WHY, WHEN AND HOW SHOULD THE "PAPER RECORD" MANDATED BY THE "HELP AMERICA VOTE ACT OF 2002" BE USED?

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"PERMANENT PAPER RECORD FOR MANUAL RECOUNTS":

The new "Help America Vote Act of 2002" changes many of the requirements for holding an election using electronic voting systems. One of the changes is that every voting unit used for an election must now produce a permanent paper record for each vote cast as part of an audit trail used for recounts.

The following are the relevant portions of the law as it relates to the paper record.

"Help America Vote Act of 2002" Title III, Subtitle A, Section 301, (2)
(A) In General.—
The voting system shall produce a record with an audit capacity for such system.

(B) Manual Audit Capacity.--

- *(i) The system shall produce a permanent paper record with a manual audit capacity for such system.*
- *(ii) The voting system shall provide the voter with an opportunity to change the ballot or correct any error before the permanent paper record is produced.*
- *(iii) The paper record produced under subparagraph (A) shall be available as an official record for any recount conducted with respect to any election in which the system is used.*

The literal reading and interpretation means that voting systems must produce a paper record that can be read and understood so that a "manual audit" can be subsequently performed if required. The key here is "manual audit". A manual audit can only be done using either the ballot image of each contest and measure or the listing of choices made by the voters on each contest and measure.

It does not explicitly state that the voter should have a chance to review and verify their vote on the paper record. But, it certainly makes more sense that if the voter has the chance to correct or change the electronic ballot on screen, then a paper record should be produced when the voter finishes casting their vote.

The wording implies that a printed permanent paper record should be available for the voter to confirm after they finish electronic voting.

For those that do not want to produce the paper record in REAL-TIME will point to the wording not being explicit enough and therefore not required. They will argue that producing a paper record at the end of an election, in the back office of the jurisdiction can also satisfy the law.

Printing the paper record after the voter has left logically absurd when anticipated audit trails and recounts occur. Without voter verification, manual recount of "post election" printed paper records is meaningless and will not provide confidence to the electorate.

INTENT OF THE "PERMANENT PAPER RECORD FOR MANUAL RECOUNTS":

Technically, when the voter casts their ballot on the screen, that ballot data is stored in the voting unit's multiple memory locations simultaneously. Once the data is stored, each voting unit will always print exactly the same paper record, even if it is incorrect, when asked to print post election. Also, if someone tampers with the data either during the election process, or after the election, the tampered results will print exactly what was stored in the flawed memory locations.

If there is anything that went wrong during the election, such as touch-screen calibration misalignment or "lost votes", as found in many of the systems used in the 2002 elections in Florida and Georgia, there is no way that it can be discovered or recovered. Other errors that were found but not widely reported were missing candidates, incorrect ballots and massive **unintentional undervotes** (12.3% not voting in one US Senate race). There is no way to discover or recover these errors after the voters have voted. Like many computer experts' concerns, if there was any systematic tampering, it is impossible to detect or recover. If there is any unintentional human induced logic or accuracy problems with the ballots using any of the systems, results will not be recovered.

Printing of the paper record after the election is a formality that has no merit and wastes a considerable amount of time. It challenges the intelligence of the voters when someone proposes such a solution to the potential problems of electronic voting.

Legally, whether printing paper records after the election will satisfy the intent of the "HAVA" requirement is highly questionable and will be the basis for many future lawsuits.

To logically interpret the law, one must ask: "What is the purpose of printing a permanent paper record for each vote cast?" Historically, when voting on paper ballots, voters express their intent by punching the paper cards or marking on the paper ballots. Any recount that must be performed with the paper records that have been marked or punched by the voters are manually recounted as heppened in the Florida 2000 General Election. The defects and errors on paper cards and ballots are unsatisfactory but there is no doubt that the errors were made by the voters. It would be logical that a "RECOUNT EQUIVALENT" is intended in the permanent paper record requirement in HAVA.

Electronic voting without a real-time paper record is like voting in a black box. There is no trace or record that the system actually recorded the voter's intent. We must now trust the "system" to record intent. The "system" could include programming errors, installation errors, set-up errors, ballot definition errors, touch-screen misalignment errors, and voter interface induced errors (such as too many contests on one screen). These errors are not hypothetical. They actually happened in every one of the elections using such paper-less "systems".

It is very difficult to trust the "system" when the people deploying the "system" are not even following the State laws and FEC guidelines to perform the required logic and accuracy testing on each voting unit. Some of the States have been lobbied by vendors to require testing only 5% of the units after an election! Logic and accuracy testing on every voting unit is supposed to be performed by actually touching or simulation of touching every single candidate and choice using a prescribed script. This script must also be specific to the nature and characteristics of that particular election and would help document and review some of the obvious errors that have occurred in the last few elections held with these electronic systems.

"RECOUNT EQUIVALENT" FOR ELECTRONIC VOTING:

If the concept of "RECOUNT EQUIVALENT" is to be realized, the printed permanent record of the vote cast must be representative of what the voter did. Instead of directly punching or marking on the ballots the voting machine print out the paper record of the electronic screen selections. This record is reviewed and "verified" by the voter.

There are two methods this to achieve this "recount equivalency":

1. The first way is what SACRAMENTO County did in the 2002 General Election for their early voting. VOTE-TRAKKER™ printed out a paper record when the voter finished and cast their ballot. The voter reviewed and verified their ballot through a transparent viewing window. After the voter was satisfied and left, the system retrieved the paper record automatically into a sealed box for any required recounts.
2. After a voter uses the touch-screen system to register their intent, the voting unit prints out an actual representation of what the voter selected. The voter then deposits the paper representation into a sealed box for subsequent tabulation. This second way is what the State of New Hampshire is contemplating to achieve the accessibility requirements of HAVA while maintaining their paper balloting history.

Both of the methods above will achieve 100% compliance in satisfying the intent of "permanent paper record" in HAVA. The voters actually "verify by viewing" or "verify by viewing and touching" the individual "paper record" before they leave the voting booth. Whatever is stored within the voting machine bears the voter's direct verification and authentication. The system tabulates the results from ballots that are "equivalent to the actual marking or punching of the paper ballots".

Another important point is that if there are any problems with the voting machines, and there is a paper record produced, the voter will notice the discrepancy and give immediate feed back to the election official. Timely checking and corrections will be made.

The only logical implication of the law is that the paper record represents exactly how the voter intended to vote and should be printed subject to verification by the voter. This verification is part of the audit trail that will provide the intended purpose of providing a hard black-and-white proof of voter intent.

The law was written to provide confidence to the voters that the "electronic black box" voting machine indeed records the voter's intent. As reflected by the printed record, they have a chance to verify the vote which improves the confidence of the voters and the candidates.

The fact that there is a paper record that has been verified by the voter as part of the audit trail, will lead to less challenges and law suits made in close races.

HISTORICAL DRE SYSTEMS AND VOTER ERRORS IN ELECTRONIC VOTING:

Before October 2002, all of the electronic voting systems (direct recording electronic, DRE) were basically electronic black boxes. Once the voter pressed the cast ballot button, the screen resets with the choices erased from the screen. Whether the voter made a mistake or the system made a mistake, there was no way anyone could tell or make corrections. At the close of polls, tallies are printed out from the system and assumed to be correct.

The reason why such a process was allowed was the assumption that there will never be errors made by the voters or by the voting units. But this is far from the truth. There have been many voting system errors, ballot errors, as well as voter errors documented in every election since DRE machines were introduced. There are several well known sources of errors in the voting process:

1. Ballots have been created with errors, e.g. typographic and transcribing errors in English and alternative languages, missing contests in English or alternative languages,
2. Generated ballots do not interface with the ballot tally program because programming was modified during the election (even though this is not recommended but is done universally),
3. Hardware or firmware problems with the incompatibility of the ballots being loaded (i.e. human errors at the election office whereby incorrect ballots are loaded into the wrong units),
4. Touch-screens out of calibration, ballot formatting and interfaces that induce excessive voter errors, and
5. Voter errors due to lack of understanding, viewing errors because of inexperience in using electronic screens.

Errors listed in items 1-4 can be caught if each voting unit undergoes what is called "logic and accuracy" testing before and after each election. The "logic and accuracy" testing requirements in the Federal Election Commission Voting System Standards has been designed to test the **PROCESS, DATA**, and **SYSTEM INTEGRITY**. Logic and accuracy testing helps to flush out any errors that are hardware or software related. These tests have been proven to be extremely useful in punch card and marksense voting systems over the years.

Because of the time-consuming nature of manually touching on the screen according to the prescribed test script to perform such logic accuracy testing, some States only ask that small percentage of the units be tested. Even States that have laws to require 100% testing (e.g. California Election Code 15000) be performed on all units, this is not the general practice of counties as of the November 2002 election. Therefore many errors found in during voting could not be corrected.

Most of these errors and the magnitude of these problems could not be documented or discovered until the end of the election. The corrections were too late or could not be done effectively thus lowering the confidence of both the voters and the candidates.

The easiest solution is to provide a paper record of every electronic ballot cast using a DRE voting unit. The only meaningful method to produce the paper record is when it is printed in the presence of the voter. Voters can confirm their selections that are printed on paper. Any errors will be immediately reported to the polling officials. If there are any errors, they can be minimized or eliminated before the voter loses their right to have the problem corrected.

Some of these documented errors in the 2002 elections in Florida and Georgia have caused alarm among computer experts. Professor Rebecca Mercuri of Bryn Mawr College and Dr. Peter Neumann of

SRI International have been calling for paper audit trails for DRE systems for years. They have now been joined by Professor David Dill, the Stanford University professor of computer science who launched the petition drive that gathered more than 300 signatures nationally of computer experts and election officials calling for "voter verifiable paper audit trail" in all DRE systems. Since then, there are at least four states that have openly expressed the adoption of voter verifiable paper records: Missouri, New Hampshire, Utah, and West Virginia.

PRINTING PAPER RECORDS WITHOUT VOTER VERIFICATION IS COSTLY AND INVITES LAWSUITS AND CHALLENGES:

In the state of California, Proposition 41 helps fund the counties to buy new voting systems that could avoid the Year 2000 election fiasco in the future. The following is the election code governing such use of public funds:

"Shelley-Hertzberg Act of 2002"

California Codes 19234 (e)

Any voting system purchased using bond funds that does not require a voter to directly mark on the ballot must produce, at the time the voter votes his or her ballot or at the time the polls are closed, a paper version or representation of the voted ballot or of all the ballots cast on a unit of the voting system.

The paper version shall not be provided to the voter but shall be retained by elections officials for use during 1 percent manual recount or other recount or contest.

The California code is written more clearly than the HAVA law. There are two options that the county can do to satisfy the requirement of providing a paper record of the ballot cast. These ballots are to be retained for the 1% recount or other recount or contest:

- Printing the paper record at the time the voter casts their ballot.
- At the time the polls are closed, *a paper version or representation of the voted ballot or of all the ballots cast on a unit of the voting system* must be printed.

It does not seem that the printing can be satisfied by a tally of the ballots alone but by the printing of **all of the ballots** themselves. The printing must be the "paper version or representation of the voted ballot" (generally referred to as ballot images in the elections industry) or a "paper version or representation of all the ballots" (a record of every choice made by voters of **all of the ballots not just votes**). *"The paper version shall not be provided to the voter but shall be retained by election officials for use during 1 percent manual recount or other recount or contest*." It is non-productive to manually recount the tallies!

The second option left a gap in the definition of when to print the paper record. The phrase "at the time the polls are closed" is not as definitive as needed. Is it before or immediately after the tally of the results are generated? Can the meaning of "at the time the polls are closed" be stretched to mean anytime **after** the polls are closed as some election officials believe?

There are several California Codes (19370, 19384, and 19386) that require each polling place to post the vote tallies of each voting unit. "One copy of the statement of return of votes cast for each machine shall be posted upon the outside wall of the precinct for all to see." Based on this law, one

would expect that the system has printed out all of the paper records of each vote before the poll is closed. Additionally, CA Election Code 15150 requires that "The semifinal official canvass shall commence immediately upon the close of the polls and **shall continue without adjournment** until all precincts are accounted for." Printing each individual paper record **after** the tallies have been generated would seem to be a waste of time.

If one has to print every paper record from each voting unit at the time of closing under the supervision of voters and the observing parties then time is needed to perform this task. This print would be just the choices made by each voter. For example, if there are 300 votes in each voting unit, and each paper record takes 6 seconds to print, the total time for each unit fitted with a fast printer would take 1800 seconds or 30 minutes. This is practical. The cost is slightly higher because poll workers must be paid during the extra print time.

If the full ballot images from each touch-screen are to be printed, the quantity of printing will be increased. The time will be increased by 30 to 50 times for a typical California ballot. It may take as long as 15-25 hours after the election for **each machine**. It is more than a little challenging to ask the poll workers to stay another 15-25 hours. It is also unreasonable for the public to wait that long for the election results.

One of the authors of the Shelley-Hertzberg Act, Mr. Kevin Shelley is the current Secretary of State of California. On January 13, 2003 Mr. Shelley was interviewed by Mr. Scott Shafer of Radio Station KQED. When asked about the paper record *"Those touch-screen voting machines eliminate the risks of hanging chads in our machines, but they have no paper trail"* Mr. Shelley said, ***"They do. We demanded in Proposition 41, when we wrote it, that a paper trail be placed in the machine as a back-up. So, there is still the mechanical backup to address the new technology."***

In accordance to Mr. Shelley's explanation, the requirements would mean either the paper records are to be printed in real-time or immediately when the polls close before the final tallies of the voting machines are made. This statement counters the claim of some vendors and election officials that only the capability to print the paper record is needed to satisfy the Proposition 41 funding of new voting equipment. In fact, if the "back-up" purpose is to be fulfilled, it should be printed in real-time.

The current California code 15360 requires that 1% of the systems print out a paper ballot image of every ballot cast. "During the official canvass of every election in which a voting system is used, the official conducting the election shall conduct a public manual tally of the ballots tabulated by those devices cast in 1 percent of the precincts chosen at random by the election official." This law applies to every jurisdiction of California whether they use the Proposition 41 money or not. Similar manual recount election codes are found in most other States.

The question that needs to be asked is:

If the system must print the paper record of each vote, why don't we print it immediately after the voter cast his or her electronic ballot so that the voter has a chance to verify it?

WHOSE ELECTION IS IT?

Isn't it the voters' right to know if their vote is counted? And should the voters know their vote is counted correctly?

It is a question that some seem willing not to answer. We have yet to hear many election officials express their opinion. Instead, most election officials elect not to print out any paper records in real-time or otherwise. The typical answer is that the law as written did not require such a process.

Currently, the California codes and all other State election codes must be brought up to the Federal standard. Whether state funds are used or not, each DRE system must produce a paper record for manual recount purposes.

If there are two paths that satisfy State and Federal laws but only one path gives the voters the ability to know if their votes are counted and counted correctly, then why do the local election officials opt not to choose such a path?

WILL THE PAPER RECORD AND AUDIT TRAIL DISENFRANCHISE OR REDUCE ACCESSIBILITY TO THOSE THAT ARE VISUALLY IMPAIRED?

Many vendors and election officials that do not want to provide the voter verifiable paper record and audit trail try to make the following argument:

Section 301, a (3)(A): "ACCESSIBILITY FOR INDIVIDUALS WITH DISABILITIES.---

> *"The voting system shall 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 the other voters;…."*

The point is that since blind voters will not be able to see the printing, the voter verifiable paper records will disenfranchise them.

- The solution to compensate for the voters having difficulty in reading would be to have the voting machine read back the ballot to them before the ballot is cast. If deemed necessary, the voting machine can also read back the ballot as stored after the ballot is cast. This is not different from providing audio ballots or voice-assistance during the voting process.
- At this time, none of the vendors opposing the use of a voter verifiable paper record and audit trail can read back the selections.
- For a complete equivalency in providing the "same opportunity for access and participation (including privacy and independence) as the other voters", accessible voting machines should be able to read back the selection IMMEDIATELY as the selection is made. This is the same as "highlighting" the selection for sighted voters.
- At the end of the selection process, the voting machine should read back the complete list of selections made by the voter and allow the voter to make changes or corrections just like the sighted voters.
- How about the write-in capability? All accessible voting system should provide a write-in capacity even if they do not know how to use a keyboard. Very few systems currently in use today provide such a capability.

- What about those blind and visually impaired voters that also have physical limitations in the use of their hands and fingers. Again, very few voting systems today provide this capability.

VOTE-TRAKKER™ provides instant read back confirmation of the selections made by the voters while they are voting. The same confirmation is also used when the voters perform a write-in. The voter can use either the modified accessibility keyboard or the scrolling alphabet function.

Blind and visually impaired voters can also use a fist to make selections using the modified accessibility keyboard that has raised functional keys at the each corner of the keyboard. At the end of the selections the full ballot is read back to the voter and changes can be made easily. Once the blind and visually impaired voter verifies their selections through the read back process, they then cast their ballots. If necessary, the system can once again read back to the voter the electronic ballot as stored.

Every voting system can achieve this level of accessibility using current text-to-speech technology.

DOES A VOTER VERIFIABLE PAPER RECORD AND AUDIT TRAIL ENHANCE THE VOTER'S CONFIDENCE IN THE ELECTION PROCESS?

Before October 2002, only the State of Colorado required an electronic voting system to produce a paper record when the voter cast the electronic ballot. The State of California incorporated a new election code in 2002 called the "Shelley-Hertzberg Act" that also specifies the printing of a paper record as part of the audit trail and recount process.

Many arguments are proposed in order to keep recently purchased systems from being required to be modified to provide the necessary paper trail. Heavy lobbying against the idea of adding paper records for the voter to verify is ongoing. They ask for any proof that the voter verifiable paper record and audit trail actually helps to enhance voter's confidence.

Even with the State law requirements, prior to the November 2002 General Election, there were no elections held using an electronic voting system that ever produced a paper record as part of the audit trail. Sacramento County, CA was the first county to use the voter verifiable paper record. The successful use of VOTE-TRAKKER™ for the Early voting portion of the General Election 2002 in Sacramento County proved that it can be done and receive outstanding reviews.

For the same General Election 2002, there were very few scholarly studies made on the actual data. However, there are two basic surveys that have been reported. The first survey was performed on election in Georgia. The study made by the Carl Vinson Institute was on the voter's confidence. Before the implementation of electronic voting, on average, 56% of the voters felt that their votes were counted when the old paper ballots were used. This number increased to 70% with 79% of white voters and 40% of the black voter feeling highly confident that their votes were counted. For the General Election early voting in Sacramento County, a survey was conducted as part of the state certification process. 86.3% felt "great" on the confidence that their votes were counted. When combined with the 10.2% that felt "so-so", the number adds up to 96.5%! The difference between 96.5% and 70% in voter confidence cannot be ignored. The key contributor to the difference may be attributed to the fact that the VOTE-TRAKKER™ was used in Sacramento provided a voter verifiable paper record for the voter to review while the systems used in Georgia did not.