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REF: M1999¹

Subject: ES&S ExpressVote XL should not be approved

Dear Members of the New York State Board of Elections:

I hope this letter finds you well. As you consider the purchase and implementation of the Election Systems & Software (ES&S) ExpressVote XL and its associated systems, I am writing to provide additional information that may not yet be part of your deliberations.

It has been said that your role is largely ministerial, and your only function is to approve the proposed voting systems based on the requirements of the law in the state of New York. I would like to suggest that your role goes far beyond that simple level, as your body is the primary interface with the public. Your role is to feedback all information, including known problems and limitations with these devices. Your approval can be conditional, with corrections or improvements that can more closely affect the needs of the public to oversee their elections. Because at the end of the day, the public is responsible for making sure our elections are run properly, and since you are a conduit of that responsibility, please consider the full scope of your role.

One more important point: The job of evaluating and approving a voting system goes beyond just the voter-facing machine, and encompasses all the aspects, including the accurate chain of custody of the votes recorded on media to the Election Management System (EMS) and ultimately to reports. This aspect is where ES&S has had recent failures that must be corrected.

Before proceeding further, some introduction is warranted. My name is Ray Lutz, and I hold a Master of Science in Electrical Engineering (MSEE). My professional background includes extensive experience in hardware and software development for document management systems, medical devices, communication systems, and I am currently on the Internet

¹ <https://copswiki.org/Common/M1999> -- this letter available on-line.

Engineering Task Force (IETF) "SCITT" working group for Supply Chain Integrity, Transparency and Trust.

Recently, I had the privilege of leading the development of the AuditEngine election tabulation auditing system. AuditEngine is designed to process all ballots in an election using the ballot images generated by the voting system. Our team has gained valuable experience in working with various ES&S systems, including the ExpressVote XL. We have also applied to provide auditing services to the State of New York, although the formal approval process is still underway.

Although the voting machines we have today may be inspected carefully for possible backdoors and hacking, experts agree that robust and comprehensive audits are necessary to check the paper record that is now being produced, and AuditEngine is the best type of system for a meticulous tabulation audit.

We have utilized AuditEngine to conduct case studies of recent election audits, including the 2020 General election in Three Florida Counties: Volusia, Collier, and St. Lucie Counties, FL², as well as Dane County, WI, Fulton County, GA, Bartow County GA³, and more recently of Monmouth County NJ, Mercer County, NJ, and Burlington County NJ⁴. Our aim is to continuously improve and refine our system to efficiently perform complete tabulations for all elections in all counties, encompassing all ballots and contests. The precision of our system sets it apart, as we meticulously compare the results on a ballot-by-ballot basis while maintaining voter privacy.

In light of our comprehensive audits, we have identified several concerns related to the ES&S ExpressVote XL. I will first summarize these concerns and then expand on them in the Appendix. Our auditing system AuditEngine can audit elections conducted using the ExpressVote XL but such audits are inherently limited by the design of the device.

1. **Unverifiable Barcodes:** Ballot Marking Devices (BMDs) that do not produce full-face ballot summary cards similar to hand-marked paper ballots make voter verification of their selections difficult or impossible. The use of barcodes on the ExpressVote XL raises concerns as voters cannot interpret them to verify the accuracy of their selections. Further, these barcodes are "theater" in that they are really not ever read or relied upon. The ExpressVote XL is essentially a DRE machine with individual paper recordings created by a Voter Verifiable Paper Audit Trail VVPAT integrated into the machine. They don't need to read the barcodes, because they just printed them, and there is no reason

² <https://copswiki.org/Common/M1970> -- "Case Study Report: 2020 Election Ballot Image Audits in Collier County, Volusia County, and St. Lucie County Florida"

³ <https://copswiki.org/Common/M1986> -- "2020 General Election Audit Reports for Bartow GA, Fulton GA and Dane WI"

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<https://docs.google.com/document/d/1HhAfIGlhEQUIHpyChl0uJORUmymGAZq9thdPMbKuGXs/edit?usp=sharing> -- NJ - 2022 Audits of Three Counties: Monmouth, Mercer, and Burlington

to do so in the future either. So these barcodes are just for show. Normally, they can be useful for auditing, but these can't be used.

We note that write-in names that are keyed-in by voters are included in the digital recording of the vote, and these are not included in barcodes, but only printed on the summary card (in this case the barcode only indicates that there is a write-in, it does not provide the text). Therefore, this proves that they do not read the barcodes for the vote of the voter. And further, this is more like a DRE with VVPAT than a traditional BMD.

Yet, the paper record of the vote is what is to be voter-verifiable, and the barcodes are part of that record, and may be relied upon by any future scanning that does not perform Optical Character Recognition (OCR) or finds that the text is difficult to read. THIS RECORD SHOULD BE FULLY VOTER VERIFIABLE AND IT IS NOT.

For this reason, as currently designed, we believe the ExpressVote XL does not comply with: Election Law § 7-202 (1) e., which, in 2005, gave voters the right to verify their vote and correct any error on the ballot before it is cast and counted; the Federal Help America Vote Act (HAVA) 52 USC 21081 (a)(1)(A)(i) and (ii), which Congress passed in 2002 to give voters the above right; Article I § 1 of the New York State Constitution, which prohibits disenfranchisement and the deprivation of any right or privilege secured to any citizen of the state; HAVA 52 USC 21081 (a)(6), which requires you to define what constitutes a valid vote for every category of voting machine in the state used in Federal elections; and your own regulations promulgated to comply with 52 USC 21081 (a)(6) -- (CRR 9, Subtitle V, §§ 6210.13, 6210.14, 6210.15 and 6210.17).

In contrast, the stand-alone BMD version of the Dominion ICX that produces full-face paper ballots that look like HMPBs are sufficiently verifiable. These devices comply with the law.

For jurisdictions that use the ExpressVote XL, we have also identified a way to substantially improve the encoding of these barcodes so they can be more easily checked by voters (if they can use their cell phone camera to read the barcodes), and then used in auditing procedures. Right now, they are worthless.

2. **Printed Text Challenges:** Ballot summary cards generated by the ExpressVote XL are challenging for voters to verify due to the use of ALL CAPS FONT, truncated contest names, and potential unavailability of printed cards in all supported languages, or making OCR too complex to complete by including too many languages, thus hindering effective audits.
3. **Lack of Proof for Voter Sessions:** Ballot summary cards used by BMDs or hybrid devices like the ExpressVote XL cannot establish what voters were shown during their private voting sessions. No one can tell by looking at the paper record if all the choices or even the right ballot was shown to the voter. In contrast, hand-marked paper ballots

provide proof of what the voter was shown because it is recorded on paper as well as the voter's choices.

This is a serious issue and we believe the "choices only" ExpressVote XL summary cards violate the "full face ballot law" in NY. The ballot summary card is the legal "ballot" for verification and auditing, and it is not "full face" and can't be used to prove whether the voter was accurately presented with all options, including those NOT voted.

4. **Dual Tabulations and Poor Data Tracking:** ES&S machines maintain two internal tabulations that may differ, raising concerns about accurate results reporting. Additionally, ES&S's poor data tracking could lead to improper data combination and hinder RCV tabulations, auditing processes, and may even result in incorrect results (as was the case in Monmouth County, NJ in the 2022 General election when one thumb drive was read twice).

In light of these concerns, I strongly advocate for the use of hand-marked paper ballots and the limited use of BMD devices, only when necessary for voters with disabilities or on an if-desired basis. Hybrid BMD devices like the ExpressVote XL both capture user votes and record them, and operate like DREs with an integrated VVPAT device. This is unlike other BMD devices that have no internal memory. The separated design of other BMDs with associated scanners is important from a security standpoint. BMD devices should adhere to only printing voted ballots in a format similar to hand-marked ballots for ease of verification, and not record the votes internally.

In conclusion, I fervently oppose the use of hybrid BMD machines like the ExpressVote XL that operate more like a DRE with integrated VVPAT device, and urge you to consider the aforementioned recommendations to strengthen the integrity and transparency of New York's electoral process, as well as the details in the Appendix to help improve these systems.

Thank you for your time and consideration. If you require any further information or clarification, I am at your disposal.

Sincerely,

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APPENDIX -- Further Details

This appendix will provide further information on the points made in the cover letter above.

In the context of AuditEngine, it's important to note that our system does not rely on reading any barcodes. Instead, we focus on reading the human-readable text in the summary using OCR, including systems from Election Systems & Software (ES&S), Dominion Voting Systems, and Hart Intercivic. Thus, since we do not rely on barcodes as our primary source.

However, we still believe these barcodes are an important part of the voted record, and should still be useful as a check on OCRing the text, which can be difficult if the text is poorly printed or if the image is corrupted. Barcodes are more robust in this regard and it is useful to have them as a double check.

DISCLAIMER: I want to emphasize that the information presented in this report is based on a thorough review of publicly available information and reverse engineering techniques. We do not have access to any privileged or insider information about these machines. It's essential to acknowledge that our understanding may not encompass potential changes or updates made in newer releases of ES&S software or voting machines that go beyond our reviewed materials.

The video explanation of the system at this link is important:

<https://www.essvote.com/blog/video/video-how-expressvote-xl-protects-your-ballot/>

But it does not show everything, such as:

1. How and when are the ballots scanned and recorded as ballot images for later review? Does the scanner scan both sides, because we do see double sided images in Monmouth County, but the video shows a single-sided scanner.
2. In the case of a very long ballot, does the text on the ballot summary card overflow to the back of the card? This is the case for Dominion. If so, how does the voter check the back?

3. If the voter decides his vote was incorrect, then how is the discarded summary card handled?
4. How is the data accurately transmitted to the EMS? If memory devices are hand-carried, how are they tracked so all devices are read in, and each only once? This has been a problem with ES&S and is not shown in the video which details only the print mechanism.
5. How is the CVR data checked against the aggregated totals? Again, this has been a problem because the aggregated totals can wind up differing from the CVR records.
6. How are ballot images combined into archives that can be matched (usually by file name) with the CVR record? The data we saw in Monmouth County, NJ which uses the ExpressVote XL provides them in large PDF files with up to say 10,000 images per file. The issue has been getting a link from those images back to the CVR record and some of the PDF files have no bookmarks with the CVR record number.

Please accept the following points.

1. **UNVERIFIABLE:** BMD devices that do not create a full-face printed ballot similar to the hand-marked paper ballot equivalent are not fully verifiable, both by the voter, and for auditing. This includes the following aspects:
 - a. **Barcodes Can't be Interpreted.**

One significant concern with the ExpressVote XL is that voters cannot verify whether the barcode accurately encodes their intended vote. The barcodes used in the ExpressVote XL are Code128 barcodes, which, in jurisdictions that allow cameras at the polling station, *can* be scanned using a cell phone camera. However, the numbers encoded in these barcodes are exceptionally difficult for voters to interpret, as will be further described. (Note: Some have told us that in NY no cell phones are allowed in the polling station, but whether a person can scan the barcode is different from taking a selfie, and may still be allowed.)

THIS SITUATION CAN BE IMPROVED BY ES&S, because the barcodes are essentially "just for show" anyway, and are completely arbitrary. They can be much more voter-verifiable (see more in the details below on this aspect in #2 below.)
 - b. **Barcodes May Differ From Printed Text**

A significant concern with barcode-based Ballot Marking Devices (BMDs) is the potential mismatch between the printed text and the encoded barcodes. While voters are encouraged to read the printed text to verify their selections, they are unable to interpret the barcodes and determine what choices they represent. Consequently, voters cannot be certain if their selections will be accurately

interpreted by the machine reading the barcodes. This issue applies to all voting machines that rely on barcodes instead of a format similar to hand-marked paper ballots, where a dark mark next to a choice clearly indicates selection. The hand-marked paper ballot format is both easily processed by machines and allows voters to verify their choices, ensuring transparency and accountability.

c. **Printed Text is hard to Read, Differs from official contest names**

Ballot summary cards are difficult for voters to verify for several reasons:

- i. **ALL CAPS FONT:** ES&S uses an ALL CAPS FONT, making the printed text harder to read for voters. Studies have found that ALL CAPS fonts are hardest to read⁵.
- ii. **Truncated Contest Names:** While the ExpressVote XL has made some improvement by allowing contest names to wrap to the next line, each line is limited to only 38 characters. As a result, contest names are often abbreviated, making them challenging to understand fully. In some cases, important parts of the contest names may be cut off, further complicating the verification process.

For example, in Monmouth NJ, which also uses the ExpressVote XL, we find the following names used in the ballot summary card:

FRHSD REP ENGL / MBE REGSUB VOTE 1 -S FRHSD REP ENGL

and

RUM-FH -FH / MBE REGTOWN VOTE 1 -S RUM-FH - FH

These are essentially unreadable and unverifiable, and there is no alternative means to check it, such as a numeric label.

This problem does not exist on full-face printed ballots similar to hand-marked paper ballots.

- iii. **Language Support:** Ballot summary cards may not be printed in all languages supported by the voting system. If they are printed in a foreign language, voters might be able to verify the text matches their vote, but auditing becomes nearly impossible. If printed in English only, then auditing is feasible but voter-verification is not. This is in contrast to traditional ballots that can show both English and a second language,

⁵ <https://accessibility.huit.harvard.edu/design-readability> -- "Avoid using all caps. Readability is reduced with all caps because all words have a uniform rectangular shape, meaning readers can't identify words by their shape."

allowing voters to verify their votes and enabling audits to check the results more effectively. This may not be relevant in NY if ES&S prints summary cards in two languages, but may make it even harder to verify with additional text.

d. **Ballot Summary Cards Can't Prove What the Voter Was Shown:**

This issue is common with any voting system such as BMD or DRE that does not use a full-face hand-marked paper ballot with hard-copy of the contests and descriptions.

The ballot summary cards utilized by the ExpressVote XL, along with other Ballot Marking Devices (BMDS) that do not use the full-face hand-marked format, are inadequate for proving what the voter saw during their private voting session.

Touch-screen displays on these machines could maliciously provide a reduced set of choices to voters. Unsuspecting voters may inadvertently vote only for the limited number of candidates displayed on the screen. They would then verify that their selection was accurately shown on the ballot summary card, but only their choice is shown on the card, not all the other choices. Although NY has a full-face ballot law, there is no way to know after the fact if the ballot displayed included all options.

In contrast, a hand-marked paper ballot format lists all the candidates running for a particular office, even those that the voter did not choose. This comprehensive representation on the hard-copy ballot card allows the voter and auditors to confirm that all candidates were presented to the voter during the voting process, which is impossible with the temporary display on a touch screen.

The limitations of ballot summary cards in capturing the full voter experience raise concerns about the accuracy and integrity of the voting process, especially in situations where voters might not be presented with all available choices. This underscores the importance of adopting voting systems that enable voters to verify their selections more comprehensively, ensuring a transparent and trustworthy electoral process, and that means hand-marked paper ballots.

THE NEW YORK STATE BOARD OF ELECTIONS SHOULD NOT APPROVE THIS MACHINE DUE TO THE VIOLATION OF THE FULL-FACE BALLOT LAW, AS THE BALLOT SUMMARY CARD IS THE BALLOT AND IT IS NOT FULL-FACE.

e. **BMD Devices Make It Hard to Find All the Candidates:**

The user interface of BMDs can be complex, and voters may not be familiar with how to navigate through all the available choices effectively. This limitation is

concerning as it could inadvertently influence voter decisions, especially if voters are unable to access the full range of candidates they have the right to choose from. It was thought that the full-face ballot law would correct this, but we assert that the grid format is hard for users to understand anyway.

f. **ExpressVote XL Can Record Votes Without Reading the Barcodes:**

The ExpressVote XL functions as a hybrid voting system, utilizing both a touch screen interface and a printed ballot summary card. When a voter casts their vote using the touch screen, the machine records the vote internally before generating the printed ballot summary card. Unlike the ExpressVote and DS200 combination, the ExpressVote XL does not heavily rely on reading the barcodes from the printed cards for tabulation.

This unique approach raises concerns about the potential for discrepancies between the recorded vote internally and the vote printed on the ballot summary card. Since the ExpressVote XL does not primarily depend on the card's information for tabulating votes, it creates the possibility of different votes being recorded in its internal memory compared to what is displayed on the ballot summary card.

Such discrepancies could occur due to various reasons, such as software bugs, glitches, or intentional manipulation. Identifying these discrepancies would be challenging without a full hand count of all the votes, a labor-intensive and time-consuming process. Alternatively, specialized tools like AuditEngine could be used to read and analyze the data from the ballot summary cards to detect any inconsistencies.

TABULATION AUDITS ARE ESSENTIAL FOR ALL CONTESTS IN THE ELECTION DUE TO THIS HAZARD.

g. **Incorrectly Printed Summary Cards Can't Be Audited**

If the human readable text differs from what the voter selected, then it is impossible to audit the election by reading the paper record or the ballot images. The system has memory of what the user has done, so it can easily spoof the voter as follows:

- i. The voter would vote and the text differs from what they selected. They don't check it or don't notice it, and the hack succeeds.
- ii. If the voter checks it, they may alert the staff of the mistake. "Are you sure you pressed the right button?" There is no way to prove it was not a mistake with the touch screen, so the voter votes again, thinking it was their fault.

- iii. The machine knows it is their second round, and this time it operates correctly, effectively hiding the hack.

The only format that is verifiable and provable is the hand-marked paper ballot, as the user marks it directly with a pen, reads the name as they do it, and it can be proven that they were presented with all the options, while this ballot style is also easily processed by machine. As a second choice, a BMD using a full-face ballot summary card is verifiable, but many voters do not check their votes. Hand-marked requires verification as the marks are made with a pen.

2. **Unpredictable Barcodes are a disaster, but can be improved.**

Although we oppose the use of the non-full-face summary cards for other reasons, we believe they can be made more acceptable and more useful for auditing and voter verification by improving the barcode encoding.

First, it is important to note that the barcodes used by the ExpressVote XL are not predictable and are different from ExpressVote (non-XL) devices.

To provide some background, the DS200 scanner can be paired with the ExpressVote (non XL) ballot marking device (BMD). The ExpressVote is a touch screen device that generates a ballot summary card similar to the one used by the ExpressVote XL. This card is then scanned by the DS200 scanner, which is capable of scanning both the ballot summary cards and hand-marked paper ballots.

In the case of the ExpressVote (non XL), the barcode encoding is determined using an X-Y coordinate system based on the timing marks on the frame of the corresponding hand-marked paper ballot format. The format of this barcode is denoted as RRCCPS, where RR represents the row of the vertical timing marks, CC is the column, P indicates the page (1 or 2 for front and back), and S is the sheet. While this encoding method is entirely predictable, it is challenging for any voter to derive the barcode since it requires knowledge of the specific row and column of the target on the hand-marked paper ballot, information which is not readily available to them.

In contrast, the ExpressVote XL does not use the row and column method but employs a sequential number format, appearing as 00NN00, where 'NN' represents the sequence of the target on the sheet, and the 00's are wasted.

Our review focused on the grid-format landscape ballot layout used in Monmouth County, NJ (which is used in some NY counties). The problem with this sequential numbering approach is that the sequence number occasionally skips a count, making it unpredictable due to the irregular skips in numbering. This unpredictability poses challenges for voters in interpreting the barcodes and verifying their encoded choices during the voting process. In any case, it goes without saying that any method of ballot verification requiring a bar code reader and a guide for interpreting the bar codes cannot

reasonably be described as voter-verifiable, meaning that it violates both HAVA and state law verifiability standards.

RECOMMENDED CHANGE

Although we don't much like the ballot summary card output of the ExpressVote XL, it can be easily improved to make the barcodes useful for auditing and to enable voter verification of the barcodes. Since these barcodes are arbitrarily assigned by the voting machine, we propose a new assignment of the six-digit number as follows:

CCCCNN

We propose that every contest be assigned a four-digit integer, (CCCC) like 1234. This number will be the same for this contest no matter where it is placed on the ballot, and these numbers could be assigned according to the official contest sequence, starting with 0001, but the numbers are just labels and the assignment is arbitrary. In any case, this number can appear on the ballot next to the contest name.

NN is then the option number within that contest. like 01, 02, 03, etc. and it can appear next to each option printed on the ballot. It may be best to include the entire 6-digit number by every choice to allow it to be verified as correctly encoded in the barcode.

With this numbering system:

1. Up to 9,999 contests can be accommodated.
2. Up to 99 options (candidates) in any one contest can be accommodated.
3. The option numbers would also be included for Write-Ins, but the write-in name would be keyed in separately as it is now.
4. The user can read the barcode using a camera, and verify that it matches the numbering on the full-face ballot displayed.
5. If the options change in any single contest, (like a candidate drops out) it does not change the numbering of all the other contests, to limit errors made in cases like Antrim County, MI.
6. Candidates can tell their voters to verify the barcodes are equal to a specific value, and they can then verify the number with their cell phone.
7. The barcodes are then very useful for auditing because they are easily predictable, even though the ExpressVote XL never really uses them.

THE NEW YORK STATE BOARD SHOULD REQUIRE THIS CHANGE TO THE EXPRESSVOTE XL AS A CONDITION IF APPROVAL IS TO BE GRANTED.

3. ES&S Maintains Dual Tabulations

ES&S Machines maintain two internal tabulations that may differ due to acquisition issues.

Our team was the first to detect and publish the fact that ES&S actually maintains two

different tabulations in their machines. This revelation came to light during our audit of the 2020 General Election in Volusia County, FL, specifically concerning the DS200 machine. As far as we know, this issue has not been resolved in ES&S software.

The genesis of this problem can be traced back to the original software used in ES&S ballot scanners and associated ballot marking devices (BMDs). These devices employed counters resembling the behavior of hardware clicker-counters used, for example, to count people entering a doorway. However, the aggregated totals presented in the printed poll-tape report and other reports were found to be non-auditable because they did not list all the ballots counted.

Consequently, ES&S faced pressure to address this concern by introducing the Cast Vote Record (CVR) and Ballot Image data as auditable information in their machines. These additions serve as a secondary tabulation. Importantly, it should be noted that the CVR is NOT USED to create the aggregated totals, and ES&S does not verify whether the CVR data matches the aggregated totals.

IMPORTANT:

The Cast Vote Record (CVR) created by these machines is NOT USED to create the aggregated totals.

The Cast Vote Record (CVR) created by these machines is indeed not used to generate the aggregated totals. However, it seems that the two tabulations do match inside the DS200 or similar devices, such as the ExpressVote XL. The discrepancy arises when the data is transferred to the Election Management System (EMS), which can result in variations due to several reasons:

a. Thumb Drive Not Uploaded, but Cell Modem Data Transferred:

In Florida, it is common to use a cell modem to transmit the aggregated results (excluding the ballot images and CVR) and then read the thumb drive with the remaining data later. If the thumb drive is not uploaded, it leads to differences between the CVR and images compared to the aggregated report. An example of this occurred in Volusia County.

b. Thumb Drive Uploaded Twice:

When the thumb drive is uploaded twice, the aggregated totals may not be repeated, while the ballot images and CVR records definitely may be repeated as new records. This incident took place in Monmouth County, NJ, resulting in nearly 9500 repeated ballots being added to the totals and one overturned contest.

c. System Reset, Data Not Completely Cleared.

In some instances, like in Volusia County, when the system is reset, it clears only the aggregated totals and does not clear the ballot images or CVR records. A

similar occurrence was detected in New York when they attempted to use the CVR record for rank-choice voting processing. This is a serious concern, invalidating the belief of some advocates that the Express Vote XL is particularly suited for use in Ranked-Choice Voting Elections. While it may appear user-friendly in guiding voters to make second and third choices, etc., that hardly matters if it may calculate the outcomes of such elections inaccurately.

The concerns regarding data integrity and accuracy during the transfer of information from voting devices to the Election Management System are significant and can impact the transparency and credibility of the entire election process. The potential discrepancies between the different tabulations can undermine the trust that voters have in the election results.

In Volusia County, despite encountering these issues, they were able to find a workaround and publish correct totals. However, it is important to note that even in such cases, the ballot images and CVR records of rescanned repeated ballots remained in the system, which could lead to complexities in the auditing process. On the other hand, in Monmouth County, where the ballots were uploaded twice, AuditEngine was able to identify the exact duplicates, highlighting the importance of thorough auditing procedures without which the source of the error leading to more votes than voters would have been undetected.

For anyone conducting an audit and relying on CVR data, it is crucial to be aware of the potential discrepancies between the CVR data and the aggregated totals. This awareness will help auditors interpret and cross-validate the results effectively, ensuring that any irregularities or inconsistencies are properly addressed and investigated.

Overall, it is essential for election officials and stakeholders to continuously work towards improving data tracking, security measures, and auditing protocols to enhance the integrity and transparency of election processes and to instill confidence in the democratic system.

ES&S SHOULD BE REQUIRED TO CORRECT THIS ISSUE AND DEMONSTRATE HOW MEDIA DEVICES ARE TRACKED AND ACCOUNTED FOR BY THE EMS, AND NOT RELY ON AD-HOC TRACKING BY ELECTION STAFF.

4. ES&S Has Poor Data Tracking

This may seem to be the same as the above issue but it is not. This has to do with tracking of data within the EMS that is separate from media devices.

The findings indicate that ES&S has poor data tracking within its election management system, leading to potential issues with data combination from improper sources. As mentioned earlier, problems arise when thumb drives are not uploaded or are uploaded multiple times, causing discrepancies and repeated ballot records with new numbers.

While diligent election staff can work around these problems, it does not excuse the lack of proper data tracking by ES&S.

ES&S SHOULD BE REQUIRED TO CORRECT THIS ISSUE AND DEMONSTRATE DATA FROM LOGIC AND ACCURACY TESTS OR OTHER SCANS CANNOT BE INADVERTENTLY MIXED WITH LIVE ELECTION DATA.

5. ES&S Cannot easily make batch reports for auditing

The lack of a streamlined batch reporting system in ES&S voting machines poses a significant challenge for conducting batch-sampled audits. Unlike Dominion Systems, which assigns a unique number to each batch, ES&S struggles to generate batch reports in advance for auditing purposes. In a batch-sampled audit, it is essential to have an audit report that lists the vote totals for every contest for all the ballots in each batch before the audit begins. This report serves as a reference point and must remain unchanged (frozen) throughout the audit process.

Unfortunately, ES&S's current method of generating batch reports is not conducive to the requirements of batch-sampled audits. They employ a "rerun it without the batch and subtract" approach, which is time-consuming and inefficient. This means that ES&S can only produce batch reports for the audited batches after the audit has been conducted, making it challenging to perform timely and comprehensive audits across all batches.

A more efficient and reliable approach would be for ES&S to develop a system that can generate batch reports in advance, ensuring that the audit data is fixed and auditors have access to a consistent reference for comparison. Such a system would facilitate the process of hand-tallying or scanning and tabulating ballots with non-voting system software, like AuditEngine, and then comparing the results with the frozen batch reports.

As voting systems are a critical component of the democratic process, it is crucial for ES&S and other vendors to prioritize the development of features that support robust auditing and transparency. The ability to produce accurate and accessible batch reports in advance can enhance the credibility of election results and provide greater assurance to the public that the electoral process is fair and accurate.

CONCLUSION

In conclusion, the undersigned adamantly oppose the use of hybrid BMD machines like the ExpressVote XL. Unverifiable barcodes, hard-to-read printed text, and the potential for incorrect summaries raise serious concerns about the integrity of the voting process.

Based on my experience and analysis, I would like to recommend the following:

1. **Use Full-Face Handmarked Paper Ballots** and BMD devices only when needed by voters with disabilities or on an if-desired basis. However, even for voters with

disabilities, the verifiability of their vote remains a challenge, especially with BMD devices.

2. **The Printed Ballot Record** should use a "full face" format similar to hand-marked ballots for better verifiability and user confidence.
3. Given the current limitations in available voting systems, here are some near-term recommendations:
 - a. Avoid using the ExpressVote XL and similar BMD systems, except when required for voters with disabilities.
 - b. BMD devices should print the ballot record using the same "full face" format as hand-marked paper ballots.
 - c. Ensure that the contract with any vendor includes full tracking of all thumb drives and internal data to prevent unintentional data mixing and double-uploads.
 - d. Encourage vendors to improve their systems by implementing cryptographic signing of all ballot images, ensuring their integrity is protected.
 - e. If barcodes are used, they should be predictable and easily verifiable. We have provided a proposed method to improve these barcodes so the value of the barcode can be compared with printed numbers on the ballot. The existing barcodes are arbitrary and "just for show" but are important for auditing.

Thank you for taking the time to consider these important points. Ensuring the integrity and verifiability of our election systems is crucial to upholding our democratic principles. I am available for any further discussion or assistance you may require.

Sincerely,

Ray Lutz, MSEE
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