Pennsylvania Needs Resilient, Evidence-Based Elections

Written Testimony Prepared For
Pennsylvania Senate State Government Hearing
September 25, 2018

Citizens for Better Elections
and
SAVE Bucks Votes

A Look at the Danaher ELECTronic/Shouptronic 1242 DRE

The Danaher ELECTronic 1242 is one of the oldest voting machines still in use. Dauphin County's machines, purchased in 1985, may be the oldest in the United States. For perspective: the first version of Microsoft Windows was launched at the end of 1985. Its age raises concerns about its reliability and suitability for use in Pennsylvania's elections. Would anyone use Windows 1.0 to do critical work today? It is a Digital Recording Electronic Voting Machine (DRE) with the problems common to DREs (see next page).

A Sample of Incidents Involving Danaher Voting Machines

- New Castle County, DE, 2000: Failed to register a vote for President for 7,876 voters (3.6%).[1]
- Nationwide, 2004: The Danaher had the highest number of voter-reported problems sent to the Election Incident Reporting System. Out of ~20 different voting machine models, 18% were on Danahers.[2]
- Franklin County, OH, 2004: Added 3,893 extra votes for President in a precinct with only 800 voters.[3]
- New Mexico, 2004: One out of every 20 ballots cast on election day did not register a vote for President.[4]
- Berks County, PA, 2005: Did not record 111 votes because several results cartridges were in "training mode." Three races were decided by less votes but the election board voted not to hold a new election. 100 angry voters petitioned the Commonwealth to re-examine the reliability of the Danaher.[5]
- Philadelphia County, PA, 2006: ~200 machines would not start up or could not record write-in votes.[6]
- Bucks County, PA, 2009: Five municipalities had machines that were broken or had jammed paper rolls for write-in ballots.[7]
- Dauphin County, PA, 2018: When a storm took out power, backup batteries on the machines failed.[8]

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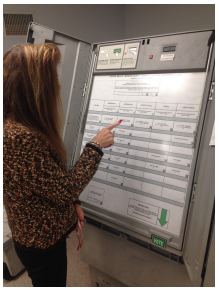
[1] "Votes At Risk In Some States," Cincinnati Post, July 9, 2004
[2] https://josephhall.org/papers/NRC-CSTB_mulligan-hall_200412.pdf
[3] https://www.nytimes.com/2004/11/06/politics/campaign/glitch-found-in-ohio-counting.html
[4] http://www.votersunite.org/info/NewMexico2004ElectionDataReport-v2.pdf
[5] "Vote Machines Will Work Well, Supplier Says," Reading Eagle, Nov. 3, 2005
[6] http://www.votetrustusa.org/pdfs/Pennsylvania/Pa%20Voting%20Machines%20Lawsuit%20MEDIA%20KIT%20with%20complaint.pdf
[7] http://www.votersunite.org/article.asp?id=8410
[8] http://www.witf.org/state-house-sound-bites/2018/05/storm-knocks-out-power-backup-batteries-at-harrisburg-polling-place.php

Problems with Direct Recording Electronic Voting Machines (DREs)

- Voters cannot verify their ballot was recorded as intended. They can only hope it was correct.
- It provides no evidence to prove result totals are correct. An election that runs smoothly is assumed to produce a correct result. If it was wrong, no one would know. There is no way to "trust but verify."
- Votes cannot be recounted. Only the stored electronic data—which may not be correct or may have been edited—can be recounted. It is like asking the same doctor for a second opinion.
- They are not resilient. Votes may be permanently lost if machines break or malfunction.
- It is a computer. All computers are vulnerable to reprogramming and to having their digital data edited without a trace. It takes a screwdriver and 15 minutes to alter the logic components. Malware can spread via the results cartridges; it does not require an internet connection. Security researchers have document many vulnerabilities and demonstrated how they can be hacked.
- They are beyond their expected lifespan of 10-15 years. The hardware is no longer manufactured and the operating systems are no longer supported or updated. Mechanical, electrical, and plastic parts wear out. Repairs are more frequent and more expensive.

Four DREs commonly used in Pennsylvania



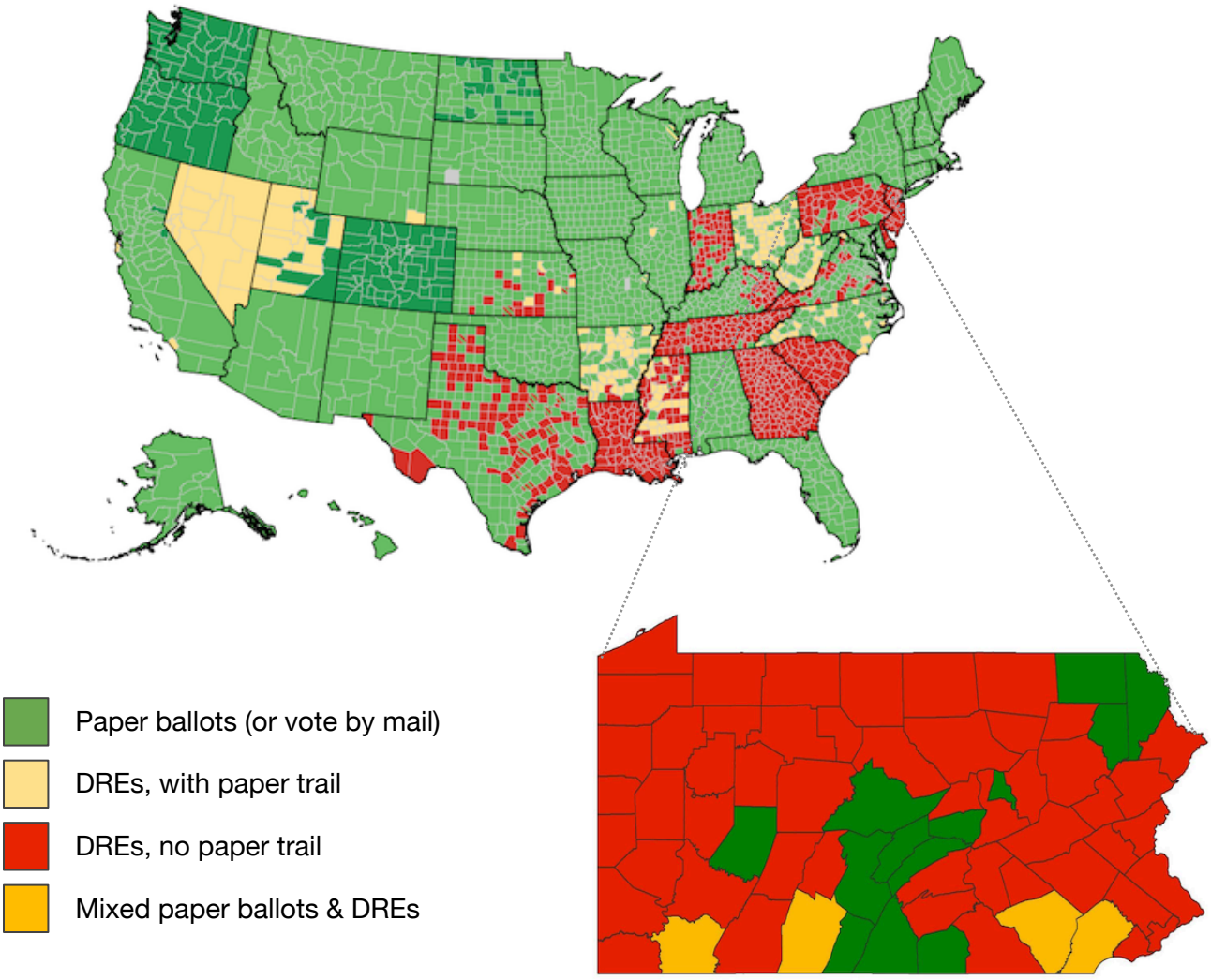
Danaher
Shouptronic 1242

Sequoia
Advantage

ES&S
iVotronic

Diebold
Accuvote TSX

80% of U.S. voters either use paper ballots or vote on machines with a paper trail. In Pennsylvania, less than 17% of voters use paper ballots or machines with a paper trail.



Source: Verified Voting / Time.com

Total registered voters in Pennsylvania	8,711,375	
Voters using electronic voting without paper audit	7,245,883	83.2%
Voters using optical scan / paper ballots	1,465,492	16.8%

(Voter data as of October 31, 2016)

The Solution: Paper Ballots

To ensure resilient, evidence-based elections, election integrity experts recommend:
- hand-marked paper ballots
- counted by an optical scanner
- with ballot marking devices for accessibility needs
- routinely verified by post-election audits

Hand-Marked Paper Ballots
Hand-marked paper ballots put as little technology between the voter and their vote as possible. There is no source of calibration errors, malfunction, or hacking. Paper ballots are intuitive and easy to use. Simple, non-technical solutions are better because many voters are not technology savvy. Paper ballots are reliable. Even if machines fail or power is lost, voters can still vote. Most importantly, paper ballots provide a paper record that can be recounted in close elections and audited to detect problems.

Optical Scanners
Scanners provide fast, accurate counts of paper ballots. They can be trusted to count the votes because there is already a paper record and routine post-election audits will detect errors. Scanners offer helpful features such as alerting voters to ballot problems, such as over-votes, and retaining digital ballot images to facilitate audits and adjudication. They can even count absentee ballots.

Ballot Marking Devices
Ballot marking devices (BMDs) assist voters with vision loss or certain mobility challenges in marking paper ballots so that they can vote privately and independently.

Post-Election Audits
Election results can be verified by recounting paper ballots. In close elections, every ballot can be recounted, but in most elections, Risk Limiting Audits (RLA) can be used to validate results using a much smaller statistical sample, sometimes less than 1%. Fortune 500 companies use similar practices all the time for quality control. RLAs should be performed routinely after every election.

Shorter Lines and Less Expense
Paper ballot systems have shorter lines, serve more voters per polling place, and require fewer machines. Most polling places only need one scanner and one BMD. Many voters can fill out ballots at the same time, which keeps lines short. If lines form, additional voting spaces can be easily added. Fewer machines means lower hardware costs and less time and money spent on testing, delivery, maintenance, and storage.

Experts Agree on Paper Ballots

Election integrity experts agree that hand-marked paper ballots, scanned by optical scanners, backed by post-election audits is the best system to guarantee elections are secure, accurate, and verifiable.

- **Letter signed by 100 experts in computer science, cybersecurity, statistics, and election auditing**
  https://www.electiondefense.org/election-integrity-expert-letter/

- **Pennsylvania Joint State Government Commission Report**
  http://jsg.legis.state.pa.us/publications.cfm?JSPU_PUBLN_ID=463

- **U.S. Senate Select Committee on Intelligence Recommendations**
  https://www.burr.senate.gov/imo/media/doc/One-Pager%20Recs%20FINAL%20VERSION%203-20.pdf

- "**We need to hack-proof our elections. An old technology can help."**
  Washington Post Opinion by Michael Chertoff and Grover Norquist
  http://wapo.st/2BYjJvu

- **The George W. Bush Center report on election security**
  http://www.bushcenter.org/publications/articles/2018/01/we-should-be-hardening-our-defenses.html

- **"America's Voting Machines at Risk"**
  Lawrence Norden and Christopher Famighetti, The Brennan Center for Justice
  https://www.brennancenter.org/publication/americas-voting-machines-risk

- **Congressional testimony by Prof. Andrew Appel, Princeton University**
  https://oversight.house.gov/wp-content/uploads/2016/09/2016-09-28-Appel-Princeton-Testimony.pdf

- **Congressional testimony by Prof. Matt Blaze, University of Pennsylvania**
  https://oversight.house.gov/wp-content/uploads/2017/11/Blaze-UPenn-Statement-Voting-Machines-11-29.pdf

- **"Evidence-based Elections"**
  Prof. Philip Stark and Prof. David Wagner, University of California Berkeley
  https://www.stat.berkeley.edu/~stark/Preprints/evidenceVote12.pdf