



July 16, 2019

Honorable Kathy Boockvar  
Acting Secretary of the Commonwealth  
Pennsylvania Department of State  
Bureau of Commissions, Elections and Legislation  
302 North Office Building, 401 North Street  
Harrisburg, PA 17120

Dear Secretary Boockvar,

Pursuant to 25 P.S. § 3031.5, on behalf of the undersigned electors of the Commonwealth of Pennsylvania, we hereby request a re-examination of the ES&S ExpressVote XL electronic voting machine. We enclose at least ten (10) certifications of duly registered electors in the Commonwealth of Pennsylvania who seek this re-examination. We have enclosed a check for \$450 payable to the Treasurer of the Commonwealth of Pennsylvania.

As you know, “[t]he Secretary’s duty to re-examine the machines upon proper request is mandatory.” *Banfield v. Aichele*, 51 A.3d 300, 314 (Commw. Ct. Penn. 2012), *aff’d sub nom. Banfield v. Cortes*, 110 A.3d 155 (2015).

We have attached a list of deficiencies in the ExpressVote XL which require attention during re-examination. We also note that the ES&S ExpressVote HW 2.1 used as a tabulator shares many of the same deficiencies as the ExpressVote XL.

We respectfully request that the Secretary of the Commonwealth re-examine the ExpressVote XL electronic voting machine and issue a report relating to the functionality of the system. We request that this re-examination be conducted expeditiously because several counties in the Commonwealth have chosen or are considering the ExpressVote XL, and all counties must act quickly to comply with the Department of State directive to select new voter-verifiable paper record voting systems no later than December 31, 2019.

If the Secretary of the Commonwealth determines that the attached deficiencies are compelling evidence to preemptively decertify the ExpressVote XL, we would withdraw our petition for re-examination.

Respectfully submitted,

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# **Petition Pages**

**200 signatures by duly registered electors  
in the Commonwealth of Pennsylvania**

**From the counties:**

**Philadelphia  
Allegheny  
Montgomery  
Bucks  
Delaware  
Westmoreland  
Northampton**

## Attachment: ES&S ExpressVote XL Deficiencies

We seek re-examination of the ES&S ExpressVote XL voting machine on these grounds.

### 1. Tampering with Ballot Cards

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7 (12), which requires that a voting system:

“Provides acceptable ballot security procedures and impoundment of ballots to prevent tampering with or substitution of any ballots or ballot cards.”

Since the Pennsylvania Certification of ES&S EVS 6.0.2.1, security researchers discovered<sup>1</sup> that the ExpressVote XL exposes a ballot card cast by a voter to an internal printer prior to tabulation and impoundment. The internal printer is controlled exclusively by software which has the ability to tamper with the content of the ballot card. A malfunctioning or manipulated ExpressVote XL could add, modify, or invalidate votes *after* the voter has viewed, confirmed, and cast her ballot. It could change election outcomes without detection. This is a very high impact defect which affects the integrity and auditability of the voting system.

This defect violates the principle of software independence: “A voting system is software-independent if an undetected change or error in its software cannot cause an undetectable change or error in an election outcome.”<sup>2</sup> Software independence will be VVSG 2.0 Guideline 9.1 and is recognized as necessary for effective auditing. It is a “crucial” requirement for evidence-based elections as defined by Professors Philip Stark and David Wagner: “All three components are crucial. The risk-limiting audit relies on the integrity of the audit trail, which was created by the software-independent voting system (the voters themselves, in the case of paper ballots) and checked for integrity by

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<sup>1</sup> References available at:

<https://freedom-to-tinker.com/2018/10/16/design-flaw-in-dominion-imagecast-evolution-voting-machine>  
<https://freedom-to-tinker.com/2018/10/22/an-unverifiability-principle-for-voting-machines>  
[https://securiosa.com/posts/how\\_the\\_expressvote\\_xl\\_could\\_alter\\_ballots.html](https://securiosa.com/posts/how_the_expressvote_xl_could_alter_ballots.html)  
[https://securiosa.com/posts/how\\_expressvote\\_barcodes\\_could\\_be\\_modified.html](https://securiosa.com/posts/how_expressvote_barcodes_could_be_modified.html)

<sup>2</sup> “On the Notion of Software-Independence in Voting Systems,” Ronald Rivest and John Wack, *Philosophical Transactions of The Royal Society*, August 6, 2008, Page 1, available at <https://people.csail.mit.edu/rivest/RivestWack-OnTheNotionOfSoftwareIndependenceInVotingSystems.pdf>

the compliance audit.”<sup>3</sup> Acceptable ballot security procedures to prevent tampering must include ensuring auditability and enabling evidence-based elections.

It is common sense that a voting machine should not have the ability to change votes after the voter has confirmed and cast her ballot. The same reasoning is evident and explicitly stated in § 1222, 25 P.S. § 3062 (a), “No person while handling the ballots shall have in his hand any pencil, pen, stamp or other means of marking or spoiling any ballot.” Acceptable ballot security procedures to prevent tampering must include a similar restriction on any machine while handling the ballots.

## **2. Chronological Ballot Storage**

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7 (1), which requires that a voting system:

“Provides for voting in absolute secrecy and prevents any person from seeing or knowing for whom any voter, except one who has received or is receiving assistance as prescribed by law, has voted or is voting.”

The ExpressVote XL ballot container stores ballot cards in chronological order. It allows any poll worker or election official who knows even limited details about the sequence of voters to violate the absolute secrecy of one or more voters. A voter’s ballot could be determined by referencing the order of voters in the poll book or on the poll list, by counting from the first or last ballot in the set, or by counting from another identifiable ballot, such as one with a known write-in vote. This is a significant defect.

Chronologically ordered ballots fail to protect voters’ right to a secret ballot and enable information harvesting, vote buying and selling, and voter coercion.

The Pennsylvania Department of State has long held the position that voting systems with chronologically ordered ballots violate absolute secrecy. Dr. Michael Shamos, statutory examiner for the Secretary of the Commonwealth from 1980 to 2010, testified to a U.S. Senate committee in 2007, “Even paper trail advocates recognize that scrolled paper trails make it easy, not just possible, to determine how every voter in a precinct voted. The first voter’s ballot is first on the tape; the last voter’s is last; and everyone else’s is sequential order in between. A simple comparison between the paper trail and the poll list gives away everyone’s vote, in violation of the Section 201 requirement of a secret ballot. Even

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<sup>3</sup> “Evidence-Based Elections,” Philip Stark and David Wagner, *IEEE Security and Privacy*, May 8, 2012, Page 2, available at <https://www.stat.berkeley.edu/~stark/Preprints/evidenceVote12.pdf>

if only two percent of the vote is audited, it means that two percent of the voters are at risk of having their votes revealed.”<sup>4</sup>

The “Conditions of Certification” for ES&S EVS 6.0.2.1 do not require any procedures to randomize the order of ballot cards or to otherwise protect ballot secrecy. Even if procedures had been required, the voting system cannot depend on procedures—which may not be consistently or correctly employed—to restore ballot secrecy. The voting system itself must provide it.

### **3. Ballot Cards Colored by Party**

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (e):

“In primary elections, the Secretary of the Commonwealth shall choose a color for each party eligible to have candidates on the ballot and a separate color for independent voters. The ballot cards or paper ballots and ballot pages shall be printed on card or paper stock of the color of the party of the voter and the appropriate party affiliation or independent status shall be printed on the ballot card or at the top of the paper ballot and on the ballot pages.”

The ballot cards used by the ExpressVote XL are made of solid white thermal paper. The card stock is not colored for each party. The ballot cards are blank and do not have the appropriate party affiliation or independent status printed on the ballot card.

In primary elections, the party affiliation of a voter is determined definitively when the voter checks in, signs the poll book, and is given a ballot card. Before the voter may vote, a poll worker must configure the ExpressVote XL to display the ballot style of the voter’s party. If ballot cards are not on colored card stock with the party affiliation, the voter can tell the poll worker a different party affiliation, cast fraudulent votes in another party’s election, and the impounded ballot card would show no evidence of the fraud. Colored card stock with the party affiliation printed also reduces the chance that a poll worker will set the wrong ballot style for a voter by accident.

It should be demonstrated that the required ballot cards are possible and that the ExpressVote XL is capable of using them.

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<sup>4</sup> Testimony before the U.S. Senate Committee on Rules and Administration, July 25, 2007, <http://euro.ecom.cmu.edu/people/faculty/mshamos/Senate20070725.pdf>

#### **4. Serially Numbered Perforated Stubs**

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (f):

“...Each ballot card shall have an attached serially numbered perforated stub, which shall be removed by an election officer before the ballot card is deposited in the district automatic tabulating equipment or in a secure ballot box. The name of the county, and a facsimile of the signature of the members of the county board shall be printed on the ballot card stub.”

The ExpressVote XL violates § 1112-A, 25 P.S. § 3031.12 (b)(6), which requires a procedure for a district using paper ballots or ballot cards:

“Following the completion of his vote, the voter shall leave the voting booth and return the ballot to the election officer by a means designed to insure its secrecy; upon removal of the stub of the ballot by the election officer, the voter shall insert the ballot into the district automatic tabulating equipment or, in the event district tabulation is not provided for by the voting system or such district tabulation equipment is inoperative for any reason, into a secure ballot box. No ballot card from which the stub has been detached shall be accepted by the election officer in charge of such equipment or ballot box, but it shall be marked “spoiled” and shall be placed in the envelope marked “Spoiled Ballots”.”

In addition, § 1113-A, 25 P.S. § 3031.13 (a) requires that, after the polls have been closed, the serially numbered stubs be used as evidence of the number of ballots issued to electors so that number may be announced in the polling place and recorded.

The ballot cards used by the ExpressVote XL do not have attached serially numbered perforated stubs. The ballot cards are blank and do not have a facsimile of the signature of the members of the county board printed on the ballot card stub.

The ExpressVote XL is designed such that a voter does not handle the ballot after the completion of her vote. The voter cannot leave the voting booth with the ballot card to return it to an election officer. The election officer does not have an opportunity to remove the stub. The election officer is not able to verify that the stub has not been detached from the ballot card in order to mark it as spoiled.

Without serially numbered stubs and signatures, any person could forge ballot cards. Forged ballot cards can be submitted for tabulation secretly and independently because, unlike most district tabulating equipment, the ExpressVote XL tabulator is inside a privacy curtain, where election workers cannot observe voter activity.

Serially numbered stubs prevent “chain voting.” Professor Doug Jones describes the fraud technique and the defense against it: “The organizer of the chain needs one valid ballot to begin with. He then marks this ballot and gives it to a voter willing to participate in the fraud. With each participant, the organizer instructs the participant to vote the pre-voted ballot and bring back a blank ballot from the polling place. Voters are paid for the blank ballot. The best defense against chain voting involves printing a unique serial number on a removable stub on each ballot. When ballots are issued to voters, the stub numbers should be recorded. No ballot should be accepted for deposit in the ballot box unless its stub number matches a recently issued number. Finally, to preserve the voter’s right to a secret ballot, the stub should be torn from the ballot before it is inserted in the ballot box.”<sup>5</sup>

It should be demonstrated that the required ballot cards are possible and that the ExpressVote XL is capable of using them.<sup>6</sup>

## **5. Valid Marks on a Ballot Card**

The ExpressVote XL violates § 1112-A, 25 P.S. § 3031.12 (b)(2-4), which applies to districts using paper ballots or ballot cards.

The three procedures in § 3031.12 (b)(2-4) each specify that a voter shall vote on a ballot card by “making a cross (X) or check (✓) mark or by making a punch or mark sense mark in the square opposite the name” of the candidate, the party, the write-in position, or the answer to a ballot question. The type of mark and its position relative to the name is specified six times in total.

The ExpressVote XL does not make a cross or check mark or make a punch or mark sense mark, nor does it permit a voter to do so. On an ExpressVote ballot card there is no

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<sup>5</sup> “On Optical Mark-Sense Scanning,” Douglas W. Jones, in *Towards Trustworthy Elections*, 2010, Page 178, available at <http://homepage.cs.uiowa.edu/~jones/voting/OpticalMarkSenseScanning.pdf>

<sup>6</sup> Upon information and belief, the ExpressVote XL could be made to use compliant ballot cards, as ES&S apparently offered serially numbered cards in Michigan. However, the machines certified and used in Pennsylvania do not use compliant ballot cards.



square opposite the name in which to place any mark. Instead a barcode is printed near the top of the ballot card, separate and far from the name. The barcodes are not even listed in the same order as the names are listed.

The type of mark and its position relative to the name is an important requirement. A valid mark next to a corresponding name allows the voter to verify that each vote matches her intent prior to casting the ballot card, ensuring the principle of “cast as intended.” A valid mark next to a corresponding name allows election officials or any person to easily observe, count, and audit the vote, without software or special equipment. The Election Code intends for the meaning of each vote to be transparent and software independent.

## 6. Indicated Voting Positions on Ballot Cards

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (a)(2).

“The pages placed on the voting device shall be of sufficient number to include, following the listing of particular candidates, the names of candidates for any nonpartisan offices and any measures for which a voter may be qualified to vote on a given election day, provided further that for municipal, general or special elections, the first ballot page shall list in the order that such political parties are entitled to priority on the ballot, the names of such political parties with designating arrows so as to indicate **the voting square or position on the ballot card** where the voter may insert by one mark or punch the straight party ticket of his choice.” (Emphasis added).

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (d).

“In partisan elections **the ballot cards shall include a voting square or position** whereby the voter may by one punch or mark record a straight party ticket vote for all the candidates of one party or may vote a split ticket for the candidates of his choice.” (Emphasis added).

The ExpressVote XL lists political parties on the touchscreen. If a voter makes a straight party choice, the ExpressVote XL will later record the selection by printing a barcode and human-readable text on the ballot card. This process does not meet the requirements.

An electronic voting machine is required to list the political parties with arrows to indicate positions *on the ballot card*. The ExpressVote XL does not indicate voting positions on the ballot card, nor does it use any “designating arrows.” In fact, there are no fixed positions on the ballot card—the location of the barcode and human-readable text will vary depending on the voter’s other selections.

## 7. Unlawful Assistance in Voting

The ExpressVote XL would require voters to violate § 1218, 25 P.S. § 3058 (a):

“No voter shall be permitted to receive any assistance in voting at any primary or election, unless there is recorded upon his registration card his declaration that, by reason of blindness, disability, or inability to read or write, he is unable to read the names on the ballot or on the voting machine labels, or that he has a physical disability which renders him unable to see or mark the ballot or operate the voting machine, or to enter the voting compartment or voting machine booth without assistance, the exact nature of such condition being recorded on such registration card, and unless the election officers are satisfied that he still suffers from the same condition.”

The ExpressVote XL would require election officers to violate § 1111-A, 25 P.S. § 3031.11 (b):

“At the polling place on the day of the election, each voter who desires shall be instructed, by means of appropriate diagrams and a model, in the operation of the voting device before he enters the voting booth. If any voter shall ask for further instructions concerning the manner of voting after entering the voting booth, any election officer may give him **audible instructions without entering such booth**, but no such election officer shall when giving such instructions in any manner request, suggest or seek to persuade or induce any such voter to vote any particular ticket or for any particular candidate or other person or for or against any particular question.” (Emphasis added).

The ExpressVote XL would require voters and election officers to violate § 1220, 25 P.S. § 3060 (a):

“... No elector shall be allowed to occupy a voting compartment or voting machine booth already occupied by another, except when giving assistance as permitted by this act.”

When any voter using the ExpressVote XL wants to spoil her ballot card or wants to handle the ballot card for physical review, they must select an option in the interface to “Quit.” The ExpressVote XL displays on screen (and reads into the audio ballot) the message: “Vote Session Canceled. Your ballot was canceled with no votes cast. Ask an election official for help.” The ExpressVote XL emits a chiming sound to alert a poll worker. A poll worker must enter the voting booth, touch a designated location on the screen, enter an administrator password using an on-screen keypad, and retrieve the ballot card from the windowed container where it is held.

All voters have the right to spoil their ballot card. (§ 1112-A, 25 P.S. § 3031.12 (b)(5): “Any voter who spoils his ballot may return it and secure another.”) A voting system is required to allow voters to spoil their ballot card. (§ 1107-A, 25 P.S. § 3031.7 (10): “If it is of a type that uses paper ballots or ballot cards to register the vote and automatic tabulating equipment to compute such votes, the system shall provide that a voter who spoils his ballot may obtain another ballot”.) The ExpressVote XL does not allow a voter to spoil her ballot card without a poll worker entering the booth in violation of the above requirements.

Voters with disabilities may wish to handle the ballot card to verify it using a magnifier or other personal assistive device. This is only possible with poll worker assistance and is only permitted if the voter has previously recorded their disability on their voter registration. Voters who have recorded a disability may “select a person” to enter the voting booth (§ 1218, 25 P.S. § 3058 (b)). This person could be a poll worker, but if another person has already been selected to assist, a poll worker entering the booth would violate the above requirements.

This deficiency has consequences for both the voter and the poll worker. § 1830, 25 P.S. § 3530 (“Unlawful assistance in voting”) specifies that any voter “who, without having made the declaration under oath or affirmation required by section 1218 of this act ... shall permit another to accompany him into the voting compartment or voting machine booth” or “any person who shall go into the voting compartment or voting machine booth with another while voting or be present therein while another is voting” is guilty of a misdemeanor and will be sentenced to pay a fine, imprisonment, or both.

## 8. Poll Workers in the Booth and Ballot Secrecy

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7 (1), which requires that a voting system:

“Provides for voting in absolute secrecy and prevents any person from seeing or knowing for whom any voter, except one who has received or is receiving assistance as prescribed by law, has voted or is voting.”

The ExpressVote XL violates the Help America Vote Act of 2002 (HAVA), § 301(a)(1)(A) (ii), which requires that a voting system shall:

“provide the voter with the opportunity (in a 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)”

The previously described procedure for spoiling a ballot card on the ExpressVote XL allows the poll worker, upon entering the voting booth, to view the selections on the ballot card through the windowed container and while handling the ballot card. The poll worker will look directly at the ballot card while extracting it from the container. The poll worker can see and know for whom the voter has voted or is voting. The ExpressVote XL does not allow any voter to privately and independently correct an error through the issuance of a replacement ballot.

It is also noteworthy that this procedure reveals an administrator password to the voter. The poll worker enters the password in front of the voter using an on-screen keypad and each character is displayed in the input field as it is typed. During public demonstrations of the ExpressVote XL, several members of the public reported easily observing the administrator password used.

## 9. Accessibility

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7(5), which requires that a voting system:

“Permits **each** voter to vote for any person and any office for whom and for which he is lawfully entitled to vote, whether or not the name of such

person appears upon the ballot as a candidate for nomination or election.” (Emphasis added).

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7(3), which requires that a voting system:

“Permits **each** voter...to vote a straight political party ticket...by one mark or act, to vote for all the candidates of one political party for every office to be voted for, and every such mark or act shall be equivalent to and shall be counted as a vote for every candidate of the political party so marked including its candidates for presidential electors, except with respect to those offices as to which the voter has registered a vote for individual candidates of the same or another political party or political body, in which case the automatic tabulating equipment shall credit the vote for that office only for the candidate individually so selected, notwithstanding the fact that the voter may not have individually voted for the full number of candidates for that office for which he was entitled to vote.” (Emphasis added).

The ExpressVote XL violates the Help America Vote Act of 2002 (HAVA), § 301(a), which requires that a voting system shall:

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.”

1.A.ii: “provide the voter with the opportunity (in a 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).”

3.A: “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.”

To the extent that any HAVA Section 261 funds are involved, use of the ExpressVote XL also violates HAVA § 261 (b):

An eligible State and eligible unit of local government shall use the payment received under this part for— (1) making polling places . . . accessible to individuals with disabilities, including 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.

The Pennsylvania Certification of ES&S EVS 6.0.2.1 included an accessibility testing report on pages 68-94. The ExpressVote XL was harshly reviewed by the accessibility test group.

“Every participant had at least one problem, despite relatively high election knowledge and digital experience, suggesting that the issue would be more severe for voters without these personal resources to help them understand what is happening.” (Page 70)

“None of the participants could verify the ballot in the glass cage:

- Blind voters had no access to the ballot to use personal technology
- Low vision voters could not position the ballot so they could read the small text
- Other voters had problems reading the ballot because of glare and because the sides of the ballot were obscured by the cage.
- Although it is possible to have the ballot ejected to handle it while verifying, the procedure is unclear and it requires voters to tell the system they want to “Quit” and call a poll worker.” (Page 74)

Participants in the accessibility study found the ExpressVote XL made it difficult to cast write-in votes. For a vote for a write-in candidate to count, spelling must be perfect and “[a]ll of the participants knew that a misspelled write-in would not be counted, but could not figure out how to review what was typed.” (Pages 70-71, 86-87). Furthermore, the ExpressVote XL did not allow participants to review any write-in votes through the audio ballot because the text of the write-in is not encoded in the barcodes printed on the ballot card. (Pages 73, 75, 88).

Voters relying on the audio ballot had significant issues with voting a “straight-party” ticket. If a voter selects a single candidate outside the straight-party ticket, the ExpressVote XL deselects all other candidates, without informing the audio-guided voter. The accessibility testing report describes this problem as “not only a failure to vote independently, but identifying and solving the problem requires revealing their votes to a poll worker or assistant.” (Pages 68-69). The audio ballot also “does not announce the party of each candidate. This made it impossible to

complete tasks based on party, including confirming straight party selections.” (Pages 83, 86).

The Pennsylvania Department of State’s accessibility testing report makes it clear that the ExpressVote XL is not accessible for individuals with disabilities “in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters.” Most importantly for these voters, it does not “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.”

## 10. The *Stein* Settlement

The ExpressVote XL violates the settlement in *Stein v. Cortes*:<sup>7</sup>

- “2. The Secretary will only certify new voting systems for use in Pennsylvania if they meet these criteria:
  - a. The ballot on which each vote is recorded is paper;
  - b. They produce a voter-verifiable record of each vote; and
  - c. They are capable of supporting a robust pre-certification auditing process.
3. The Secretary will continue to direct each county in Pennsylvania to implement these voting systems by the 2020 primaries, so that every Pennsylvania voter in 2020 uses a voter-verifiable paper ballot.”

The ExpressVote XL does not provide the voter a paper ballot, as that term is defined by 25 P.S. § 3031.1. Instead, it provides a “ballot card.” A paper ballot is a piece of paper with the options pre-printed, whereas a ballot card only prints a voter’s selection on blank piece of paper. *See id.* (defining paper ballot as “a printed paper ballot which conforms in layout and format to the voting device in use” and ballot card as “a card which is compatible with automatic tabulating equipment and on which votes may be registered”).

Because the ExpressVote XL does not provide a paper ballot, Pennsylvania voters in counties using the ExpressVote XL will not receive a voter-verifiable paper ballot in 2020, in contravention of the *Stein* settlement’s requirement that the Secretary “direct each county in Pennsylvania to implement these voting systems by the 2020 primaries, so that every Pennsylvania voter in 2020 uses a voter-verifiable paper ballot.”

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<sup>7</sup> *Stein v. Cortes*, No. 16-cv-06287, ECF No. 108 (E.D. Pa. Nov. 28, 2018), available at <http://bit.ly/SteinSettlement>.