<h1 style="text-align:center">MEMORANDUM</h1>

TO: Karen Brinson Bell
FROM: Craig Merrill, Kitty Hawk, Dare County, NC
DATE: August 19, 2019

SUBJ: **Voting System Certification Considerations**

Summary

There are a few key areas that the North Carolina State Board of Elections (NCSBE) should consider prior to certifying new voting systems for our state:

● The combination of federal and North Carolina state election regulations mandate that our voting systems produce permanent paper ballots marked by the voter and which enable them to verify their choices at the time of voting. The paper ballots must also allow for post-election hand-to-eye counting. The regulations stipulate that election officials provide an ADA compliant system for disabled voters; however, they do not require that all voters use an ADA compliant system for voting.

● North Carolina General Statute requires that voting systems receive a thorough security review, and that the results of the review be reported.

● Recent studies demonstrate that:

○ many voters do not properly verify their voting choices when reviewing a ballot or ballot summary that they did not mark by hand;

○ Ballot Marking Devices (BMDs) have a significantly higher lifecycle cost when compared to using hand-marked ballots with optical scanning; and,

○ BMDs introduce additional security risks that are not well understood.

Recommendation

For these reasons, I urge the NCSBE to limit their certification of voting systems to systems, or portions thereof, that will allow election officials to <u>conduct elections using hand-marked paper ballots and separate ballot-marking devices (BMDs) using inkjet or laser ink to meet the needs of disabled voters</u>. This is the only option that appears to meet all regulations while minimizing costs and unnecessary security risks.

As summarized by one group of voting system experts—with similar sentiments echoed by many others: "The only known practical technology for a contestable, defensible, strongly software independent voting system is hand-marked paper ballots." [1]

Discussion

Regulation Considerations

North Carolina General Statutes require voting systems to meet all applicable federal and state laws before being certified by the state board.[2] This imposes important restrictions on voting systems as described below.

Ballots vs. Ballot Summaries

North Carolina General Statutes require that voting systems generate a paper ballot of each individual vote that is cast and defines a ballot as "an instrument on which a voter indicates that voter's choice . . . and is evidenced by an individual paper document that bears marks made by the voter by hand or through electronic means . . ." [3] According to Black's Law Dictionary and usa.gov, a ballot contains a list of all the candidates or choices.[4, 5] Therefore, voting systems that produce ballot summary cards as the paper record of voter intent do not "bear marks made by the voter," and do not include all possible choices. As such, ballot summaries do not meet North Carolina statute and do not meet the accepted definition of a ballot. Therefore, voting systems that use ballot summaries as the paper record of voter intent are not acceptable.

Ballots That Count Using Barcodes

Federal regulations require voting systems to produce a permanent paper record that can be used for manual audits;[6] and, North Carolina General Statutes require that the paper ballot generated by a voting system allow for hand-to-eye counting and auditing.[7] Therefore, a ballot that uses a barcode to record a voter's intentions cannot be used because humans cannot read barcodes; i.e., barcodes do not allow for hand-to-eye counting.

Ballot Permanence

Taken together, Federal and state regulations require that paper ballots serve as a permanent record of the election. [6, 3] Material printed using ink jet or laser jet printers are considered permanent records. However, direct thermal printed paper ink fades, especially when exposed to heat or light. Thus, it is not considered suitable for information considered critical or which must persist for extended periods. [8, 9][1]

Voter Verification

Federal regulations require that the voting system permit the voter to verify the votes they selected on the ballot.[10] Recent research suggests that when voters are given the opportunity to review the BMD output of their votes, their review is often error-prone (assuming the output does not use barcodes which are completely unreadable by voters), or they simply fail to review the output (possibly because they assume the computer won't make a mistake recording their vote). [11] Therefore, BMD-generated ballots will not meet the intent of the federal voter verification regulation for a significant portion of voters.

Security

North Carolina regulations stipulate that, "[p]rior to certifying a voting system . . . the State Board's review shall include a review of security, application vulnerability, application code, wireless security, security policy and processes, security/privacy program management, technology infrastructure and security controls, security organization and governance, and operational effectiveness, as applicable to that voting system." [12] The state's certification standard uses the laboratories approved for voting system

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[1] Previous public presentations have mentioned the concern that direct thermal print ballots will not meet the 22-month retention requirement. However, this regulation (52 USC § 20701) only applies to election records. Ballots must meet the more stringent "permanent paper record" criteria.

certification by the Election Assistance Commission (EAC). However, the EAC's test manual only requires the test laboratories to review one percent of the source code submitted by the voting system vendor, and only for the purpose of ensuring "that the code is mature and does not contain any systematic non-conformities." [13] Therefore, it is not evident that the laboratories have the technical capability to perform a meaningful security assessment of the voting system (penetration testing, system interface control, robust source code review, etc.) since the EAC does not require the laboratories to have this capability.

Nonetheless, even if the laboratories do have this expertise, the testing and certification documents made available to the public provide no objective quality evidence that the vendors' systems underwent a thorough security review as required by North Carolina statute. Unless the NCSBE has access to information the public does not, they should not have confidence that these voting systems meet the level of security intended by state law.

Cost of an All-BMD System

The estimated cost for using only BMDs for voting in the state of Georgia is 112 to 180 percent of the state's estimated cost for using just hand-marked paper ballots and scanners over a 10-year period. [14] The range in cost is caused by an assumed range of ballot printing requirements from high to moderate.[2]

As attacks on US voting systems become more sophisticated, it is reasonable to assume that the current generation of voting systems will not contain the protective measures needed to ensure the security of our elections (even assuming without evidence that they now do). This will require either significant upgrades to existing systems or the purchase new ones. Regardless, the result will be an unplanned increase in the cost of elections; a cost that could largely be mitigated by relying on hand-marked paper ballots.

References

[1] Appel, Andrew and DeMillo, Richard and Stark, Philip, Ballot-Marking Devices (BMDs) Cannot Assure the Will of the Voters (April 21, 2019). Available at SSRN: https://ssrn.com/abstract=3375755 or http://dx.doi.org/10.2139/ssrn.3375755.

[2] NCGS § 163A-1115 (a)(2)

      "That the voting system comply with all federal requirements for voting systems."

[3] NCGS § 163A-1115 (a)(4)

      "With respect to electronic voting systems, that the voting system generate a paper ballot of each individual vote cast . . ."

[4] Black's Law Dictionary. Definition of a ballot can be found at https://thelawdictionary.org/ballot.

[5] usa.gov. Definition of a ballot can be found at https://www.usa.gov/voting-and-election-definitions.

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[2] As explained by the author, printing estimates for the moderate hand-marked ballot (180%) "are based on generous upward adjustments from Georgia statewide historical results of total ballots cast, including voter registration growth between election cycles." The high printing estimate (112%) assumes "printing for 120% of 7.1 million registered voters, for every election, with x2 for Presidential Preference Primaries, and x3 for General Primary elections. (Note: Historical records for total ballots cast are actually far less than the calculated numbers of ballots printed.)" [14]

[6] 52 USC § 21081 (a)(2)(B)(i)

"The voting system shall produce a permanent paper record with a manual audit capacity for such system."

[7] NCGS § 163A-1115 (a)(4)

". . . paper ballot shall be maintained in a secure fashion and shall serve as a backup record for purposes of any hand-to-eye count, hand-to-eye recount, or other audit."

[8] Zebra Solutions discussion of thermal printing can be found at https://www.zebra.com/us/en/resource-library/getting-started/direct-thermal-thermal-transfer/direct-thermal-faq.html

[9] SATO America discussion of thermal printing can be found at https://www.satoamerica.com/resources/learning-center/white-papers/thermal-transfer-vs.-direct-thermal-five-key-considerations

[10] 52 USC § 21081 (a)(1)(A)(i)

". . . 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."

[11] DeMillo, Richard and Kadel, Robert and Marks, Marilyn, What Voters are Asked to Verify Affects Ballot Verification: A Quantitative Analysis of Voters' Memories of Their Ballots (November 23, 2018, Revised April 13, 2019). Available at SSRN: https://ssrn.com/abstract=3292208 or http://dx.doi.org/10.2139/ssrn.3292208.

[12] NCGS § 163A-1115 (e):

"At a minimum, the State Board's review shall include a review of security, application vulnerability, application code, wireless security, security policy and processes, security/privacy program management, technology infrastructure and security controls, security organization and governance, and operational effectiveness, as applicable to that voting system."

[13] EAC, "Voting System Test Laboratory Program Manual," Version 2.0, May 31, 2015, p. 21.

[14] Perez, "Georgia State Election Technology Acquisition: A Reality Check," (March 2019). Available at https://trustthevote.org/wp-content/uploads/2019/03/06Mar19-OSETBriefing_GeorgiaSystemsCostAnalysis.pdf.