the vote. Instead, it prints out a ballot (image) that can be read by a machine.

In principle, the requirements for the precinct-based optical scanning system interfaces should be upheld to the same requirements of the DRE voting system. It was made clear in the overview section of the 2002 FEC voting system on "accessibility". "**The requirements** (developed by the Access Board, a federal agency responsible for developing accessibility standards to implement Section 508 of the Rehabilitation Act Amendments of 1998) **provide common standards that must be met by all voting devices claiming accessibility** and specific standards related to various types of DRE voting systems". That is, *not meeting the FEC 2002 voting system to provide accessibility is not meeting Section 508 and thus not in compliant with the law.*

IS THERE AN IDEAL COMBINATION OF VOTING SOLUTIONS?

We believe that the full functionality of DRE voting system is most ideal way of voting for the blind voters and voters with other disabilities or voters with alternate language requirements. Particularly for the blind and visually impaired voters, it is not very practical for them to handle ballots that have multiple sheets or even single sheet with specific orientation requirement. Even though one may argue with the use of privacy envelope and so on, it is still unnerving for the blind voters with varying degree of physical ability to manage these tasks proficiently when they only vote once in a few years.

Yet, there is a certain appeal to unify the absentee mail-in ballots and the precinct-based voting ballots so that uniformity of voting system can be achieved. For example, State of Minnesota and Michigan have expressed their wishes for such integrated voting system. With the more use of "no fault" absentee voting, the use of paper ballot systems has become more important in States such as California and Oregon.
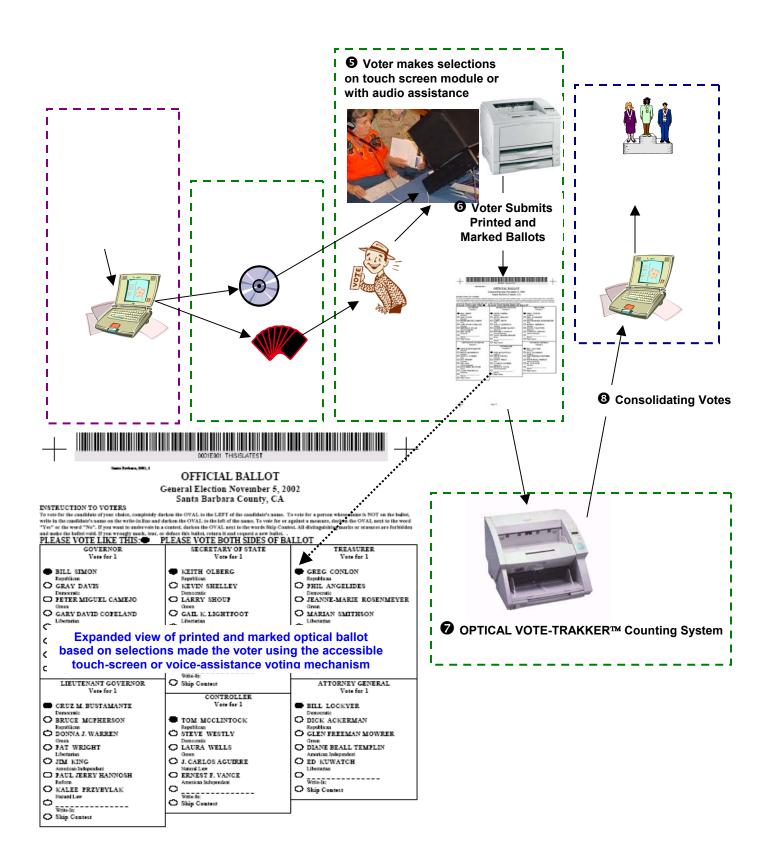
Thus, there is a substantial interest in voting system that automatically marked on standard paper ballots such as those commonly used today. The idea of combining the DRE-like voter interface for accessibility and a print out in the form of typical paper ballot was the original scheme favored by the State of New Hampshire. There are at least two suppliers that can provide such a solution: AVANTE and ES&S through the collaboration of AUTOMARK voting system. AUTOMARK system introduced into the market in 2003 focuses on primarily automatically marking the ovals that reflect the choices made by the voters using an electronic interface. In principle, the AUTOMARK system fills the ovals after the voter finished making and reviewed their selections through the touch-screen or audio voting interfaces.

AVANTE has FIVE pending patents in providing such solution and their variations. One of the solutions is combining the DRE-like interface and print or filled the choices on a paper ballots that will be subsequently scanned by an optical scan system for tabulation. The primary optical scanning technology used AVANTE is pixel-based that also imaged the ballots while they are being scanned. Such technology also allows the evaluation of voter intent automatically against a standard setting.

Using the captured ballot images rather than going through the piles to manually pick out those ballots that have over-voted or under-voted contests for manual inspections is a much easier and trustworthy method. Any ballots that need to be examined can be pulled and displayed on screen for all to review. No extraneous may be introduced by additional manual handling of the original ballots. All of the original ballots can be sealed as final audit trail for additional security. This 2002 FEC voting system NASED certified voting system has the potential to resolve all of the potential tampering concerns for the paper ballot systems.

As long as the marking positions of the scanning equipment are coordinated, the paper ballots printed can also be read with the more traditional discrete sensor scanner as

well. AVANTE's patent-pending invention covers both marking on pre-printed traditional paper ballots as well as printed the complete ballots from a blank page. The pending patents also cover the reading of such ballots with either discrete sensor or pixel-based optical scanners. However, it is much more accurate and versatile to print and mark the ballots at the same time. In this case, even early voting process requiring the availability of all ballot styles can be easily accommodated.

With the incorporation of another patent-pending feature of unique but randomly generated ballot identifier, the traditional problems of ballot stuffing and other tampering potentials are also eliminated.

❺ **Voter makes selections on touch screen module or with audio assistance**

❻ **Voter Submits Printed and Marked Ballots**

❽ **Consolidating Votes**

❼ **OPTICAL VOTE-TRAKKER™ Counting System**

Expanded view of printed and marked optical ballot based on selections made the voter using the accessible touch-screen or voice-assistance voting mechanism

OFFICIAL BALLOT

General Election November 5, 2002
Santa Barbara County, CA

INSTRUCTION TO VOTERS

To vote for the candidate of your choice, completely darken the OVAL to the LEFT of the candidate's name. To vote for a person whose name is NOT on the ballot, write in the candidate's name on the write-in line and darken the OVAL to the left of the name. To vote for or against a measure, darken the OVAL next to the word "Yes" or the word "No". If you want to undervote in a contest, darken the OVAL next to the words Skip Contest. All distinguishing marks or erasures are forbidden and make the ballot void. If you wrongly mark, tear, or deface this ballot, return it and request a new ballot.

PLEASE VOTE LIKE THIS:● PLEASE VOTE BOTH SIDES OF BALLOT

GOVERNOR
Vote for 1

● BILL SIMON
Republican
○ GRAY DAVIS
Democratic
○ PETER MIGUEL CAMEJO
Green
○ GARY DAVID COPELAND
Libertarian

SECRETARY OF STATE
Vote for 1

● KEITH OLBERG
Republican
○ KEVIN SHELLEY
Democratic
○ LARRY SHOUP
Green
○ GAIL K. LIGHTFOOT
Libertarian

○ Write-In:
○ Skip Contest

TREASURER
Vote for 1

● GREG CONLON
Republican
○ PHIL ANGELIDES
Democratic
○ JEANNE-MARIE ROSENMEYER
Green
○ MARIAN SMITHSON
Libertarian

LIEUTENANT GOVERNOR
Vote for 1

● CRUZ M. BUSTAMANTE
Democratic
○ BRUCE MCPHERSON
Republican
○ DONNA J. WARREN
Green
○ PAT WRIGHT
Libertarian
○ JIM KING
American Independent
○ PAUL JERRY HANNOSH
Reform
○ KALEE PRZYBYLAK
Natural Law
○ _____
Write-In:
○ Skip Contest

CONTROLLER
Vote for 1

● TOM MCCLINTOCK
Republican
○ STEVE WESTLY
Democratic
○ LAURA WELLS
Green
○ J. CARLOS AGUIRRE
Natural Law
○ ERNEST F. VANCE
American Independent
○ _____
Write-In:
○ Skip Contest

ATTORNEY GENERAL
Vote for 1

● BILL LOCKYER
Democratic
○ DICK ACKERMAN
Republican
○ GLEN FREEMAN MOWRER
Green
○ DIANE BEALL TEMPLIN
American Independent
○ ED KUWATCH
Libertarian
○ _____
Write-In:
○ Skip Contest

ACCESSIBLE OPTICAL VOTE-TRAKKER™ SYSTEM ARCHITECTURE AND OVERVIEW
(Rev. 05-18-2004)

CONCLUSIONS

There are many confusing aspects of buying or retrofitting voting systems to meet the HAVA and 2002 FEC voting system requirements. The following are some of the most important aspects on the voting systems for the voters and the jurisdictions to fully realize. Rushing into buying voting systems that have not been certified under the 2002 FEC voting systems can be a costly mistake. In fact, many jurisdictions that purchased their systems from 2000-2004 may have to spend substantial sum to bring their system to compliant with HAVA by January 1, 2006.

1) There are substantial differences between 1990 and 2002 FEC voting system in terms of both accuracy in processing ballots and the accessibility to voters with different disabilities.

2) The traditional precinct-based optical scanning systems as is will meet the 2002 FEC voting system in terms of both accuracy of reading ballots as well as accessibility. These systems will not be in compliant with the HAVA requirements as well. Thus, by January 1, 2006, they must be replaced or upgraded. The cost of upgrading to meet the accessibility alone for each unit of the precinct-based system may be as high as a new DRE voting system. It is not clear if the accuracy of resolving ballots can be upgraded at all.

3) Thus, buying voting systems to complement the precinct-based and central counting optical paper ballots do not make logical and financial sense. Even if the voting interfaces may be able to meet the 2002 FEC voting system, the reading of the ballots must also be brought to the same level of accuracy.

4) The traditional full-face touch button DRE voting systems will not be able to meet the 2002 FEC voting system and accessibility standard required by HAVA. The cost of retrofitting will probably cost more than the original equipment.

5) DRE voting systems that have been certified under the 2002 voting systems are the only means today to meet both the HAVA accessibility and accuracy requirement. Adding voter verified paper audit trails improve both security and confidence of any DRE voting systems.

6) DRE voting systems can be used as interface to generate paper ballots that are filled and used either as the official ballot or as audit trail. DRE-like voter interfaces print or mark a paper ballots can easily meet the accessibility requirements of HAVA and FEC 2002 voting system standard. However, they must also be read and deciphered by systems that are also meeting the 2002 FEC voting system standard in terms of accuracy and other criteria.